Muskoka Airport Development Options



PRESENTED TO
District Municipality of Muskoka

FEBRUARY 2022
ISSUED FOR USE REV.1
FILE: TRN.AIRP03465-06

Tetra Tech Canada Inc.
PO Box 74042 Beechwood PO
Ottawa, ON K1M 2H9 CANADA

This page intentionally left blank.

EXECUTIVE SUMMARY

The Muskoka Airport Master Plan (MP) was approved by the District Municipality of Muskoka in February 2021. There has been significant discussion since that time on the implications of the closure of the existing turf Runway 09-27 and the repositioning of this runway on a new turf Runway 12-30 heading.

The October 2021 report to Council prepared by the Muskoka Airport Board provided many recommendations, one being the closure of Runway 09-27 and the protection of lands for a potential new turf runway (Runway 12-30). The recommendation for the closure of Runway 09-27 was based on the direction of the MP while the protection of lands for Runway 12-30, rather than construction, was due to the recent cost estimate for the new turf Runway 12- increasing from the conceptual budgetary cost of $600,000, to a Class B cost estimate of $994,000.

It was clear from the October Council meeting that most Councillors supported the inclusion of a crosswind runway, whether on a 09-27 heading or 12-30 heading. The final direction from Council at the October meeting was to compare the costs for continuing Runway 09-27 operations and developing potentially suitable lands east of the main Runway 18-36, to the development concepts that were included in the MP.

In addition, Council directed staff to review and compare the costs for extending both runways. The analysis was intended to compare equal runway scenarios for both alignments including turf runways of approximately 2,000 ft., runways at 2,400 ft. (the maximum length Runway 12-30 can be extended on airports property), and 4,500 ft for potential future use. The objective was to compare runways at equal lengths for consistency. The extended runways are intended to serve Aircraft Group Number (AGN) II aircraft and the runway pavement structure is therefore significantly different than the structure required for a turf runway, which only serves AGN I aircraft.

It is understood that lengthening Runway 12-30 to longer than 2,400 ft. would require the crossing of Runway 18-36 and, extending further, relocation of the Gravenhurst Parkway and acquisition of lands west of the Parkway.

To be clear, an extension of the crosswind runway was not considered in the original master plan because there was no evidence of demand that would support this action. In addition, the mandate was to investigate the highest and best use of airport-owned lands only.

This report is referred to as the Muskoka Airport Development Options (MADO) and follows the District Council directions outlined above. The Airport Improvement and Development Strategies in this MADO are structured to respond to demands during the master planning period (20 years), similar to the original MP. However, 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-19 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 focuses on a positive outcome to the pandemic, returned growth in the aviation industry and as a result, potential development at Muskoka Airport over the next 10 years and beyond.

The MADO report is divided into three distinct sections:

- Strategy #1 – construction of a new turf Runway 12-30 and planned commercial development in areas identified in the MP.
- Strategy #2 – maintaining Runway 09-27 and assessing commercial development on alternative airport lands.
- Evaluation of runway extensions for 2,400 ft. and 4,500 ft. for Runway 09-27 and 12-30.

Comparison of Strategy #1 and #2 development costs, as shown in the following tables shows Strategy #1 development costs are higher over the 20-year period. It is important to consider how each development area is phased. Changing the land use (e.g., multi-lots versus a single large MRO) can alter costs considerably because the large MRO concept assumes the developer is responsible for the bulk of the land development costs whereas in a multi-lot development scenario the airport incurs the higher up-front costs.

Strategy #1 Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Southwest Quadrant Development (Large MRO) – assumes airport constructs apron, access road and parking lot)			
Total Cost	$3,875,000	$1,550,000	$5,425,000
Southeast Quadrant Development			
Total Cost	$4,700,000	$1,880,000	$6,580,000
West Quadrant Development			
Total Cost	$3,639,000	$1,455,000	$5,094,000
Total Airport Development Costs (20-Year)	**$12,214,000**	**$4,885,000**	**$17,099,000**

Strategy #2 Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
East Quadrant Development	$8,145,000	$3,258,000	$11,403,000
West Quadrant Development - MRO	$2,538,000	$1,015,000	$3,553,000
Total Airport Development Cost (20-Year)	**$10,683,000**	**$4,273,000**	**$14,956,000**

In the shorter term, one must consider the costs to develop an MRO site and an initial supply of development lots (e.g., 12 lots) finds the strategies comparative because Strategy #2 requires higher upfront costs (e.g., access road construction, taxiway etc.). The land development concepts in the East Quadrant in Strategy #2 also position the development areas in close proximity to environmentally sensitive areas. An environmental assessment and regulatory approvals will be required and the findings from the assessment are not clear at this time. This is not to suggest that development cannot occur in these areas, rather, the EA will determine whether the developments can proceed and what types of mitigation measures may be required to ensure environmental protection.

The MADO mandate was to compare alternative land development strategies with the MP and to assess the implications and costs for a longer, fully functional, crosswind runway.

The runway 09-27 and 12-30 runway extension costs indicated in the following Tables shows Runway 09-27 to be a more cost effective and viable option with less operational constraints for construction. It is recognized that land acquisition may be required at both ends of the runway to achieve 4,500 ft in length.

Runway 09-27 can be extended to 4,000 ft. on airport-owned property and be able to accommodate many of the AGN II aircraft that are identified as suitable for a 4,500 ft. runway. It is important to restate that a longer crosswind runway was not considered in the MP and there is no evidence to suggest the runway is or will ever be required. A more detailed air service study would be needed to determine this requirement.

Crosswind Runway 12-30 Cost Comparison

	Construction	Contingencies and Engineering	Total Cost
Crosswind Runway at 2,400 ft.	$5,185,000	$2,074,000	$7,259,000
Crosswind Runway at 4,500 ft.	$9,614,000	$3,846,000	$13,460,000

Crosswind Runway 09-27 Cost Comparison

	Construction	Contingencies and Engineering	Total Cost
Crosswind Runway at 2,400 ft.	$3,976,000	$1,590,000	$5,566,000
Crosswind Runway at 4,500 ft.	$8,927,000	$3,570,000	$12,497,000

The following are the salient points and findings from the financial and economic analysis.

- It is assumed that Strategy #1 would move faster and generate economic activity more quickly because there is an active prospect interested in a large investment now.
- Strategy #1 has a higher NPV over 25 years because it is projected to generate revenue more quickly. The projected NPV for Strategy #1 is $6.1 million versus $4.9 million for Strategy #2.
- The economic impact is higher for Strategy #1 after five years, but the two strategies are projected to have comparable impacts after 10 years.

The comparative analysis in conjunction with the economic impact assessment suggests that the demand for immediate commercial development may favour Strategy #1 while the possible requirement for a future 4,500 ft. crosswind runway favours an overall Strategy #2 development.

Decisions on which strategy best serves the airport must weigh the importance of immediate and long-term commercial development and the actual need for a crosswind runway and the associated investment that will be required.

There is immediate demand for development lots at the airport, and the highest and best use of airport lands favours Strategy #1. Also, the upfront development costs in the East Quadrant are higher and the potential environmental constraints are more significant at the east side of the airport.

Net Present Value (NPV) calculations suggest that investments in the developments identified in the approved master plan provide the best investment strategy in the short-term, and that the region will potentially see a significant economic impact from airport development over the next five years.

It is therefore recommended that the Airport Board proceed with the approved Muskoka Airport Master Plan dated October 2020, approved by Muskoka District Council on January 29, 2021. Further it is recommended that lands be reserved along the Runway 12-30 alignment in the event a crosswind runway is required.

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

1.0 INTRODUCTION 1

2.0 AIRPORT IMPROVEMENT AND DEVELOPMENT STRATEGY 2
2.1 Land Development Concepts 2
2.2 Environmental Assessment 3
2.2.1 Provincial Policy Statement 4

3.0 STRATEGIC DEVELOPMENT PLANNING 4
3.1 Development Strategy #1 4
3.2 Development Strategy #2 5
3.3 Runway Extensions 5

4.0 DEVELOPMENT STRATEGY #1 5
4.1 Southwest Quadrant Development 7
4.2 Southeast Quadrant Development 10
4.3 West Quadrant Development (West of Existing Skyservice Building) 12
4.4 Strategy #1 Cost Summary 14

5.0 STRATEGY #2 14
5.1 East Quadrant Development 16
5.2 West Quadrant Development (West of Existing Skyservice Building) 18
5.3 Northeast Quadrant Development 20
5.4 Strategy #2 Cost Summary 22

6.0 RUNWAY EXTENSION ASSESSMENT 22
6.1 Runway 12-30 25
6.2 Runway 09-27 26
6.3 Runway Length Considerations 26
6.4 Runway Length Cost Comparisons 29

7.0 COMPARATIVE ANALYSIS 30

8.0 FINANCIAL ANALYSIS AND ECONOMIC IMPACT ASSESSMENT 31

9.0 CLOSURE 35

LIST OF TABLES IN TEXT

Table 6-1: Pros and Cons Analysis for Runway 12-30 25
Table 6-2: Pros and Cons Analysis for Runway 09-27 26
Table 6-3: Runway Length Requirements 28
Table 6-4: Runway Use Projections 29

Table 6-5: Crosswind Runway 12-30 Cost Comparison 29
Table 6-6: Crosswind Runway 09-27 Cost Comparison 29
Table 7-1: Development Strategy Comparison with Turf AGN I Crosswind Runway 30
Table 7-2: Development Strategy Comparison with 2,400 ft. Paved AGN II Crosswind Runway 30
Table 7-3: Development Strategy Comparison with 4,500 ft. Paved AGN II Crosswind Runway 31
Table 8-1: Strategy #1 vs Strategy #2 Direct Economic Impacts after 5 Years, 2021 $s 34
Table 8-2: Strategy #1 vs Strategy #2 Economic Impacts after 10 Years, 2021 $s 34
Table 8-3: Strategy #1 vs Strategy #2 Direct Capital Impacts after 10 years, 2021 $s 35

LIST OF FIGURES IN TEXT

Drawing 4-1: Overall Development Strategy #1 6
Drawing 4-2– Southwest Quadrant - Large MRO Development 9
Drawing 4-3: Southeast Quadrant Commercial Development 11
Drawing 4-4: West Quadrant Commercial Development Option A 13
Drawing 5-1: Overall Development Strategy #2 15
Drawing 5-2: East Quadrant Development Area 17
Drawing 5-3: West Quadrant Commercial Development – Large MRO 19
Drawing 5-4: Northeast Quadrant Development 21
Drawing 6-1: Runway 12-30 Length Analysis 23
Drawing 6-2: Runway 09-27 Length Analysis 24

APPENDIX SECTIONS

Appendix A Limitations on the Use of This Document
Appendix B Development Cost Estimates

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of 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 Muskoka Airport Master Plan (MP) was approved by the District Municipality of Muskoka in February 2021. There has been significant discussion since that time on the implications of the closure of the existing turf Runway 09-27 and the potential repositioning of this runway as a new turf runway on a 12-30 heading.

The October 2021 report to Council prepared by the Muskoka Airport Board provided many recommendations, one being the closure of Runway 09-27 and the protection of lands for a potential new turf runway (Runway 12-30). The recommendation for the closure of Runway 09-27 was based on the direction of the MP while the protection of lands for Runway 12-30, rather than construction, was due to the recent cost estimate for the new turf Runway 12- increasing from the conceptual budgetary cost of $600,000 to a Class B cost estimate of $994,000.

It was clear from the October Council meeting that most Councillors supported the inclusion of a crosswind runway, whether on a 09-27 heading or 12-30 heading. The final direction from Council at the October meeting was to compare the costs for continuing Runway 09-27 operations and developing potentially suitable lands east of the main Runway 18-36, to the development concepts that were included in the MP.

In addition, Council directed staff to review and compare the costs for extending both runways. The analysis was intended to compare equal runway scenarios for both alignments including turf runways of approximately 2,000 ft., runways at 2,400 ft. (the maximum length Runway 12-30 can be extended on airports property), and 4,500 ft for potential future use. The objective was to compare runways at equal lengths for consistency. The extended runways are intended to serve Aircraft Group Number (AGN) II aircraft and the runway pavement structure is therefore significantly different than the structure required for a turf runway, which only serves AGN I aircraft.

To be clear, an extension of the crosswind runway was not considered in the MP because there was no evidence of demand that would support this action. In addition, the mandate was to investigate the highest and best use of airport-owned lands only.

This report is referred to as the Muskoka Airport Development Options (MADO) and follows the District Council directions outlined above. The Airport Improvement and Development Strategies in this MADO are structured to respond to demands during the master planning period (20 years), similar to the original MP. However, 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-19 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 focuses on a positive outcome to the pandemic, returned growth in the aviation industry and as a result, potential development at Muskoka Airport over the next 10 years and beyond.

The MADO is divided into three distinct sections:

- Strategy #1 – construction of a new Runway 12-30 and planned commercial development in areas identified in the MP.
- Strategy #2 – maintaining Runway 09-27 and assessing commercial development on alternative airport lands.
- Evaluation of runway extensions for 2,400 ft. and 4,500 ft. for Runway 09-27 and 12-30.

In addition to a series of recommendations relating to airport infrastructure in the MP, our development concepts anticipated a phased development strategy. This development strategy is referred to in this MADO as Strategy #1 and includes the following phasing:

- Southwest (SW) Quadrant

- Southeast (SE) Quadrant
- West (W) Quadrant (west of Skyservice).

A continued Runway 09-27 operation would require a completely different development strategy which is referred to as Strategy #2 in this MADO. The development strategy includes the East and Northeast Quadrants which were not included in the MP.

For this MADO, the Strategy #2 phasing would be:

- East (E) Quadrant
- West (W) Quadrant (West of Skyservice)
- Northeast (NE) Quadrant

The analysis in the following sections is intended to assess the two strategies for airport needs over a 20-year planning period.

2.0 AIRPORT IMPROVEMENT AND DEVELOPMENT STRATEGY

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

The development timelines are:

- Short Term (2022 – 2027)
- Medium Term (2028 – 2033)
- Long Term (2033 and beyond)

2.1 Land Development Concepts

The Muskoka Airport lands are largely developed, and the availability of new commercial development lands is extremely limited (e.g., 2 or 3 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 development costs render these options fiscally challenging and perhaps unacceptable due to environmental constraints.

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. The phasing for development for the first major development area will depend on the speed at which infill lots are leased. 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. This includes aprons and parking lots for the MRO options.
- 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 10 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.
- The development areas are conceptual in nature and developers will be required to complete geotechnical and drainage studies as part of the design process.

2.2 Environmental Assessment

A Natural Heritage opportunities and constraints assessment was included in the approved Muskoka Airport Master Plan and Land Use Plan to assist the airport with facilitating long-term development. The final report included recommendations based on the Natural Heritage records review, constraints mapping, and identified mitigation strategies for the entire property. The opportunities and constraints assessment are intended to inform future airport expansion and operation by identifying areas with relatively high and 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 MADO. 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.

Development potential on the East and Northeast Quadrants were not included in the MP due to the environmentally sensitive area delineation and the inclusion of these areas in the MADO will trigger a more comprehensive environmental assessment. Regulatory approvals will be required for the eastern developments.

It is noteworthy that the environmentally sensitive delineations are present on the western boundaries of the airport as well.

It is expected that the environmental assessment and regulatory decisions will take approximately 8 months.

2.2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) provides policy direction on matters of interest related to land use planning and development. Natural features and areas shall be protected for the long term.

The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features. Key statements from the PPS include:

- Development and site alteration shall not be permitted in significant wetlands.
- Development and site alteration shall not be permitted in wetlands with significant wildlife habitat and significant areas of natural and scientific interest and development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
- Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.
- Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

The areas to the east and west of the airport property have not been determined as significant wetlands at this time. This designation would only be determined after the environmental assessment was completed.

3.0 STRATEGIC DEVELOPMENT PLANNING

The commercial development concepts identified in this section are intended to compare the two airport development strategies. The strategies are dependent on either a closure of Runway 09-27 and construction of a new turf runway on a 12-30 magnetic north heading, or the continued operation of Runway 09-27.

For this planning exercise, earthwork quantities for all development areas and runway extensions were better estimated using Light Detection and Ranging (LiDAR) survey data provided by the District.

