



TETRA TECH

Niagara Region Airport Study Niagara District Airport Land Use Plan and Financial Projection



PRESENTED TO

The Regional Municipality of Niagara

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EXECUTIVE SUMMARY

The Regional Municipality of Niagara (Region) is currently reviewing the ownership structure and operations of the Niagara District Airport (NDA). In 2015, the Niagara District Airport Commission (NDAC) and the local municipality passed a motion requesting the Region consider assuming operations of the airport. In July 2015, the Region approved a motion to support engaging in preliminary discussions with the airport and the respective municipalities.

The Town of Niagara-on-the-Lake owns most of the airport property. The City of St. Catharines has a small land holding in the southwest portion of airport lands.

To determine the overall benefit of a regional role in the airports operations, the Region contracted Tetra Tech EBA Inc. (Tetra Tech) and Operations Economics Inc. (OEI) to develop an updated land use plan, a financial projection (Annex 1), and a risk analysis for the airport. The study included a comprehensive consultation with the airport operators, municipalities and airport tenants.

The airport is fortunate to have an Airport Zoning Regulation that protects airspace around the airport from incompatible land uses. A Niagara-on-the-Lake Zoning Bylaw also defines appropriate land uses at the airport.

Tourism operators, flight training schools and recreation pilots account for about 32,000 annual aircraft movements.

In 2011, under a government-funding grant, construction began on a new terminal building and airfield pavements (e.g., primary runway (06-24), a portion of the crosswind runway (01-19) and taxiways A, B and C). Airport infrastructure is therefore in good condition requiring only ongoing lifecycle maintenance.

The primary runway is equipped with approach navigation systems that will require the installation of an emergency backup power system to ensure ongoing operations in instrument flight rule (IFR) conditions. The remaining length of Runway 01-19, Runway 11-29 and Taxiway D pavements have exceeded a normal lifecycle and will require immediate attention if they are going to continue being used. Airport groundside assets (roads, services, utilities) are in good condition and will likely require normal lifecycle maintenance and repair during the plan period (20-years).

The Land Use Plan identifies suitable land uses for all areas of the airport. The plan first identifies areas that are critical to ongoing airport operations (e.g. airfield infrastructure, terminal and operations/maintenance buildings, access and parking). Based on stakeholder consultations, development designs are specific to certain types of activities. As an example, the Southwest Development Area (SWDA) layout design is for small hangar/multi-use construction, while the East (EDA) and Northwest (NWDA) Development Areas include lots for larger commercial customers or private owners with more significant land requirements. Development is demand driven and therefore the development of the NWDA and changes to the airfield (e.g., the conversion of Runway 11-29 to a taxiway) will only be required at such time the development area is required.

The total estimated cost to develop the SWDA is approximately \$3,800,000. The cost is divided into three separate phases with development in two phases over the next 20 years.

The general findings from the financial analysis show the NDA has stable and varied operations. The NDA has operated with an operating surplus based on the annual municipal grants. The Capital Plan for the airport recommends an investment of approximately \$9,700,000 over the next 11 years, or \$885,000 on an annualized basis. Operating budget projections anticipate an annual deficit (before municipal grants) declining slowly over the next ten years. Highlights of the Capital Plan include \$600,000 in equipment replacement, \$736,000 for runway rehabilitation and approximately \$3,600,000 for development depending on demand.

Airports face a number of types of risk, but governments, airport organizations, pilots, and others have developed methods and procedures to reduce them. The main risks that the airport faces relate to federal regulation and policy, environmental, safety and security, and financial concerns.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
Organizations	
CATSA	Canadian Air Transport Security Agency
CBSA	Canadian Border Security Agency
ICAO	International Civil Aviation Organization
NDA	Niagara District Airport
NDAC	Niagara District Airport Commission
OEI	Operations Economics Inc.
OGS	Ontario Geological Survey
Region	Regional Municipality of Niagara
Tetra Tech	Tetra Tech EBA Inc.
Airport Terms	
ADAF	Aircraft De-icing and Anti-icing Fluids
AOE	Airport of Entry
AOM	Airport Operations Manual
AGN	Aircraft Group Number
ASL	Above Sea Level
ATB	Air Terminal Building
AZR	Airport Zoning Regulation
CA	Critical Aircraft
CAP	Canada Air Pilot
CARS	Canadian Aviation Regulations
CFS	Canada Flight Supplement
CYSN	St. Catharines/Niagara District Airport
EAS	Environmental Assessment Screening
EDA	East Development Area
EG	Ethylene Glycol
ELC	Ecological Land Classification
FBO	Fixed Base Operator

Acronyms/Abbreviations	Definition
FEC	Field Electric Centre
FOD	Foreign Object Damage
FSS	Flight Service Station
kt	knots
HVAC	Heating Ventilation Air Conditioning
LUP	Land Use Plan
MDA	Minimum Descent Altitude
NDB	Non-directional Beacon
NWDA	Northwest Development Area
ODALS	Omni-directional Approach Landing System
OLS	Obstacle Limitation Surface
PAPI	Precision Approach Path Indicator
RESA	Runway End Safety Area
RFE	Regulated Floodplain
RNAV	Area Navigation
ROW	Right-of-Way
SDA	Southwest Development Area
SMS	Safety Management Systems
VFR	Visual Flight Rules
Other Terms	
ASL	Above Sea Level
EAS	Environmental Assessment Screening
ELC	Ecological Land Classification
HVAC	Heating Ventilation Air Condition
OGS	Ontario Geological Survey
RFE	Regulated Floodplain Extent
ROW	Right of Way

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of The Regional Municipality of Niagara and their agents. Tetra Tech EBA 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 The Regional Municipality of Niagara, 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.

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1.0 INTRODUCTION

The Regional Municipality of Niagara (Region) is currently reviewing the ownership structure and operations of the Niagara District Airport (NDA). In June and July 2015, the Niagara District Airport Commission (NDAC) and the local municipality passed a motion requesting the Region consider assuming operations of the airport. In July 2015, the Region approved a motion to support engaging in preliminary discussions with the airport and the respective municipalities.

The Town of Niagara-on-the-Lake owns most of the airport property. The City of St. Catharines has a small land holding in the southwest portion of airport lands. Transport Canada (St. Lawrence Seaway Authority) owns lands to the west of the airport. The privately owned land around the airport is for agriculture.

The NDAC manages and operates the airport. The NDAC is comprised of representatives selected by the City of St. Catharines, Niagara Falls, and Niagara-on-the-Lake. The NDAC has one part-time and four full-time employees at the airport. The airport is for general aviation and there are a number of aviation-related businesses and private hangar owners located at the airport. There are approximately 75 privately owned aircraft based at the airport. The volunteer Niagara-on-the-Lake Fire Department provides emergency services.

To determine the overall benefit of a regional role in the airports operations, the Region contracted Tetra Tech EBA Inc. (Tetra Tech) and Operations Economics Inc. (OEI) to develop an updated land use plan, a financial forecast (Annex 1), and a risk analysis for the airport. The study includes a comprehensive consultation with the airport operators, municipalities and airport tenants. A list of stakeholders is included in Appendix A.

2.0 AERONAUTICAL ZONING AND AIRCRAFT MOVEMENTS

A federal Airport Zoning Regulation (AZR) regulates approach surfaces for each runway. Development on specified lands and within specified air space surrounding the NDA is subject to the constraints identified within the regulation and/or the approval of Transport Canada by recommendation from the Airport.

The Niagara District Airport Zoning Regulations (AZRs), referred to officially as the St. Catharines Airport Zoning Regulations (SOR/84-901), include restrictions to structure heights within the vicinity of the airport, including the site identified for the proposed Garden City Skyway. Height restrictions reference the Obstacle Limitation Surfaces (OLS) as described in SOR/84-901.

2.1.1 Garden City Skyway Bridge

A separate consultant assessed the potential effect of a proposed second transportation corridor spanning the Welland Canal on the NDA AZR. The WSP report states, "Where penetration of the Outer Surface occurs the result can be a restriction to instrument flight procedures and/or a change in visual flight patterns. The location of the proposed bridge in relation to the Airport will require increases be made to instrument flight procedure visual circling minima and possibly a change to visual flight circuit patterns."

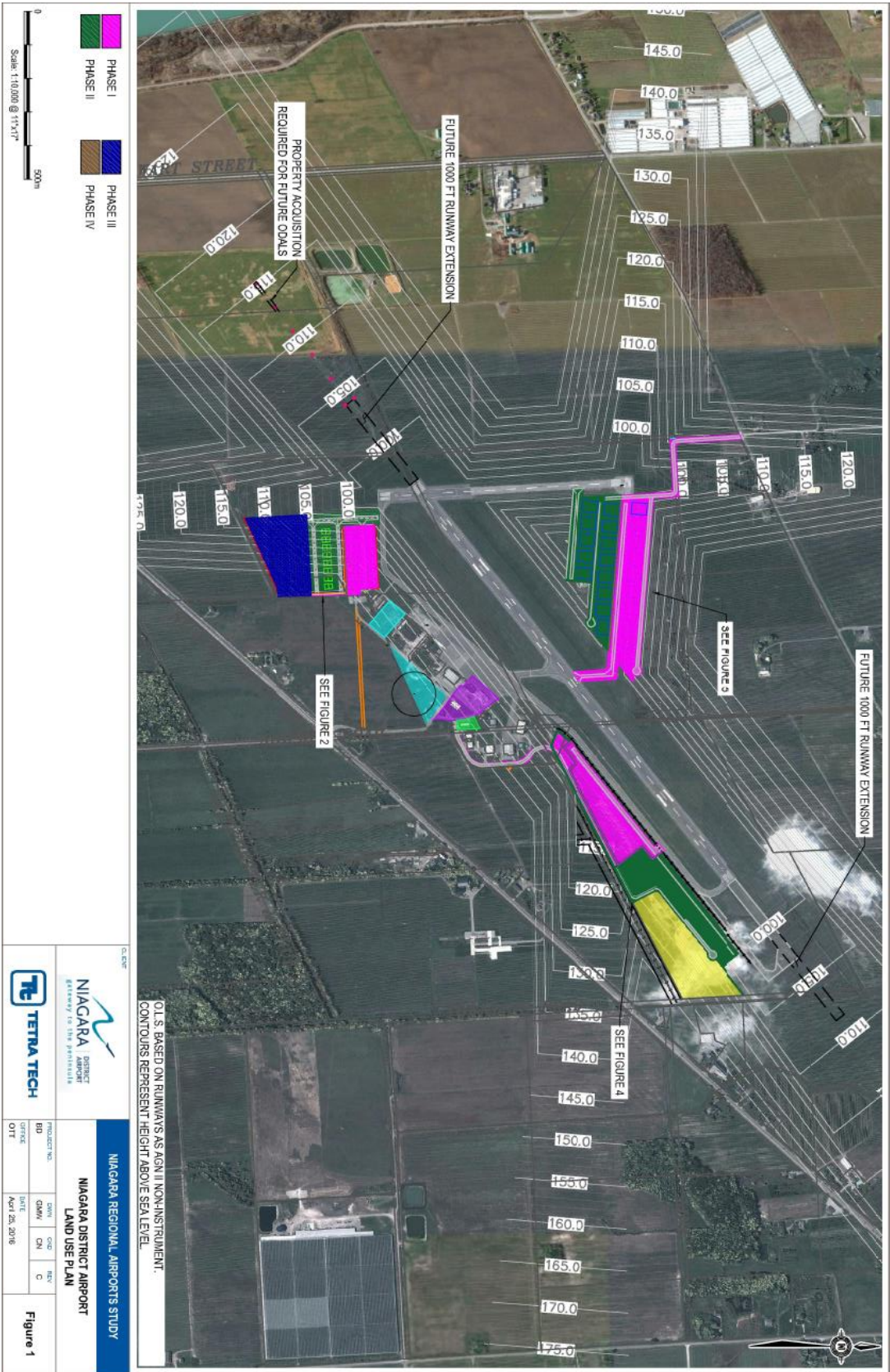
The analysis found that departures from Runways 01, 06, 11, 19, and 29 bypass the perimeter of the bridge planning box and therefore do not require further assessment. The proposed bridge planning box would penetrate the Runway 24 OLS; therefore, the departure procedure for Runway 24 requires adjustment to avoid the bridge. Based on the analysis, a modest climb gradient of 310 ft. (94.5 m) per nautical mile would be required until reaching 800 ft. (243.8 m) above sea level (ASL) to safely avoid the bridge and provide sufficient clearance between aircraft and obstructions.

The proposed Skyway Bridge, if restricted to a maximum build height of 528 ft. (161 m) ASL, does not pose a significant constraint to operations from the existing runway. The penetrations that would occur to the NDA's registered zoning and required operational zoning would be limited to specific areas of outer surface that are mitigated through changes to circling procedures and official amendments to the registered zoning. The potential impact of an extended runway and the Skyway Bridge is under a separate study.

If the proposed Skyway Bridge were to be constructed to the maximum build height of 630 ft. (192.1 m) as previously assumed for the planning box, the impacts to existing instrument approach procedures would be significant and negatively impact the airport's usability. However, restricting the bridge height to a maximum of 528 ft. (161 m) ASL can mitigate most impacts based on the current runway length. Unavoidable impacts would be to the non-directional beacon (NDB) Runway 06 approach and both area navigation (RNAV) and NDB circling approach. The most significant impact would be to the circling approaches, which, depending on the mitigation option chosen, could either raise the minimum descent altitude (MDA) a maximum of 100 ft. (61.0 m) or restrict circling to avoid overflight of the bridge. This may reduce the usability of the airport in a limited number of cases, but only slightly, and only for aircraft unable to execute a direct approach to Runways 06 or 24.

The impact evaluation did not include a Runway 06 extension onto St. Lawrence Seaway Authority property.

Figure 1 : Niagara District Airport Land Use Plan – Overall Airport



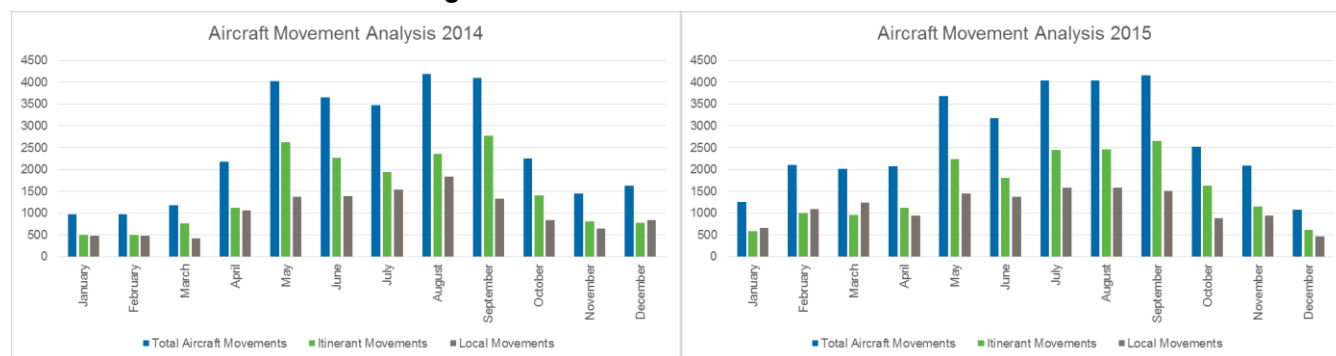
2.2 AIRPORT ZONING

The airport is currently zoned “Airport Zone” under the Niagara-on-the Lake Zoning Bylaw. The airport is defined as “the use of land for airport services in support of airport activities, including the sale and manufacturing of airplanes, parts and service.” The definition is very specific and if alternative land uses are identified (e.g., solar farm) a bylaw amendment may be required. Section 6.22 of the bylaw also restricts height within a 3,962.4 m radius of the NDA centre point. Height restrictions are set in accordance with OLS requirements.

2.3 AIRCRAFT MOVEMENTS

Figure 2-1 shows NDA aircraft movements of 30,000 and 32,000 for years 2014 and 2015 respectively. It is apparent that the majority of aircraft movements occur during the period May through September. This is not surprising because weather conditions are more favourable to recreational and pilot training activities and this time of year is also the prime tourism season. It is noted jet aircraft typically accounted for less than 1% of the total aircraft movements.

Figure 2-1: Aircraft Movements 2014/2015



A single runway can accommodate a significant number of aircraft movements (greater than 200,000 movements). Open V runway environments increase the overall practical capacity even more. As indicated, NDA will not exceed the runway capacity limits; however, one must consider peak-hour movements when conducting an overall runway capacity evaluation. During the summer months, aircraft activity is in the range of 60 to 80 daily movements. Movements are calculated using the total number of arrivals and departures. As an example, an itinerant movement is defined as an aircraft that proceeds to or arrives from another location, or leaves the circuit but returns without landing at another airport. Local movements are those aircraft that remain within the circuit. Typically, flight training activities occur within the circuit and, as such, a single aircraft can account for a significant number of movements in a given day. This analysis shows that the 60 to 80 movements in a single day can result from much fewer numbers of actual aircraft (e.g., 30 to 40). If these aircraft are generally spread over the course of a day there would be no significant peak-hour movements that would cause queuing problems.

3.0 AIRPORT ASSETS

An inventory of airport assets that are due for replacement over the next twenty years is included in Appendix B. The inventory includes a listing of assets, the acquisition/construction date and the expected replacement date.

The following sections describe airport assets in detail.

3.1 AIRFIELD ASSETS

The critical aircraft (CA) for the airport is the Boeing 737-700. The Aircraft Group Number (AGN) for this aircraft (AGN IIIB) is based on the Transport Canada, TP 312 Aerodrome and Recommended Practices, 5th Edition. Table 3-1 identifies the AGN specifications and approach speed categories. The AGN determines both the physical dimension of the design aircraft (e.g., wing span, outer main gear span) and the runway operating environment (e.g., runway width, transitional zoning). The approach speed of the aircraft can also determine which category the aircraft falls into. As an example, an aircraft dimension may be such that it falls into a specific AGN category; however, the landing speed (approximately 1.3 times the aircraft design stall speed) may require the aircraft to be designated in a higher category, resulting in a change to the overall airfield environment.

Table 3-1: Aircraft Group Number and Approach Speed Categories

Aircraft Group Number (AGN)	Wing Span	Outer Main Gear
I (for approach speed CAT C or D use AGN IIIB)	Less than 14.94 m	Less than 4.5 m
II (for approach speed CAT C or D use AGN IIIB)	14.94 m up to but not including 24.10 m	5.0 m up to but not including 9.0 m
IIIA (for approach speed CAT C or D use AGN IIIB)	24.10 m up to but not including 36.00 m	6.0 m up to but not including 9.0 m
IIIB (includes groups I-IIIA with CAT C or D approach speeds)	14.94 m up to but not including 24.10 m	14.94 m up to but not including 24.10 m
Approach Speed Category (knots) (kt)		
Category A	Speed less than 91 kt	
Category B	Speed 91 kt or more but less than 121 kt	
Category C	Speed 121 kt or more but less than 141 kt	
Category D	Speed 141 kt or more but less than 166 kt	
Category E	Speed 166 kt or more	

Table 3-2 identifies airport characteristics and the operating environment as published in the Canada Flight Supplement (CFS). Pilots will reference the CFS and the Canada Air Pilot (CAP) when preparing flight plans. The CAP provides airport reference material and published airspace, approach, and departure procedures.