3.1 Development Strategy #1

- Closure of Runway 09-27
- Construction of a New Runway 12-30
- Development in the Southwest (SW) Quadrant
- Development in the Southeast (SE) Quadrant
- Development in the West (W) Quadrant
- The work required in this section was completed as part of the MP.
- For comparison, estimated costs in this report have been updated as required to reflect current pricing.

3.2 Development Strategy #2

- Continued operation of Runway 09-27
- Development of the East (E) Quadrant
- Development of the West (W) Quadrant (like the MP concept)
- Development in the Northeast (NE) Quadrant

3.3 Runway Extensions

Runway 09-27 is currently a 2,199 ft. turf runway. Runway 12-30 was proposed as a 2,000 ft. turf runway as an alternate to Runway 09-27 following its closure. The analysis in this report includes these runway lengths and surface types (i.e., turf) as a base case, with reconstruction to paved runways of 2,400 ft. and 4,500 ft. for comparison. As noted above, Runway 12-30 aligns with Strategy #1 and Runway 09-27 with Strategy #2.

The assessment includes identification of potential constraints and estimated Class D costs for the runway extensions.

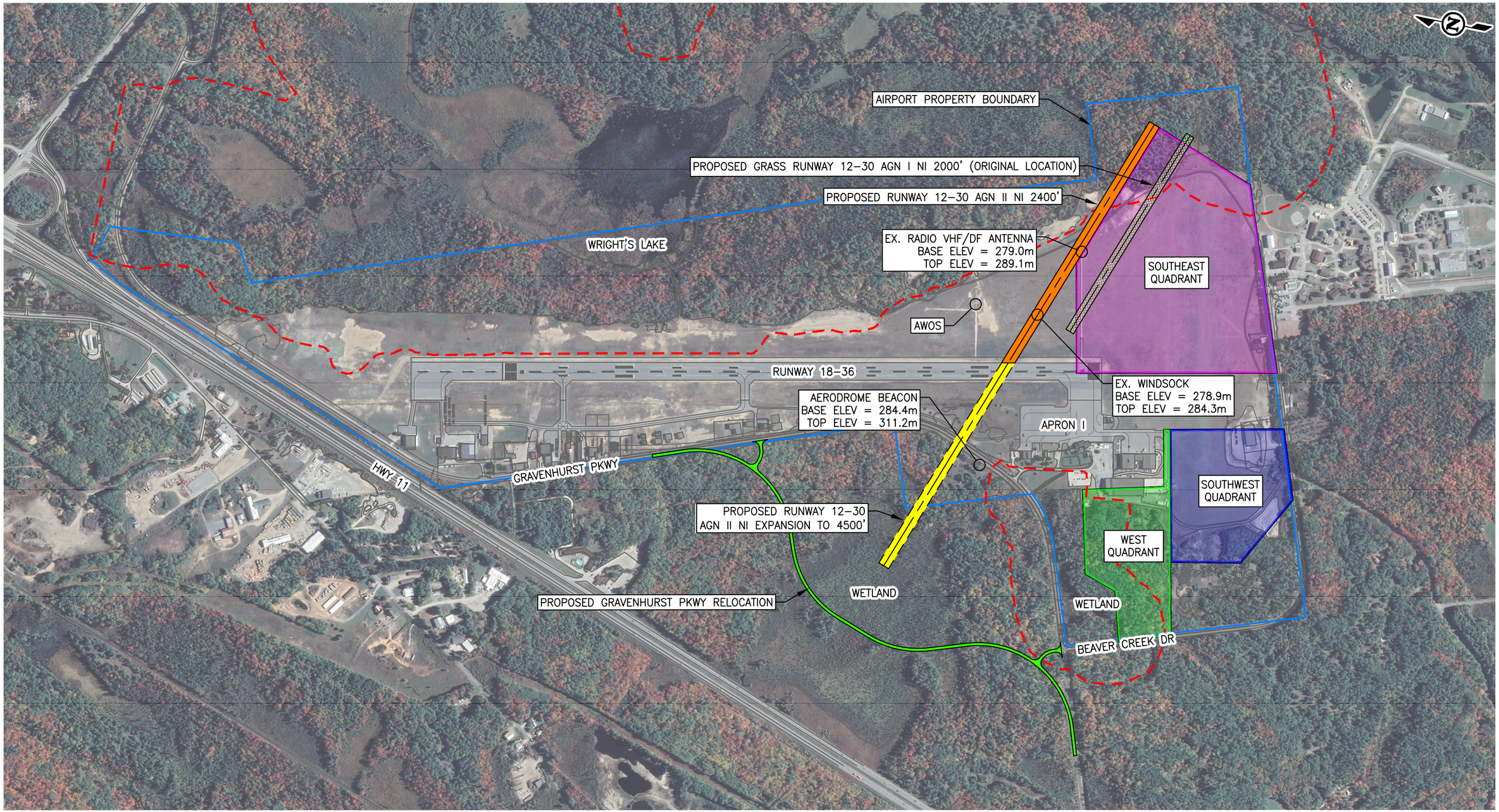
A detailed design of the runways, costs associated with the repositioning of the Gravenhurst Parkway, and procurement of lands west of the Gravenhurst Parkway, are not included in this assignment. For perspective, the costs for the repositioning the Parkway and the land acquisition have been estimated in the $5,000,000 range.

As stated previously, the requirement for a longer, paved crosswind runway was not included in the MP. Consultations with various commercial stakeholders have not indicated a demand for a crosswind runway. Also, a 4,500 ft. runway will only be an acceptable length for Aircraft Group Number (AGN) II type (e.g., twin-engine turboprop aircraft). One must note that these aircraft can also accommodate higher crosswind components. AGN I aircraft (e.g., small single-engine piston type aircraft) are historically the typical users of the existing turf Runway 09-27 when crosswinds exceed 10 knots.

4.0 DEVELOPMENT STRATEGY #1

Development Strategy #1 includes development sections from the MP which have not been significantly altered. The fundamental implication for Development Strategy #1 remains unchanged from the MP. It includes the closure of existing Runway 09-27, construction of a new turf Runway 12-30, and development initially occurring on the lands currently occupied by Runway 09-27.

Drawings have been prepared for the overall development strategy as well as each individual quadrant. The drawings follow each section.



LEGEND:

- SOUTHWEST QUADRANT DEVELOPMENT (4–2)
- SOUTHEAST QUADRANT DEVELOPMENT (4–3)
- WEST QUADRANT DEVELOPMENT (4–4)
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- GRAVENHURST PKWY EXPANSION
- RUNWAY 12–30 EXTENSION TO 4500'
- RUNWAY 12–30 2400'
- RUNWAY 12–30 2000'

0 200 500

SCALE: 1:10,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT

MUSKOKA AIRPORT YQA, MUSKOKA ON

OVERALL STRATEGY 1
DEVELOPMENT CONCEPT PLAN

PROJ : TRN.AIRP03465-06		CONTR :	
DFTG : J.S.	DSGN : C.N.	CHK : C.N.	APPD :

DATE : 2022/01/31

4-1

PLOT DATE: 2022/01/31 AT 10:28:48 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15574\AIRP03465-06_FIG4-1.DWG [Overall Strategy 1 Development Concept Plan]

4.1 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 5 to 10 years.

The site is ideal for development because of the existing topography east of the gravel airport perimeter road and relatively low development costs.

Table 4-1: Southwest Development Area Benefits and Challenges

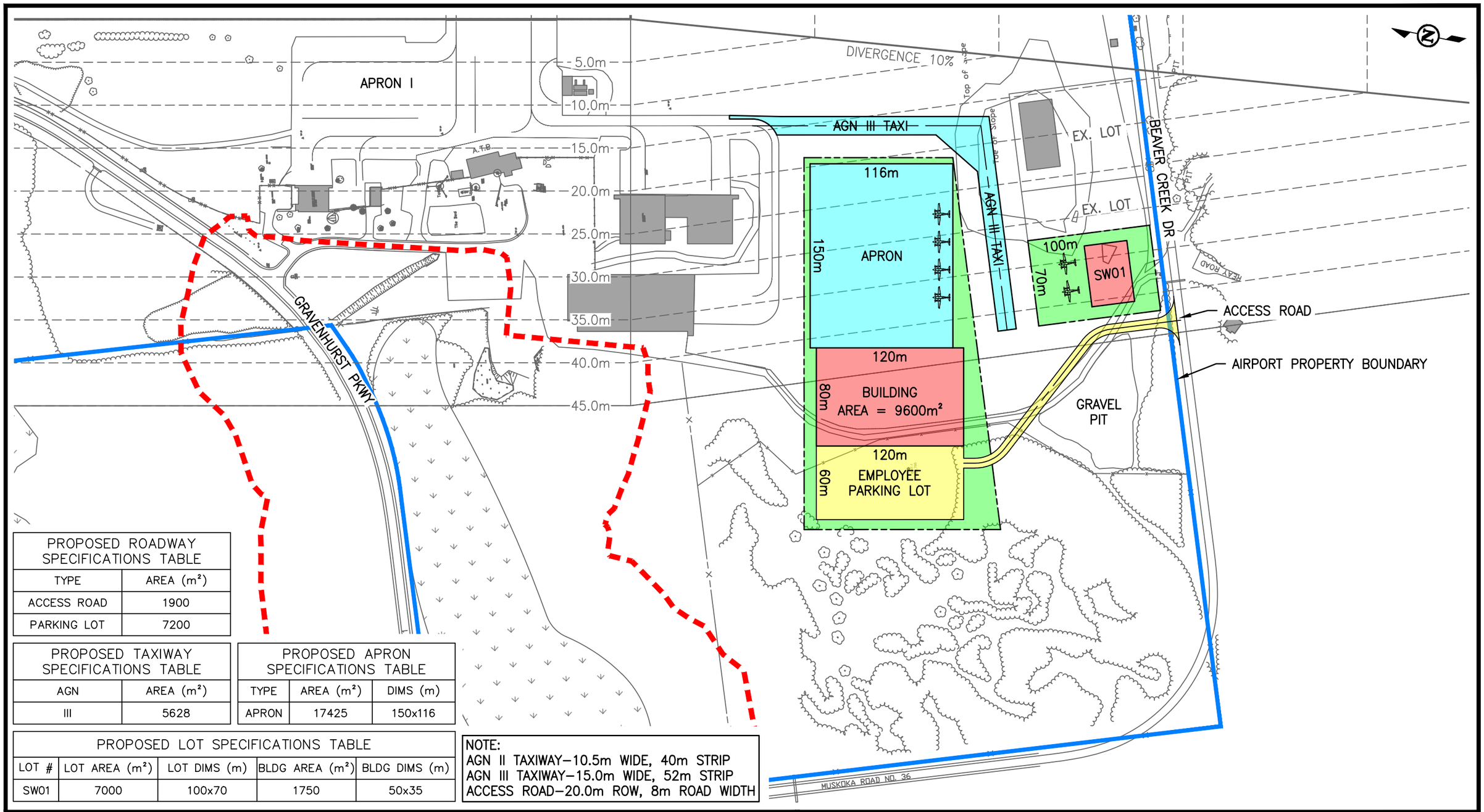
Benefits	Challenges
Easy access from Beaver Creek Drive	Would require the closure of Runway 09-27
Depending on the required lot size this parcel could provide for a significant number of development lots (12) or a large MRO development	Development scenarios would have to consider the location of the gravel pit
The topography is relatively flat and clear east of the gravel airport perimeter road	Topography west of the gravel airport perimeter road undulates significantly and is understood to be comprised of bedrock.
Relatively easy Taxiway D connection to access Apron I and Runway 18-36	Drainage issues in the general development area can cause seasonal flooding in some areas
The land would be suitable for any type of development (e.g., large maintenance, repair, overhaul (MRO), or smaller parcels for hangar development)	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 aircraft operations on the main Runway 18-36 become problematic
Infrastructure development costs would be reasonable	

Table 4-2: Southwest Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease
Total Development Area	5.0 ha
Typical Lot Size	1 large MRO: Apron 17,400 m^2, Building 9,600 m^2 and parking area 7,200 m^2 1 Lot, 100 m x 70 m Concept B – this alternative land development was included in the MP but is not included in this MADO. 12 Lots ranging from 30 m x 90 m to 70 m x 100 m
Typical Lot Area	Concept A: 4.3 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 or south end
Services Available	Developer to provide septic services and water well

Table 4-3: Southwest Development Area Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Large MRO Development (assumes airport funds taxiway connection, access road and lease lot preparation MRO) (Refer to Drawing 4-2)	$3,875,000	$1,550,000	$5,425,000



PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ACCESS ROAD	1900
PARKING LOT	7200

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
III	5628

PROPOSED APRON SPECIFICATIONS TABLE		
TYPE	AREA (m²)	DIMS (m)
APRON	17425	150x116

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SW01	7000	100x70	1750	50x35

NOTE:
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH

LEGEND:
- PROPOSED LOT
- PROPOSED ACCESS ROAD & PARKING LOT
- PROPOSED APRON & AGN III TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 150
SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

STRATEGY 1
SOUTHWEST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06 | CONTR :
DFTG : J.S. | DSGN: C.N. | CHK : C.N. | APPD :
DATE : 2022/01/31

4-2

PLOT DATE: 2022/01/31 AT 10:29:04 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15574\AIRP03465-06_FIG4-2.DWG [Southwest Quadrant Development]

4.2 Southeast Quadrant Development

The Southeast Quadrant of the airport is suitable for multi-lot development.

Table 4-4: Benefits and Challenges

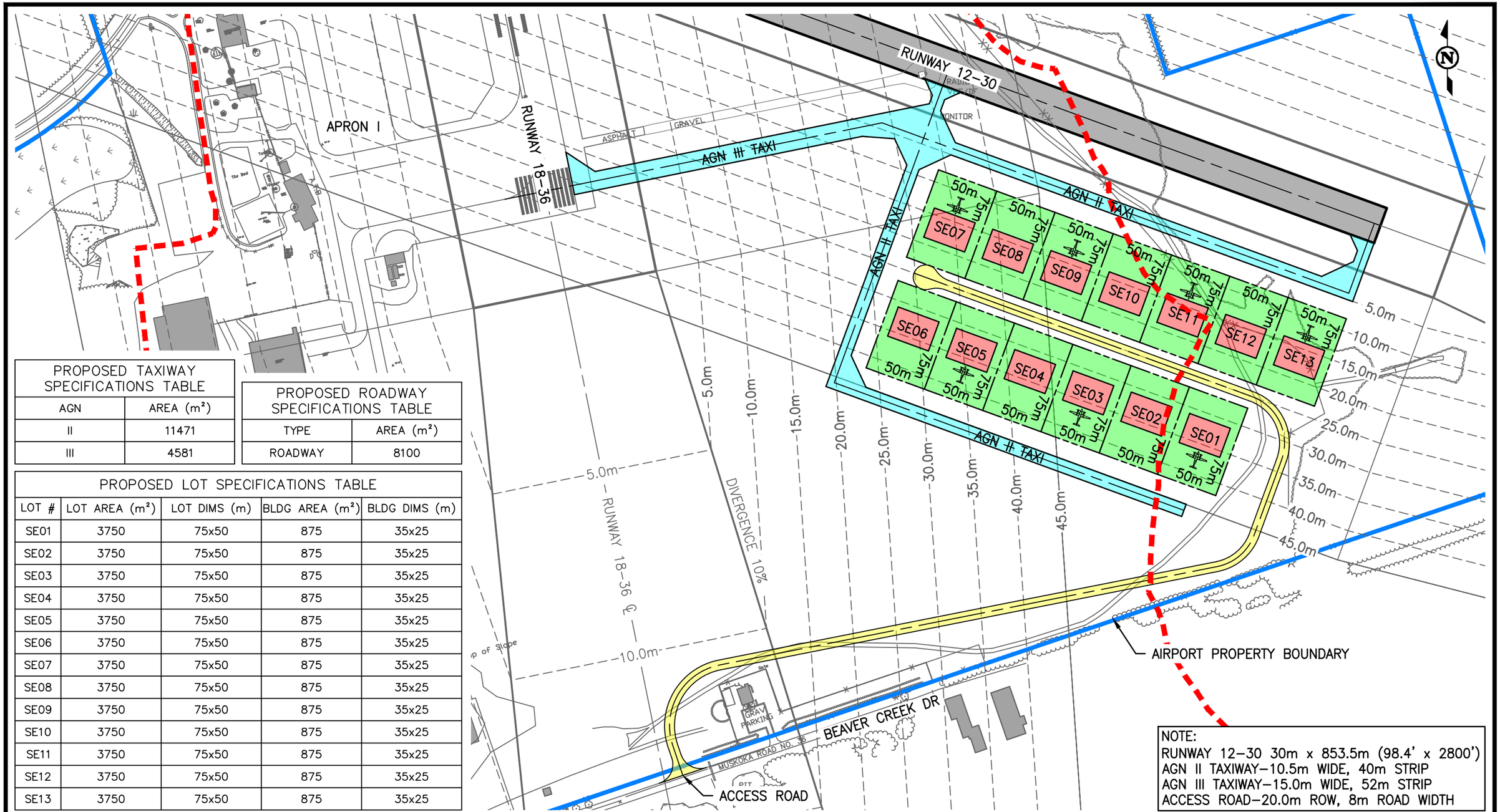
Benefits	Challenges
Access from Beaver Creek Drive	Separation from the main hangar line is not desirable
The topography is relatively flat and clear	Development must consider separation from AWOS and VHF/DF antenna
Easy taxiway connection to Runway 18-36	Possible environmental constraints (e.g., wetlands) on the east end of the development area
Large parcels for development	The Southeast Quadrant development is predicated on the closure of Runway 09-27
The land would be suitable for any type of development (e.g., hangars)	
Infrastructure development costs would be reasonable	

Table 4-5: Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease only
Total Development Area	4.875 ha
Typical Lot Size	13 lots: 50 m x 75 m
Typical Lot Area	0.375 ha
Height Limitations	10 m plus
Airside Access	Connection to Threshold Runway 36 and Proposed Runway 12-30
Landside Access	Connection to Beaver Creek Road
Services Available	Developer to provide septic services and water well

Table 4-6: Southeast Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Multi-lot Development	$4,700,000	$1,880,000	$6,580,000



PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
II	11471
III	4581

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	8100

PROPOSED LOT SPECIFICATIONS TABLE

LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SE01	3750	75x50	875	35x25
SE02	3750	75x50	875	35x25
SE03	3750	75x50	875	35x25
SE04	3750	75x50	875	35x25
SE05	3750	75x50	875	35x25
SE06	3750	75x50	875	35x25
SE07	3750	75x50	875	35x25
SE08	3750	75x50	875	35x25
SE09	3750	75x50	875	35x25
SE10	3750	75x50	875	35x25
SE11	3750	75x50	875	35x25
SE12	3750	75x50	875	35x25
SE13	3750	75x50	875	35x25

NOTE:
RUNWAY 12–30 30m x 853.5m (98.4' x 2800')
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II & AGN III TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 150
SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON
STRATEGY 1
SOUTHEAST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**4-3**
DFTG : J.S.	DSGN : C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:29:22 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15574\AIRP03465-06_FIG4-3.DWG [Southeast Quadrant Development]

4.3 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 costs for the land development area is significant.

Table 4-7: West Quadrant Development Area Benefits and Challenges

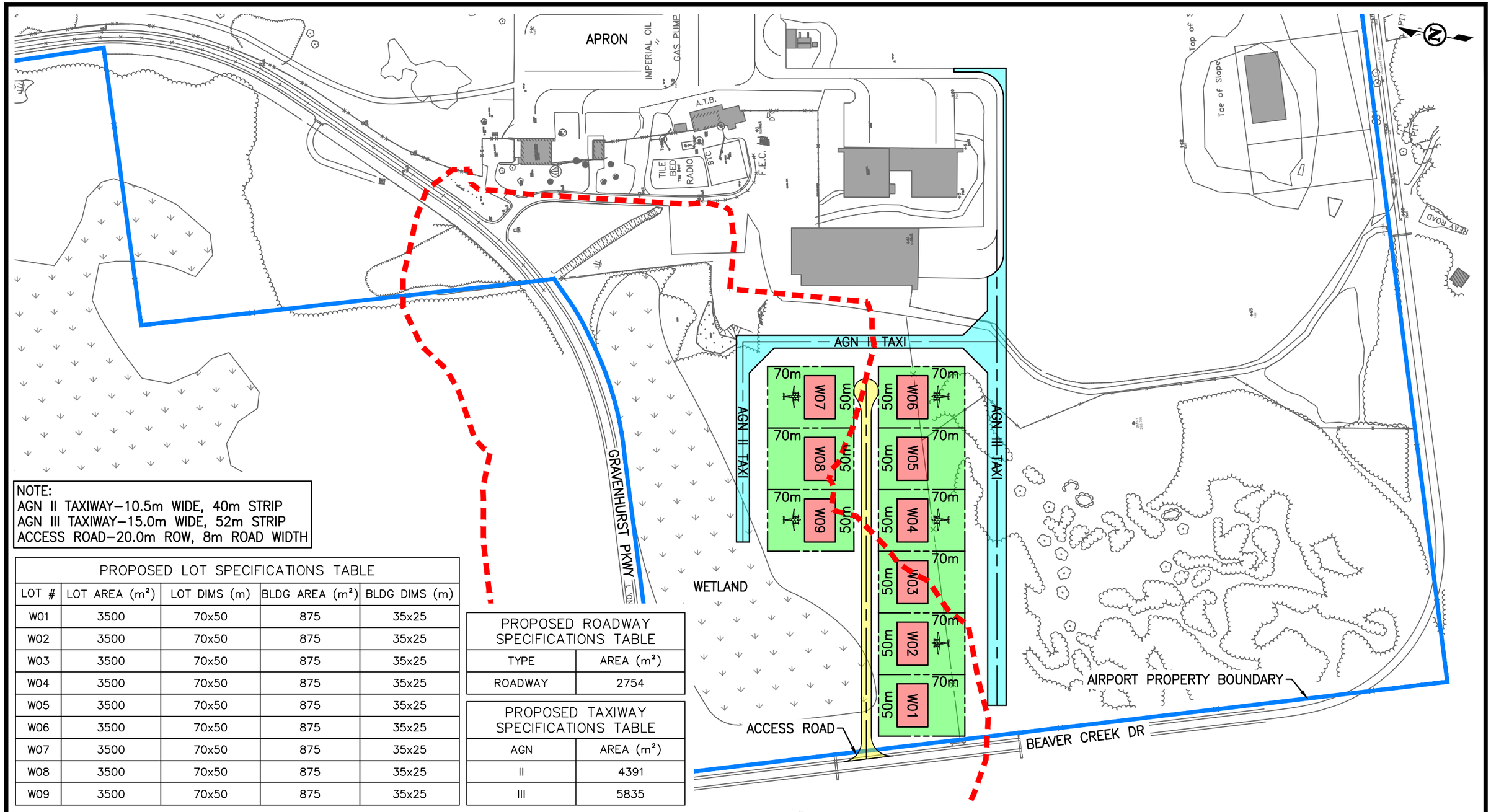
Benefits	Challenges
Easy access from Beaver Creek Drive or from main terminal area	Development cost will be very high due to topography. Aircraft can only operate on taxiways with relatively flat slopes (e.g., less than 2%) and therefore this site would require significant blasting and clearing and grubbing.
Easy taxiway extension from Taxiway D	Possible environmental constraints (e.g., wetlands). An environmental assessment and regulatory approvals would be required.
Large parcels for development	
The land would be suitable for any type of development (e.g., hangars)	

Table 4-8: West Quadrant Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease only
Total Development Area	3.15 ha
Typical Lot Size	9 Lots: 50 m by 70 m
Typical Lot Area	0.35 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 4-9: West Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Multi-lot Development	$3,639,000	$1,455,000	$5,094,000



NOTE:
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m^2)	LOT DIMS (m)	BLDG AREA (m^2)	BLDG DIMS (m)
W01	3500	70x50	875	35x25
W02	3500	70x50	875	35x25
W03	3500	70x50	875	35x25
W04	3500	70x50	875	35x25
W05	3500	70x50	875	35x25
W06	3500	70x50	875	35x25
W07	3500	70x50	875	35x25
W08	3500	70x50	875	35x25
W09	3500	70x50	875	35x25

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m^2)
ROADWAY	2754

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m^2)
II	4391
III	5835

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II AND AGN III TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 150
SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

STRATEGY 1
WEST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**4-4**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:29:39 PLOTTED BY: SCHITHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15574\AIRP03465-06_FIG4-4.DWG [West Quadrant Development]

4.4 Strategy #1 Cost Summary

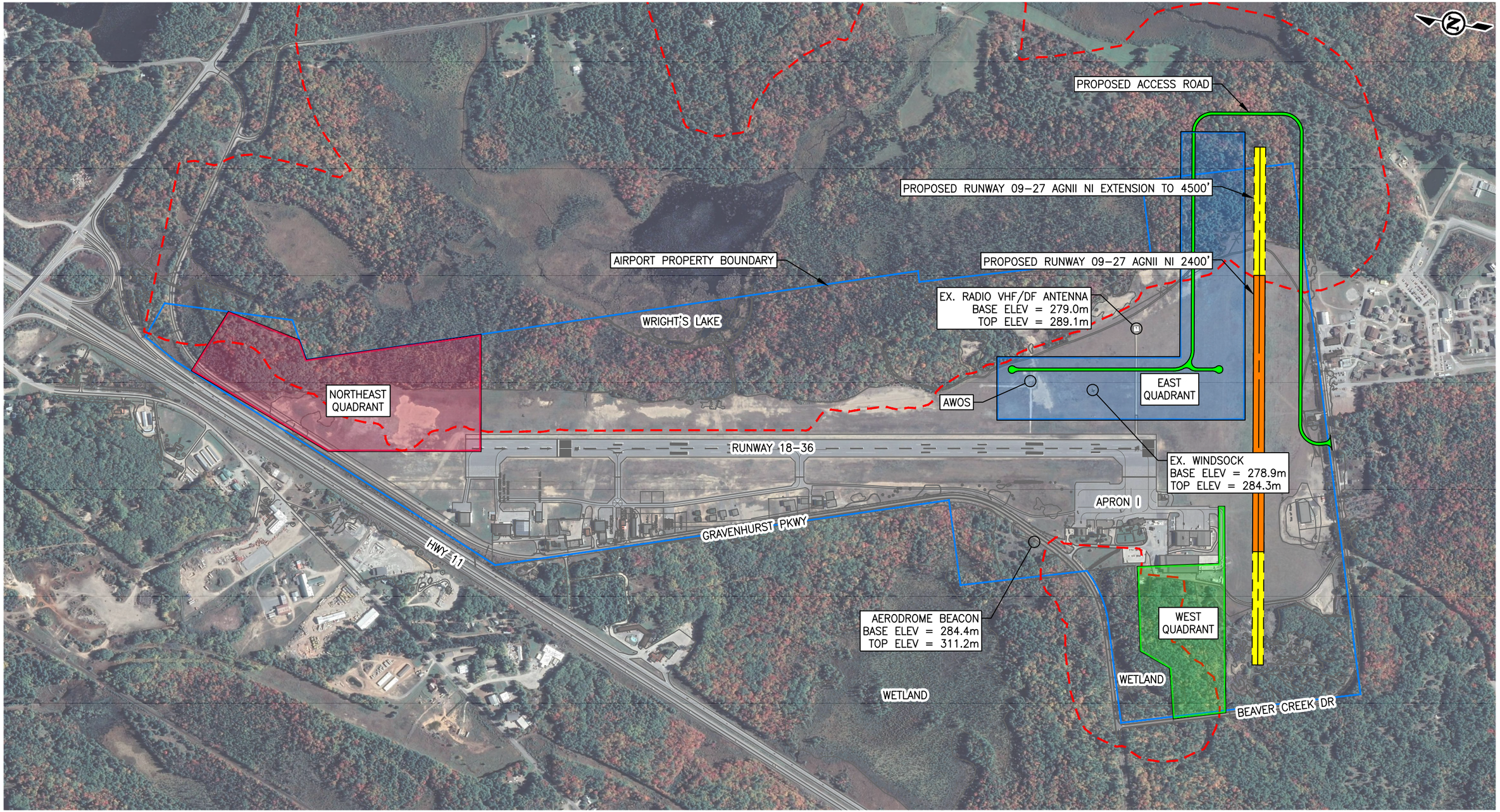
Table 4-10: Development Costs - Strategy #1

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Southwest Quadrant Development (Large MRO) – assumes airport constructs apron, access road and parking lot)			
Total Cost	$3,875,000	$1,550,000	$5,425,000
Southeast Quadrant Development			
Total Cost	$4,700,000	$1,880,000	$6,580,000
West Quadrant Development			
Total Cost	$3,639,000	$1,455,000	$5,094,000
Total Development Costs (20-years)	**$12,214,000**	**$4,885,000**	**$17,099,000**

5.0 STRATEGY #2

Development Strategy #2, except for the West Quadrant, explores development potential in two additional areas, the East and Northeast Quadrant. The major implication for Development Strategy #2 is that Runway 09-27 would remain operational.

Drawings have been prepared for the overall development strategy as well as each individual quadrant. The drawings follow each section.



LEGEND:

- EAST QUADRANT DEVELOPMENT (5–2)
- WEST QUADRANT DEVELOPMENT (5–3)
- NORTHEAST QUADRANT DEVELOPMENT (5–4)
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- PROPOSED ACCESS ROAD
- RUNWAY 09–27 EXTENSION TO 4800'
- RUNWAY 09–27 2400'

0 200 500

SCALE: 1:10,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

OVERALL STRATEGY 2
DEVELOPMENT CONCEPT PLAN

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**5-1**
DFTG : J.S.	DSGN : C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:30:00 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15575\AIRP03465-06_FIG5-1.DWG [Overall Strategy 2 Development Concept Plan]

5.1 East Quadrant Development

In this scenario, the East quadrant of the airport shows the best promise for cost-effective development that will provide the airport with short-term development over the next five to ten years.