Table 3-2: Airport Characteristics

St. Catharines/Niagara District Airport CYSN	
Reference	N43 11 30 W79 10 16
Elevation	321 ft.
Customs	AOE/15
Flight Service Station (FSS)	Nav Canada FSS
Runway Data	Runway 06-24: 5,000 ft. x 100 ft.
	Runway 01-19: 2,496 ft. x 75 ft.
	Runway 11-29: 1,988 ft. x 75 ft.
Localizer Performance with Vertical guidance (LPV)	Published Global Positioning System approach for Runway 06-24
Runway Condition Report	Flight Service Station (FSS) Canadian Runway Friction Index (CRFI)/Runway Surface Condition (RSC) Mon-Fri 1100-2400Z O/T contact operations. Limited winter maintenance.
Lighting	Runway 05 and 23 (Threshold and Runway End (TE), Medium Intensity Runway Edge Lights (ME), variable 3 settings), Precision Approach Path Indicator (P2), Omni-directional Approach Lighting System (ODALS) ARCAL – 123.5 type K
Procedures	For flight over Niagara Falls, see Niagara Falls VTPC. Glider activity vicinity of the airport Sat, Sun, holidays Apr-Jun & Sep-Nov. Gliders non-standard pattern. NOISE MITIGATION: After takeoff from Rwy 24, track on or north of the extended runway centreline, no turns below 1,000 ft. ASL. Hold position on Taxiway A is for both Rwy 01 and 06. Pilots intending to depart Rwy 06 must verify correct orientation on Rwy 06 prior to departure. Hold position on Taxiway B is for Rwy 06/24 and Rwy 29

3.1.1 Runways

Runway 06-24

Runway 06-24 is the main runway at the airport and is used approximately 86% of the time for arrivals and departures. The runway is 5,000 ft. in length and suitable for the types of aircraft expected to regularly serve the airport.

The runway pavements and edge lighting systems were upgraded in 2011 and are in excellent condition. The lifecycle for a typical runway pavement is dependent on a number of factors: the types of aircraft using the runways, the frequency of aircraft movements, weather conditions (e.g., thaw cycles) and general maintenance (e.g., crack sealing). A 15 to 20 year lifecycle is normally considered for the runway pavements and it is therefore expected a runway pavement rehabilitation will be required in the 2026 to 2031 timeframe. The runway lighting systems would require upgrading at the same time as the pavement rehabilitation.

Runway 06-24 Extension

To accommodate a wider variety of aircraft, a 1,000 ft. (304.8 m) runway extension may be required in the future. A longer runway will allow a broader range of aircraft operations. As an example, AGN IIIB (e.g., B737 series aircraft) will be able to use the runway for landing and takeoff. The allowable takeoff weight for the aircraft would need to be determined based on a number of factors including: number of passengers, ambient temperatures and distance to destination (e.g., fuel requirement).

The extension will likely be constructed at the Runway 24 end. The advantage of a Runway 24 extension is that all of the land required for the extension is currently on airport lands. The 24 end will, however, require that the airport negotiate leases or access to private lands to accommodate relocated Omni-Directional Approach Lighting System (ODALS) towers.

There is consideration for extending the runway on the 06 end which would require the acquisition of St. Lawrence Seaway Authority lands (approximately 90 acres) located west of the airport.

There is also a major municipal drain along the airport's western boundary. Construction at this end of the runway will require relatively significant drainage modifications.

Costing for a runway extension is included in the land use plan however the need for the extension is dependent on the inclusion of a scheduled or charter airline service using larger aircraft that require longer runways. A separate, passenger service viability assessment is currently in progress. The estimated cost for the runway extension is \$3,600,000. The runway extension is a relatively significant capital investment and a detailed business case will be required to justify an investment of this magnitude.

Runway 01-19

Runway 01-19 is a paved 2,496 ft. runway that is often used when conditions are such that the allowable crosswind component for safe aircraft operations on Runway 06-24 is compromised, or for convenience. The runway is used by recreational pilots and the flight training school. It is estimated the runway accounts for approximately 7% of the total aircraft movements. The runway length is suitable for smaller aircraft. The runway is not equipped with lighting systems and is therefore only useable during daytime Visual Flight Rule (VFR) operations.

The runway is in generally poor condition, with the exception of approximately 1,000 ft. (300 m) at the Runway 01 end that was rehabilitated in 2011. Ongoing maintenance can lengthen the pavement lifecycle; however, the potential for pavement surface failure (e.g., delamination) can result in flight safety concerns (e.g., foreign object damage (FOD)). The 1,000 ft. (300 m) at the Runway 01 end will require rehabilitation in the 2031 to 2036 timeframe whereas the remaining 1,500 ft. will require rehabilitation within the next few years.

Runway 11-29

Runway 11-29 is a paved 1,988 ft. runway that is used when crosswind components are not favourable to alternate runway use. The runway accounts for approximately 7% of the total aircraft movements; however, a large component of aircraft activity relates to glider operations. The runway is not equipped with lighting systems and is therefore only useable during daytime VFR operations.

Ongoing maintenance can lengthen the pavement lifecycle; however, the potential for pavement surface failure (e.g., delamination) can result in flight safety concerns (e.g., foreign object damage (FOD)). The runway is in very poor condition and requires immediate rehabilitation. During consultations, there was discussion of lengthening Runway 11-29 to provide for a more useable crosswind runway, reflective of the types of aircraft that would be using Runway 06-24.

The runway would be lengthened on the Runway 29 end and extend into the southeast development area. The current runway configuration allows aircraft operations in most wind conditions and the cost of a runway extension to 11-29 will be prohibitive. It is important to note that the results of a wind rose analysis may define further the optimum wind direction for a cross-wind runway (e.g., 01-19 vs. 11-29). The runway extension was not included in the timeframes associated with this study planning period.

Runway Operations

Aircraft manufacturers establish allowable crosswind limits for aircraft and pilots are trained to factor crosswinds, headwinds, and tailwinds into their flight planning. At some point, wind speed will exceed allowable limits for preferential runway use and in these circumstances, a crosswind runway will be used. At the NDA, runway use shows Runway 06-24 accounts for approximately 86% of arrivals and departures. Runways 11-29 and 01-19 account for 7% respectively, splitting the remaining arrivals and departures. It was noted that Runway 11-29 activity includes a relatively significant number of glider aircraft. The gliders are an integral component of the Royal Canadian Air Cadet spring and fall training program.

Based on wind analysis (wind rose), one can estimate the expected percentage of the time that winds will be out of a specific direction. Often winds can change seasonally and, as such, it is necessary to prepare an updated wind rose to verify seasonal wind direction and to determine which of the crosswind runways (01-19 or 11-29) is aligned most often with the dominant wind directions. The airport can then determine whether both runways are required for continued operations. If one of the runways is to be closed, the analysis can confirm which runway is best suited as the alternate runway.

There are airports in Canada that operate from single runways (e.g., Kelowna, Toronto Billy Bishop). Weather patterns, geography, and obstacles will dictate the suitability of a single runway operation. For example, the Kelowna airport is situated in a valley and, therefore, winds are funneled into the valley in a relatively constant direction. Toronto Billy Bishop is located adjacent to the downtown centre and, as such, the tall buildings will affect wind direction. In either case, the dominant wind and crosswind components are favourable to ongoing operations.

3.1.2 Taxiways and Aprons

The runways are accessed by way of four taxiways: A, B, C, and D. Taxiway A extends along the north edge of the main apron, terminating at Runway 01. Taxiway B extends from the main apron, connecting approximately midway on Runway 06-24. Taxiway C was constructed in 2011 and extends from the east end of the main apron to Runway 24. Taxiways A and B were rehabilitated as part of the 2011 runway rehabilitation projects. Ongoing maintenance (e.g., crack filling) will be required to maximize the pavement structure life cycle. The taxiways will require rehabilitation in the same timeframe as the main runway (2026 to 2031).

Taxiway D is paved and connects Runway 11-29 to Runway 06-24. The taxiway is in very poor condition and will require rehabilitation in the short term (within the next 5 years).

The main apron area (19,600 m²) is paved and the majority of the apron was resurfaced during the 2011 construction. Ongoing maintenance will maximize the lifecycle of the pavement structure and the apron should not require major rehabilitation during the planning period

3.1.3 Navigational Aids

Runway 06 and 24 are equipped with ODALS, a strobe light system that provides centreline guidance to the runway; and a Precision Approach Path Indicator (P2), a visual aid that provides vertical guidance to the pilot. The aids are in good condition. The navigational aids will require upgrading in the 2027 to 2037 timeframe.

3.1.4 Airport Fuel

The NDA provides both Avgas (22,480 L) and jet fuel (45,000 L). The fuel system is owned and operated by Allied Aviation. One of the major challenges is the fuel system is only available during working hours or on a call-out. The location of the fuel storage tanks (groundside) do not allow for a card-lock system that would allow pilots to fuel their aircraft and pay for the fuel online. To provide this service, the fuel tanks would need to be relocated airside (e.g., in front of the Allied Hangar).

NDA also owns aboveground diesel (2,090 L) and unleaded gasoline (2,200 L) tanks that are used for NDA vehicles.

3.1.5 Glycol Pad

A proposed Aircraft De-icing and Anti-icing Fluids (ADAF) collection tank will be located at the northeast end of the main apron near the intersection of Taxiways B and C. Aircraft operators regularly apply ADAF to prevent the formation of ice on aircraft critical surfaces. Ice buildup on an aircraft surfaces dramatically change takeoff characteristics (additional weight) and if undetected can result in serious accidents.

ADAF are comprised of glycol, additives, and water. Ethylene Glycol (EG) concentrations in Type I fluids are normally in the 54% range with some additives and water comprising the remaining 46%.

Studies suggest that biodegradation is the most important process for glycol breakdown and that bioaccumulation is not a likely factor. Glycol in high concentrations can deplete oxygen in receiving waters resulting in inhospitable conditions for aquatic organisms. For this reason, an Order in Council (Glycol Guideline) under the Canadian Environmental Protection Act limits glycol concentrations in stormwater leaving airport property to 100 mg/l.

Uncontrolled ADAF would enter the stormwater drainage system located immediately north of the proposed ADAF pad. A pad will be designed so that ADAF will drain to a collection storage tank located at the apron edge. The storage tank will be emptied regularly and the fluids will be disposed at an approved sump site or, under approval, directly into the sanitary sewer. Throughout Canada, glycol is often disposed in wastewater treatment systems since glycol degrades easily in treatment plant sludge. To control organic overloading in the treatment plant, discharges can be coordinated in off-peak flow hours. A sanitary sewer discharge will require approval from the Municipality.

The storage tank contents require regular testing during the de-icing season and when test results indicate glycol concentrations below Canadian water quality guidelines, water is discharged to the stormwater drainage system.

The airport must develop an emergency contingency plan designed to protect environmental ecosystems in the event higher than normal glycol concentrations enter the stormwater drainage system. The contingency plan will determine how airport personnel will close off the stormwater discharge and pump glycol-contaminated water into pump trucks for later disposal at an approved disposal location. Airport management will consult with the Municipality to confirm the acceptability of this practice in an emergency.

The glycol pad is not required for current airport operations and would only be necessary if the airport were successful in securing a scheduled or charter airline service.

3.2 GROUND SIDE ASSETS

3.2.1 Airport Owned Buildings

The Commission owns a number of buildings at the airport that are either used by Commission staff or leased to tenants. Buildings include: Building #2, the air terminal building (ATB), Building #6, the maintenance garage, Hangar

#7 located immediately west of the ATB, Hangar #11 located near the west end of the hangar lines, Building #1 located south of the ATB, and the field electric centre (FEC).

Air Terminal Building

The ATB was constructed in 2011 and is in excellent condition. The building currently houses the airport administration offices and National Helicopters' front office.

The airport is currently authorized by the Canadian Border Services Agency (CBSA) as an Airport of Entry (AOE/15) for general aviation flights where the flights are unscheduled and the traveler capacity does not exceed 15 persons, including the flight crew. International air service, whether scheduled or charter, is normally provided by airlines or charter companies that fly larger aircraft (e.g. Bombardier C100, Q400) that allow for a larger number of passengers. To accommodate this type of service, the airport will be required to apply for a change to the AOE to allow for a larger number of passengers (e.g., 75 or 100). If these changes occur, the ATB will then require expansion to provide facilities (e.g., arrivals areas, hold rooms, baggage handling, customs, CATSA) to process the increased number of passengers with a reasonable level of service. The requirement for the ATB expansion is tied to the implementation of a scheduled or charter air service. A concurrent study is evaluating the potential for these types of services. Details of the ATB modifications will be based on the findings and recommendations from that study and are not included in this study. The total estimated cost¹ for the ATB expansion ranges from \$4.6 M to \$5.1 M (includes a 7.6% design fee and 10% contingency).

Field Electric Centre

The FEC, located immediately east of the ATB, was constructed in 2011 and is in excellent condition. The FEC contains all of the switchgear, transformers, and electric panels that serve the ATB, airfield, and other electrical systems.

Maintenance Garage

The maintenance garage is located south and east of the ATB. The building is relatively old (age unknown), but is in fair condition. The garage is used to store and maintain airport equipment. To accommodate newer equipment, it may be necessary to expand the maintenance garage. The building expansion will increase the size of the existing building by about 50%.

Hangar #7 (Allied Aviation)

The hangar is located immediately west of the ATB. The hangar is leased to Allied Aviation and is used as a Fixed Base Operator (FBO) providing pilot services and fueling for the airport. The building is in good condition.

Hangar #11 (Genaire Industries) and Storage Building

Hangar #11 was constructed circa 1940s. The building is in relatively poor condition and requires ongoing renovation. The building is leased to Genaire Industries, who manufacture landing gears, aircraft radome, and fuel cells, largely for the Department of National Defense. Genaire also leases a smaller building located south and west of the ATB which they use for general storage.

¹ Explorer Solutions, Business Case: Airport Improvement for Transborder Traffic & Commercial Land Development Strategies, Niagara District Airport, October 2014

3.2.2 General Building Lifecycle

Ongoing maintenance of building systems is necessary and capital investment is required when building system life cycles are reached. Some systems may require replacement within the plan timeframe: roof (depending on type): 15 to 20 years (2031 to 2036); HVAC (boilers and chillers): 15-30 years (2031 to 2046); flooring (depending on type): 10 years (2026).

Tenants are responsible for maintaining the buildings they own or lease.

3.2.3 Access Roads and Parking

The main airport access, Airport Road, connects to County Road 55 (Niagara Stone Road). The paved road is approximately 8 m in width. Drainage ditches are located on either side of the road with the main drainage ditch located on the east side of the road.

The access road provides one-way circulation to the air terminal building (ATB) and adjacent parking areas. The ATB currently provides for approximately 58 parking stalls and 3 larger bus stalls. The adjacent hangar owned by the airport and leased to Allied Aviation includes an additional 35 stalls.

The Explorer study suggested the expansion of the parking areas into the grassed area located immediately south of the existing parking lot allows for an additional 106 vehicles² (Figure 3-1). The total number of parking spaces available (164) will meet the airports needs into the long-term. Figure 2 shows the proposed parking lot expansion area. The estimated cost for the parking lot expansion (reference Explorer Study) ranges from \$461,000 to \$507,000 (includes an 8% design fee and 10% contingency).

Figure 3-1: Parking Lot Expansion Concept Layout



The parking lot expansion will be considered as part of the concurrent review of scheduled passenger services, and have been excluded from the capital forecast in this report.

Access for both the southwest and east tenant areas is from Airport Road. Vehicles are required to access the east tenant areas through a locked security gate.

The access roads and parking areas are in good condition and based on lifecycle (10 to 15 years) will require rehabilitation during the period 2026 to 2031.

3.2.4 Water and Sewers

At present, sanitary sewer and water connections are available at the northeast corner of the development area. The sanitary service is a 200 mm diameter SDR35 PVC pipe. The water service is a 150 mm diameter, CL150 DR18 PVC pipe. Consultations with the Region suggest that in the short-term the capacity of the sanitary and water services is adequate to serve the potential demand from the southwest development area.

² Explorer Solutions, Business Case: Airport Improvement for Transborder Traffic & Commercial Land Development Strategies, Niagara District Airport, October 1, 2014

At this early stage in the development preparation, ultimate capacity is determined on broad-based sewer estimations. As an example, T-Hangars used for aircraft storage often do not require significant amounts of water and sanitary service whereas a Fixed Base Operator (FBO) can have relatively significant demand.

Water and sewer systems generally have a long lifecycle if properly maintained. There will not be major capital investment required for the existing systems during the plan period. A detailed capacity analysis will be required to confirm the sanitary and water services (water services/fire flows, etc.) can meet the projected volume demand as the terminal building expands, and the southwest, east, and northwest development areas are constructed.

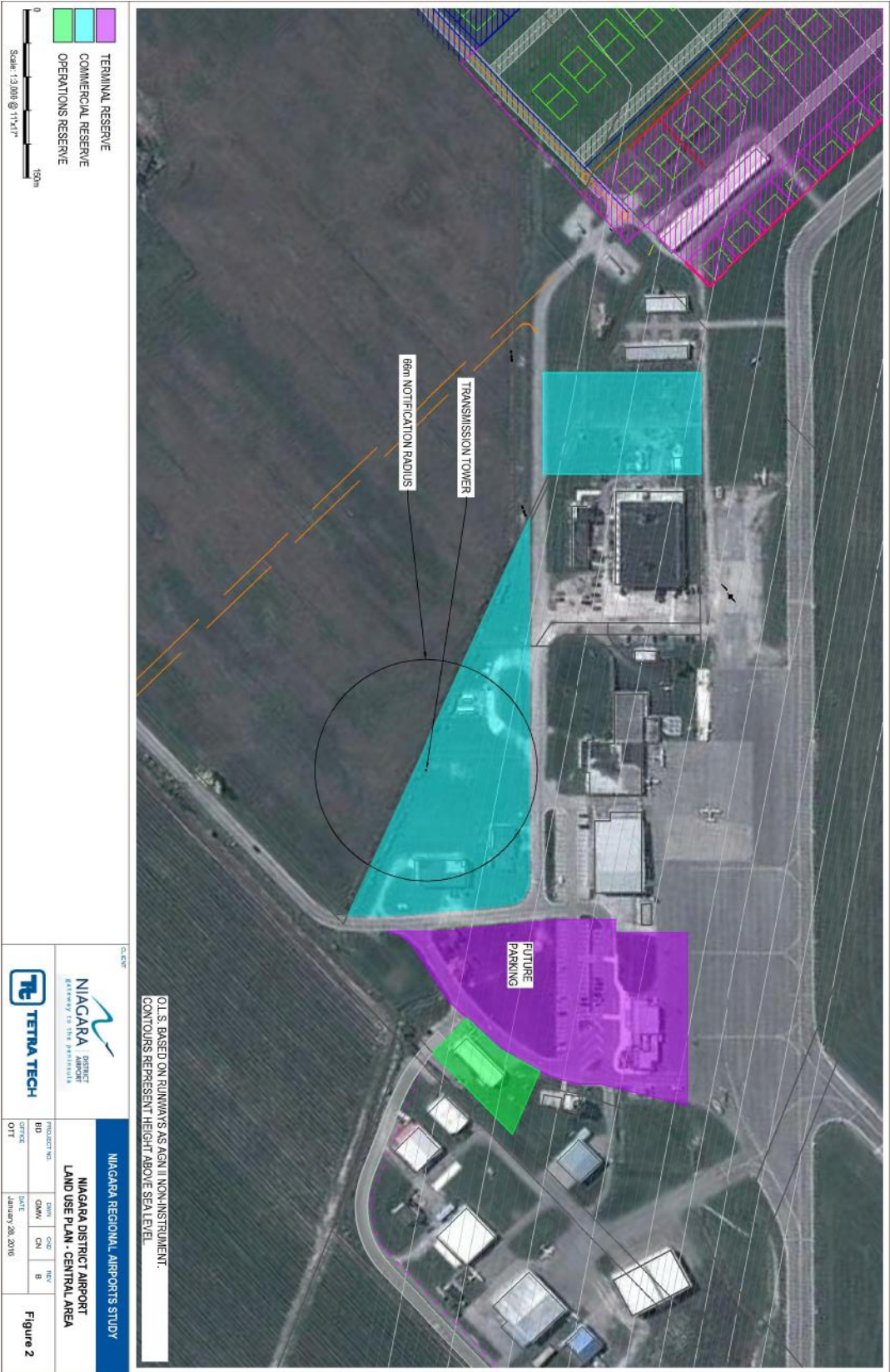
3.2.5 Electrical

Discussions with Niagara Power indicate 3-phase power supply is available at the airport and the supply capacity will likely meet future needs. The main power feed to the airport terminates at the FEC.