Table 5-1: East Development Area Benefits and Challenges

Benefits	Challenges
Access from Beaver Creek Drive	Would require construction of a relatively long access road and a new parallel taxiway
Depending on the required lot size this parcel could provide for a number of development lots (17)	Environmental constraints on the east side of the development areas due to lakes and wetland areas, Environmental assessment required and Ministry of Environment, Conservation and Parks approvals
The topography is relatively flat and clear; save near the easterly property boundary	Utilities would have to be extended from Beaver Creek Road to the new development area.
Would not require the closing of Runway 09-27	Possible that the AWOS and VHF/DF antenna would need to be relocated.
The land would be suitable for many types of development (e.g., large maintenance, repair, overhaul or smaller parcels for hangar development)	
Depending on the environmental assessment additional lots may be developed to the north along runway 18-36.	
Lots can be larger depending on demand	

Table 5-2: East Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease
Total Development Area	8.25 Ha
Typical Lot Size	22 lots: 50 m x 75 m
Typical Lot Area	0.375 ha
Height Limitations	10 m plus
Airside Access	New parallel taxiway
Landside Access	Connection to Beaver Creek Drive, east end
Services Available	Developer to provide septic services and water well

Table 5-3: East Development Area Costs

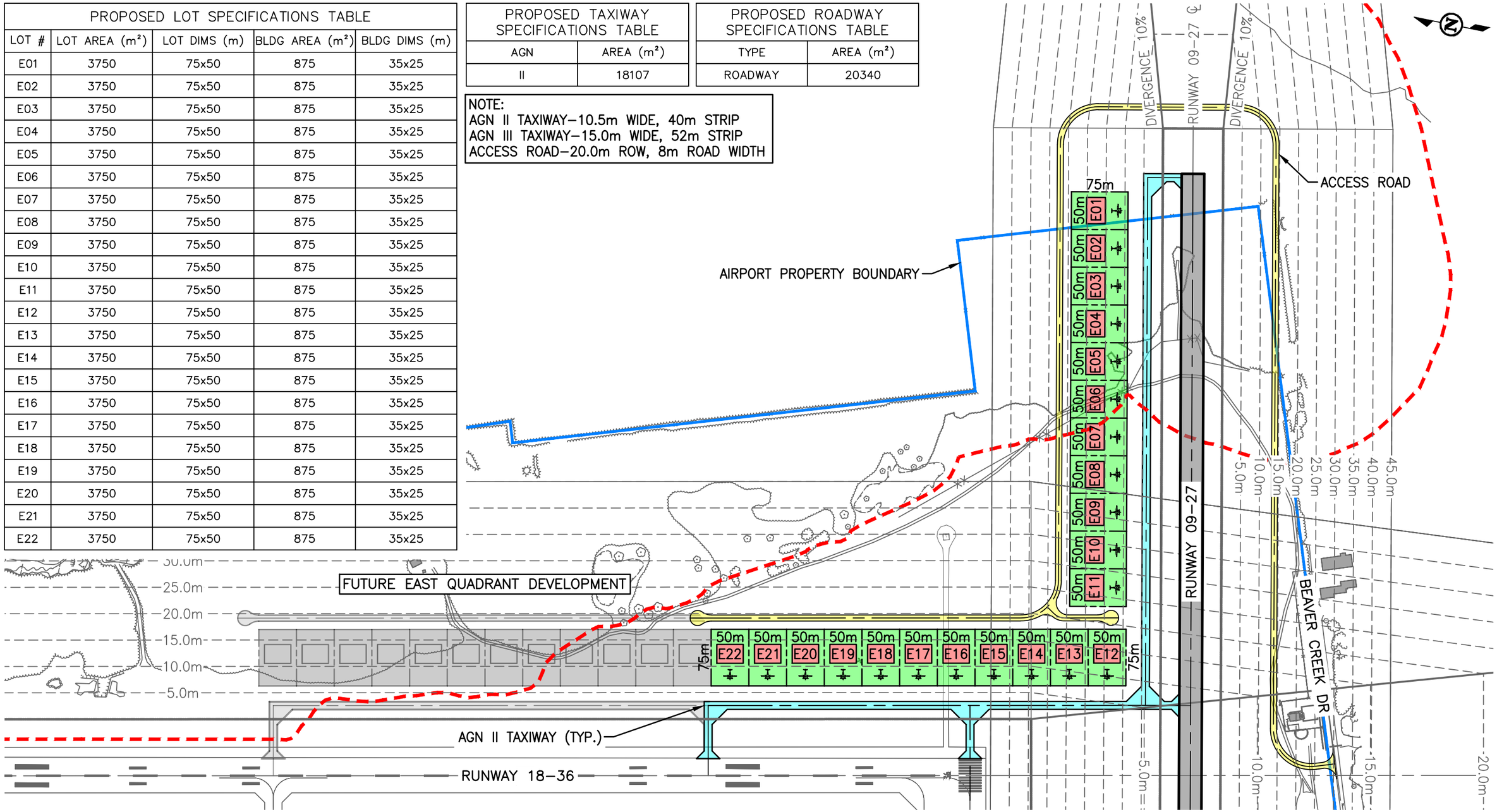
	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Multi-lot Development	$8,145,000	$3,258,000	$11,403,000

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m^2)	LOT DIMS (m)	BLDG AREA (m^2)	BLDG DIMS (m)
E01	3750	75x50	875	35x25
E02	3750	75x50	875	35x25
E03	3750	75x50	875	35x25
E04	3750	75x50	875	35x25
E05	3750	75x50	875	35x25
E06	3750	75x50	875	35x25
E07	3750	75x50	875	35x25
E08	3750	75x50	875	35x25
E09	3750	75x50	875	35x25
E10	3750	75x50	875	35x25
E11	3750	75x50	875	35x25
E12	3750	75x50	875	35x25
E13	3750	75x50	875	35x25
E14	3750	75x50	875	35x25
E15	3750	75x50	875	35x25
E16	3750	75x50	875	35x25
E17	3750	75x50	875	35x25
E18	3750	75x50	875	35x25
E19	3750	75x50	875	35x25
E20	3750	75x50	875	35x25
E21	3750	75x50	875	35x25
E22	3750	75x50	875	35x25

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m^2)
II	18107

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m^2)
ROADWAY	20340

NOTE:
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH



LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 250

SCALE: 1:5,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

STRATEGY 2
EAST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**5-2**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:30:19 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15575\AIRP03465-06_FIG5-2.DWG [East Quadrant Development]

5.2 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 area is relatively significant.

Table 5-4: West Quadrant Development Area Benefits and Challenges

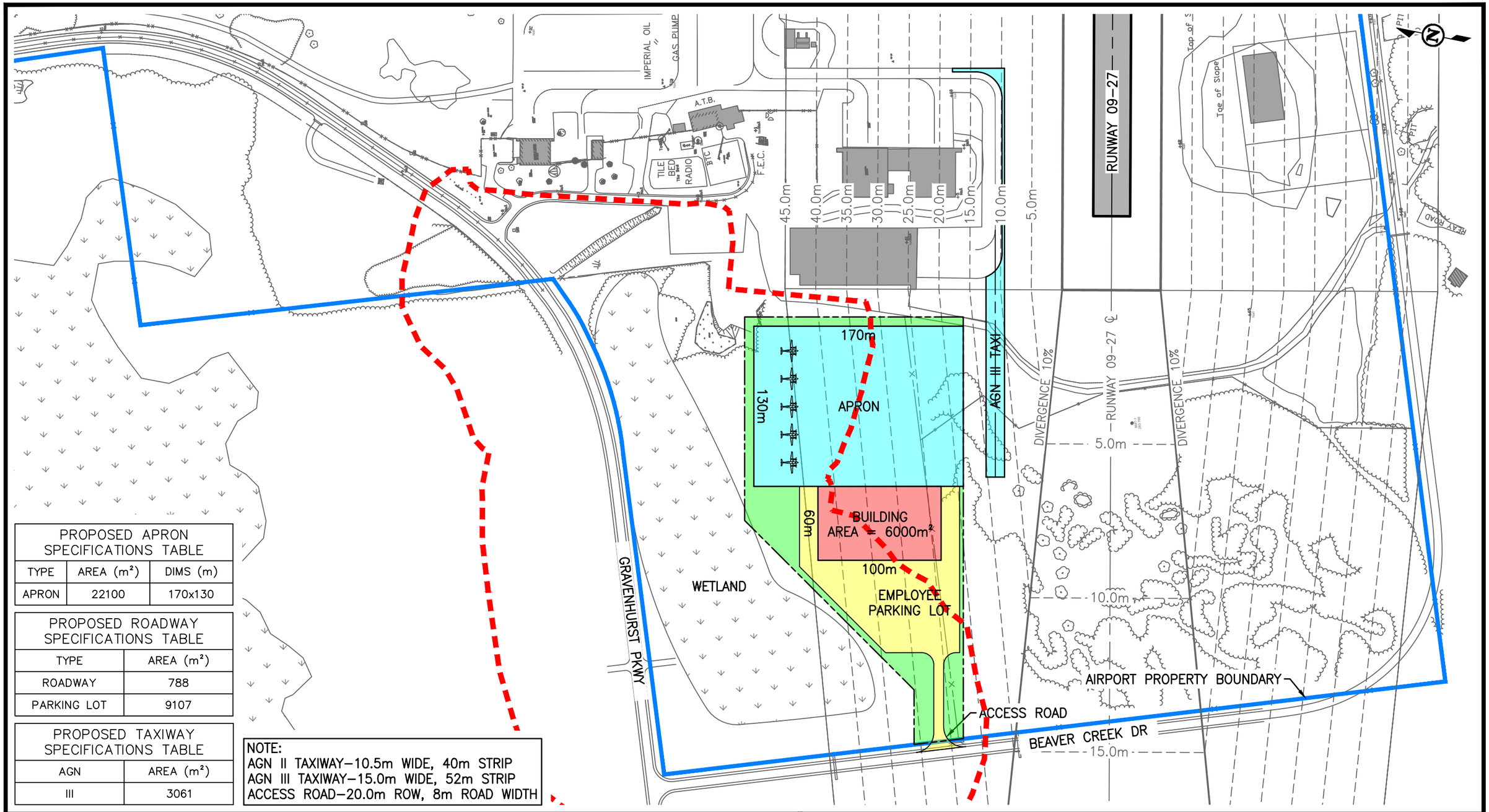
Benefits	Challenges
Easy access from Beaver Creek Drive or from main terminal area	Development cost will be very high due to topography. Aircraft can only operate on taxiways with relatively flat slopes (e.g., less than 2%) and therefore this site would require significant blasting and clearing and grubbing.
Easy taxiway extension from Taxiway D	Possible environmental constraints (e.g., wetlands). Environmental Assessment and Ministry of Environment, Conservation and Parks approvals required.
Large parcels for development	
The land would be suitable for any type of development (e.g., hangars)	

Table 5-5: West Quadrant Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease only
Total Development Area	4.6 ha
Typical Lot Size	MRO development – 4.6 ha
Typical Lot Area	4.6 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 5-6: West Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Large MRO development	$2,538,000	$1,015,000	$3,553,000



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

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	788
PARKING LOT	9107

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
III	3061

NOTE:
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD & PARKING LOT
- PROPOSED APRON & AGN III TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 150

SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA
Managing Our Legacy Together

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

STRATEGY 2
WEST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**5-3**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:30:37 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15575\AIRP03465-06_FIG5-3.DWG [West Quadrant Development]

5.3 Northeast Quadrant Development

The Northeast Quadrant of the airport was considered as part of the overall development scenarios. However, the location of this site in relation to Wright's Lake watershed could present environmental challenges including issues in relation to the wetland and watershed areas. Due to the likelihood of the East Quadrant being able to accommodate the number of lots identified over the 20-year planning period, the costs for this Northeast Quadrant are not extended in the total comparative cost analysis. The costs have been prepared and presented below for information.

Table 5-7: Northeast Quadrant Development Area Benefits and Challenges

Benefits	Challenges
Easy access from Gravenhurst Parkway	Development cost may be 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.
Large parcels for development	Possible environmental constraints (e.g., wetlands) to east and south. Environmental assessment and Ministry of the Environment, Conservation and Parks approval required.
	Significant taxiway extension from to Runway 18-36

Table 5-8: Northeast Quadrant Development Area Attributes

Development Attribute	Area / Details
Land Tenure Policy	Lease only
Total Development Area	3.75 ha
Typical Lot Size	10 lots: 50m x 75m
Typical Lot Area	0.375 ha
Height Limitations	15 m plus
Airside Access	New taxiway to Runway 18-36
Landside Access	Connection Gravenhurst Parkway
Services Available	Developer to provide septic services and water well

Table 5-9: Northeast Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Airside Commercial	$4,707,000	$1,883,000	$6,590,000

ACCESS ROAD

AIRPORT PROPERTY BOUNDARY

ACCESS ROAD CONNECT TO PKWY

AGN II TAXI

NE01 NE02 NE03 NE04 NE05 NE06 NE07 NE08 NE09 NE10

75m 50m

BEAVER DAM

DIVERGENCE 10%

AGN II TAXI

AGN II TAXI

HIGHWAY NO. 11

HWY 11

GRAVENHURST PKWY

RUNWAY 18–36 ℄

RUNWAY 18–36

45.0m 40.0m 35.0m 30.0m 25.0m 20.0m 15.0m 10.0m 5.0m

ASPHALT

DIVERGENCE 10%

NOTE:
AGN II TAXIWAY–10.5m WIDE, 40m STRIP
AGN III TAXIWAY–15.0m WIDE, 52m STRIP
ACCESS ROAD–20.0m ROW, 8m ROAD WIDTH

PROPOSED LOT SPECIFICATIONS TABLE

LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
NE01	3750	75x50	875	35x25
NE02	3750	75x50	875	35x25
NE03	3750	75x50	875	35x25
NE04	3750	75x50	875	35x25
NE05	3750	75x50	875	35x25
NE06	3750	75x50	875	35x25
NE07	3750	75x50	875	35x25
NE08	3750	75x50	875	35x25
NE09	3750	75x50	875	35x25
NE10	3750	75x50	875	35x25

PROPOSED ROADWAY SPECIFICATIONS TABLE

TYPE	AREA (m²)
ACCESS ROAD	4814

PROPOSED TAXIWAY SPECIFICATIONS TABLE

AGN	AREA (m²)
II	6475
III	2140

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II AND AGN III TAXIWAY
- PROPOSED HANGAR
- AIRPORT PROPERTY BOUNDARY
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- KING AIR 350

0 100 150

SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA
Managing Our Legacy Together

MASTER PLAN AMENDMENT
MUSKOKA AIRPORT YQA, MUSKOKA ON

STRATEGY 2
NORTHEAST QUADRANT DEVELOPMENT

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**5-4**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:30:54 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15575\AIRP03465-06_FIG5-4.DWG [Northeast Quadrant Development]

5.4 Strategy #2 Cost Summary

Table 5-10: Development Costs - Strategy #2

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
East Quadrant Development	$8,145,000	$3,258,000	$11,403,000
West Quadrant Development – MRO	$2,538,000	$1,015,000	$3,553,000
Total Development Cost (20-year)	**$10,683,000**	**$4,273,000**	**$14,956,000**

6.0 RUNWAY EXTENSION ASSESSMENT

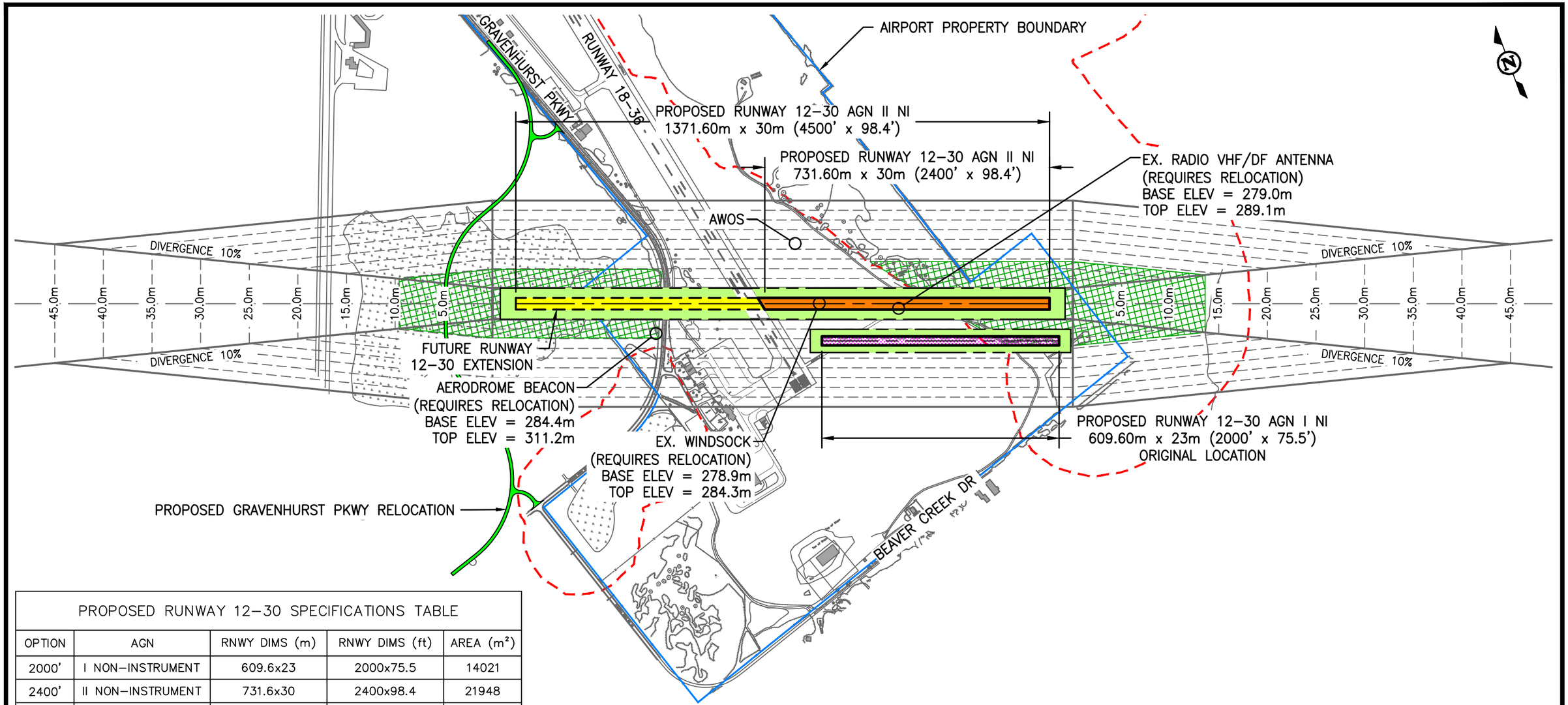
One of the action items resulting from the October District Council meeting was an instruction to District staff to evaluate and compare crosswind runways, including extensions, for existing Runway 09-27 and the proposed Runway 12-30. The extended runways will require complete reconstruction to meet AGN II pavement structure requirements. In addition, the crosswind runway features will include edge and threshold lighting.

The MP did not include evaluation for a longer crosswind runway. Rather, the MP fundamentally repositioned the existing turf runway (Runway 09-27) on alternative magnetic heading (Runway 12-30). This alignment was supported by various wind studies. The intent of the new turf runway was to replicate Runway 09-27 along a new alignment allowing for development of the existing Runway 09-27 lands. Runway 12-30 was therefore planned as a 2,000 ft., Non-Instrument, Aircraft Group Number (AGN) I turf runway. The requirement was to continue to provide small aircraft with an alternative runway to Runway 18-36, following the closure of Runway 09-27, when cross winds exceeded 10 knots.

Following the request of District Council, the focus of this portion of the MADO is to consider a paved crosswind runway to support a broader range of aircraft in all-weather conditions. The first part of this analysis includes evaluating the longest runway that can be accommodated on airport property. Runway 09-27 could be lengthened to 4,000 ft. on airport property, whereas Runway 12-30 is limited to approximately 2,400 ft. before encountering challenges with the runway intersection and Gravenhurst Parkway. Ultimately, both runways could be lengthened to 4,500 ft., however, would require land acquisitions to do so. Therefore, for an equivalent comparison, each runway extension was evaluated for a 2,400 ft. length, to stay on airport property, and a 4,500 ft. length, requiring land acquisition.

Tables 6-1 and 6-2 provide a pros and cons analysis for each runway scenario. The basic requirements for the crosswind runways include a paved surface, pavement markings, and runway edge lighting system for night operations.

Drawings 6-1 outlines the Runway 12-30 scenario and Drawing 6-2 outlines the Runway 09-27 scenario. The drawings also show the turf runway alignments and characteristics for information, despite them not being analysed as part of this section of the MADO.



PROPOSED RUNWAY 12–30 SPECIFICATIONS TABLE				
OPTION	AGN	RNWY DIMS (m)	RNWY DIMS (ft)	AREA (m^2)
2000'	I NON–INSTRUMENT	609.6x23	2000x75.5	14021
2400'	II NON–INSTRUMENT	731.6x30	2400x98.4	21948
4500'	II NON–INSTRUMENT	1371.6x30	4500x98.4	41148

PROPOSED RUNWAY 12–30 THRESHOLD COORDINATES						
THRESHOLD	NORTHING (2000')	EASTING (2000')	NORTHING (2400')	EASTING (2400')	NORTHING (4500')	EASTING (4500')
12	4980936.906	633773.990	4981077.095	633668.992	4981296.731	633067.860
30	4980727.702	634346.568	4980826.023	634356.161	4980826.023	634356.161

LEGEND:

- PROPOSED RUNWAY PAVEMENT
- PROPOSED RUNWAY GRADED STRIP
- RUNWAY 12–30 EXTENSION TO 4500'
- RUNWAY 12–30 2400'
- RUNWAY 12–30 2000'
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- AIRPORT PROPERTY BOUNDARY
- TREE TRIMMING AREAS

0 200 500

SCALE: 1:10,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

Managing Our Legacy Together

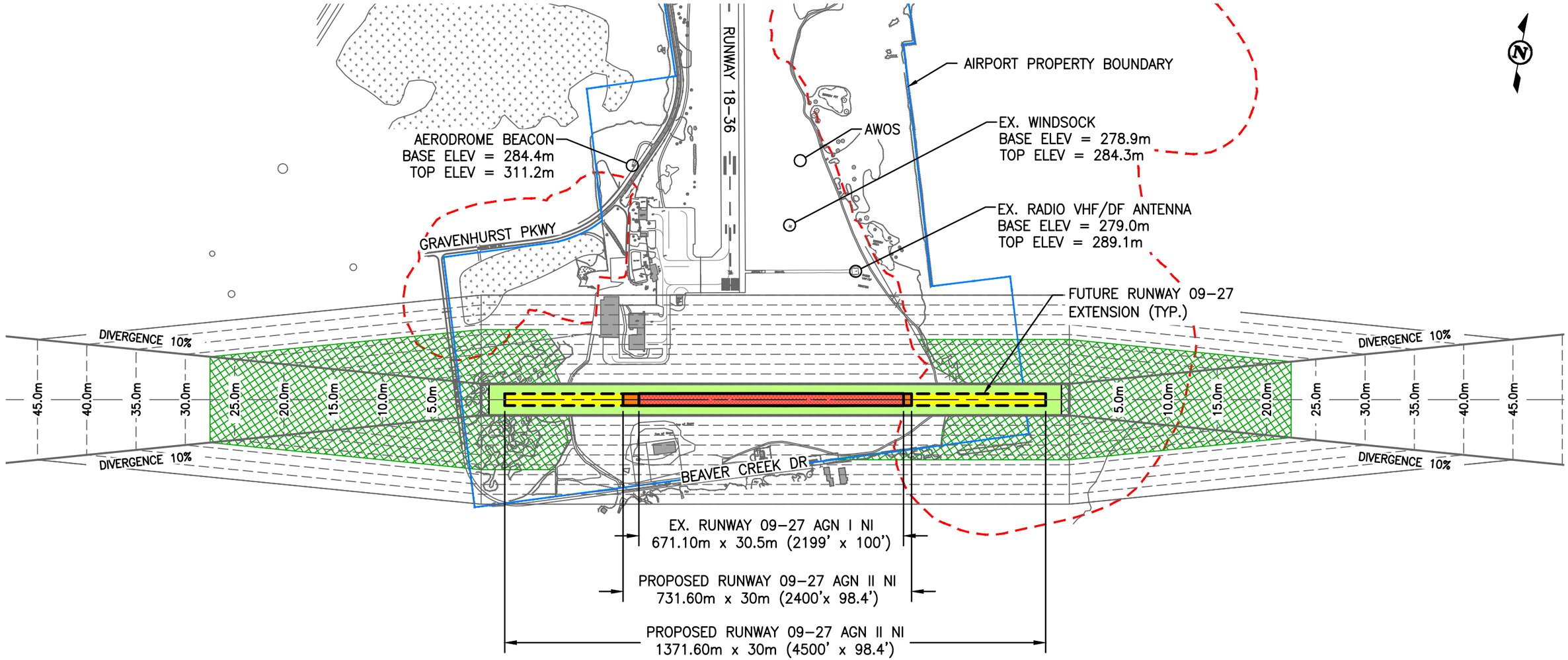
MASTER PLAN AMENDMENT

MUSKOKA AIRPORT YQA, MUSKOKA ON

RUNWAY 12-30
LENGTH ANALYSIS

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**6-1**
DFTG : J.S.	DSGN : C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:31:11 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15576\AIRP03465-06_FIG6-1.DWG [Runway 12-30 Length Analysis]



PROPOSED RUNWAY 09–27 SPECIFICATIONS TABLE				
OPTION	AGN	RNWY DIMS (m)	RNWY DIMS (ft)	AREA (m²)
2199'	II NON–INSTRUMENT	670.3x30.5	2199x100	20431
2400'	II NON–INSTRUMENT	731.5x30	2400x98.4	21945
4500'	II NON–INSTRUMENT	1371.6x30	4500x98.4	41148

PROPOSED RUNWAY 09–27 THRESHOLD COORDINATES							
THRESHOLD	NORTHING (2199')	EASTING (2199')	NORTHING (2400')	EASTING (2400')	NORTHING (4500')	EASTING (4500')
09	4980522.197	633511.764	4980514.401	633472.367	4980456.166	633178.073
27	4980652.470	634170.110	4980656.416	634190.051	4980722.415	634523.583

LEGEND:

- PROPOSED RUNWAY PAVEMENT
- PROPOSED RUNWAY GRADED STRIP
- RUNWAY 09–27 EXTENSION TO 4800'
- RUNWAY 09–27 2400'
- RUNWAY 09–27 2199'
- OBSTACLE LIMITATION SURFACE (OLS) CONTOURS
- LIMIT OF ENVIRONMENTALLY SENSITIVE AREA
- AIRPORT PROPERTY BOUNDARY
- TREE TRIMMING AREAS

0 200 500

SCALE: 1:10,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MASTER PLAN AMENDMENT

MUSKOKA AIRPORT YQA, MUSKOKA ON

RUNWAY 09-27 LENGTH ANALYSIS

PROJ : TRN.AIRP03465-06		CONTR :		DATE : 2022/01/31	**6-2**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2022/01/31 AT 10:31:29 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\PWWORKING\CAN_INFRA\DMS15577\AIRP03465-06_FIG6-2.DWG [Runway 09-27 Length Analysis]

6.1 Runway 12-30

Drawing 6-1 shows two locations for Runway 12-30; the original location to accommodate a 2,000 ft. turf runway, and a revised location repositioned approximately 100 m north. The reason for this repositioning is that a longer, paved crosswind runway would be constructed to a higher standard to accommodate a broader range of aircraft. The 2,000 ft. turf runway was designed to accommodate Aircraft Group Number (AGN) I aircraft whereas the extended runway would be designed to an AGN II standards. The AGN II runway requires different physical characteristics including pavement structure, runway width, runway strip, and runway safety areas. The new runway alignment will improve clearance near the air terminal building and main apron, however, will also require relocation of the AWOS and Aerodrome Beacon.

A Runway 12-30 beyond 2,400 ft. in length will require the relocation of the Gravenhurst Parkway and land acquisition for the Gravenhurst Parkway relocation and runway extension.

The extended runway would require significant tree clearing for the runway approaches and transitional surfaces on both ends of the runway.

The proposed 4,500 ft. runway will impact forested wetland areas west of the airport. An environmental assessment will be required to determine whether construction can occur in the wetland areas and what types of mitigation strategies will be required. The Ministry of the Environment, Conservation and Parks will need to accept and approve the overall construction plan.

Table 6-1: Pros and Cons Analysis for Runway 12-30

Pros	Cons
Allows commercial development on prime airport-owned lands.	The construction of a new turf runway is relatively expensive ($994,000).
The 2,000 ft. option meets the original intent of a short turf runway.	Runway can only be extended to 2,400 ft. on airport property.
If the runway was extended to 4,500 ft. it would open development areas west of the parkway.	Topography challenges at east end Runway 30.
Alignment more favourable to dominant west/northwest winds.	AWOS and Aerodrome Beacon would need to be relocated.
Transport Canada Notice Period has been submitted and included stakeholder and affected resident consultations.	Restricts main apron expansion to the north.
	Aircraft using Runway 12-30 would fly in close proximity to built-up areas.
	At 4,500 ft. the runway would require the relocation of Gravenhurst Parkway and land acquisition west of the parkway.
	At 4,500 ft. the runway impacts forested wetlands west of the Gravenhurst Parkway and as such, environmental assessment is required and approvals would be required from the provincial authorities to proceed.

6.2 Runway 09-27

Drawing 6-2 shows the existing Runway 09-27, as well as the reconstructed and extended runway options for 2,400 ft. and 4,500 ft.

The 2,400 ft. runway option can be accommodated along the existing alignment on airport lands.

The 4,500 ft. runway option is achievable in the west end on airport lands; however, the will require land acquisition to the east. The amount of land to be acquired would depend on the runway length and the addition of an access road for the East Quadrant development area.

Construction of Runway 09-27 on airport property would be relatively easy for approximately 3,000 ft. in length. Beyond this length, the east end will require substantial fill, tree clearing and grubbing, and wetland impact areas, as well as land acquisition to achieve 4,500 ft. The west end would require substantial tree clearing and grubbing, and topography adjustments including rock removal (e.g., blasting) due to rock outcrops. Clearance over Beaver Creek Dr. has been used as the limiting factor for the west end extension.

For consideration, Runway 09-27 could be extended to approximately 4,000 ft. on existing airport property. As illustrated in Table 6-3, there is not a significant difference in the type of aircraft that can use a 4,000 ft. runway versus a 4,500 ft. runway.

Table 6-2: Pros and Cons Analysis for Runway 09-27

Pros	Cons
The existing 2,199 ft. runway can be rehabilitated a cost of $300,000 (lower than new construction for 12-30).	Prohibits development on prime airport owned lands.
The existing runway has protection under the Airport Zoning Regulation (AZR).	Runway cannot be extended to 4,500 ft. on airport property. Land would need to be acquired east of the Runway 27 threshold for an access road to the East Quadrant.
Acceptable positioning to west/northwest winds.	Challenges east and west due to topography and rock outcrops.
Runway extensions are less operationally disruptive to existing infrastructure (i.e., air terminal building and main apron).	Some form of acquisition or lease arrangement would be required to remove obstacles (i.e., trees) east and west of airport property.
	Environmental Assessment will be required for development east of Runway 27 threshold. Approval will be required by the province.

6.3 Runway Length Considerations

The runway lengths calculated in Table 6-3, consider the specific aircraft reference field length and the adjusted field length based on potential runway contamination and different temperature scenarios. The calculations assume:

- Maximum takeoff weight
- Landing Length - determined by highest flap setting and wet runway (turbojet engine) as per FAA AC 150-5325-4B
- Fuel is based on a requirement for the aircraft to be able to fly for 1 1/2 hours

- Accelerate Stop Distance Available (ASDA) assumes aircraft flying with one engine inoperative
- Reference field length, MTOW, range, and pax capacity for each aircraft drawn from manufacturer specifications online when available or third-party websites.

It is understood that by changing these elements (e.g., reduced fuel load), aircraft can land and takeoff on shorter runway lengths. As an example, a theoretical calculation shows a Q400 requires a 6,400 ft. runway however, it is common knowledge that Porter airlines routinely operate their Q400 aircraft at Billy Bishop Toronto City Airport, which has a 3,988 ft. runway length. To operate on this length of runway, significant maintenance costs are required (e.g., runway sweeping, chemical use).

Airlines and pilots ultimately decide on the required runway length for a safe takeoff and landing. The table does indicate however that a relatively small change in runway length (e.g., +/- 500 ft.) does not significantly change the types of aircraft that can use the runway.

The table is for illustration purposes and includes a selection of aircraft that are typical to Muskoka. The brown highlighted cells denote those aircraft that can operate on runway lengths up to 4,500 ft. at 24 degrees Celsius and the blue cells denote the same aircraft at 30 degrees Celsius.

Table 6-3: Runway Length Requirements

Aircraft Type	Manufacturer Specified Takeoff Distance (ft.)	Adjusted Field Length (24C) in ft.	Adjusted Field Length (30C) in ft.
Beechcraft Queen Air 65	1400	1653	1743
Piper Navajo	1450	1712	1805
Beechcraft C90	2261	2670	2815
Cessna 310	1700	2008	2116
Cessna 402	1700	2623	2765
Air Tractor 802	2000	2362	2490
Cessna Stationair	1860	2197	2315
Cessna Caravan	2055	2427	2558
DHC Twin Otter Series 400	1490	2693	2838
Cessna Grand Caravan	1365	2858	3013
Piper Seneca	1140	2964	3125
Pilatus PC12	2602	3073	3239
Beechcraft King Air 200	2579	3046	3211
DH8-100	3280	4261	4491
Cessna Citation II	2385	4482	4724
Dornier 228 NG	2600	3070	3237
Dornier 328 TP	3570	4638	4889
Cessna Citation Encore	3490	4534	4779
Cessna Citation XLS	3560	4625	4875
DH8-300	3600	5021	5293
Cessna Citation Sovereign	3580	4728	4984
Beechcraft 1900	3737	4854	5117
Learjet 40	4330	5625	5929
Learjet 45	4350	5651	5957
Learjet 60	5450	7080	7463
DH8-Q400	4675	6073	6402
B737-500	5100	6625	6984
Bombardier CRJ100	5800	7534	7942
Bombardier CRJ200	5510	7158	7545
C130 Hercules	3290	4658	4910
	Aircraft capable of takeoff at 4,500 ft. at 24C		
	Aircraft capable of takeoff at 4,500 ft.at 30C		

Table 6-4 illustrates potential runway use scenarios based on historical annual aircraft movements, runways used and anticipated aircraft use based on different runway lengths. One must recognize that many of the aircraft noted can also operate safely under higher crosswind components. The actual runway use would vary throughout the year depending on wind conditions.