Electrical lines in development areas will tie to the existing lines. In general, electrical supply for individual development lots will connect to new transformers located adjacent to access roads within the development. As an example, the access roads shown in the SDA would each have a transformer located conveniently to serve the lots located along that access road.

The airport will have to confirm overall electrical power requirements and assess the electrical demand for future development areas.

Figure 2: Niagara District Airport Land Use Plan – Central Area



3.2.6 Emergency Power

At present, the airport does not have a backup emergency power system. In the event of a main power outage, critical airfield services will not have electrical power (e.g., ODALS; threshold, runway and apron edge lights; PAPIs).

TP 312 5th Edition, Section 8.1.1.1, Application, states, “A secondary power supply is provided for: a takeoff runway operating in visibility conditions less than RVR 1200 (1/4 SM).”

The airport will require installation of an emergency power backup generator complete with a diesel fuel tank. The FEC will require appropriate modifications (e.g., switch gear, transfer connections). For the purposes of this report we have specified a 300 KW (375 KVA), 600 V, 3 pole emergency generator complete with a diesel fuel storage tank, switchgear, and enclosure.

The installation of an emergency power system will be required in the next few years.

3.2.7 Other Utilities

Other utilities (e.g., natural gas, telephone line, high-speed internet services) are present at the airport and will be included in new development areas as required. Costs associated with “other utilities” are normally borne by the land developers when an area is developed.

3.2.8 Airport Equipment

The Commission owns equipment that is used to maintain the airport. The Asset Management Plan (Appendix B) shows the inventory and expected replacement schedule and cost. Certain equipment listed in the table was acquired in recent years but the acquisition date noted does not reflect the equipment manufacture year. The replacement year column uses typical equipment life cycle replacement values.

3.3 STORMWATER DRAINAGE

The NDA is located within the 8-Mile Creek watershed. Stormwater ditches convey water during storm events to minimize flooding and provide general irrigation control. Drains flow along most of the airport’s perimeter areas with connecting drains throughout the developed areas.

A central drain originates south and east of the NDA and wraps around the existing southeast hangars, conveying water under Runway 06-24 to the airport’s north boundary and then west along the northern boundary to connect with ditches running along the airport’s west boundary. The water flows north approximately 4 km, discharging into Lake Ontario.

Three 100-year Regulated Floodplain Extent (RFE) areas are located within the boundaries of the NDA. The RFE to the east of the airport is part of the municipal drain that runs along the eastern edge of the property.

Development in areas adjacent to the municipal drains must provide a minimum 10 m buffer on either side of the drains. Municipal permits are required for crossings and culvert installations.

3.4 ENVIRONMENT

A comprehensive environmental assessment screening (EAS) was prepared in October 2010. The EAS provides significant detail on airport “environmental” systems and will be referenced extensively in this section.

Groundwater

In 2005, a regional groundwater study conducted by Waterloo Hydrogeological provided a detailed overview of regional groundwater conditions. The study suggested groundwater is approximately 1 to 2 m below ground level and generally flows north towards Lake Ontario. The groundwater is used as a potable source of water in agricultural areas.

A geotechnical investigation conducted by Trow Associates shows groundwater was only encountered in the proposed apron expansion area at about 0.7 m below the existing surface. Based on the Trow report it is not likely groundwater will be encountered when the development areas are constructed.

Surface Geology

The NDA is located in the Niagara Fruit Belt section of the glacial Lake Iroquois formation and the soils are comprised of lacustrine deposits from Lake Iroquois (Chapman and Putman, 1984). The Ontario Geological Survey (OGS) Quaternary Geological Map for Niagara-Welland indicates the airport is underlain by Halton till, described as silty clay and clay loam till with imperfect or poor drainage. Geological maps indicate considerable overburden in the area with bedrock depths estimated at 30 to 35 m.

Soils test conducted as part of the Trow study indicated the inorganic parameters in the soil meet the criteria for industrial/commercial/community use. Excess soils from excavation can therefore be reused on-site.

Vegetation and Wetlands

The Ecological Land Classification (ELC) system identified five distinct vegetation communities on the airport:

- Gray Dogwood Deciduous Thicket
- Fresh-Moist Mixed Meadow
- Combined Fresh-Moist Mixed Meadow/Gray Dogwood Deciduous Thicket
- Common Reed Graminoid Mineral Meadow Marsh (old sludge lagoons)
- Combined Mixed Mineral Meadow Marsh/Mineral Deciduous Thicket Swamp

Other areas at the airport include mowed and maintained areas and a bare soil area in the eastern portion of the airport (Northeast Development Area).

The vegetation and wetland areas are described in significant detail in the Trow report. In a general context these areas must be considered in the final development area design. Water from off-airport areas must be prevented from flowing to airport lands and water on-airport should be managed for a controlled discharge to the surrounding ditches. Examples of strategies to control stormwater include: road side ditches, parking areas designed for water detention, stormwater detention ponds. All designs must include provisions to discourage wildlife.

The AMEC environmental assessment (EAS) provides a detailed evaluation of potential environmental impacts associated with airport development. The summary finding from the assessment was “no significant adverse environmental effects are anticipated as a result of the project.” The EAS did not look specifically at development in the EDA although the extent of the assessment included that area.

When development occurs, prospective developers must include mitigation measures included in the EAS to ensure environmental protection. These measures are in large part typical to most construction contracts.

4.0 LAND USE PLAN

The Land Use Plan identifies suitable land uses for all areas of the airport. The plan first identifies areas that are critical to ongoing airport operations (e.g. airfield infrastructure, terminal and operations/maintenance buildings, access and parking). Based on stakeholder consultations, development designs are specific to certain types of activities. As an example, the Southwest Development Area (SWDA) layout design is for small hangar/multi-use construction, while the East (EDA) and Northwest (NWDA) Development Areas include lots for larger commercial customers or private owners with more significant land requirements.

The development concepts provide for a logical development strategy for the airport over the next 20 years. Development is demand driven and therefore changes (e.g., the conversion of Runway 11-29 to a taxiway) will only be required at such time the development area is required. In this specific example, Runway 11-29 would continue as an alternate runway.

The following sections provide further information on each development area. Figure 1 shows the overall airport land use.

4.1 SOUTHWEST DEVELOPMENT AREA

The Southwest Development Area (SWDA) is suited for immediate airport expansion plans. The site is located south and west of the existing hangars and is a logical choice for expansion. The overall land area available is approximately 8.2 ha (20.3 acres) in size. Figure 3 illustrates the site development and includes reference to acceptable building heights based on transitional zoning.

The SDA is for private and recreational hangar development. The hangars are generally small T-Hangar or multi-use hangars. Hangar sizes can range from 93 m² to 186 m² depending on the user needs.

One of the components of the development is that the taxiway layout necessitates combined use (i.e., aircraft and vehicles). Operational procedures can safely minimize conflicts between vehicles and taxiing aircraft (e.g., signage or gate control). Development phasing relies on demand. A phased approach defers costs over a planning horizon.

The overall development of the site has been divided into 3 separate phases. As an example, Phase 1 allows for the development of 16 lots with another 16 lots available depending on the type of hangar development. The general layout is designed so aircraft can exit either side of the hangar to a taxiway. In Phase 1, hangars on the north side of Taxi 2 and south side of Taxi 3 would only have access on one side. The airport would continue construction of the remaining development areas as demand warrants. When hangars are on 70% of the lots new construction would begin. One must consider there are additional costs when phasing construction (i.e., mobilization, costs efficiencies with larger projects).

Phase 2 will provide for 24 lots (including the lots north of Taxi 2). As shown on Figure 3, an existing hangar will need to be relocated. By deferring development, the airport can also consider alternate land use (e.g. larger airside commercial businesses) if demand warrants this type of activity in this area.

Phase 3 will allow for development of another 29 lots.

4.1.1 Taxiway Connection

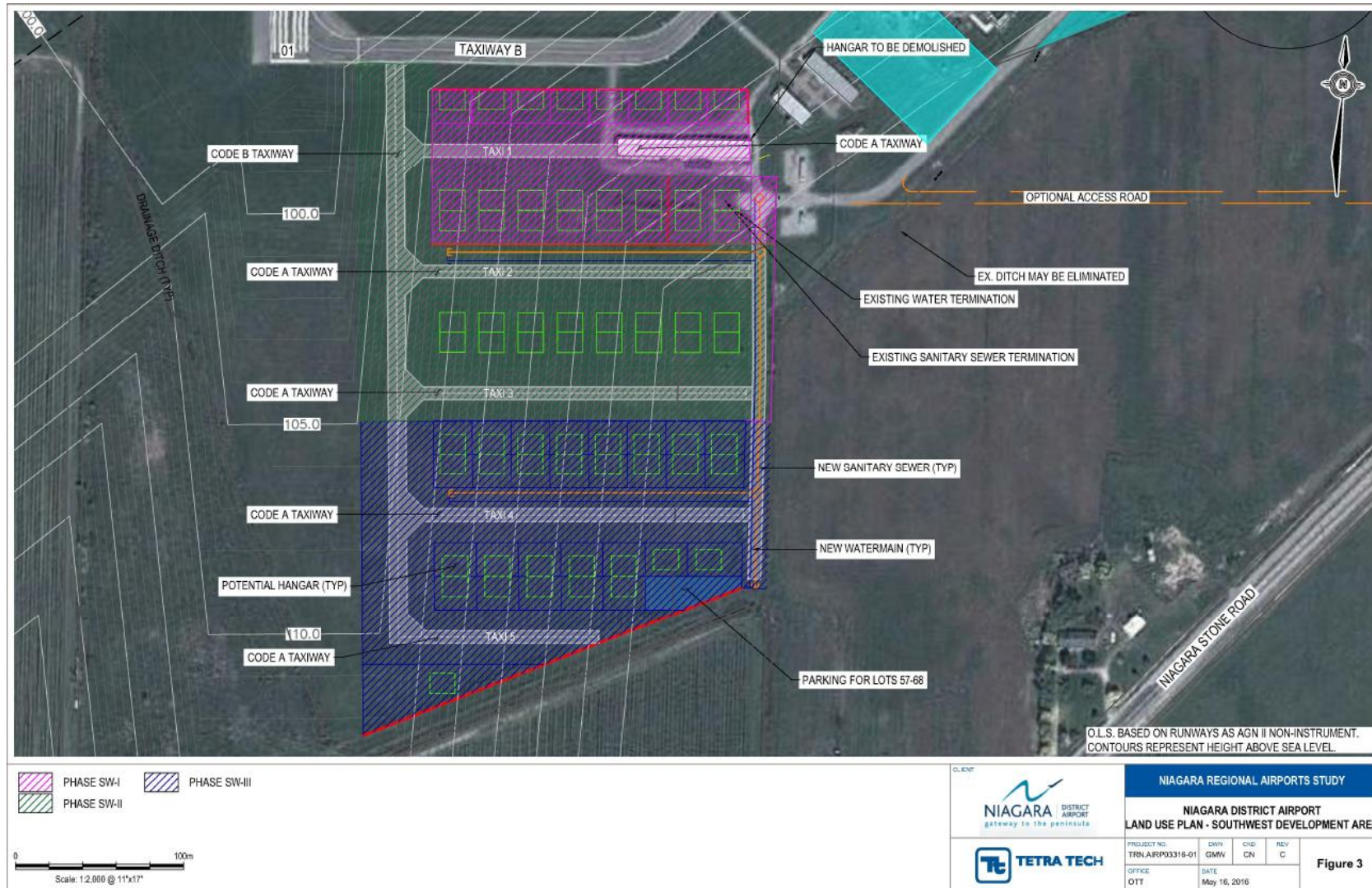
Taxiway A is located at the northern edge of the proposed development area and provides easy access from the development area to Runway 01-19 and Runway 06-24.

The overall taxiway layout shows a main taxiway connection to Taxiway A approximately 75 m east of the Runway 01 threshold. The taxiway then extends southward into the development area with five taxiway stubs extending to the east, maximizing airside commercial development. The taxiway extension at the north end of SDA will require relocation of the existing T-Hangar.

The taxiways are designed for Aircraft Group Number I type aircraft (e.g., Beech Bonanza, Cessna 182). The taxiway will be 7.5 m wide. An overall Right-of Way (ROW) of 31 m (15.5 m either side of centreline) has been included in the design to allow for adequate separation from the taxiway centreline and fixed objects on tenant aprons.

The taxiway pavement structure used in the cost estimate is 65 mm Hot-Mix Asphalt Concrete, 200 mm Granular Base Course, 250 mm Granular Sub-base Course. This pavement structure uses conceptual design parameters and the final design will take into account specific site conditions, including subgrade conditions and local climate.

Figure 3: Niagara District Airport Land Use Plan – Southwest Development Area



4.1.2 Access Roads

Airport Road connects the terminal and hangar areas to County Road 55 (Niagara Stone Road). The existing road will extend along the east side of the development area. The taxiways/roads will extend into the new development area as indicated on Figure 3.

The access road will be asphalt pavement construction. The roadway will have an 8 m surface with a 15 m ROW to accommodate water and sanitary services and drainage ditches.

4.1.3 Lot Layout

For illustration purposes the lots shown in the SWDA are approximately 0.046 ha (0.11 acres) in size. It is important to note that the lots sizes can change to allow for larger tenant lease areas if demand warrants. The total SWDA will provide for 69 lots.

4.1.4 Overall Suitability

Table 4-1: Southwest Development Area Suitability Evaluation

Pros	Cons
Logical extension to the existing hangar line	Area is in proximity to floodplain and as such, development will have to consider stormwater management. The airport operator suggested the lands are normally dry.
Large number of lots for lease	The general area will require relatively extensive grading.
Excellent access to existing taxiway system and runways	Combined access roads/taxiways will require operational controls (e.g. signage or gates)
Concepts allow for modifications to lot sizes to meet user needs	
Lot development can be phased with triggers (e.g. themed development areas would be constructed first and the most southerly taxiway and most northerly taxiway and access road network would only be constructed when the mid-development area is 70% occupied)	
Sanitary, water, and electrical services are adequate to meet the needs of this development and are readily available at northeast corner of the development area	
The phasing can be scheduled so that the existing hangar relocation can be deferred until all of the other lots are developed	

4.1.5 Development Area Costs

Table 4-2 details the SWDA development costs. Detailed cost estimates are located in Appendix B. It is important to consider the cost estimates use specific assumptions. As an example, the project does not include detailed surveys or geotechnical investigations; therefore, costs associated with excavation and the final pavement structure design assume relatively ideal conditions. The north south taxi connecting to Taxiway A pavement structure is designed for AGN I category aircraft. The costs for the SWDA are divided into 3 phased concepts and distributed over the next twenty years.

Table 4-2: Southwest Development Area Costs

Development Area Costs	Phase 1 2019 - 2026	Phase 2 2027 - 2036	Phase 3 Greater than 20 years
General	\$139,000	\$46,000	\$105,000
Area grading	\$452,000	\$151,000	\$339,000
Access roads	\$144,000	\$48,000	\$108,000
Taxiways	\$341,000	\$114,000	\$256,000
Services	\$96,000	\$32,000	\$72,000
T-Hangar Relocate	-	\$400,000	-
Engineering and Contingency (35%)	\$410,000	\$277,000	\$308,000
Total Development Area Cost	\$1,582,000	\$1,068,000	\$1,188,000

4.2 EAST DEVELOPMENT AREA

The East Development Area (EDA) extends the existing hangars east of the terminal building. The overall development area is approximately 7.7 ha (19.1 acres) in size. Figure 4 illustrates the proposed lot layouts. The Figure includes reference to acceptable building heights based on transitional zoning.

4.2.1 Taxiway Connection

One of the main challenges is a large drainage swale that parallels Taxiway C. To minimize impacts to stormwater management, a separate taxiway is located on the south side of the swale with a single crossing and connection to Taxiway C.

The taxiways will be 10.5 m in width to accommodate AGN II sized aircraft. An overall ROW of 40 m (20 m either side of centreline) has been included in the design to allow for adequate separation from the taxiway centreline and fixed objects on tenant aprons. The taxiway pavement structure used in the cost estimate is a 65 mm Hot-Mix Asphalt Concrete, 200 mm Granular Base Course, 250 mm Granular Sub-base Course. This pavement structure uses conceptual design parameters and will be revisited during the preliminary and detailed design stage to take into account specific site conditions, including subgrade conditions and local climate.

4.2.2 Access Roads

Area access will be via Airport Road with an extension to the existing road that currently serves east hangar tenants.

The access road will be asphalt pavement construction. The roadway will have an 8 m surface with a 15 m ROW to accommodate water and sanitary services and drainage ditches.

4.2.3 Lot Layout

For illustration purposes the lots shown in the EDA (Figure 4) average 0.30 ha (0.74 acres) in size. It is important to note the lot sizes can change to allow for larger tenant lease areas as demand warrants.

A 2.8 ha (7 acre) lot is identified for a potential solar farm at the southeast corner of the EDA.

4.2.4 Overall Suitability

Table 4-3: East Development Area Suitability Evaluation

Pros	Cons
Logical extension to the existing east hangar line.	Area is in proximity to sludge lagoons and major stormwater drainage areas.
Access to existing taxiway system.	Major swale along Taxi A will need modification to accommodate a taxi connection to the development area.
Concepts allow for modifications to lot sizes to meet user needs.	The general area will require relatively extensive grading. The site has been used as a sump site and a geotechnical investigation will be required to determine subsurface conditions.
Lot development can be phased with triggers (e.g. those lots adjacent to Taxiway C would be developed initially). The remaining lots would be developed whenever a runway and taxiway extension to Runway 06-24 is considered.	Sanitary, water and electrical services may need to be upgraded assuming the SDA is developed first. Detailed studies will be required.