Table 6-4: Runway Use Projections

Runway	Runway Length	Expected Percent of Total Aircraft Movements on a crosswind runway 09-27 or 12-30	Expected Percent of Annual Aircraft Movements on Runway 18-36
09-27 (turf)	2,199 ft.	<4.0 %	>96.0%
12-30 (turf)	2,000 ft.	<4.0 %	>96.0%
09-27 (paved)	2,400 ft.	10.0%	90.0%
12-30 (paved)	2,400 ft.	10.0%	90.0%
09-27 (paved)	4,500 ft.	50.0%	50.0%
12-30 (paved)	4,500 ft.	50.0%	50.0%

6.4 Runway Length Cost Comparisons

Table 6-5 shows construction costs associated with extending Runway 12-30 to 2,400 ft. and 4,500 ft.

Table 6-6 shows construction costs associated with extending Runway 09-27 to 2,400 ft. and 4,500 ft

As indicated, the cost for Runway 12-30 is more expensive than the costs for similar lengths for Runway 09-27. The reason for the cost difference is largely attributed to differences in cut and fill quantities.

The costs shown in Table 6-5 and Table 6-6 do not include additional costs associated with runway extensions to 4,500 ft. for both Runway 09-27 and 12-30.

The Gravenhurst Parkway would have to be relocated and possible land acquisition for the Runway 12-30 extension (e.g., anecdotal costs in the range of $5,000,000).

There would also be extra costs associated with possible land acquisition for tree clearing on the Runway 09-27 approaches (e.g., likely less than $1,000,000).

Table 6-5: Crosswind Runway 12-30 Cost Comparison

	Construction	Contingencies and Engineering	Total Cost
Crosswind Runway at 2,400 ft.	$5,185,000	$2,074,000	$7,259,000
Crosswind Runway at 4,500 ft.	$9,614,000	$3,846,000	$13,460,000

Table 6-6: Crosswind Runway 09-27 Cost Comparison

	Construction	Contingencies and Engineering	Total Cost
Crosswind Runway at 2,400 ft.	$3,976,000	$1,590,000	$5,566,000
Crosswind Runway at 4,500 ft.	$8,927,000	$3,570,000	$12,497,000

7.0 COMPARATIVE ANALYSIS

Table 7-1 shows the total development cost comparison. The overall development costs favour Strategy #2 however the immediacy and feasibility of construction in Strategy #2 areas and the economic impact findings identified in Section 8.0 require careful consideration.

Runway 12-30 will require relocation of the Parkway and acquisition of lands west of the Parkway. The Runway 09-27 extension to 4,500 ft. would require a relatively small land acquisition east of the airport boundary.

Table 7-1: Development Strategy Comparison with Turf AGN I Crosswind Runway

Development Strategy #1		Development Strategy #2	
	Total Cost		Total Cost
Southwest Quadrant – Single MRO Development	$5,424,000	East Quadrant	$11,403,000
Runway 12-30 – 2,000 ft.	$994,000	Runway 09-27 – 2,199 ft.	$300,000
Southeast Quadrant	$6,580,000	West Quadrant – Single MRO Development	$3,553,000
West Quadrant	$5,094,000		
Total Airport Development - 20 Years	**$18,092,000**		**$15,256,000**

Table 7-2: Development Strategy Comparison with 2,400 ft. Paved AGN II Crosswind Runway

Development Strategy #1		Development Strategy #2	
	Total Cost		**Total Cost**
Southwest Quadrant – Single MRO Development	$5,425,000	East Quadrant	$11,403,000
Runway 12-30 – 2,400 ft.	$7,259,000	Runway 09-27 – 2,400 ft.	$5,566,000
Southeast Quadrant – Phase 1	$6,580,000	West Quadrant – Single MRO Development	$3,553,000
West Quadrant – Phase 1	$5,094,000		
Total Airport Development - 20 Years	**$24,358,000**		**$20,522,000**

Table 7-3: Development Strategy Comparison with 4,500 ft. Paved AGN II Crosswind Runway

Development Strategy #1		Development Strategy #2	
	Total Cost		**Total Cost**
Southwest Quadrant – Single MRO Development	$5,425,000	East Quadrant	$11,403,000
Runway 12-30 – 4,500 ft	$13,460,000	Runway 09-27 – 4,500 ft	$12,497,000
Southeast Quadrant – Phase 1	$6,580,000	West Quadrant – Single MRO Development	$3,553,000
West Quadrant – Phase 1	$5,094,000		
Gravenhurst Parkway Relocation and Land Acquisition	$5,000,000 estimate (not extended to total)	Land acquisition to the east	Unknown
Total Airport Development - 20 Years	**$30,559,000**		**$27,453,000**

8.0 FINANCIAL ANALYSIS AND ECONOMIC IMPACT ASSESSMENT

This section compares the financial and economic analysis for the two proposed strategies. The principles used to guide analysis are reviewed first, followed by the analysis, and finally findings.

8.1 Principles

The financial and economic analysis are guided by the airport's strategic plan, and by industry standards and best practices.

- The Strategic Plan guides decision making.
- Long-term leases are preferred to land sales to obtain best value for land and to allow the airport to respond to changing land lease needs over time.
- Market rates for land uses are recommended.
- Airport considers the economic, social and environmental impacts of all uses.
- Opportunities with significant catalytic impacts are preferred.
- This means opportunities that bring related positive impacts. For example, a large MRO opportunity would probably attract other aerospace opportunities to the airport.
  - Opportunities with limited positive impact or significant negative impacts would be refused
  - Opportunities would have to show a reasonable return on investment from a business case basis

8.2 Financial Analysis

8.2.1 Assumptions

Assumptions guide projections because humans are unable to foresee the future. These assumptions are based on current economic trends, airport-specific analysis, and professional judgement. Financial analysis is concerned with the timing of expenses and revenues as well as total capital costs. The following assumptions have been used to guide the financial analysis.

General

- The economy will recover strongly as COVID winds down in both strategies and there will be demand for land at Muskoka Airport.
- It is assumed that the demand for on-airport land is the same in both strategies. The difference between the two is how quickly the land can be offered for lease.
- Demand for commercial and industrial land in Southern Ontario and the Muskoka region will continue to be strong. The demand for airport land is the same in each strategy.
- An annual lease rate of $35,500 per hectare is assumed, the equivalent of $3.55 per square metre per year.
- The analysis is in 2021 dollars.

Strategy 1

- The airport will be able to develop and lease the entire Southwest quadrant to a single entity within two years of recovery. An MRO currently intends to do this.
- The Southeast quadrant will be developed within four years of recovery and its 4.9 ha will be leased out within 14 years of recovery.
- The Western quadrant will be developed within 15 years of recovery and its 3.5 ha will be leased out within 21 years of recovery.
- At the end of 25 years, 13.6 ha of newly developed land will be leased out as a result of these developments.
- A total of $18.1 million in capital (in 2021 dollars) is spent within the 25 year projections.

Strategy 2

- Developing the East quadrant is more complex, and it will be developed within Year 5 after recovery. The initial costs for this development are high and it will probably require committed tenants before development proceeds. Land in this development will be leased out at the rate of approximately 1 ha every two years, and 10 ha will be leased at the end of 25 years.
- The Western quadrant is developed faster in this scenario, within 10 years of recovery, and leased to a single entity.
- The NE quadrant is not developed within 25 years as the Eastern quadrant will still have land available.

Comparison

- At the end of 25 years Strategy #1 has 13.6 ha leased out and Strategy #2 has 13.9 ha leased.
- The significant difference between the two scenarios is that in #1 the airport could obtain a significant lease more quickly with relatively little development delay, whereas in #2 the development would take longer and be more expensive.

8.2.2 Indicators

The table provides some indicators for the two scenarios. After 25 years, the number of hectares leased is similar, as is annual revenue in the twenty-fifth year. However, cumulative revenue for Scenario #1 is significantly higher because the airport can begin collecting significant revenues earlier in this scenario.

	Scenario #1	Scenario #2
Total potential hectares (ha) developed at full build out	13.6	22.7
Ha developed after 25 years	13.6	13.9
Revenue per year after 25 years	$4.39 million	$4.50 million
Sum of revenue over 25 years	$80.60 million	$58.90 million

8.2.3 Net Present Value of the Two Strategies

Net Present Value (NPV) is a calculation often used to compare capital projects or financial investment options. NPV is a measure of the value of a project over a period of years. Positive NPV is good, and negative NPV is not so good. NPV reviews cash flows occurring at different times and analyzes which return is higher. The present value of a cash flow depends on the interval of time between now and the cash flow. Now is preferable for cash flow. NPV is used when calculating financial choices like these two because there are numerous factors and it is difficult to “eyeball” the better choice.

Based on the assumptions above, and using the capital estimates provided, the NPV of both strategies was analyzed over a period of 25 years, typical for major capital projects. The rate for both investments was set at 7%. Major findings of the analysis are

- Both NPVs are positive.
- Scenario #1 NPV: $6.1 million
- Scenario #2 NPV: $4.9 million

The NPV for Scenario #1 is approximately 25.4% higher for Scenario #2, primarily because of the speed with which #1 can begin earning revenue, particularly the Southwest quadrant, which may develop sooner. Scenario #2 both takes longer to complete and does not offer as quick a financial return. Thus the NPV for Scenario #1 is higher.

If the only consideration for the airport is financial return, Scenario #1 would be chosen. Also, as the development and the opportunity is pushed farther off into the future in Scenario #2, it has a higher risk profile.

8.3 Economic Analysis

8.3.1 Assumptions

The following assumptions are made for the economic analysis.

General

- The economy will recover strongly as COVID winds down in both scenarios and there will be demand for land at Muskoka Airport.
- The majority of leased land (95%) will be for job generating activities.

- Each ha leased will generate seven FTEs, except in the case of an MRO which will generate 100 FTEs. This estimate takes into account leases for lots that do not generate jobs.

Strategy #1

- The first development in Strategy #1 is an MRO which generates 100 FTEs.
- Within this strategy 6.5 ha are leased in the first five years including 5.5 ha for the MRO.
- Within 10 years, an additional 3 ha are developed.

Strategy #2

- As development takes longer, only 1 ha is developed within 5 years.
- Within 10 years, 6.9 ha are developed including the MRO.
  - The MRO is developed in the 10th year.

8.3.2 Economic Impacts after Five and 10 Years

An economic impact for a project or organization is a snapshot that explains economic activity at a specific time, usually a year such as 2021. For this analysis, the comparative economic impacts for Strategy #1 and #2 after 5 Years and after 10 Years are compared. This analysis is for economic activity on developed lands alone in both scenarios and not for the airport as a whole.

Table 8-1 provides a comparison of the economic impacts for both Strategy #1 and Strategy #2. After five years, Strategy #1 has significant economic activity because it got off to a relatively quick start. Strategy #2 has lower economic activity after five years because the project begins more slowly in the assumptions.

Table 8-1: Strategy #1 vs Strategy #2 Direct Economic Impacts after 5 Years, 2021 $s

	Strategy #1	Strategy #2
FTEs	107	7
Income	$7,100,000	$460,000
GDP	$13,970,000	$910,000
Output	$33,010,000	$2,160,000

Table 8-2 provides a comparison of the economic impacts for both Strategy #1 and Strategy #2 after 10 years. After 10 years the two strategies generate comparable economic activity.

Table 8-2: Strategy #1 vs Strategy #2 Economic Impacts after 10 Years, 2021 $s

	Strategy #1	Strategy #2
FTEs	128	121
Income	$8,490,000	$8,030,000
GDP	$16,710,000	$15,790,000
Output	$39,490,000	$37,330,000

8.3.3 Capital Impacts

Construction projects also generate significant economic impact. This analysis displays the impacts over a 10- year period. The direct impacts of the capital projects over 10 years in Strategy #1 and Strategy #2 are compared in the table below. As the capital costs of Strategy #2 are higher, the economic impacts of it over 10 years are also greater.

Table 8-3: Strategy #1 vs Strategy #2 Direct Capital Impacts after 10 years, 2021 $s

	Strategy #1	Strategy #2
Value of Capital Spend over 10 Years	$12,000,000	$15,000,000
Jobs	52.5	65.6
Income	$4,000,000	$5,016,000
GDP	$4,900,000	$6,169,000
Output	$13,400,000	$16,719,000

8.4 Findings

The following are the salient points and findings from the financial and economic analysis.

- It is assumed that Strategy #1 would move faster and generate economic activity more quickly because there is an active prospect interested in a large investment now.
- Strategy #1 has a higher NPV over 25 years because it is projected to generate revenue more quickly. The projected NPV for Strategy #1 is $6.1 million versus $4.9 million for Strategy #2.

The economic impact is higher for Strategy #1 after five years, but the two strategies are projected to have comparable impacts after 10 years

9.0 CLOSURE

The Muskoka Airport Development Options mandate was to compare alternative land development strategies with the MP and to assess the implications and costs for extended crosswind runways.

Comparison of Strategy #1 and Strategy #2 shows that Strategy #1 development costs are higher over the 20-year period. It is important however to consider how each development area is phased. Changing the land use (e.g., multi-lots versus a single large MRO) can alter costs considerably because the large MRO concept assumes the developer is responsible for the bulk of the land development costs whereas in a multi-lot development scenario the airport incurs the higher up-front costs.

In the shorter term, considering the costs to develop an MRO site and an initial supply of development lots (e.g., 12 lots), one finds the strategies comparable because Strategy #2 requires higher upfront costs (e.g., access road construction, taxiway etc.). The land development concepts in Strategy #2 also position the development areas in close proximity to environmentally sensitive areas. An environmental assessment and regulatory approvals will be required and the findings and potential restrictions from the assessments are unknown at this time. This is not to suggest that development cannot occur in these areas, but that the EA will determine whether the developments can proceed and what types of mitigation measures may be required to ensure environmental protection.

The Runway 09-27 and 12-30 runway extension analysis shows Runway 12-30 to be approximately $963,000 more expensive for the 4,500 ft. ultimate length. This does not consider the costs associated with the Gravenhurst Parkway relocation and land acquisition.

The Runway 09-27 alignment is more favourable for construction. It is recognized that land acquisition may be required at both ends of the runway to achieve the ultimate 4,500 length. However, Runway 09-27 can be extended to 4,000 ft. on airport-owned property and be able to accommodate many of the AGN II aircraft that are identified as suitable for a 4,500 ft. runway. It is important to restate that a longer crosswind runway was not considered in the MP as there is no capacity driven evidence to suggest the runway is or will ever be required. A more detailed air service study would be needed to determine this requirement.

The comparative analysis in conjunction with the economic impact assessment suggests that the demand for immediate commercial development may favour Strategy #1 while the possible requirement for a future 4,500 ft. crosswind runway favours Strategy #2.

The following are the salient points and findings from the financial and economic analysis.

- It is assumed that Strategy #1 would be developed more quickly and generate economic activity more quickly because there is an active prospect interested in a large investment now.
- Strategy #1 has a higher Net Present Value (NPV) over 25 years because it is projected to generate revenue more quickly. The projected NPV for Strategy #1 is $6.1 million versus $4.9 million for Strategy #2.
- The economic impact is higher for Strategy #1 after five years, but the two strategies are projected to have comparable impacts after 10 years

Decisions on which strategy best serves the airport requirements must weigh the importance of short and long-term commercial development, the need for a crosswind runway, and the associated investment that will be required.

There is immediate demand for development lots at the airport, and the highest and best use of airport lands favours Strategy #1. Also, the upfront development costs in the East Quadrant are higher and the potential environmental constraints are more significant at the east side of the airport.

Net Present Value (NPV) calculations suggest that investments in the developments identified in the approved master plan provide the best investment strategy in the short-term, and that the region will potentially see a significant economic impact from airport development over the next five years.

It is therefore recommended that the Airport Board proceed with the approved Muskoka Airport Master Plan dated October 2020, approved by Muskoka District Council on January 29, 2021. Further it is recommended that lands be reserved along the Runway 12-30 alignment in the event a crosswind runway is required.

APPENDIX A

LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

DESIGN REPORT

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless so stipulated in the Design Report, TETRA TECH was not retained to explore, address or consider, and has not explored, addressed or considered any environmental or regulatory issues associated with the project specific design.

1.8 CALCULATIONS AND DESIGNS

TETRA TECH may have undertaken design calculations and prepared project specific designs in accordance with terms of reference that were previously set out in consultation with, and agreement of, TETRA TECH's client. These designs have been prepared to a standard that is consistent with current industry practice. Notwithstanding, if any error or omission is detected by TETRA TECH's Client or any party that is authorized to use the Design Report, the error or omission should be immediately drawn to the attention of TETRA TECH.

1.9 GEOTECHNICAL CONDITIONS

A Geotechnical Report is commonly the basis upon which the specific project design has been completed. It is incumbent upon TETRA TECH's Client, and any other authorized party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the geotechnical information that was reasonably acquired to facilitate completion of the design.

If a Geotechnical Report was prepared for the project by TETRA TECH, it may be included in the Design Report as appropriate. The Geotechnical Report contains Limitations that should be read in conjunction with these Limitations for the Design Report.

1.10 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This report has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

DEVELOPMENT COST ESTIMATES

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
New Runway 12-30 - AGN II Non-Instrument
731.6 x 30 m (2,400 x 100 ft)

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 500,000
2.00	Preparatory Site Works				$ 1,519,500
3.00	Runway 12-30				$ 2,665,000
4.00	Electrical Work				$ 500,500
	Subtotal Estimate of Probable Construction Costs				**$ 5,185,000**
5.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 259,250
6.00	Engineering Design, Tender and Construction Management			10%	$ 518,500
7.00	Project Contingencies and Unknowns			25%	$ 1,296,250
	Total Estimate of Probable Costs (rounded)				**$ 7,259,000**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 500,000	$ 500,000
				Subtotal General Requirements (1.00)	**$ 500,000**
2.00	**Preparatory Site Works**				
2.01	Tree Clearing	m^2	139,500	$ 1	$ 139,500
2.02	Grubbing	m^2	26,400	$ 5	$ 132,000
2.03	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	7,450	$ 15	$ 111,750
2.04	Common Excavation to On-Site Fill	m^3	19,350	$ 12	$ 232,200
2.05	Common Excavation c.w. Disposal Off-Site	m^3	42,300	$ 20	$ 846,000
2.06	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium - Estimate 10% of Common Excavation to On-Site Fill	m^3	1,935	$ 30	$ 58,050
				Subtotal Preparatory Site Works (2.00)	**$ 1,519,500**
3.00	**Runway 12-30**				
3.01	Granular Subbase Course (GSBC) - 200mm Thick	m^3	4,700	$ 50	$ 235,000
3.02	Granular Base Course (GBC) - 200mm Thick	m^3	4,700	$ 60	$ 282,000
3.03	Asphalt Paving - 100 mm Compacted Thickness	Tonne	5,850	$ 160	$ 936,000
3.04	Storm Drainage Measures	Lump Sum	1	$ 75,000	$ 75,000
3.05	Finish Grading, Topsoil, Hydroseed	m^2	55,600	$ 20	$ 1,112,000
3.06	Pavement Markings	Lump Sum	1	$ 25,000	$ 25,000
				Subtotal Runway 12-30 (3.00)	**$ 2,665,000**
4.00	**Electrical Work**				
4.01	Trenching c.w. Ductwork, Cable, Counterpoise, etc.	Lin.m.	1,600	$ 150	$ 240,000
4.02	Runway Edge Lighting	Each	30	$ 1,000	$ 30,000
4.03	Runway Threshold Lighting	Each	12	$ 1,500	$ 18,000
4.04	Runway Signage	Each	4	$ 15,000	$ 60,000
4.05	Field Electrical Centre (FEC) Modifications	Lump Sum	1	$ 100,000	$ 100,000
4.06	Relocate Existing Windsock	Lump Sum	1	$ 7,500	$ 7,500
4.07	Decommission Radio VHF/DF Antenna	Lump Sum	1	$ 5,000	$ 5,000
4.08	Relocate Aerodrome Beacon	Lump Sum	1	$ 40,000	$ 40,000
				Subtotal Electrical Work (4.00)	**$ 500,500**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works (2.00 + 3.00 + 4.00).
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Limited rock breaking is anticipated for this concept configuration. There are terrain outcrops at the west end of the proposed runway which are anticipated to require some rock removal.
6) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. A site specific pavement design must be completed based on geotechnical and climatic site conditions.
7) The estimate of probable cost is based on limited topographic contours and site conditions provided through LiDAR, Google Earth and Ontario GIS applications. Further topographic survey is required to confirm these site conditions and the estimted quantities.
8) This Class D estimate of probable costs is provided as an order of magnitude budgetary estimate based on conceptual quantities and previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Runway 12-30 Extension - AGN II Non-Instrument
731.6 m (2,400 ft) to 1,371.6 m (4,500 ft)

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 414,500
2.00	Preparatory Site Works				$ 1,435,400
3.00	Runway 12-30 Extension				$ 2,252,000
4.00	Electrical Work				$ 327,000
	Subtotal Estimate of Probable Construction Costs				**$ 4,428,900**
5.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 221,445
6.00	Engineering Design, Tender and Construction Management			10%	$ 442,890
7.00	Project Contingencies and Unknowns			25%	$ 1,107,225
	Total Estimate of Probable Costs (rounded)				**$ 6,200,500**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 402,000	$ 402,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 414,500**
2.00	**Preparatory Site Works**				
2.01	Tree Clearing	m^2	114,500	$ 1	$ 114,500
2.02	Grubbing	m^2	33,500	$ 5	$ 167,500
2.03	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	3,340	$ 15	$ 50,100
2.04	Common Excavation to On-Site Fill	m^3	25,300	$ 12	$ 303,600
2.05	Import Common Fill	m^3	28,600	$ 20	$ 572,000
2.06	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 30% of Common Excavation to On-Site Fill)	m^3	7,590	$ 30	$ 227,700
				Subtotal Preparatory Site Works (2.00)	**$ 1,435,400**
3.00	**Runway 12-30 Extension**				
3.01	Granular Subbase Course (GSBC) - 200mm Thick	m^3	4,000	$ 50	$ 200,000
3.02	Granular Base Course (GBC) - 200mm Thick	m^3	4,000	$ 60	$ 240,000
3.03	Asphalt Paving - 100 mm Compacted Thickness	Tonne	5,000	$ 160	$ 800,000
3.04	Storm Drainage Measures	Lump Sum	1	$ 50,000	$ 50,000
3.05	Finish Grading, Topsoil, Hydroseed	m^2	46,850	$ 20	$ 937,000
3.06	Pavement Markings	Lump Sum	1	$ 25,000	$ 25,000
				Subtotal Runway 12-30 Extension (3.00)	**$ 2,252,000**
4.00	**Electrical Work**				
4.01	Trenching c.w. Ductwork, Cable, Counterpoise, etc.	Lin.m.	1,450	$ 150	$ 217,500
4.02	Runway Edge Lighting	Each	30	$ 1,000	$ 30,000
4.03	Relocate Runway Threshold Lighting Runway 12	Each	6	$ 750	$ 4,500
4.04	Runway Signage	Each	4	$ 15,000	$ 60,000
4.05	New Illuminated Windsock	Each	1	$ 15,000	$ 15,000
				Subtotal Electrical Work (4.00)	**$ 327,000**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works (2.00 + 3.00 + 4.00).
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration on the west side of the Gravenhurst Pkwy near the existing Aerodrome Beacon.
6) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. A site specific pavement design must be completed based on geotechnical and climatic site conditions.
7) The estimate of probable cost is based on limited topographic contours and site conditions provided through LiDAR, Google Earth and Ontario GIS applications. Further topographic survey is required to confirm these site conditions and the estimted quantities.
8) This Class D estimate of probable costs is provided as an order of magnitude budgetary estimate based on conceptual quantities and previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
New Runway 09-27 - AGN II Non-Instrument
731.6 x 30 m (2,400 x 100 ft)

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 362,000
2.00	Preparatory Site Works				$ 466,000
3.00	Runway 09-27				$ 2,699,600
4.00	Electrical Work				$ 448,000
	Subtotal Estimate of Probable Construction Costs				**$ 3,975,600**
5.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 198,780
6.00	Engineering Design, Tender and Construction Management			10%	$ 397,560
7.00	Project Contingencies and Unknowns			25%	$ 993,900
	Total Estimate of Probable Costs (rounded)				**$ 5,565,800**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 362,000	$ 362,000
				Subtotal General Requirements (1.00)	**$ 362,000**
2.00	**Preparatory Site Works**				
2.01	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	12,000	$ 15	$ 180,000
2.02	Common Excavation to On-Site Fill	m^3	16,000	$ 12	$ 192,000
2.03	Import Common Fill	m^3	4,700	$ 20	$ 94,000
				Subtotal Preparatory Site Works (2.00)	**$ 466,000**
3.00	**Runway 09-27**				
3.01	Granular Subbase Course (GSBC) - 200mm Thick	m^3	4,600	$ 50	$ 230,000
3.02	Granular Base Course (GBC) - 200mm Thick	m^3	4,600	$ 60	$ 276,000
3.03	Asphalt Paving - 100 mm Compacted Thickness	Tonne	5,760	$ 160	$ 921,600
3.04	Storm Drainage Measures	Lump Sum	1	$ 75,000	$ 75,000
3.05	Finish Grading, Topsoil, Hydroseed	m^2	58,600	$ 20	$ 1,172,000
3.05	Pavement Markings	Lump Sum	1	$ 25,000	$ 25,000
				Subtotal Runway 09-27 (3.00)	**$ 2,699,600**
4.00	**Electrical Work**				
4.01	Trenching c.w. Ductwork, Cable, Counterpoise, etc.	Lin.m.	1,600	$ 150	$ 240,000
4.02	Runway Edge Lighting	Each	30	$ 1,000	$ 30,000
4.03	Runway Threshold Lighting	Each	12	$ 1,500	$ 18,000
4.04	Runway Signage	Each	4	$ 15,000	$ 60,000
4.05	Field Electrical Centre (FEC) Modifications	Lump Sum	1	$ 100,000	$ 100,000
				Subtotal Electrical Work (4.00)	**$ 448,000**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works (2.00 + 3.00 + 4.00).
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) No rock breaking is anticipated for this concept configuration.
6) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. A site specific pavement design must be completed based on geotechnical and climatic site conditions.
7) The estimate of probable cost is based on limited topographic contours and site conditions provided through LiDAR, Google Earth and Ontario GIS applications. Further topographic survey is required to confirm these site conditions and the estimted quantities.
8) This Class D estimate of probable costs is provided as an order of magnitude budgetary estimate based on conceptual quantities and previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Runway 12-30 Extension - AGN II Non-Instrument
731.6 m (2,400 ft) to 1,371.6 m (4,500 ft)

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 461,500
2.00	Preparatory Site Works				$ 2,050,850
3.00	Runway 09-27 Extension				$ 2,111,000
4.00	Electrical Work				$ 327,500
	Subtotal Estimate of Probable Construction Costs				**$ 4,950,850**
5.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 247,543
6.00	Engineering Design, Tender and Construction Management			10%	$ 495,085
7.00	Project Contingencies and Unknowns			25%	$ 1,237,713
	Total Estimate of Probable Costs (rounded)				**$ 6,931,200**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 449,000	$ 449,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 461,500**
2.00	**Preparatory Site Works**				
2.01	Tree Clearing	m^2	523,700	$ 1	$ 523,700
2.02	Grubbing	m^2	38,300	$ 5	$ 191,500
2.03	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	4,150	$ 15	$ 62,250
2.04	Common Excavation to On-Site Fill	m^3	47,400	$ 12	$ 568,800
2.05	Common Excavation c.w. Disposal Off-Site	m^3	13,900	$ 20	$ 278,000
2.06	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 30% of Common Excavation to On-Site Fill)	m^3	14,220	$ 30	$ 426,600
				Subtotal Preparatory Site Works (2.00)	**$ 2,050,850**
3.00	**Runway 09-27 Extension**				
3.01	Granular Subbase Course (GSBC) - 200mm Thick	m^3	4,000	$ 50	$ 200,000
3.02	Granular Base Course (GSBC) - 200mm Thick	m^3	4,000	$ 60	$ 240,000
3.03	Asphalt Paving - 100 mm Compacted Thickness	Tonne	5,000	$ 160	$ 800,000
3.04	Storm Drainage Measures	Lump Sum	1	$ 50,000	$ 50,000
3.05	Finish Grading, Topsoil, Hydroseed	m^2	39,800	$ 20	$ 796,000
3.06	Pavement Markings	Lump Sum	1	$ 25,000	$ 25,000
				Subtotal Runway 09-27 Extension (3.00)	**$ 2,111,000**
4.00	**Electrical Work**				
4.01	Trenching c.w. Ductwork, Cable, Counterpoise, etc.	Lin.m.	1,450	$ 150	$ 217,500
4.02	Runway Edge Lighting	Each	26	$ 1,000	$ 26,000
4.03	Relocate Runway Threshold Lighting Runway 12	Each	12	$ 750	$ 9,000
4.04	Runway Signage	Each	4	$ 15,000	$ 60,000
4.05	New Illuminated Windsock	Each	1	$ 15,000	$ 15,000
				Subtotal Electrical Work (4.00)	**$ 327,500**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration for the west end of the runway extension between the airport access road and Beaver Creek Dr.
6) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
7) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
8) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 1 - South West Quadrant - Fig 4-2

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 353,000
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 2,922,600
3.00	AGN III Taxiways				$ 420,000
4.00	Access Road				$ 142,000
5.00	SW 01 and New Building Lease Lot Services				$ 37,000
	Subtotal Estimate of Probable Construction Costs				**$ 3,874,600**
6.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 193,730
7.00	Engineering Design, Tender and Construction Management			10%	$ 387,460
8.00	Project Contingencies and Unknowns			25%	$ 968,650
	Total Estimate of Probable Costs (rounded)				**$ 5,424,400**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 353,000	$ 353,000
				Subtotal General Requirements (1.00)	**$ 353,000**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	2,400	$ 5	$ 12,000
2.02	Common Excavation to On-Site Fill	m^3	4,550	$ 12	$ 54,600
2.03	Common Excavation c.w. Disposal Off-Site	m^3	69,000	$ 20	$ 1,380,000
2.04	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 50% of Common Excavation)	m^3	36,800	$ 30	$ 1,104,000
2.05	Finish Grading, Topsoil, Hydroseed	m^2	24,800	$ 15	$ 372,000
				Subtotal Preparatory Site Works (2.00)	**$ 2,922,600**
3.00	**AGN III Taxiways**				
3.01	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	1,200	$ 15	$ 18,000
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	1,200	$ 50	$ 60,000
3.03	Granular Base Course (GBC) - 200mm Thick	m^3	1,200	$ 60	$ 72,000
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	1,500	$ 160	$ 240,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 20,000	$ 20,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 10,000	$ 10,000
				Subtotal AGN III Taxiways (3.00)	**$ 420,000**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpiling for Reuse - Approx. 200mm Depth	m^3	400	$ 15	$ 6,000
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	400	$ 50	$ 20,000
4.03	Granular Base Course (GBC) - 200mm Thick	m^3	400	$ 60	$ 24,000
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	500	$ 160	$ 80,000
4.05	Storm Drainage Measures	Lump Sum	1	$ 10,000	$ 10,000
4.06	Pavement Markings	Lump Sum	1	$ 2,000	$ 2,000
				Subtotal Access Road (4.00)	**$ 142,000**
5.00	**SW 01 and New Building Lease Lot Services**				
5.01	Step Down Transformer	Lump Sum	2	$ 8,000	$ 16,000
5.02	Overhead Electricity Feed incl. Transformer, OH lines, poles, etc.	Lin.m.	210	$ 100	$ 21,000
				Subtotal SW 01 and New Building Lease Lot Services (5.00)	**$ 37,000**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration. There is a large terrain outcrop at the west end of the building footprint that spans to Beaver Creek Dr. The access road has been shown from the south to avoid this large rock outcrop.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Development of the lots, apron and parking lot are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
8) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 1 - South East Quadrant - Fig 4-3