4.2.5 Development Area Costs

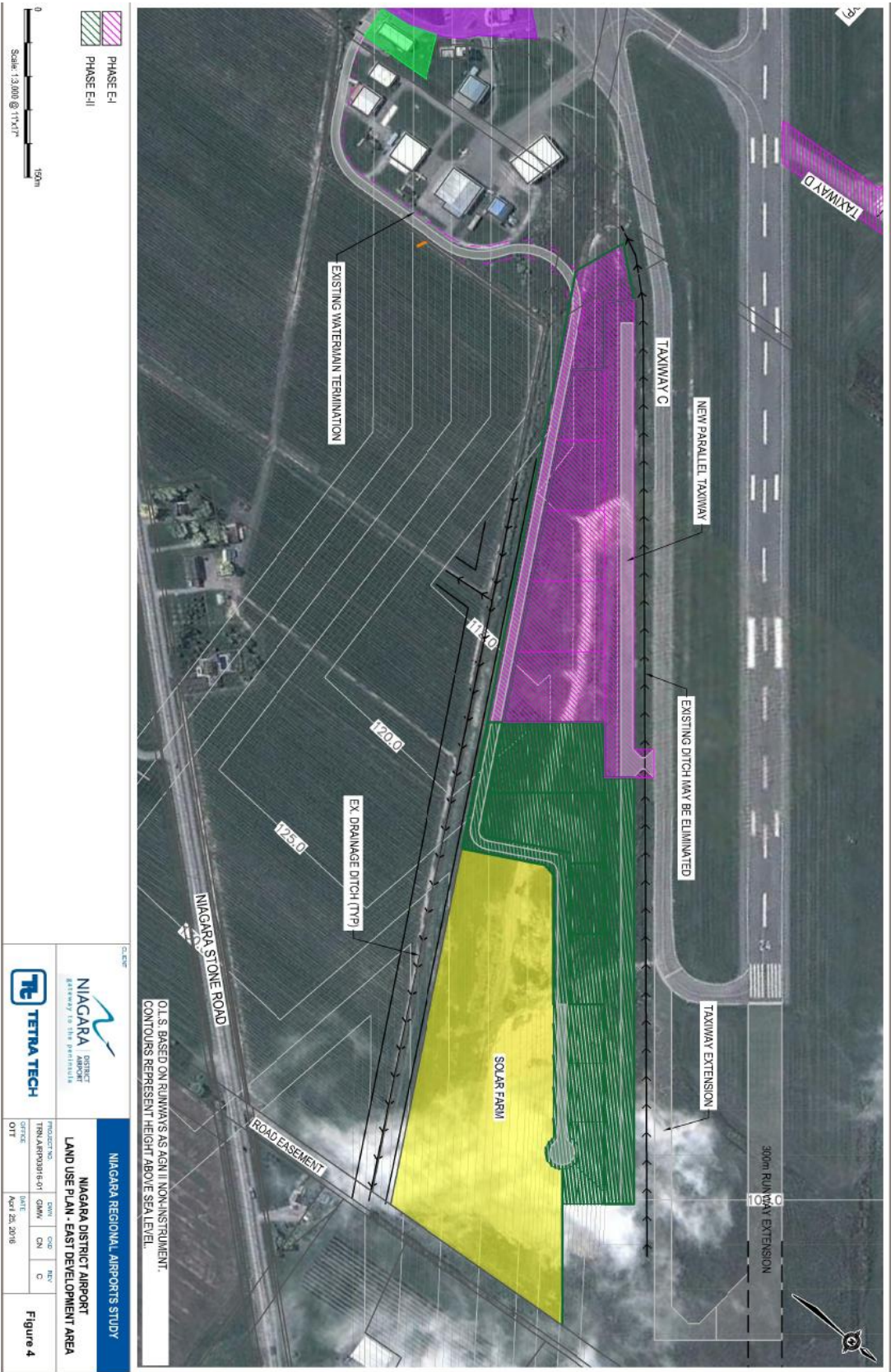
Table 4-4 identifies development costs for the EDA. Detailed cost estimates are located in Appendix B. Specific assumptions are included in the cost estimates. As an example, the project does not include detailed surveys or specific geotechnical investigations; therefore, costs associated with excavations and the pavement structures assume relatively ideal conditions.

The EDA construction uses demand triggers. For planning purposes the development area has been divided into 2 phases of similar size. When demand warrants a runway extension, the development areas will extend to the end of the new runway threshold. With taxiway construction, this expansion would allow for three additional airside lots.

Table 4-4: East Development Area Costs

Development Area Costs	Phase 1 2022 - 2028	Phase 2 Future
General	\$144,000	\$144,000
Area grading	\$520,000	\$520,000
Access roads	\$329,000	\$329,000
Taxiways	\$283,000	\$283,000
Services	\$243,000	\$243,000
Engineering and Contingency (35%)	\$532,000	\$532,000
Total Development Area Cost	\$2,051,000	\$2,051,000

Figure 4: Niagara District Airport Land Use Plan – East Development Area



4.3 NORTHWEST DEVELOPMENT AREA

The Northwest Development Area (NWDA) assumes Runway 11-29 will convert to a taxiway. The NDA opens a broader development area with good access. The development of the NWDA will be demand driven. Runway 11-29 would remain as an alternate runway until development is required.

The development area is approximately 11 ha (27 acres) in size and would be suitable to private/commercial tenants. Figure 5 illustrates the proposed lot layout. The Figure includes reference to acceptable building heights based on transitional zoning.

4.3.1 Taxiway Connection

The taxiway will connect to Runway 06-24 using existing Taxiway D. Figure 5 shows the location of a future taxiway connecting to Runway 01-19.

The taxiways will be 10.5 m wide to accommodate AGN II sized aircraft. An overall ROW of 40 m (20 m either side of centreline) has been included in the design to allow for adequate separation from the taxiway centreline and fixed objects on tenant aprons. The taxiway pavement structure used in the cost estimate is a 65 mm Hot-Mix Asphalt Concrete, 200 mm Granular Base Course, 250 mm Granular Sub-base Course. The pavement structure conceptual design parameters may change during the preliminary and detailed design stage, to take into account specific site conditions including subgrade conditions and local climate.

4.3.2 Access Roads

Area access will be via McNab Road, off Carlton Street. The access road ROW is the property of the St. Lawrence Seaway Authority. The NDA will have to purchase or lease the land from that organization. The access road will extend into the proposed hangar areas.

The access road will be asphalt pavement construction. The roadway will have an 8 m surface with a 15 m ROW to accommodate water and sanitary services and drainage ditches.

4.3.3 Lot Layout

For illustration purposes the lots shown in the NWDA (Figure 5) are approximately 0.25 ha (0.62 acres) in size. It is important to note the lots can change to allow for larger tenant lease areas as demand warrants. In the current configuration, the NWDA would provide for approximately 23 airside lots.

4.3.4 Overall Suitability

Table 4-5: Northwest Development Area Suitability Evaluation

Pros	Cons
Opens a relatively large area for development	To fully develop the area Runway 11-29 would have to be converted to a taxiway.
Excellent access to existing runways	The McNab Street ROW will have to be purchased or access negotiated with the St. Lawrence Seaway Authority

Pros	Cons
Concepts allow for modifications to lot sizes to meet user needs	Sanitary, water, and electrical services may need to be extended from the south part of the airport. Detailed studies will be required to determine whether the existing sewer and water capacity can accommodate the development area needs.
Lot development can be phased with triggers (e.g. those lots north of Runway 11-29 would be developed initially). The remaining lots would be developed whenever there is sufficient interest	Location north of the main commercial areas may not appeal to some prospective developers
Good access to Carlton Street	

4.3.5 Development Area Costs

It is important to consider the cost estimates use specific assumptions. As an example, the project does not include detailed surveys or specific geotechnical investigations; therefore, costs associated with excavations and the pavement structures assume relatively ideal conditions.

The NWDA construction uses demand triggers. As an example, lots would extend to the north of the taxiway and when 70% occupied, access will be to the south of the taxiway. The total cost to develop the NWDA would be \$4,083,000. Detailed cost estimates are located in Appendix B. It is not expected this area will be developed within the plan timeframe.



5.0 RISK ASSESSMENT

Airports face a number of types of risk, but governments, airport organizations, pilots, and others have developed methods and procedures to reduce them. This section discusses, at a high level, the risks that airports face and how airport owners manage them. The types of risk discussed are:

1. Regulatory and Policy
2. Environmental
3. Safety and Security
4. Financial

For this discussion, risk is anything that would potentially expose the owner to danger, harm, or loss. This could include managerial, financial, human or other risk. Airport operations focus on managing security and safety risks, but the risks for the airport owner are broader and more complex.

5.1 REGULATION AND POLICY

The risks that have generated the most concern for many airport owners since the devolution of airports from the federal government has been actual or proposed changes to aviation regulation and policy. This is because every aspect of airport operations, management, financing, and development continues to be subject to federal regulation.

The Canadian Aviation Regulations (CARs) guide all aspects of aircraft and airport operations, and air navigation. Changes to these regulations, or federal policy, can have significant impacts on the owner, and the federal government often assumes no responsibility for the potential impacts. One example of a potential change to regulations that could affect airports in the Niagara Region is the proposed Runway End Safety Area (RESA) regulation.

The International Civil Aviation Organization (ICAO), the organization that defines aviation standards worldwide, has mandated that all runways with scheduled air service must have RESAs added to reduce risk during landing and departure. The added length of the safety area to the runway (90 m to 150 m) will require significant capital investment.

The federal government has not committed to providing funding if regulatory change requires RESAs at Canadian airports. If Transport Canada mandates RESA, and the NDA secures a scheduled service, it may require the NDA construct a RESA at a potential cost of millions of dollars in capital cost and additional operating expenses.

Transport Canada inspections that are required at certified airports are also a potential source of risk to owners in that inspectors can require significant and expensive changes to airports to meet regulatory requirements. This is particularly true with a transfer of airport ownership. At the time of ownership transfer, Transport Canada will likely conduct a detailed inspection of operations and infrastructure at NDA. When these inspections occur, TC inspectors will be meticulous and may find small problems at the airport that may require significant funding to fix.

Finally, if the NDA were to secure a scheduled air service, the requirements for CATSA and CBSA services would result in significant regulatory oversight from those organizations.

5.2 ENVIRONMENTAL

The airport is relatively old, dating back to before the Second World War. The airport is now subject to modern environmental legislation. With older sites, there is a risk that unidentified environmental damage exists. Examples could include an old fuel spills or equipment buried at the site at the end of the Second World War.

The new owner of an airport may be found responsible or inherit responsibility for potential environmental damage whether the damage occurred prior to ownership. The airport is currently managing these risks and based on existing studies reviewed as part of this project, there are no known significant environmental risks other than the fuelling operations. A significant risk at the airport relates to potential fuel spills or leaks from fuel storage tanks. Good management practices, plans and appropriate insurance minimize the risk associated with fuel tanks.

5.3 SAFETY AND SECURITY

Airports are required to manage for safety and security. Transport Canada inspects airports, aircraft, and air carriers to ensure they operate safely. The CARs focus on ensuring that aviation in Canada is safe. Transport Canada requires certified airports to implement Safety Management Systems (SMS) to increase safety. The SMS standard was initially developed for other industries.

Certified airports such as NDA are required to have an Airport Operations Manual (AOM). The AOM describes all aspects of airport management and operations. Airport operators are responsible to manage and operate airports in accordance with all applicable federal law and regulations.

Airport insurance provides owners with financial security in the event of unavoidable incidents. The key to mitigating safety and security risk is to ensure appropriate insurance and plans are in place, and that airport management understands the industry and the complexities of aviation regulations and standards.

5.4 FINANCIAL

Any organization operating an airport is subject to risk, primarily because of the risk factors discussed above. The primary result of changes to policy and regulation, environmental issues, and safety and security concerns is increased expense. Risk seldom leads to reduced cost. The financial risk affects capital and operational planning, although the impact of capital impacts can be much greater. As many risks are unknown, the financial scale of these risks is difficult to estimate. Financial risks normally represent an incremental increase rather than large, onetime increases.

SMS and increasing regulatory oversight have increased operational and capital requirements at airports. Transport Canada has avoided significant costs such as the implementation of new Emergency Response Services (ERS) regulations via CARs 308, SMS implementation and RESA requirements. However, the potential for these types of regulatory changes to be implemented at significant cost to airport operators remains.

REFERENCES

1. WSP, Garden City Skyway Bridge Aeronautical Impact Assessment Technical Findings Report, March 17, 2015
2. Explorer Solutions, Business Case: Airport Improvement for Transborder Traffic & Commercial Land Development Strategies, Niagara District Airport, October 2014

APPENDIX A

STAKEHOLDER CONSULTATION LIST

Name	Title	Company/Municipality
Glen Cowan	Associate Director, Finance Consulting and Special Projects	Niagara Region
Rick Wilson	Planner	Niagara Region
Susan Dunsmore	Development Engineer	Niagara Region
John Rizzo	Project Manager	Niagara Region
Matt Kernahan	Senior Planner	Niagara Region
Sarah Mastroianni	Watershed Planner	Niagara Peninsula Conservation Authority
Heather Salter	Deputy City Solicitor/Deputy Clerk	City of St. Catharines
Dave Macklem	Property Manager	City of St. Catharines
Marco Marino		City of St. Catharines Economic Development
Ken Todd	CAO	City of Niagara Falls
Todd Harrison	Director of Finance and Treasurer	City of Niagara Falls
Aaron Butler	Senior Planner	Niagara-on-the-Lake
Len O'Connor	Airport Manager	Niagara District Airport
Robin Garrett	Vice Chair	Niagara District Airport Commission
Gary Murphy	Chair	Niagara District Airport Commission
Peter Ramm	President	Invicta Air
Mike Neave		St. Catharines Flying Club
Dion Faulkner		Allied Aviation
Bob Evans		Eagle Rock Aviation
Lorraine Warner		Genaire
Gary Burroughs		Genaire
Gord Tessier		CARES
Sheila Piece		National Helicopter
Rob Cobban		Pangea
Tim Grech		Niagara Sky Dive Centre

APPENDIX B

ASSET MANAGEMENT PLAN

Asset Type	Asset Acquisition Year	Replacement Year	Replacement Cost
Office Equipment	2011	2016	\$14,000
Terminal Entrance		2016	\$92,000
John Deere Sweeper	1997	2016	\$16,000
John Deere Tractor	1996	2016	\$33,000
Line Painter	2007	2016	\$10,000
Boss Snow Plow	2003	2016	\$7,000
GMC Sierra Truck	2003	2016	\$57,000
TOTAL ASSET REPLACEMENT 2016			\$229,000
Allied Aviation Apron	1996	2017	\$26,000
Exterior Lighting Arcal	2007	2017	\$5,000
Taxi D	1996	2017	\$12,000
TOTAL ASSET REPLACEMENT 2017			\$43,000
Kubota Lawnmower	2003	2018	\$20,000
CRFI Decelerometer	2003	2018	\$7,000
Crack Sealing	2014	2018	\$45,000
TOTAL ASSET REPLACEMENT 2018			\$72,000
3-2 way Radios	2014	2019	\$3,000
Truck and Plow	2014	2019	\$110,000
Paint Lines AR/GS	2011	2019	\$103,000
TOTAL ASSET REPLACEMENT 2019			\$216,000
Plow 82	2015	2020	\$129,000
East Apron	1996	2020	\$71,000
TOTAL ASSET REPLACEMENT 2020			\$200,000
Plow 83	2015	2020	\$132,000
Terminal Furniture	2011	2021	\$37,000
Office Furniture	2011	2021	\$40,000
Wooden Garbage Bin	2011	2021	\$10,000

Asset Type	Asset Acquisition Year	Replacement Year	Replacement Cost
Chevy pickup Truck	2015	2021	\$20,000
JCB Loader	2015	2021	\$56,000
TOTAL ASSET REPLACEMENT 2021			\$163,000
Crack Sealing 2018	2014	2022	\$49,000
Maintenance Garage Doors	2012	2022	\$18,000
Genaire HVAC	2002	2022	\$46,000
TOTAL ASSET REPLACEMENT 2022			\$113,000
Paint lines AR/GS	2011	2023	\$112,000
TOTAL ASSET REPLACEMENT 2023			\$112,000
SCFC Apron	2004	2024	\$209,000
Taxi Access East of Tower	2004	2024	\$40,000
TOTAL ASSET REPLACEMENT 2024			\$249,000
Taxi Access Old Taxi C	2005	2025	\$62,000
Genaire Boiler Building Roof	2005	2025	\$16,000
Genaire Roof	2005	2025	\$77,000
TOTAL ASSET REPLACEMENT 2025			\$155,000
Crack Sealing 2022	2014	2026	\$53,000
AV System	2011	2026	\$27,000
TOTAL ASSET REPLACEMENT 2026			\$80,000
Paint Lines AS/GS	2011	2027	\$121,000
TOTAL ASSET REPLACEMENT 2027			\$121,000
SMI Runway Sweeper	2014	2029	\$42,000
TOTAL ASSET REPLACEMENT 2029			\$42,000

Asset Type	Asset Acquisition Year	Replacement Year	Replacement Cost
Crack Sealing	2014	2030	\$57,000
Maintenance Shed	2015	2030	\$52,000
TOTAL ASSET REPLACEMENT 2030			\$109,000
Apron Fuel System	2011	2031	\$22,000
Terminal Parking Lot	2011	2031	\$164,000
Asphalt	2011	2031	\$30,000
Paint Lines	2011	2031	\$131,000
Gates and Control Systems	2011	2031	\$171,000
HVAC System	2011	2031	\$85,000
Hangar Line Road	2011	2031	\$1,105,000
Groundside Airside Sewer	2011	2031	\$28,000
FEC Power and Control System	2011	2031	\$44,000
John Deere Gator 221	2011	2031	\$22,000
John Deer Tractor 170	2011	2031	\$285,000
Plow - Extendmax	2011	2031	\$38,000
Terminal Apron	2011	2031	\$1,501,000
Electrical Wiring and Piping	2011	2031	\$1,584,000
TOTAL ASSET REPLACEMENT 2031			\$5,210,000
Provost Snow Blower	2012	2032	\$65,000
TOTAL ASSET REPLACEMENT 2032			\$65,000
Crack sealing	2014	2034	\$62,000
Tie down Pad	2004	2034	\$50,000
TOTAL ASSET REPLACEMENT 2034			\$112,000
Paint Lines	2011	2035	\$142,000
Hydrants - 11	1996	2035	\$31,000
Airport Highway Sign	2015	2035	\$63,000
Bat Mower	2015	2035	\$39,000
TOTAL ASSET REPLACEMENT 2035			

Asset Type	Asset Acquisition Year	Replacement Year	Replacement Cost
Electrical Street Wiring	2011	2036	\$223,000
Genaire Boiler Building	1996	2036	\$97,000
Maintenance Structure	1996	2036	\$364,000
Maintenance Garage Roof	1996	2036	\$49,000
Terminal Roof	2011	2036	\$146,000
TOTAL ASSET REPLACEMENT 2036			1,154,000
Fuel Storage Tank replacement	2011	2037	\$440,000
TOTAL ASSET REPLACEMENT 2037			\$440,000
Values shown in the coloured boxes are not shown in the capital plan. The costs are either tenant related or have been included in overall development area costs.			