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 428,000
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 2,444,750
3.00	AGN II and AGN III Taxiways				$ 1,123,500
4.00	Access Road				$ 577,250
5.00	SE 01 - SE 13 Lease Lot Services				$ 126,500
	Subtotal Estimate of Probable Construction Costs				**$ 4,700,000**
6.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 235,000
7.00	Engineering Design, Tender and Construction Management			10%	$ 470,000
8.00	Project Contingencies and Unknowns			25%	$ 1,175,000
	Total Estimate of Probable Costs (rounded)				**$ 6,580,000**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 428,000	$ 428,000
				Subtotal General Requirements (1.00)	**$ 428,000**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	22,650	$ 5	$ 113,250
2.02	Common Excavation to On-Site Fill	m^3	13,000	$ 12	$ 156,000
2.03	Common Excavation c.w. Disposal Off-Site	m^3	69,400	$ 20	$ 1,388,000
2.04	Finish Grading, Topsoil, Hydroseed	m^2	52,500	$ 15	$ 787,500
				Preparatory Site Works, Lot Grading, Finish Grading (2.00)	**$ 2,444,750**
3.00	**AGN II and AGN III Taxiways**				
3.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	3,300	$ 15	$ 49,500
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	3,300	$ 50	$ 165,000
3.03	Granular Base Course (GBC) - 200mm Thick	m^3	3,300	$ 60	$ 198,000
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	4,100	$ 160	$ 656,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 40,000	$ 40,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 15,000	$ 15,000
				Subtotal AGN II and AGN III Taxiways (3.00)	**$ 1,123,500**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	1,650	$ 15	$ 24,750
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	1,650	$ 50	$ 82,500
4.03	Granular Base Course (GBC) - 200mm Thick	m^3	1,650	$ 60	$ 99,000
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	2,100	$ 160	$ 336,000
4.05	Storm Drainage Measures	Lump Sum	1	$ 30,000	$ 30,000
4.06	Pavement Markings	Lump Sum	1	$ 5,000	$ 5,000
				Subtotal Access Road (4.00)	**$ 577,250**
5.00	**SE 01 - SE 13 Lease Lot Services**				
5.01	Step Down Transformer	Lump Sum	3	$ 8,000	$ 24,000
5.02	Overhead Electricity Feed incl. Transformer, OH lines, poles, etc.	Lin.m.	1,025	$ 100	$ 102,500
				Subtotal SE 01 - SE 13 Lease Lot Services (5.00)	**$ 126,500**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) No rock breaking is anticipated for this concept configuration.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
8) Development of the lots, aprons and parking lots are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 1 - West Quadrant - Fig 4-4

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 342,500
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 2,283,550
3.00	AGN II and AGN III Taxiways				$ 755,750
4.00	Access Road				$ 209,300
5.00	W 01 - W 09 Lease Lot Services				$ 47,500
	Subtotal Estimate of Probable Construction Costs				**$ 3,638,600**
6.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 181,930
7.00	Engineering Design, Tender and Construction Management			10%	$ 363,860
8.00	Project Contingencies and Unknowns			25%	$ 909,650
	Total Estimate of Probable Costs (rounded)				**$ 5,094,000**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 330,000	$ 330,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 342,500**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	56,000	$ 5	$ 280,000
2.02	Common Excavation to On-Site Fill	m^3	50,100	$ 12	$ 601,200
2.03	Import Common Fill	m^3	8,430	$ 20	$ 168,600
2.04	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 50% of Common Excavation)	m^3	25,050	$ 30	$ 751,500
2.05	Finish Grading, Topsoil, Hydroseed	m^2	32,150	$ 15	$ 482,250
				Preparatory Site Works, Lot Grading, Finish Grading (2.00)	**$ 2,283,550**
3.00	**AGN II and AGN III Taxiways**				
3.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	2,150	$ 15	$ 32,250
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	2,150	$ 50	$ 107,500
3.03	Granular Base Course (GSBC) - 200mm Thick	m^3	2,150	$ 60	$ 129,000
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	2,700	$ 160	$ 432,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 40,000	$ 40,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 15,000	$ 15,000
				Subtotal AGN II and AGN III Taxiways (3.00)	**$ 755,750**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	580	$ 15	$ 8,700
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	580	$ 50	$ 29,000
4.03	Granular Base Course (GSBC) - 200mm Thick	m^3	580	$ 60	$ 34,800
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	730	$ 160	$ 116,800
4.05	Storm Drainage Measures	Lump Sum	1	$ 15,000	$ 15,000
4.06	Pavement Markings	Lump Sum	1	$ 5,000	$ 5,000
				Subtotal Access Road (4.00)	**$ 209,300**
5.00	**W 01 - W 09 Lease Lot Services**				
5.01	Step Down Transformer	Lump Sum	2	$ 8,000	$ 16,000
5.02	Overhead Electricity Feed incl. Transformer, OH lines, poles, etc.	Lin.m.	315	$ 100	$ 31,500
				Subtotal W 01 - W 09 Lease Lot Services (5.00)	**$ 47,500**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration. There are two large terrain outcrops on the western portion of the development plot. Excavation will be required to provide development lots, access road, and taxiways as shown.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
8) Development of the lots, aprons and parking lots are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 2 - East Quadrant - Fig 5-2

Revised: 2021/11/30

Item	Cost Summary				Total
1.00	General Requirements				$ 752,500
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 4,412,700
3.00	AGN II Taxiways				$ 1,263,000
4.00	Access Road				$ 1,427,000
5.00	E 01 - E 22 Lease Lot Services				$ 290,000
	Subtotal Estimate of Probable Construction Costs				**$ 8,145,200**
6.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 407,260
7.00	Engineering Design, Tender and Construction Management			10%	$ 814,520
8.00	Project Contingencies and Unknowns			25%	$ 2,036,300
	Total Estimate of Probable Costs (rounded)				**$ 11,403,300**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 740,000	$ 740,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 752,500**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	108,000	$ 5	$ 540,000
2.02	Common Excavation to On-Site Fill	m^3	144,350	$ 12	$ 1,732,200
2.03	Common Excavation c.w. Disposal On-Site	m^3	9,900	$ 15	$ 148,500
2.04	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 15% of Common Excavation)	m^3	23,100	$ 30	$ 693,000
2.05	Finish Grading, Topsoil, Hydroseed	m^2	86,600	$ 15	$ 1,299,000
				Preparatory Site Works, Lot Grading, Finish Grading (2.00)	**$ 4,412,700**
3.00	**AGN II Taxiways**				
3.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	3,640	$ 15	$ 54,600
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	3,640	$ 50	$ 182,000
3.03	Granular Base Course (GSBC) - 200mm Thick	m^3	3,640	$ 60	$ 218,400
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	4,550	$ 160	$ 728,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 60,000	$ 60,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 20,000	$ 20,000
				Subtotal AGN II Taxiways (3.00)	**$ 1,263,000**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	4,200	$ 15	$ 63,000
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	4,200	$ 50	$ 210,000
4.03	Granular Base Course (GSBC) - 200mm Thick	m^3	4,200	$ 60	$ 252,000
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	5,200	$ 160	$ 832,000
4.05	Storm Drainage Measures	Lump Sum	1	$ 60,000	$ 60,000
4.06	Pavement Markings	Lump Sum	1	$ 10,000	$ 10,000
				Subtotal Access Road (4.00)	**$ 1,427,000**
5.00	**E 01 - E 22 Lease Lot Services**				
5.01	Step Down Transformer	Lump Sum	5	$ 8,000	$ 40,000
5.02	Overhead Electricity Feed incl. Transformer, OH lines, poles, etc.	Lin.m.	2,500	$ 100	$ 250,000
				Subtotal E 01 - E 17 Lease Lot Services (5.00)	**$ 290,000**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration. There is undulating terrain along the access road path at the east end of the site and in lots E13-E17. Excavation will be required to provide development lots, access road, and taxiways as shown.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
8) Development of the lots, aprons and parking lots are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 2 - West Quadrant - Fig 5-3

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 242,500
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 2,008,550
3.00	AGN III Taxiways				$ 224,250
4.00	Access Road				$ 62,750
	Subtotal Estimate of Probable Construction Costs				**$ 2,538,050**
5.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 126,903
6.00	Engineering Design, Tender and Construction Management			10%	$ 253,805
7.00	Project Contingencies and Unknowns			25%	$ 634,513
	Total Estimate of Probable Costs (rounded)				**$ 3,553,300**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 230,000	$ 230,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 242,500**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	60,300	$ 5	$ 301,500
2.02	Common Excavation to On-Site Fill	m^3	16,400	$ 12	$ 196,800
2.03	Common Excavation c.w. Disposal Off-Site	m^3	28,150	$ 20	$ 563,000
2.04	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 50% of Common Excavation)	m^3	22,275	$ 30	$ 668,250
2.05	Finish Grading, Topsoil, Hydroseed	m^2	18,600	$ 15	$ 279,000
				Preparatory Site Works, Lot Grading, Finish Grading (2.00)	**$ 2,008,550**
3.00	**AGN III Taxiways**				
3.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	650	$ 15	$ 9,750
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	650	$ 50	$ 32,500
3.03	Granular Base Course (GSBC) - 200mm Thick	m^3	650	$ 60	$ 39,000
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	800	$ 160	$ 128,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 10,000	$ 10,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 5,000	$ 5,000
				Subtotal AGN III Taxiways (3.00)	**$ 224,250**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	170	$ 15	$ 2,550
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	170	$ 50	$ 8,500
4.03	Granular Base Course (GSBC) - 200mm Thick	m^3	170	$ 60	$ 10,200
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	200	$ 160	$ 32,000
4.05	Storm Drainage Measures	Lump Sum	1	$ 7,500	$ 7,500
4.06	Pavement Markings	Lump Sum	1	$ 2,000	$ 2,000
				Subtotal Access Road (4.00)	**$ 62,750**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration. There are two large terrain outcrops on the western portion of the development plot. Excavation will be required to provide development lots, access road, and taxiways as shown.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
8) Development of the lots, aprons and parking lots are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.

Muskoka Airport Master Plan Amendment
Conceptual Class 'D' Estimates of Probable Cost
Strategy 2 - North East Quadrant - Fig 5-4

Revised: 2021/11/29

Item	Cost Summary				Total
1.00	General Requirements				$ 439,500
2.00	Preparatory Site Works, Lot Grading, Finish Grading				$ 3,175,300
3.00	AGN II and AGN III Taxiways				$ 648,000
4.00	Access Road				$ 368,000
5.00	NE 01 - NE 10 Lease Lot Services				$ 76,000
.	**Subtotal Estimate of Probable Construction Costs**				**$ 4,706,800**
6.00	District of Muskoka Overhead (Insurance, Internal Costs etc.)			5%	$ 235,340
7.00	Engineering Design, Tender and Construction Management			10%	$ 470,680
8.00	Project Contingencies and Unknowns			25%	$ 1,176,700
	Total Estimate of Probable Costs (rounded)				**$ 6,589,500**

Item	Description	Unit	Est. Quantity	Unit Price	Total Price
1.00	**General Requirements**				
1.01	Temporary Facilities: Mob / Demob, Survey, Locates, Enviro, Safety, etc.	Lump sum	1	$ 427,000	$ 427,000
1.02	Environmental Assessment	Lump sum	1	$ 12,500	$ 12,500
				Subtotal General Requirements (1.00)	**$ 439,500**
2.00	**Preparatory Site Works, Lot Grading, Finish Grading**				
2.01	Tree Clearing and Grubbing	m^2	53,300	$ 1	$ 53,300
2.02	Common Excavation to On-Site Fill	m^3	11,500	$ 12	$ 138,000
2.03	Common Excavation c.w. Disposal Off-Site	m^3	56,500	$ 20	$ 1,130,000
2.04	Bedrock Blasting and/or Rock Breaking Cubic Metre Premium (Estimate 60% of Common Excavation)	m^3	40,800	$ 30	$ 1,224,000
2.05	Finish Grading, Topsoil, Hydroseed	m^2	42,000	$ 15	$ 630,000
				Preparatory Site Works, Lot Grading, Finish Grading (2.00)	**$ 3,175,300**
3.00	**AGN II and AGN III Taxiways**				
3.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	1,800	$ 15	$ 27,000
3.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	1,800	$ 50	$ 90,000
3.03	Granular Base Course (GSBC) - 200mm Thick	m^3	1,800	$ 60	$ 108,000
3.04	Asphalt Paving - 100 mm Compacted Thickness	Tonne	2,300	$ 160	$ 368,000
3.05	Storm Drainage Measures	Lump Sum	1	$ 40,000	$ 40,000
3.06	Pavement Markings and Edge Markers	Lump Sum	1	$ 15,000	$ 15,000
				Subtotal AGN II and AGN III Taxiways (3.00)	**$ 648,000**
4.00	**Access Road**				
4.01	Topsoil Stripping and Stockpile for Reuse - Approx. 200mm Depth	m^3	1,000	$ 15	$ 15,000
4.02	Granular Subbase Course (GSBC) - 200mm Thick	m^3	1,000	$ 50	$ 50,000
4.03	Granular Base Course (GSBC) - 200mm Thick	m^3	1,000	$ 60	$ 60,000
4.04	Asphalt Paving - 100mm Compacted Thickness	Tonne	1,300	$ 160	$ 208,000
4.05	Storm Drainage Measures	Lump Sum	1	$ 30,000	$ 30,000
4.06	Pavement Markings	Lump Sum	1	$ 5,000	$ 5,000
				Subtotal Access Road (4.00)	**$ 368,000**
5.00	**NE 01 - NE 10 Lease Lot Services**				
5.01	Step Down Transformer	Lump Sum	2	$ 8,000	$ 16,000
5.02	Overhead Electricity Feed incl. Transformer, OH lines, poles, etc.	Lin.m.	600	$ 100	$ 60,000
				Subtotal NE 01 - NE 10 Lease Lot Services (5.00)	**$ 76,000**

Notes:

1) Costs shown do not include taxes.
2) Estimated quantities include between 1-5% contingency depending on the order of magnitude, and are rounded to the nearest ten, hundred or thousand.
3) Temporary Facilities are based on an estimate of ~10% of the Subtotal Site Works.
4) Asphalt tonnage pricing is estimated at $160 per Tonne.
5) Rock breaking is anticipated for this concept configuration. There is a large terrain outcrop at the northwestern edge of the property. The current access road alignment is through this locations. Development reconfiguration or elimination of E08-E10 lots may achieve lower rock removal costs. The current configuration will require rock excavation be completed for development lots, access road, and taxiways as shown.
6) Section 2.00 includes cut and fill operations to provide lots at grade. No further lot site preparation is included.
7) Taxiways and Access Roads have been modelled with appropriate sloping for drainage, taxiway safety areas (graded areas), right of ways, etc. This allowance reduces the required allowance for storm drainage measures however increases the earthworks quantities when compared with the methodology used for the Master Plan.
8) Development of the lots, aprons and parking lots are developer responsibility. Cut/fill quantities shown above for these areas include site grading for level terrain only.
9) The pavement structure layer thicknesses are an estimate based on understood subgrade strengths and estimated partial frost protection. Exact pavement design must be completed to confirm a site specific pavement design based on geotechnical and climatic site conditions.
10) The estimate of probable cost is based on limited topographic contours and site conditions (LiDAR, Google Earth and Ontario GIS applications). Further investigations are required to confirm these site conditions.
11) This estimate of probable costs is provided for budgetary purposes only based on previous pricing for similar works. It is not to be interpreted as a guarantee by Tetra Tech of the actual project costs. The actual project cost shall be determined by the tender and construction process.