APPENDIX C

CAPITAL PLAN

Niagara District Airport Capital Plan												
		White cell	Tetra Tech Estimated Costs. Tetra Tech costs include a 10% design fee and a 25% contingency									
			Costs from 2014 Explorer Study									
			Taken from the NDA Capital Plan									
Costs are in 2016 Dollars												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
AIRFIELD ASSETS												
Runways												
	Runway 01-19 rehabilitation			\$55,000	\$681,000							
	Runway 11-29 rehabilitation				\$70,000	\$879,000	Note: this is only required if the runway continues to be used					
Taxiways												
	Taxiway D rehabilitation				\$7,000	\$93,000						
	Taxi access east of tower								\$40,000			
	Apron 1 asphalt rehabilitation					\$23,000	\$303,000		\$23,000	\$303,000		
	Allied Aviation Apron	\$26,000										
	East Apron				\$71,000							
	SCFC Apron								\$209,000			
	Taxi access old taxi C									\$62,000		
Crack Sealing			\$45,300				\$49,000				\$53,000	
GROUNDSIDE ASSETS												
Terminal Building												
	Office furniture	\$14,000										
	Terminal entrance	\$92,000										
	Terminal and Office Furniture/garbage bin					\$87,000						
	Parking lot upgrade											
	AV System										\$27,000	
Maintenance Garage												
	Maintenance garage expansion (assume a 50% increase in size)								\$60,000	\$750,000		
	Maintenance garage doors						\$18,000					
FEC Modifications												
	Emergency Power		\$550,000									
Access Road												
	Main Airport Road										\$275,000	
	Hangar Road (east and west)										\$307,000	
Electrical												
	Overall electrical study for proposed development areas	\$40,000										
	Exterior Lighting	\$4,600										
Sewer and Water												
	Sewer and water study for future development						\$50,000					
Paintlines				\$103,000				\$112,000				
Mobile Equipment												
	GMC Sierra Truck	\$57,000										
	John Deere Sweeper	\$16,000										
	John Deere Tractor	\$33,000										
	Line Painter	\$10,000										
	Boss Snow Plow	\$7,000										
	Kubota Lawnmower		\$20,000									
	Truck and Plow			\$110,000								
	Plow 82				\$129,000							
	Plow 83					\$132,000						
	Chevy pickup Truck					\$20,000						
	JCB Loader					\$56,000						
	CFRI Decelerometer		\$7,000									
	3-2-way radios			\$3,000								
DEVELOPMENT AREAS												
Southwest Development Area Construction (3 Phases)												
	Topographic survey	\$20,000										
	Area construction divided into phases		\$117,000	\$1,465,000								
East Development Area Construction												
	Area construction							\$152,000	\$1,899,000			
Total Capital Investment												
\$229,000 \$90,600 \$739,300 \$1,736,000 \$958,000 \$1,290,000 \$420,000 \$264,000 \$2,231,000 \$1,115,000 \$662,000												
NOTE: costs rounded to the nearest thousand												
									Total First 10 Years	\$9,734,900		

Niagara District Airport Capital Plan											
	White cell	Tetra Tech Estimated. Tetra Tech costs include a 10% design fee and a 25% contingency									
		Costs from 2014 Explorer Study									
		Taken from the NDA Capital Plan									
Costs are in 2016 Dollars											
	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
AIRSIDE ASSETS											
Runways											
Runway 06-24 rehabilitation					\$316,000	\$3,946,000					
Taxiways											
Taxiway A rehabilitation					\$47,000	\$594,000					
Taxiway B rehabilitation					\$15,000	\$186,000					
Taxiway C rehabilitation					\$83,000	\$1,035,000					
Aprons											
Apron 1 asphalt rehabilitation		\$23,000	\$303,000				\$23,000	\$303,000			
General Airside											
General Crack Sealing								\$62,000			
T-Down Rehabilitation								\$50,000			
Navigational Aids											
New PAPI		\$75,000									
Crack Sealing				\$57,000							
Hydrants (11)									\$31,000		
Paint Lines	\$121,000				\$131,000				\$142,000		
Gates and Controls					\$170,000						
GROUNDSIDE ASSETS											
Terminal Building											
Main terminal HVAC replacement					\$85,000						
Main terminal roof										\$147,000	
Main terminal parking lot rehabilitation					\$164,000						
Main parking lot expansion											
General Asphalt					\$30,000						
Maintenance Garage											
Maintenance garage expansion										\$412,000	
Maintenance shed				\$52,000							
FEC Modifications											
Control system upgrades					\$44,000						
General Airport Upgrades											
Airport fencing											
Signage replacement									\$63,000		
Gates and controls					\$171,000						
Fuel Storage Tank Replacement (22,000 Low Lead and 45,000 Jet)											\$540,000
Sewer and Water											
Sewer upgrades					\$28,000						
Mobile Equipment											
SMI Runway Sweeper			\$42,000								
John Deere Gator 221					\$22,000						
John Deer Tractor 170					\$285,000						
Plow - Extendmax					\$38,000						
Provost Snow Blower						\$65,000					
Bat Mower									\$38,000		
DEVELOPMENT AREAS											
Southwest Development Area Construction (3 Phases)											
Area construction			\$79,000	\$989,000							
East Development Area Construction											
Area Construction											
Total Capital Investment	\$121,000	\$98,000	\$424,000	\$1,098,000	\$1,629,000	\$5,826,000	\$23,000	\$415,000	\$274,000	\$559,000	\$540,000
NOTE: costs rounded to the nearest thousand											
									Total Remaining 10 Years		\$11,007,000

APPENDIX D

LAND USE PLAN DETAILED COST ESTIMATES



**Niagara Region Airport Study
Niagara District Airport
Niagara District Airport 10-Year Capital Plan**

Groundside Assets

May 17, 2016

Item	Description				Total
1.00	General Requirements				\$ 18,527
2.00	Site Works				\$ 185,266
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 20,379.30
--	Project Contingencies			25%	\$ 50,948.25
Total Estimate - Main Airport Road Rehabilitation					\$ 275,121
1.00	General Requirements				\$ 13,458
2.00	Site Works				\$ 134,585
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 14,804.25
--	Project Contingencies			25%	\$ 37,010.63
Total Estimate - Southwest Tenant Road Rehabilitation					\$ 199,857
1.00	General Requirements				\$ 7,250
2.00	Site Works				\$ 72,501
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 7,975.05
--	Project Contingencies			25%	\$ 19,937.63
Total Estimate - East Tenant Road Rehabilitation					\$ 107,663
Item	Description	Unit	Est Quantity	Unit Price	Total Price
Main Airport Road Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 18,527	\$ 18,527
2.00	Site Works				
2.01	Mill and Remove Existing Hot-Mix Asphalt Concrete - 65mm Depth	m ²	4,404	\$ 15	\$ 66,060.00
2.02	Tack Coat	m ²	4,404	\$ 1.50	\$ 6,606.00
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	4,404	\$ 25	\$ 110,100.00
2.04	Paint Markings	Lump Sum	1	\$ 2,500	\$ 2,500.00
Subtotal					\$ 203,793
Southwest Tenant Road Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 13,458	\$ 13,458
2.00	Site Works				
2.01	Mill and Remove Existing Hot-Mix Asphalt Concrete - 65mm Depth	m ²	3,243	\$ 15	\$ 48,645.00
2.02	Tack Coat	m ²	3,243	\$ 1.50	\$ 4,864.50
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	3,243	\$ 25	\$ 81,075.00
Subtotal					\$ 148,043



East Tenant Road Rehabilitation					
1.00 General Requirements					
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 7,250	\$ 7,250
2.00 Site Works					
2.01	Mill and Remove Existing Hot-Mix Asphalt Concrete - 65mm Depth	m ²	1,747	\$ 15	\$ 26,205.00
2.02	Tack Coat	m ²	1,747	\$ 1.50	\$ 2,620.50
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	1,747	\$ 25	\$ 43,675.00
Subtotal					\$ 79,751
Notes:					
1.0	The above estimates are based on conceptual layout and design information. Quantities and costs are subject to change during preliminary and detailed design phases.				
2.0	Temporary Facilities are based on an estimate of 10% of the Site Works				
3.0	This estimate of probable costs is provided for budgetary purposes only. 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.				



**Niagara Region Airport Study
Niagara District Airport
Niagara District Airport 10-Year Capital Plan**

Airfield Assets

May 6, 2016

Item	Description				Total
1.00	General Requirements				\$ 49,552.00
2.00	Surface Rehabilitation (1,500ft Section)				\$ 495,516.50
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 54,506.85
--	Project Contingencies			25%	\$ 136,267.13
Total Estimate - Runway 01-19 Rehabilitation					\$ 735,842.48
1.00	General Requirements				\$ 63,947.00
2.00	Surface Rehabilitation				\$ 639,469.85
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 70,341.69
--	Project Contingencies			25%	\$ 175,854.21
Total Estimate - Runway 11-29 Rehabilitation					\$ 949,612.75
1.00	General Requirements				\$ 287,000.00
2.00	Surface Rehabilitation				\$ 2,818,001.75
3.00	Electrical Rehabilitation				\$ 52,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 315,700.18
--	Project Contingencies			25%	\$ 789,250.44
Total Estimate - Runway 06-24 Rehabilitation					\$ 4,261,952.36
1.00	General Requirements				\$ 241,952.00
2.00	Site Works				\$ 1,575,624.00
3.00	Electrical Relocations				\$ 346,120.00
4.00	Taxiway C Extension				\$ 497,779.25
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 266,147.53
--	Project Contingencies			25%	\$ 665,368.81
Total Estimate - Runway 06-24 Extension					\$ 3,592,991.59
1.00	General Requirements				\$ 43,163.00
2.00	Site Works				\$ 409,625.00
3.00	Electrical Rehabilitation				\$ 22,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 47,478.80
--	Project Contingencies			25%	\$ 118,697.00
Total Estimate - Taxiway A Rehabilitation					\$ 640,963.80
1.00	General Requirements				\$ 13,526.00
2.00	Site Works				\$ 129,257.60
3.00	Electrical Rehabilitation				\$ 6,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 14,878.36
--	Project Contingencies			25%	\$ 37,195.90
Total Estimate - Taxiway B Rehabilitation					\$ 200,857.86
1.00	General Requirements				\$ 75,276.00
2.00	Site Works				\$ 720,758.50
3.00	Electrical Rehabilitation				\$ 32,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 82,803.45
--	Project Contingencies			25%	\$ 207,008.63
Total Estimate - Taxiway C Rehabilitation					\$ 1,117,846.58



1.00	General Requirements				\$ 6,701.00
2.00	Site Works				\$ 63,005.00
3.00	Electrical Rehabilitation				\$ 4,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 7,370.60
--	Project Contingencies			25%	\$ 18,426.50
Total Estimate - Taxiway D Rehabilitation					\$ 99,503.10
1.00	General Requirements				\$ 83,040.00
2.00	Site Works				\$ 818,400.00
3.00	Electrical Rehabilitation				\$ 12,000.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 91,344.00
--	Project Contingencies			25%	\$ 228,360.00
Total Estimate - Apron 1 Asphalt Rehabilitation					\$ 1,233,144.00



Item	Description	Unit	Est Quantity	Unit Price	Total Price
Runway 01-19 Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 49,552	\$ 49,552.00
2.00	Surface Rehabilitation (1,500ft Section)				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	11,651	\$ 15	\$ 174,765.00
2.02	Tack Coat	m ²	11,651	\$ 1.50	\$ 17,476.50
2.03	Hot-Mix Asphalt Concrete - 65 mm thick (1 lift)	m ²	11,651	\$ 25	\$ 291,275.00
2.04	Paint Markings	Lump Sum	1	\$ 12,000	\$ 12,000.00
Subtotal					\$ 545,068.50
Runway 11-29 Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 63,947	\$ 63,947.00
2.00	Surface Rehabilitation				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	15,156	\$ 15	\$ 227,338.50
2.02	Tack Coat	m ²	15,156	\$ 1.50	\$ 22,733.85
2.03	Hot-Mix Asphalt Concrete - 65 mm thick (1 lift)	m ²	15,156	\$ 25	\$ 378,897.50
2.04	Paint Markings	Lump Sum	1	\$ 10,500	\$ 10,500.00
Subtotal					\$ 703,416.85
Runway 06-24 Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 287,000	\$ 287,000.00
2.00	Surface Rehabilitation				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	67,615	\$ 15	\$ 1,014,217.50
2.02	Tack Coat	m ²	67,615	\$ 1.50	\$ 101,421.75
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	67,615	\$ 25	\$ 1,690,362.50
2.04	Paint Markings	Lump Sum	1	\$ 12,000	\$ 12,000.00
3.00	Electrical Rehabilitation				
3.01	New Runway Edge Lighting Fixtures	ea	52	\$ 1,000	\$ 52,000.00
Subtotal					\$ 3,157,001.75
Runway 06-24 Extension					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 241,952	\$ 241,952.00
2.00	Site Works				
2.01	Clearing, Grubbing, Stripping (Assume 100mm Depth)	m ²	13,716	\$ 10	\$ 137,160
2.02	Site Grading	m ²	13,716	\$ 5	\$ 68,580
2.03	Common Excavation	m ³	8,230	\$ 15	\$ 123,444.00
2.04	Granular Subbase Course - 300mm thick	m ²	13,716	\$ 17	\$ 233,172.00
2.05	Gravel Base Course - 250mm thick	m ²	13,716	\$ 15	\$ 205,740.00
2.06	Hot-Mix Asphalt Concrete - 150mm thick (2 lifts)	m ²	13,716	\$ 58	\$ 795,528.00
2.07	Pavement Markings	Lump Sum	1	\$ 12,000	\$ 12,000.00
3.00	Electrical Relocations				
3.01	New Runway Edge Lighting Fixtures	ea	12	\$ 500	\$ 6,000
3.02	Trenching, Duct, Cable, Junction Boxes for Edge Lighting System Extension	m	1,060	\$ 102	\$ 108,120
3.03	Relocate Existing Threshold and Runway End Lights	ea	6	\$ 1,500	\$ 9,000
3.04	Relocate Existing ODALS	Lump Sum	1	\$ 180,000	\$ 180,000
3.05	Relocate Existing PAPIS c.w. Foundations, Pull Pits etc.	Lump Sum	1	\$ 25,000	\$ 25,000
3.06	Illuminated Airfield Signage c.w. Concrete Foundation	ea	6	\$ 3,000	\$ 18,000



4.00	Taxiway C Extension				
4.01	Clearing, Grubbing, Stripping (Assume 100mm Depth)	m ²	5,730	\$ 10	\$ 57,300.00
4.02	Site Grading	m ²	5,730	\$ 5.00	\$ 28,650.00
4.03	Common Excavation	m ³	2,378	\$ 15.00	\$ 35,669.25
4.04	Granular Subbase Course - 250mm thick	m ²	5,730	\$ 15.00	\$ 85,950.00
4.05	Gravel Base Course - 200mm thick	m ²	5,730	\$ 12.00	\$ 68,760.00
4.06	Hot-Mix Asphalt Concrete - 65mm thick (1lift)	m ²	5,730	\$ 25.00	\$ 143,250.00
4.07	Pavement Markings	Lump Sum	1	\$ 3,000.00	\$ 3,000.00
4.08	Trenching, Duct, Cable, Junction Boxes for Edge Lighting System	m	600	\$ 102	\$ 61,200.00
4.09	Illuminated Airfield Signage c.w. Concrete Foundation	ea	3	\$ 3,000	\$ 9,000.00
4.10	New Taxiway Edge Lighting Fixtures	ea	10	\$ 500	\$ 5,000.00
Subtotal					\$ 2,661,475.25
Taxiway A Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 43,163	\$ 43,163
2.00	Site Works				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	9,750	\$ 15	\$ 146,250.00
2.02	Tack Coat	m ²	9,750	\$ 1.50	\$ 14,625.00
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	9,750	\$ 25	\$ 243,750.00
2.04	Paint Markings	Lump Sum	1	\$ 5,000	\$ 5,000.00
3.00	Electrical Rehabilitation				
3.01	New Taxiway Edge Lighting Fixtures	ea	22	\$ 1,000	\$ 22,000.00
Subtotal					\$ 474,788
Taxiway B Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 13,526	\$ 13,526
2.00	Site Works				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	3,054	\$ 15	\$ 45,816.00
2.02	Tack Coat	m ²	3,054	\$ 1.50	\$ 4,581.60
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	3,054	\$ 25	\$ 76,360.00
2.04	Paint Markings	Lump Sum	1	\$ 2,500	\$ 2,500.00
3.00	Electrical Rehabilitation				
3.01	New Taxiway Edge Lighting Fixtures	ea	6	\$ 1,000	\$ 6,000.00
Subtotal					\$ 148,784
Taxiway C Rehabilitation					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 75,276	\$ 75,276
2.00	Site Works				
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	17,199	\$ 15	\$ 257,985.00
2.02	Tack Coat	m ²	17,199	\$ 1.50	\$ 25,798.50
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	17,199	\$ 25	\$ 429,975.00
2.04	Paint Markings	Lump Sum	1	\$ 7,000	\$ 7,000.00
3.00	Electrical Rehabilitation				
3.01	New Taxiway Edge Lighting Fixtures	ea	32	\$ 1,000	\$ 32,000.00
Subtotal					\$ 828,035



Taxiway D Rehabilitation					
1.00 General Requirements					
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 6,701	\$ 6,701
2.00 Site Works					
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	1,470	\$ 15	\$ 22,050.00
2.02	Tack Coat	m ²	1,470	\$ 1.50	\$ 2,205.00
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	1,470	\$ 25	\$ 36,750.00
2.04	Paint Markings	Lump Sum	1	\$ 2,000	\$ 2,000.00
3.00 Electrical Rehabilitation					
3.01	New Taxiway Edge Lighting Fixtures	ea	4	\$ 1,000	\$ 4,000.00
Subtotal					\$ 73,706
Apron 1 Asphalt Rehabilitation					
1.00 General Requirements					
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-Built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 83,040	\$ 83,040
2.00 Site Works					
2.01	Mill and Remove Ex. Hot-Mix Asphalt Concrete (65mm depth)	m ²	19,600	\$ 15	\$ 294,000.00
2.02	Tack Coat	m ²	19,600	\$ 1.50	\$ 29,400.00
2.03	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	19,600	\$ 25	\$ 490,000.00
2.04	Paint Markings	Lump Sum	1	\$ 5,000	\$ 5,000.00
3.00 Electrical Rehabilitation					
3.01	New Apron Edge Lighting Fixtures	ea	12	\$ 1,000	\$ 12,000.00
Subtotal					\$ 913,440
Notes:					
1.0	The above estimates are based on conceptual layout and design information. Quantities and costs are subject to change during preliminary and detailed design phases.				
2.0	Temporary Facilities are based on an estimate of 10% of the Construction items				
3.0	The runway extension pavement structure utilized in the above estimate include 150 mm HMA, 250 mm Base Course, and 300 mm Subbase Course. The pavement structure is subject to change during preliminary and detailed design phases.				
4.0	This estimate of probable costs is provided for budgetary purposes only. 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.				



**Niagara Region Airport Study
Niagara District Airport
Niagara District Airport 10-Year Capital Plan**

Development Areas

May 16, 2016

Item	Description				Total
1.00	General Requirements				\$ 287,389.00
2.00	Area Grading				\$ 941,045.85
3.00	Taxiway Construction				\$ 710,513.63
4.00	Access Roads Construction				\$ 300,647.44
5.00	T-Hanger Relocation				\$ 400,000.00
6.00	Utilities				\$ 200,542.00
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 284,013.79
--	Project Contingencies			25%	\$ 710,034.48
Total Estimate - Southwest Development Area					\$ 3,834,186.19
1.00	General Requirements				\$ 287,389
2.00	Area Grading				\$ 1,039,830
3.00	Taxiway Construction				\$ 564,941
4.00	Access Road Construction				\$ 659,054
5.00	Utilities				\$ 487,090
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 303,830.30
--	Project Contingencies			25%	\$ 759,575.75
Total Estimate - East Development Area					\$ 4,101,709
1.00	General Requirements				\$ 274,935
2.00	Area Grading				\$ 1,070,606
3.00	Taxiway Construction				\$ 271,381
4.00	Access Road Construction				\$ 808,201
5.00	Utilities				\$ 599,161
--	Estimated Engineering Costs - Design and Construction Management			10%	\$ 302,428.43
--	Project Contingencies			25%	\$ 756,071.07
Total Estimate - Northwest Development Area					\$ 4,082,784



Item	Description	Unit	Est Quantity	Unit Price	Total Price
Southwest Development Area					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 287,389	\$ 287,389.00
2.00	Area Grading				
2.01	Clearing, Grubbing, Stripping	m ²	62,736	\$ 10	\$ 627,363.90
2.02	Site Grading	m ²	62,736	\$ 5	\$ 313,681.95
3.00	Taxiway Construction				
3.01	Common Excavation - Dispose/Re-use On-site	m ³	4,062	\$ 15	\$ 60,922.50
3.02	Granular Subbase Course - 250mm thick	m ²	9,787	\$ 15	\$ 146,801.25
3.03	Granular Base Course - 200mm thick	m ²	9,787	\$ 12	\$ 117,441.00
3.04	Prime Coat	m ²	9,787	\$ 1.50	\$ 14,680.13
3.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	9,787	\$ 25	\$ 244,668.75
3.06	Paint Markings	Lump Sum	1	\$ 4,000	\$ 4,000.00
3.07	Retroreflective Taxiway Edge Markers c.w. Frangible Coupling etc.	ea	130	\$ 500	\$ 65,000
3.08	Airfield Taxiway Information Signage	ea	18	\$ 1,500	\$ 27,000
3.09	Supply and Install 200dia CSP for Stormwater Drainage	m	150	\$ 200	\$ 30,000.00
4.00	Access Roads Construction				
4.01	Common Excavation - Dispose/Re-use On-site	m ³	2,239	\$ 15	\$ 33,580.80
4.02	Granular Subbase Course - 250mm thick	m ²	4,347	\$ 15	\$ 65,205.60
4.03	Granular Base Course - 200mm thick	m ²	4,347	\$ 12	\$ 52,164.48
4.04	Prime Coat	m ²	4,347	\$ 1.5	\$ 6,520.56
4.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	4,347	\$ 25	\$ 108,676.00
4.06	Retroreflective Roadway Markers c.w. Frangible Coupling etc.	ea	54	\$ 500	\$ 27,000
4.07	Roadway Signage	ea	3	\$ 500	\$ 1,500
4.08	Supply and Install 200dia CSP for Stormwater Drainage	m	30	\$ 200	\$ 6,000.00
5.00	T-Hanger Relocation				
5.01	Prepare New Hanger Location, Disassemble/Reassemble Hanger, Utility Connections, New Ex. Foundation	Lump Sum	1	\$ 400,000	\$ 400,000.00
6.00	Utilities				
6.01	Sanitary Sewer Piping	Lin.m.	600	\$ 175	\$ 105,070.00
6.02	Watermain Connections	Lin.m.	597	\$ 160	\$ 95,472.00
Subtotal					\$ 2,840,137.92
East Development Area					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 287,389	\$ 287,389
2.00	Area Grading				
2.01	Clearing, Grubbing, Stripping	m ²	69,322	\$ 10	\$ 693,220
2.02	Site Grading	m ²	69,322	\$ 5	\$ 346,610
3.00	Taxiway Construction				
3.01	Common Excavation - Dispose/Re-use On-site	m ³	3,533	\$ 15	\$ 52,995.00
3.02	Granular Subbase Course - 250mm thick	m ²	8,513	\$ 15	\$ 127,695.00
3.03	Granular Base Course - 200mm thick	m ²	8,513	\$ 12	\$ 102,156.00
3.04	Prime Coat	m ²	8,513	\$ 1.50	\$ 12,769.50
3.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	8,513	\$ 25	\$ 212,825.00
3.06	Paint Markings	Lump Sum	1	\$ 5,000	\$ 5,000.00
3.07	Retroreflective Taxiway Edge Markers c.w. Frangible Coupling etc.	ea	82	\$ 500	\$ 41,000
3.08	Airfield Taxiway Information Signage	ea	3	\$ 1,500	\$ 4,500
3.09	Supply and Install 200dia CSP for Stormwater Drainage	m	30	\$ 200	\$ 6,000.00



4.00	Access Road Construction				
4.01	Common Excavation - Dispose/Re-use On-site	m ³	4,097	\$ 15	\$ 61,455.00
4.02	Granular Subbase Course - 250mm thick	m ²	9,871	\$ 15	\$ 148,065
4.03	Granular Base Course - 200mm thick	m ²	9,871	\$ 12	\$ 118,452
4.04	Prime Coat	m ²	9,871	\$ 1.50	\$ 14,807
4.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	9,871	\$ 25	\$ 246,775
4.06	Retroreflective Roadway Markers c.w. Frangible Coupling etc.	ea	124	\$ 500	\$ 62,000
4.07	Roadway Signage	ea	3	\$ 500	\$ 1,500
4.08	Supply and Install 200dia CSP for Stormwater Drainage	m	30	\$ 200	\$ 6,000
5.00	Utilities				
5.01	Sanitary Sewer Piping	Lin.m.	1,454	\$ 175	\$ 254,450
5.02	Watermain Connections	Lin.m.	1,454	\$ 160	\$ 232,640
Subtotal					\$ 3,038,303



Northwest Development Area					
1.00	General Requirements				
1.01	Temporary Facilities - Mobilization, Demobilization, Trailers, Survey Layout, As-built Survey, Utility Locates, Temporary Fencing etc.	Lump Sum	1	\$ 274,935	\$ 274,935
2.00	Area Grading				
2.01	Remove, and Dispose Existing Hot-Mix Asphalt Concrete	m ²	458	\$ 15	\$ 6,875
2.02	Clearing, Grubbing, Stripping	m ²	52,812	\$ 15	\$ 792,174
2.03	Site Grading	m ²	52,812	\$ 5	\$ 264,058
2.04	Re-painting Runway 11-29 to Taxiway D	Lump Sum	1	\$ 7,500	\$ 7,500
3.00	Taxiway Construction				
3.01	Common Excavation - Dispose/Re-use On-site	m ³	1,601	\$ 15	\$ 24,012
3.02	Granular Subbase Course - 250mm thick	m ²	3,857	\$ 15	\$ 57,861
3.03	Granular Base Course - 200mm thick	m ²	3,857	\$ 12	\$ 46,288
3.04	Prime Coat	m ²	3,857	\$ 1.50	\$ 5,786
3.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	3,857	\$ 25	\$ 96,434
3.06	Paint Markings	Lump Sum	1	\$ 2,000	\$ 2,000
3.07	Retroreflective Taxiway Edge Markers c.w. Frangible Coupling etc.	ea	36	\$ 500	\$ 18,000
3.08	Airfield Taxiway Information Signage	ea	6	\$ 1,500	\$ 9,000
3.09	Supply and Install 200dia CSP for Stormwater Drainage	m	60	\$ 200	\$ 12,000
4.00	Access Road Construction				
4.01	Common Excavation - Dispose/Re-use On-site	m ³	4,945	\$ 15	\$ 74,177
4.02	Granular Subbase Course - 250mm thick	m ²	11,916	\$ 15	\$ 178,745
4.03	Granular Base Course - 200mm thick	m ²	11,916	\$ 12	\$ 142,996
4.04	Prime Coat	m ²	11,916	\$ 1.50	\$ 17,874
4.05	Hot-Mix Asphalt Concrete - 65mm thick (1 lift)	m ²	11,916	\$ 25	\$ 297,908
4.06	Retroreflective Roadway Markers c.w. Frangible Coupling etc.	ea	148	\$ 500	\$ 74,000
4.07	Roadway Signage	ea	9	\$ 500	\$ 4,500
4.08	Supply and Install 200dia CSP for Stormwater Drainage	m	90	\$ 200	\$ 18,000
5.00	Utilities				
5.01	Sanitary Sewer Piping	Lin.m.	1,789	\$ 175	\$ 312,995
5.02	Watermain Connections	Lin.m.	1,789	\$ 160	\$ 286,167
Subtotal					\$ 3,024,284
Notes:					
1.0	The above estimates are based on conceptual layout and design information. Quantities and costs are subject to change during preliminary and detailed design phases.				
2.0	Temporary Facilities are based on an estimate of 10% of the Construction items				
3.0	The taxiway and access road pavement structure utilized in the above estimate include 65 mm HMA, 200 mm Base Course, and 250 mm Subbase Course. The pavement structure is subject to change during preliminary and detailed design phases.				
4.0	This estimate of probable costs is provided for budgetary purposes only. 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.				

Niagara Region Airport Study							
Niagara District Airport							
NDA 10-Year Capital Plan							
Item	Description	Unit	Est Quantity	Unit Price	Total	Comment	
1.00	Fuel Tank Replacement						
	22,000 L Low Lead	Each	1	\$168,000		Costs taken from other similar projects	
	45,000 Jet Fuel	Each	1	\$217,000			
	Site Modifications	Lump Sum		\$40,000			
	Card Lock	Each	1	\$45,000			
	Engineering (15%)			\$70,500			
	Total Fuel Tank Replacement Cost				\$540,500		
2.00	Navigational Aids (PAPI)	Lump Sum			\$75,000	Cost based on previous project costs	

ANNEX 1: AIRPORT FINANCIAL PROJECTIONS – NIAGARA DISTRICT AIRPORT – OPERATIONS ECONOMICS INC.



Airport Financial Projections

Niagara District Airport

2 June 2016

Executive Summary

Findings of the analysis include the following:

- Niagara District Airport (NDA) has supported stable and varied operations in recent years.
- NDA has operated with an operating surplus based on support from the annual municipal grants.
- The Capital Plan developed for the site recommends spending \$9.7 million over 11 years, or \$885,000 on an annualized basis.
- Operating budget projections anticipate the annual deficit (before municipal grant) increasing gradually over the 10-year period.

Highlights of the Capital Plan over the next 11 years include

- \$600,000 for mobile equipment.
- \$735,000 for runway 01-19 rehabilitation in 2019-20.
- \$2.7 million for development of the Southwest Development Area between 2018 and 2023.
- \$2.1 million for development of the East Development Area in 2023 and 2024.

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1. Introduction

The Niagara District Airport (NDA) is in the Niagara Region of Southern Ontario. The Regional Municipality of Niagara (Niagara Region) is reviewing the ownership structure and operations of the NDA and the Niagara Central Dorothy Rungeling Airport (NCDRA). This supports a motion passed by the Region in July 2015 to engage in preliminary discussions with the airports and the respective municipalities.

Two parallel reports have been produced for NDA and NCDRA. This report examines only NDA.

The Niagara District Airport Commission (NDAC) manages and operates the airport. The NDAC is comprised of representatives selected by the City of St. Catharines, Niagara Falls and Niagara-on-the-Lake. The NDA is a general aviation (GA) airport, and there are approximately 75 aircraft based at the site.

To determine the overall benefit of a regional role in the airport's operations, the Region contracted Tetra Tech EBA Inc. (Tetra Tech) and Operations Economics Inc. (OEI) to develop an updated land use plan, a financial projection and a risk assessment for the airport. This report provides the financial projection.

Methodology

This project has been developed with a series of site meetings, trend analysis, financial review, stakeholder interviews, and interaction with the Land Use Plan team. Documents used included airport commission financial statements and other airport documents, Niagara-on-the-Lake documents, Statistics Canada statistics, and industry reports.

This report first describes the current situation and its financial performance, and then projects conservative financial performance based on historic airport results, emerging aviation trends in Southern Ontario and region, and general aviation projections in Canada. More detailed information and financial information are included in the appendices at the end of this report.

A separate evaluation and report related to scheduled passenger service development at the NDA has been undertaken concurrent with the development of this report. As such, the financial plan outlined in this report does not include cost or revenue projections associated with passenger services.

2. Economic and Regional Context

Niagara Region

Economy

Within a one-day drive of the region of Niagara live 55% of the U.S. and 60% of Canada's population, making the region a natural base for American and Canadian companies wishing to reach both markets. The region of Niagara provides every transportation mode modern industry and commerce requires, including major highways, Class I railways, the Welland Canal connecting Lake Erie and Lake Ontario, and airports.

Manufacturing is the largest sectoral employer in the Region. The sector includes auto industry parts suppliers and advanced manufacturers including digital, aerospace and other ICT expertise. Tourism and agriculture are both important regional sectors. The Niagara Region population in 2011 was 431,000.¹

Regional and Municipal Planning

Development in the Niagara Region is governed by the Regional Official Plan. The Plan guides the Niagara Region Growth Management Strategy that aligns with the Provincial Growth Plan for the Greater Golden Horseshoe, the Provincial Policy Statement, and the Greenbelt Plan. Planning and land use for airport lands is included in the Niagara-on-the-Lake Official Plan.

General Aviation

The Niagara District Airport (NDA) is a general aviation airport. General aviation (GA) includes all aviation activity that is not scheduled passenger or cargo flights. General aviation includes "business, sightseeing, search and rescue, training, recreational, survey, aerial ambulance and a variety of other purposes used to complete the world's transportation system. Ranging in size from a small two-seat trainer to a large airline-size aircraft..."² Many of these purposes generate revenue or provide significant social benefit, like search and rescue. When people think of GA, however, they typically think of recreational flying.

¹ <https://www.niagararegion.ca/about-niagara/statistics/population-and-maps.aspx>

² <http://www.iaopa.org/what-is-general-aviation/>

Trends

Trends in GA traffic in Canada are difficult to measure because Statistics Canada no longer tracks it, but a number of indicators are available.

- Business aviation in Canada generates significant economic activity. Business aircraft are flown by a broad cross-section of businesses and organizations, ranging in size from small to large. Business aviation in Canada generates annual direct impacts of
 - 11,500 person years of employment
 - \$810 million in wages
 - \$1.3 billion in GDP³
- Business aviation declined between 2006 and 2011 (the last year data is available for) measured by business aviation aircraft movements counted by NAVCAN.⁴ It is difficult to make broad assessments from this time period because aviation activity in general peaked in 2008 and declined after the recession in that year. Activity may have returned to pre-2008 levels by this time.
- Recreational pilot activity is declining in Canada, measured by a number of indicators. For example, the number of non-commercial pilot licenses issued per year has declined from a little over 5,000 annually in 1981 to a little over 2000 in 2011.⁵ This is attributed to a number of trends including declining personal disposable income, increasing relative aircraft cost, declining federal support for pilot training, and changing public interests.

Generally, in North America, the business and commercial aspects of general aviation are stable but recreational flying is declining.

Airports and Aviation in Southern Ontario

Southern Ontario is growing and current airport capacity will not meet projected demand for scheduled passenger services in years to come. In response, the Greater Toronto Airport Authority (GTAA) is exploring options including:

- 1) Expansion of YYZ, and
- 2) Creation of an integrated airport network in Southern Ontario.⁶ The federal government has also considered the development of a new airport (Pickering) in the

³ CBAA, Economic Impact of Business Aviation in Canada, 2015.

⁴ Ibid.

⁵ Vice President's Report for COPA AGM 2015. These are based on Transport Canada statistics.

⁶ Urban Strategies Inc., "Toronto Pearson: Growth, Connectivity, Capacity," 2015.

region. The projected aviation demand implies opportunity for most if not all airports in Southern Ontario.

Aerospace and Aviation Related Activity and Opportunities

Aerospace and aviation related businesses are significant economic generators in Canada, Canada's aerospace sector alone consists of 700 companies generating annual revenues of more than \$25 billion in 2013. Canadian aerospace is integrated into the global supply chains and exports 80% of its production globally.⁷ The Canadian aerospace industry creates approximately 73,000 jobs annually. Other aviation related jobs include maintenance, cargo, air carrier support services, and related activity.

Related opportunities which NDA could potentially attract include:

- Logistics and warehousing.
- Post-secondary training associated with an airport.
- Maintenance, Repair and Overhaul (MRO) business for specific companies or types of aircraft.
- Specialty services such as aircraft avionics, upholstery, and painting.
- Tourism services such as sightseeing flights, and car rentals.
- Manufacturing of aircraft parts or aviation related systems.
- Non-aviation related commercial and light industrial services.
- Aviation photography and aerial surveying.
- Agricultural aviation such as crop spraying.
- On-demand or air taxi services for passengers.

No aviation regulation proposed changes which would impact the financial plan have been identified.

⁷ <http://www.international.gc.ca>

3. Current Airport Situation

Funding and Governance

Niagara District Airport is located in Niagara-on-the-Lake, and financially supported by Niagara-on-the-Lake, Niagara Falls, and St Catharines. The Niagara District Airport Commission runs the airport on behalf of the three municipalities. The Commission has nine commissioners - an elected Councillor from each municipality, and six others nominated by the participating municipalities.

Planning and Infrastructure

In 2009, the Niagara District Airport undertook a \$12 million upgrade through the Infrastructure Stimulus Program, including construction of a new Air Terminal Building (ATB), rehabilitation of the main runway and taxiways and construction of a new taxiway.

The airport is located within Niagara-on-the-Lake and airport zoning is included under the municipality's Official Plan.

Operations and Staffing

The airport is open 24 hours a day, seven days a week. CBSA provides customs entry services for small aircraft at the site (AOE15). Fuel is provided by Allied Aviation and is available 24 hours per day on a call-out basis.

The airport staff complement includes

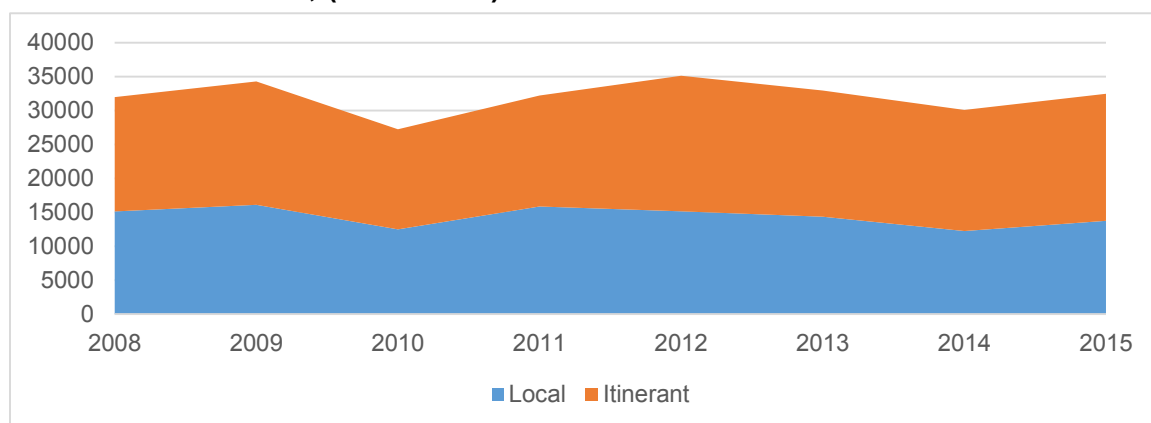
- An Airport Manager
- An Operations Managers
- 2 Operators
- A part-time Executive Assistant
- A contract Payroll Clerk
- Seasonal operator (approximately 30 hours in 2015-16)

Activity Indicators

For NDA, three activity indicators are available. These are

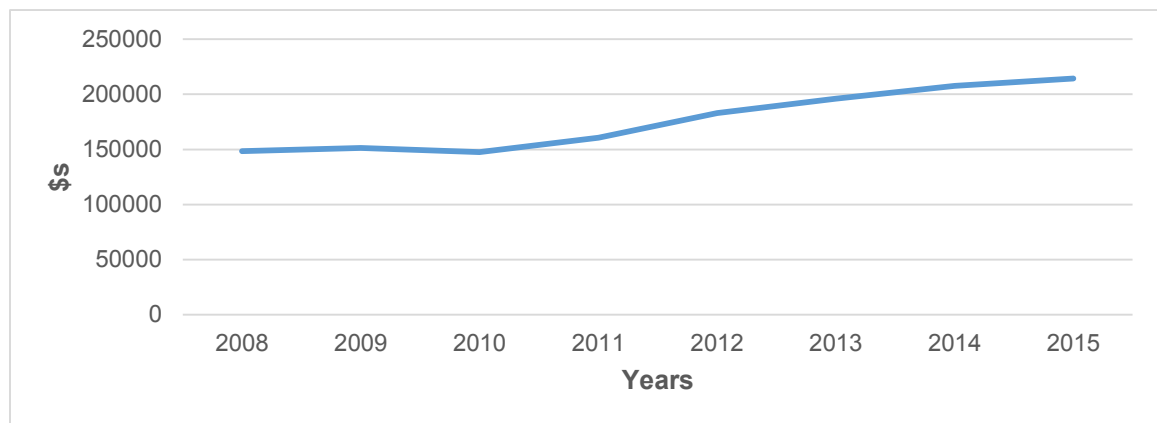
- **Aircraft movements.** Over the last eight years, movements have been reasonably stable, with a slight increase in itinerant movements and a slight decrease in local movements. Local movements are typically training flights, and itinerant movements are typically between different sites.

Aircraft Movements, (2008-2015)

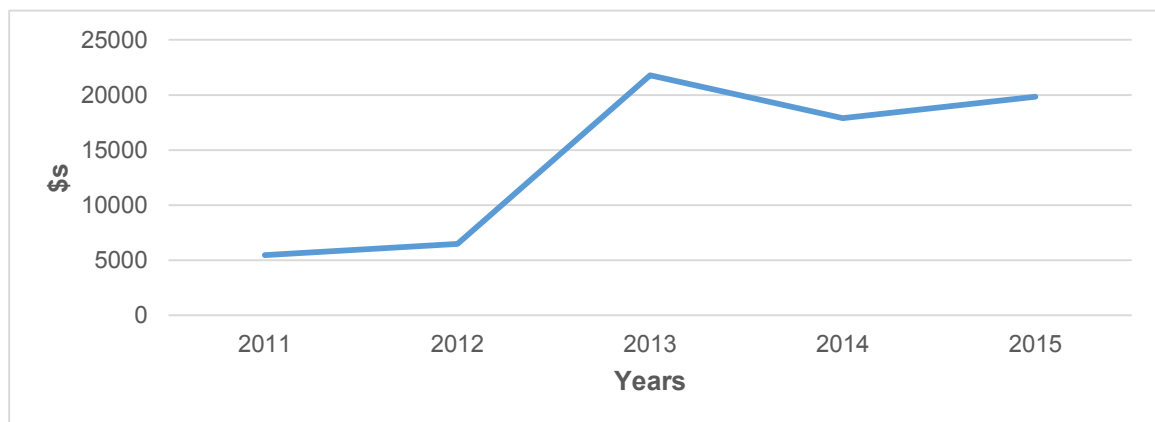


Source: NDA, StatsCan

- **Leases.** Leases are a significant source of revenue for GA airports, but they usually lease at rates which are relatively low. Airport leases are typically long-term, in the range of 20-25 years. This is also the case at NDA and many tenants have a long history with the site. The increase in rents is primarily from increases to lease rates to bring them in line with other Southern Ontario airports.

Rental Revenue, \$s (2008-2015)

- **Fuel net revenue.** Fuel is often the primary source of income for a GA airport, so understanding this revenue source is important. The blue line shows the fuel net revenue from 20011 to 2015. Allied Aviation took responsibility for fuel at the airport in 2012. Fuel sales in 2011 were low because of reduced aircraft operations as a result of construction at the airport. Revenues before 2011 are not shown because the revenue and expenses was reported in a different form.

Fuel Revenue, \$s (2011-2015)

4. Historic Financial Performance

As a general rule, smaller airports require a subsidy in some form. The federal government provides the Airport Capital Assistance Program (ACAP) to provide capital funding for airside safety for airports with over 2,000 passengers a year in recognition of this. Larger National Airport System (NAS) airports are not eligible for this program. Economists have identified that airports typically need to generate approximately one million passengers or more per year to be self-sustaining. This is because the capital costs for airports are relatively high and air passengers can be charged a reasonable level of fees. Many of the larger regional airports with less than one million passengers annually can be self-sustaining depending on their fees and charge structure.

General Aviation airports are the in the most difficult position in Canada because they receive relatively little support from senior government. While some GA airports appear to be performing well financially with very low fees, it is generally because they are not replacing capital or making allowance for its replacement. This is largely because light aircraft do not impact airfield infrastructure to the same extent that heavy aircraft would, allowing many GA sites to extend the useful life of their runway with careful maintenance.

Revenue

NDA generated \$272,000 per year in revenue in 2015. Including municipal grants (deferred capital included) the airport generated \$622,000. **Figure 4-1** provides the five ear revenue for NDA.

Figure 4-1: NDA Historic Revenue, \$\$ (2011-15)

	2011	2012	2013	2014	2015
Lease/Rentals	160,625	182,869	195,951	207,799	214,255
Fuel	5,454	6,480	21,785	17,902	19,840
Landing and parking fees	13,961	15,948	17,475	16,974	15,317
Interest	4,830	1,872	1,433	1,620	2,383
Events	27,790	32,380	11,820	774	7,455
Miscellaneous	20,368	49,140	14,006	12,171	12,908
Subtotal	233,028	288,689	262,470	257,240	272,158
Municipal Grant	250,846	266,778	271,098	328,500	349,722
TOTAL	483,874	555,467	533,568	585,740	621,880

Major Revenue Lines

This section covers major revenue lines for the airport.

Rentals

Rentals are the largest source of revenue. This includes land and office rentals, tie downs for aircraft, and advertising. Over the last five years, rentals have grown 40%. This has partly been the result of bringing lease rates into line with other airports in Southern Ontario. The airport has 17 major rental clients. Genaire is the largest tenant at the airport.

Rental rates at NDA appear comparable to fees at many other Southern Ontario airports, as shown in **Figure 4-2**, though at the low end of the range. The NDA has increased its rental rates in recent years to be comparable and is seeking 30 cents a square foot in 2016. Based on the table below, this appears reasonable and competitive with other Southern Ontario sites. NCDRA has lower rates. Its rates are 25 cents for commercial and 15 cents for non commercial tenants.

Figure 4-2: Airport Hangar Lease Rates, 2016, \$s

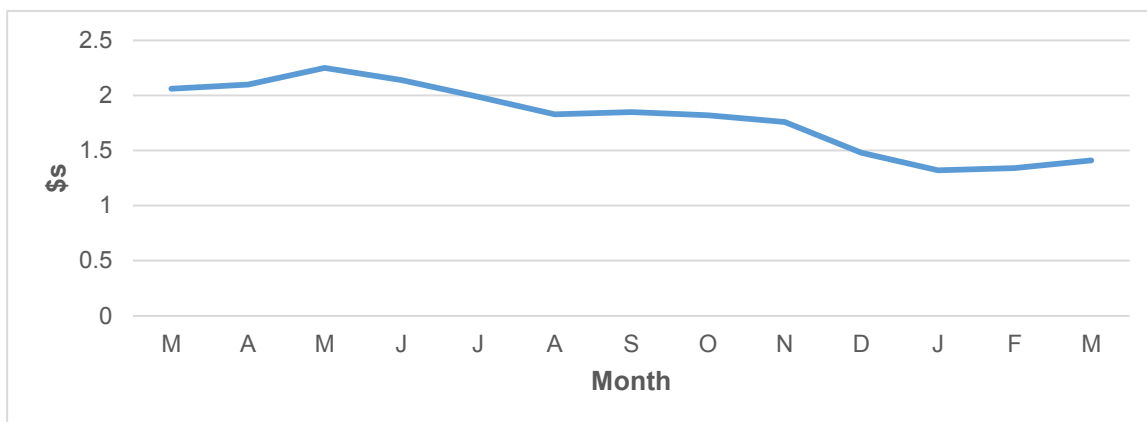
Airport	Rental rate / square feet
Brantford	.38
Lake Simcoe	.31
NDA	.30
NCDRA	.25 and .15
Peterborough	.30
Waterloo	.29

Fuel

Fuel is the second largest source of revenue. Allied Aviation provides fuel service at the airport. In 2012, Allied entered into a five-year lease for an airport-owned hangar and provides full FBO services. The airport receives five cents per litre for all aviation fuel sold at the site. Fuel sales, and the airport's total flowage fee, have increased strongly, 120%, over the last five years. However, in 2011, the first year of the lease period, flight activity was low because of runway construction.

Comparative rates for fuel are infamously difficult to obtain because they are often fluctuating. **Figure 4-3** displays the jet fuel spot price over the last year. While this is the wholesale price in \$s per US gallon, it shows a sense of jet fuel fluctuations. What is worth noting is that NDA is served by a major fuel supplier in North and South America that understands the market and competing in it. Fuel sales will increase primarily if the airport generates significant new or increased activity.

**Figure 4-3: Jet Fuel Spot Price FOB \$s/ US gallon
(March 2015 – March 2016)**



Source: US Energy Information Administration

Fees

Fees refer primarily to landing fees charged to aircraft using the site, as well as parking fees for overnight aircraft. At most North American airports recreational airport pilots do not pay landing fees. At NDA, itinerant aircraft are charged landing fees based on the aircraft maximum take-off weight (MTOW) of over 4,000kg (8,800lb). Fees are charged as follows

- 4,000 kg-13,630 kg (8,800 lbs-30,000 lbs) \$57.50 per landing
- Over 13,630 kg (30,000 lbs.) \$115.00 per landing

Only larger GA aircraft meet these weight qualifications.

Landing fee revenues have fluctuated over the five-year period, and peaked in 2013. Landing fee revenues increased over the period by 8.9%.

Fees charged to aircraft are complex and larger airports generally charge both higher fees and fees for more services. Fees at airports are not entirely comparable because of differences in what is charged for and how it is charged. The tables below, **Table 4-4** through **4-7**, and shows how other regional airports charge fees to aircraft. Brantford Municipal Airport was also considered but does **not** charge landing fees for any aircraft. Oshawa and Waterloo both have a relatively simplified fee structure. This is a more modern approach because airports have generally moved to simplifying their fee structures in recent years because simplified fee structures are relatively easy to

administer. Muskoka and Lake Simcoe display more traditional, graduated landing fee structures.

The lowest fee structure is at Brantford Municipal Airport with no landing fees. The highest fee structure is at Muskoka Airport which charges \$7 per 1,000 kg for aircraft of between 3-4,000 kg. For a 4,000kg aircraft this would mean a landing fee of \$28, a lower rate than NDA's charges of \$57.50 for a 4,000 kg aircraft. However, for a 13,000kg aircraft, Muskoka's fee of \$10 per 1,000 kg would result in a total fee of \$130, significantly lower than NDA's \$57.50 fixed fee.

Two of the airports examined have a differential fee, charging one fee for based aircraft, and a higher fee for itinerant aircraft. These two airports are Oshawa and Lake Simcoe. For aircraft over 2,000kg, Oshawa charges a 31% differential for non based aircraft. Lake Simcoe has a more complex fee structure, but for aircraft between 3,000-4,999 kg the airport charges a 53% differential for non based aircraft.

Fees at general aviation airports vary considerably because traffic and opportunities at them vary. It is therefore difficult to draw more than general insights from fee comparisons.

Figure 4-4: Oshawa Executive Airport Landing Fees

Non Airport Tenants

Less than 2,000 kg	\$5.85 / 1,000 kg
Over 2,000 kg	\$5.85 / 1,000 kg

Airport Tenants

Less than 2,000 kg	\$4.45 / 1,000 kg (applies to commercially registered aircraft only)
Over 2,000 kg	\$4.45 / 1,000 kg

Figure 4-5: Region of Waterloo Airport Landing Fees

Below 3,000 kg	No Charge
3,000 to 21,000 kg	\$6.50 / 1,000 kg
21,001 to 45,000 kg	\$6.50 / 1,000 kg
Over 45,000 kg	\$6.50 / 1,000 kg

Figure 4-6: Muskoka Airport

No Charge for any aircraft less than 3,000 kg	
No Charge for aircraft based at Muskoka Airport if less than 5,000 kg	
3,000kg – 4,000 kg	\$7.00 / 1,000 kg
5,000 kg – 9,000 kg	\$8.00 / 1,000 kg
10,000 kg – 19,000 kg	\$10.00 / 1,000 kg
20,000 kg – 44,000 kg	\$11.00 / 1,000 kg
45,000 kg or greater	\$12.00 / 1,000 kg

**Figure 4-7: Lake Simcoe Regional Airport
Non Based Aircraft**

No Charge for any aircraft less than 2,999 kg	
3,000 kg – 4,999 kg	\$5.50/1000 kg
5,000 kg – 9,999 kg	\$6.00/1000 kg
10,000 kg – 19,999 kg	\$6.50/1000 kg
20,000 kg – 44,999 kg	\$7.00/1000 kg
45,000 kg +	\$7.50/1000 kg

Based Aircraft

No Charge for any aircraft less than 2,999 kg	
3,000 kg – 4,999 kg	\$3.60/1000 kg
5,000 kg – 9,999 kg	\$3.90/1000 kg
10,000 kg – 19,999 kg	\$4.20/1000 kg
20,000 kg – 44,999 kg	\$4.50/1000 kg
45,000 kg +	\$4.80/1000 kg

Expenses

Figure 4-8 shows expenses for the five-year period. Over the last five years, expenses have increased by 18.8%. Personnel costs increased at approximately the same rate, while maintenance costs for buildings and vehicles increased more rapidly, 54.8% and 27.9%, respectively. This is a relatively high growth in expenses over this period.

Figure 4-8: NDA Historic Expenses, \$s (2011-15)

	2011	2012	2013	2014	2015	% Change, 2011-2015
Personnel	239,532	280,520	291,997	301,886	294,164	22.8
Operations	139,627	150,948	142,283	141,913	132,402	-5.2%
Maintenance, building and property	36,122	44,830	40,297	30,366	79,899	121.2
Maintenance, vehicles and equipment	33,015	30,341	31,480	36,415	45,764	38.6
SUBTOTAL	448,296	506,639	506,057	510,580	552,229	23.2

To provide additional insight into NDA expenses, **Figure 4-9** provides additional detail on expenses. The following points to note in this figure include:

- Personnel expenses have a one-time bump up in 2016. This covers about one FTE increase.
- Airfield expenses included a one-time expense of approximately \$50,000 in 2015.
- Aging mobile equipment results in budgeted maintenance increases in 2016 in the final line item.

Figure 4-9: NDA Expense Detail, \$s (2015 actual vs. 2016 budget)

	2015	2016 Budget	Difference
Salaries, wages & benefits	276,079	339,900	63,821
Operations			
Promotion and marketing	2,018	5,500	3,482
Legal, Audit and accounting	29,529	27,000	-2,529
Office	34,514	77,200	42,686
Light, heat and water, telephone	42,922	45,000	2,078
Insurance	14,213	17,000	2,787
Consulting	18,085	14,000	-4,085
Bad debt (recovery) expense / Collection Fees	1,000	1,000	-
PILT	9,198	11,000	1,802
Repairs and maintenance			
Building and Property	28,678	26,200	-2,478
Airfield	51,221	7,500	-43,721
Vehicles and Equipment	45,764	61,200	15,436
TOTAL	553,221	632,500	72,279

Note: Figure 4-9 sums differently from Figure 4-2 because different data sources were used.

Five-Year Performance

The five-year financial performance at NDA is shown in **Figure 4-8**. The figure shows that over this period, the annual deficit for the site increased, and municipal grants also increased. In 2015 the deficit was \$280,000 and the total municipal grant was \$349,722, with an operating surplus of \$69,500.

Figure 4-8: Five-Year Operating Performance Overview \$s (2011-2015)

	2011	2012	2013	2014	2015
Revenue (excluding Municipal Grants)	233,028	288,689	262,470	257,240	272,158
Expenses	448,296	506,639	506,057	510,580	552,229
Net Operating Surplus/(Deficit) before municipal Grants	(215,268)	(217,950)	(243,587)	(253,340)	(280,071)
Municipal Grant	250,846	266,778	271,098	328,500	349,722
Net Operating Surplus/(Deficit)	35,578	48,828	27,511	75,160	69,651

Note: Figure excludes capital amortization and financing expenses.

5. Capital Requirements

A 20-year Capital Plan was prepared for NDA as part of the Land Use Plan prepared in parallel with this financial projection. The capital plan itemized major recommended upcoming capital expenses and the year in which action is recommended. Highlights of that plan are identified below. The complete plan is provided in the Land Use Plan and a table based on it is shown in **Appendix C**.

Highlights of the first 10 years of the Capital Plan include

- \$600,000 for mobile equipment.
- \$735,000 for runway 01-19 rehabilitation in 2019-20.
- \$950,000 for runway 11-29 rehabilitation in 2020-21.
- \$1.6 million for development of the Southwest Development Area between 2018-19.
- \$2.1 million for development of the East Development Area in 2023 and 2024.

The total recommended capital budget including development area expansions is \$11.8 million for the 2016 to 2026 period. This includes \$950,000 for rehabilitation of Runway 11-29 which may be decommissioned during this time-period.

Capital costs related to scheduled passenger services have been omitted from the forecast presented herein.

6. Financial Projection

Methodology

Projections for NDA have been developed to show the potential financial performance of the site over the next 10 years based on past and current performance, consultation with stakeholders, market trends and the investments identified in the land use plan. Conservative assumptions have been used. For this analysis, it has been assumed that inflation will increase at 2.0% for expenses and revenues based on Bank of Canada projections to 2017.

The operating budget projection has considered a 10-year forecast period. Financing of the capital program developed in the parallel Land Use Plan has been included with this forecast. The capital program has been forecasted for a 20-year period, but only the first 10-year period is included with this projection.

A sensitivity analysis is also provided. It considers scenarios related to key risks and opportunities not included in the base case.

10-Year Operating Budget

Starting from the 2016 budget, projections have been developed to 2025 based on the analysis above and are provided in **Figure 6-1**. Revenues increase with inflation over the study period. Leases grow more quickly because it is assumed that new stand-alone and T-hangars will be developed in the Southwest Development Area. The base projection assumes two lots are constructed per year for the first five years, followed by two lots every three years on average. It is assumed that the municipal grant will cover NDA deficits. See **Appendix B** for further supporting detail.

Figure 6-1: 10-Year Financial Projection (\$) (Excludes capital financing)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Budget										
Revenue (excluding Municipal Grants)	276,100	281,495	286,995	295,915	305,078	314,490	324,157	334,085	353,880	362,678
Expenses	632,500	632,604	645,256	658,161	671,324	684,751	698,446	712,415	726,663	741,196
Net Operating Surplus/ (Deficit) before municipal Grants	(356,400)	(351,110)	(358,261)	(362,246)	(366,246)	(370,261)	(374,289)	(378,330)	(372,784)	(378,518)
Municipal Grant	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	378,518

Note: Figure excludes capital amortization and financing expenses.

10-Year Capital Requirements

A year-by-year review of the Capital Plan requirements prepared for the Land Use Plan is provided below in **Figure 6-2** with supporting detail outlined in **Appendix C**. The Land Use Plan includes a 20-year capital projection, but only the first 11 years are discussed in this report. (Financing of capital and amortization is excluded from the operating forecast and the capital plan and will be addressed outside of this report.) Operating expenses have not been increased to match capital improvements because it is assumed that while airport activity increases, the improvements to capital will reduce demands, balancing each other off.

Excluded from this forecast are costs associated with scheduled passenger services (example – terminal and parking expansions), as these costs are being evaluated through a concurrent study process. This base case scenario also excludes some investments that are separately considered in the sensitivity analysis (example – card lock investment).

Figure 6-2: Capital Requirements

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Airside	-	26,000	45,300	55,000	829,000	995,000	352,000	-	272,000	365,000	53,000
Groundside	229,000	44,600	577,000	216,000	129,000	295,000	68,000	112,000	60,000	750,000	609,000
Development	-	20,000	117,000	1,465,000	-	-	-	152,000	1,899,000	-	-
Total	229,000	90,600	739,300	1,736,000	958,000	1,290,000	420,000	264,000	2,231,000	1,115,000	662,000

7. Sensitivity Analysis

To examine how the NDA might be impacted by potential operations scenarios over the next 10 years, the following scenario-based sensitivity analysis has been developed. The analysis considers the potential impacts of each scenario and the degree to which they might impact base airport projections.

Solar Panel Farm

The NDA has considered development of a solar panel farm on the southeast side of the airport property. The project would proceed in partnership with the Town of Niagara-on-the-Lake and a private sector partner. The private sector partner would incur the capital and operating costs. This plan is contingent on receiving provincial funding to implement the program. Agreements for the project are in place, and the NDA estimates that it would receive \$45,000 annually from the farm if/when it is realized, or a maximum upside of \$450,000 over the 10-year projection.

Major Maintenance Site / Warehouse Development

This scenario assumes the development of a major aviation-related maintenance site or warehouse at the airport. It is assumed that the site would be operational in 2019, that the site would generate approximately \$120,000 annually in leases and \$4,000 in landing fees. The proposed scenario structure is approximately half the size of the largest facility built at a Canadian GA airport in the last decade. The rounded figure was arrived at because large scale developments of this type are often subject to unique negotiations. Fuel has not been assumed because aircraft in this scenario may not be based at the site. Based on these assumptions, the airport would receive approximately \$880,000 in lease revenue over the study period, and \$30,000 in landings fees.

Loss of Key Tenant

This scenario assumes the loss of a major NDA tenant. The loss would primarily be to lease revenue as the largest tenant at the airport does not operate aircraft. For this scenario an annual loss of \$5,200 in lease revenue is assumed in 2018. The loss would escalate with inflation over time. If the building was not re-leased within a few years, it would likely be recommended for demolition. This expense has not been estimated.

8. Findings

Key findings of this analysis include the following:

- The site has had supported stable and varied operations in recent years.
- NDA has operated with an operating surplus based on support from the annual municipal grants.
- The Capital Plan developed for the site recommends spending \$9.7 million over 11 years, or \$885,000 on an annualized basis.
- Operating budget projections anticipate the annual deficit (before municipal grant) increasing gradually over the 10-year period.

Appendix A: Development Area Projections

Overview

A detailed review of potential development area investments and resulting revenue is warranted as the capital costs are significant and lease revenue is the single largest source of revenue for airport. The development plan includes two areas of development, Southwest Development Area (SWDA), East Development Area (EDA), and the Northwest Development Area (NWDA).

The developments are assessed separately below with respect to capital investment timing, take-up rate of the units, and resulting revenue projections for the airport. The resulting base case scenario is then incorporated into the financial forecast for the airport. Low and high growth scenarios are considered in the sensitivity analysis.

For the analysis, the airport's current lease rate structure is used. As noted earlier, the NCDRA's lease rates are below market levels.

Southwest Development Area (SWDA)

The SWDA is intended for private and recreational hangar development. In total, it will accommodate approximately 69 lots in three phases. The average lot size equals 0.048 ha, but development may include larger lot sizes as demand warrants.

The total capital cost for the SWDA is \$3.8 million. Upon full build-out, the 69 lots could generate revenue of up to \$108,000 per year. (All figures are in 2016 dollars). This analysis implies a simple payback period of 36 years on average, with the first phase of development having the highest payback period, at 63 years. If value of time, investment time, occupancy, and maintenance costs were factored in, the payback periods would be longer. The analysis indicates that the SWDA would not generate a profit.

Figure A-1: SWDA Payback Period (2016 dollars)

	Capital Cost	Number of Lots	Maximum Annual Lease Revenue (\$s)	Payback Period (Years)
Phase 1	\$1,582,000	16	\$24,965	63
Phase 2	\$1,068,000	24	\$37,448	29
Phase 3	\$1,188,000	29	\$45,250	26
Sub-total	\$3,838,000	69	\$107,663	36

Notes: Average lot size of 0.048 ha and lease revenue of \$0.302 per square foot annually per year. Other incremental sources of revenue are assumed to be relatively low. Simple payback period calculation disregards the value of time, maintenance costs, and timing of investment.

The construction of Phase I of SWDA is projected for 2019 because consultation shows existing demand but there is limited developable land at the airport currently. The base projection assumes two lots are constructed per year for the first five years, followed by two lots every three years on average. As noted, construction may involve larger single investments. This take-up rate on lots would trigger the need for Phase 2 construction in approximately 2030. Phase 3 would not be required in the 2037 forecast period. Over the forecast period to 2037, up to 103,000 square feet of lease-generating land would be developed with up to \$507,000 in total revenue as shown in **Figure A-2** below.

Figure A-2: Projected SWDA Cash Flow, inflated at 2%

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	10-Year Total	Years 11-22	22-Year Total
Lease Revenue	-	-	-	3,312	6,756	10,336	14,058	17,923	20,110	22,377	94,872	412,287	507,159
Capital Investment			(121,727)	(1,554,670)							(1,676,397)	-	(1,676,397)
Phase 1												(1,407,159)	(1,407,159)
Phase 2												-	-
Phase 3												-	-
Subtotal	-	-	(121,727)	(1,554,670)	-	-	-	-	-	-	(1,676,397)	(1,407,159)	(3,083,556)
Net Cash Flow	-	-	(121,727)	(1,551,358)	6,756	10,336	14,058	17,923	20,110	22,377	(1,581,525)	(994,672)	(2,576,397)

Sensitivity analysis completed shows that in the low growth scenario one lot would be developed in each of the first five years followed by one lot every two years for the balance of the period to 2037. The total lease-generating space generated would decrease to 62,000 square feet. Phase 2 would not be required by 2037, and the total revenue generated would decrease to up to \$280,000 over the 20-year period.

In the high growth scenario, 12 lots would be developed by the fifth year, followed by one lot per year for the balance of the period to 2037. The total leasable space generated by 2037 would increase to 134,000 square feet. Phase 2 would be required in approximately 2027, and the total revenue generated to 2037 would increase to \$648,500.

East Development Area (EDA)

The EDA is intended for commercial hangar development and uses. It would accommodate approximately 13 lots in two phases. The average lot size would equal 0.3 ha, but development may incorporate larger lot sizes as demand warrants.

The total capital cost for the EDA is \$4.1 million. Once fully developed, the 13 lots could potentially generate revenue of up to \$127,000 per year. (All figures are in 2016 dollars.) These figures imply a simple payback period of 32 years on average, with Phase 1 having the highest payback period at 42 years. If value of time, investment time, occupancy, and maintenance costs were factored in, the payback periods would be longer. The analysis indicates that the SWDA would not generate a profit.

Figure A-3: EDA Payback Period (2016 dollars)

	Capital Cost	Number of Lots	Maximum Annual Lease Revenue (\$s)	Payback Period (Years)
Phase 1	\$2,051,000	5	\$48,761	42
Phase 2	\$2,051,000	8	\$78,017	26
Sub-total	\$4,102,000	13	\$126,777	32

Notes: Average lot size of 0.3 ha and lease revenue of \$0.302 per square foot annually per year. Other incremental sources of revenue are assumed to be relatively low. Simple payback period calculation disregards the value of time, maintenance costs, and timing of investment.

The construction of Phase I of the EDA is projected to happen in 2024 following the rehabilitation (potential closure of one) secondary runways. The base case projection assumes one commercial development is constructed every fifth year on average. At this rate of development, Phase 2 construction would not be required in the 2037 planning period. Over this period, up to 97,000 square feet of leasable land would be developed generating up to \$363,000 in revenue collections estimated.

Figure A-4: Projected EDA Cash Flow, inflated at 2%

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	10-Year Total	Years 11-22 Total	22-Year Total
Lease Revenue	-	-	-	-	-	-	-	-	11,426	11,655	23,081	339,906	362,986
Capital Investment								(272,239)	(2,222,638)		(2,494,876)	-	(2,494,876)
Phase 1													
Phase 2													
Subtotal	-	-	-	-	-	-	-	(272,239)	(2,222,638)	-	(2,494,876)	-	(2,494,876)
Net Cash Flow	-	-	-	-	-	-	-	(272,239)	(2,211,212)	11,655	(2,471,796)	339,906	(2,131,890)

Sensitivity analysis completed shows that in the low growth scenario, one lot would be developed by 2037. The total lease-generating space generated decreases to approximately 32,000 square feet. The total revenue generated would decrease to approximately \$159,500 over the period.

In the high growth scenario, five lots would be developed by 2037 as opposed to three lots in the base case. The total lease-generating space generated by 2037 increases to 161,500 square feet. Phase 2 would be required in approximately 2027, and the total revenue generated would increase to up to \$668,500 over the period.

Northwest Development Area (NWDA)

The NWDA is intended for private and commercial development. In total, it will accommodate approximately 23 lots in three phases. The average lot size would be 0.25 ha.

The total capital cost for the NWDA is \$4.1 million. Once fully developed, the 23 lots would potentially generate revenue of \$187,000 per year. (All figures are in 2016 dollars.) This analysis implies a simple payback period of 22 years on average. If time value of money, timing of investment and occupancy, and future maintenance costs were factored in, these payback periods would become even larger. If value of time, investment time, occupancy, and maintenance costs were factored in, the payback periods would be longer. The analysis indicates that the SWDA would not generate a profit.

Figure A-5: NWDA Payback Period (2016 dollars)

	Capital Cost	Number of Lots	Maximum Annual Lease Revenue (\$s)	Payback Period (Years)
Phase 1	\$4,083,000	23	186,915	22

Notes: Average lot size of 0.25 ha and lease revenue of \$0.302 per square foot annually per year. Other incremental sources of revenue are assumed to be relatively low. Simple payback period calculation disregards the value of time, maintenance costs, and timing of investment.

The construction of the first phase of the NWDA is not included within the planning period. This development would require acquisition of access easement, clarification on the future of Runway 11-29, funding and constructing services to the site, and demand for additional capacity.

A-6: Base Case Land Development Projections

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Notes
A. Existing Rental Revenue											
Lease Revenue per Sq. Ft. - Non-Commercial	\$ 0.302	\$ 0.308	\$ 0.314	\$ 0.320	\$ 0.327	\$ 0.333	\$ 0.340	\$ 0.347	\$ 0.354	\$ 0.361	Current non-commercial rates for NCDRA are approximately market rates, increase by inflation. Non-commercial currently pay same rate at NDA, therefore there's a potential opportunity to increase revenue from non-commercial. Have applied current rate structure here for conservatism.
Lease Revenue per Sq. Ft. - Commercial	\$ 0.302	\$ 0.308	\$ 0.314	\$ 0.320	\$ 0.327	\$ 0.333	\$ 0.340	\$ 0.347	\$ 0.354	\$ 0.361	
Revenue	\$226,400	\$230,928	\$235,547	\$240,257	\$245,063	\$249,964	\$254,963	\$260,062	\$265,264	\$270,569	
B. Southwest Development Area (SWDA)											
Year of Budgeted Funding for Phases			PH1 - D	PH1 - C							D = Year design funding is approved; C = Year construction funding is approved, Phase 1 timing aligns with LUP and reflects immediate need. Remaining phases are timed based on need given estimated take-up rate.
<i>Non Commercial Development</i>											
# of Developed lots (Cumulative)	-	-	-	2	4	6	8	10	11	12	Lot construction begins in 2019 which is year capital funding for Phase 1 is identified. Take-up rate assumed at 2 lots per year initially based on existing demand, then 2 every three years after year 5. Given small lot sizes as described in LUP, this take-up should be seen as the average as actual construction may occur simultaneously for multiple lots.
Square Footage Developed (Cumulative)	-	-	-	10,333	20,667	31,000	41,333	51,667	56,833	62,000	
Lease Revenue per Sq. Ft. - Non-Commer	\$ 0.302	\$ 0.308	\$ 0.314	\$ 0.320	\$ 0.327	\$ 0.333	\$ 0.340	\$ 0.347	\$ 0.354	\$ 0.361	Average size per lot is 0.04 ha (0.61 acres), which is equivalent to approx. 4,306 square feet (at 107/69,104 sq. ft. per ha) Rates are at market level, therefore no change aside from inflation is included.
Total Rental Revenue - SWDA	\$ -	\$ -	\$ -	\$ 3,312	\$ 6,756	\$ 10,336	\$ 14,058	\$ 17,923	\$ 20,110	\$ 22,277	
C. East Development Area (EDA)											
Year of Budgeted Funding for Phases								PH1 - D	PH1 - C		D = Year design funding is approved; C = Year construction funding is approved, Phase 1 timing is based on LUP with construction following runway rehabilitations. Remaining phases are timed based on need given estimated take-up rate.
<i>Commercial Development</i>											
# of Developed lots (Cumulative)	-	-	-	-	-	-	-	-	1	1	Assumed 1 Commercial opportunity every 5th year. Average size per lot is 0.3 ha assumed, which is equivalent to approx. 32,292 square feet (at 107/69,104 sq. ft. per ha) No change aside from inflation is included in base case analysis. As noted in report, current rates are well below market rates therefore higher rate structure is considered in scenario analysis.
Square Footage Developed (Cumulative)	-	-	-	-	-	-	-	-	32,292	32,292	
Lease Revenue per Sq. Ft. - Non-Commer	\$ 0.302	\$ 0.308	\$ 0.314	\$ 0.320	\$ 0.327	\$ 0.333	\$ 0.340	\$ 0.347	\$ 0.354	\$ 0.361	
Total Revenue - EDA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 11,426	\$ 11,555	
TOTAL RENTAL REVENUE	\$226,400	\$230,928	\$235,547	\$243,569	\$251,818	\$260,300	\$269,021	\$277,986	\$286,800	\$304,601	
<i>Incremental Growth</i>	2.0%	2.0%	2.0%	3.4%	3.4%	3.4%	3.4%	3.3%	6.8%	2.6%	
<i>Cumulative Growth</i>	2.0%	4.0%	7.6%	11.2%	15.0%	18.8%	22.8%	31.1%	34.5%		

A. Existing Rental Revenue		2016	2017	2018	2019	2010	2011	2012	2013	2014	2015	2016	2017	Notes
Lease Revenue per Sq. Ft. - Non-Commercial		\$ 0.368	\$ 0.375	\$ 0.383	\$ 0.391	\$ 0.398	\$ 0.406	\$ 0.415	\$ 0.423	\$ 0.431	\$ 0.440	\$ 0.449	\$ 0.458	Current non-commercial rates for NCORA are approximately market rates, increase by inflation. Non-commercial currently pay same rate as NDA, therefore there's a potential opportunity to increase revenue from non-commercial. Have applied current rate structure here for conservatism.
Lease Revenue per Sq. Ft. - Commercial		\$ 0.368	\$ 0.375	\$ 0.383	\$ 0.391	\$ 0.398	\$ 0.406	\$ 0.415	\$ 0.423	\$ 0.431	\$ 0.440	\$ 0.449	\$ 0.458	
Revenue		\$ 275,980	\$ 281,500	\$ 287,130	\$ 292,873	\$ 298,730	\$ 304,705	\$ 310,799	\$ 317,015	\$ 323,355	\$ 329,822	\$ 336,418	\$ 343,147	
B. Southwest Development Area (SWDA)														
Year of Budgeted Funding for Phases					Ph1- D									D = Year design funding is approved; C = Year construction funding is approved Phase 1 timing aligns with LLP and reflects immediate need. Remaining phases are timed based on need given estimated take-up rate.
Non-Commercial Development														
# of Developed Lots (Cumulative)		12	13	14	14	15	16	16	17	18	18	19	20	Lot construction begins in 2019 which is year capital funding for Phase 1 is identified. Take-up rate assumed at 2 lots per year initially based on existing demand, then 2 every three years after year 5. Given small lot sizes as described in LLP, this take-up should be seen as the average as actual construction may occur simultaneously for multiple lots. Average site per lot is 0.04 ha (0.51 acres), which is equivalent to approx. 4,306 square feet (at 107,628 sq. ft. per ha)
Square Footage Developed (Cumulative)		62,000	67,167	72,233	72,233	77,500	82,667	82,667	87,934	93,000	99,000	98,167	103,334	
Lease Revenue per Sq. Ft. - Non-Commercial		\$ 0.368	\$ 0.375	\$ 0.383	\$ 0.391	\$ 0.398	\$ 0.406	\$ 0.415	\$ 0.423	\$ 0.431	\$ 0.440	\$ 0.449	\$ 0.458	Rates are at market level, therefore no change aside from inflation is included. Lease Revenue = Square Footage Developed * Lease Revenue per Sq. Ft.
Total Rental Revenue - SWDA		\$ 22,824	\$ 23,221	\$ 27,704	\$ 28,258	\$ 30,882	\$ 33,600	\$ 34,272	\$ 37,142	\$ 40,114	\$ 40,916	\$ 44,053	\$ 47,299	
C. East Development Area (EDA)														
Year of Budgeted Funding for Phases														D = Year design funding is approved; C = Year construction funding is approved Phase 1 timing is based on LLP with construction following runway rehabilitations. Remaining phases are timed based on need given estimated take-up rate.
Commercial Development														
# of Developed Lots (Cumulative)		1	1	1	2	2	2	2	2	3	3	3	3	Assumed 1 Commercial opportunity every 5th year. Average site per lot is 0.3 ha assumed, which is equivalent to approx. 32,292 square feet (at 107,628 sq. ft. per ha) No change aside from inflation is included in base case analysis. As noted in report, current rates are well below market rates therefore higher rate structure is considered in scenario analysis.
Square Footage Developed (Cumulative)		32,292	32,292	32,292	64,583	64,583	64,583	64,583	64,583	96,875	96,875	96,875	96,875	
Lease Revenue per Sq. Ft. - Non-Commercial		\$ 0.368	\$ 0.375	\$ 0.383	\$ 0.391	\$ 0.398	\$ 0.406	\$ 0.415	\$ 0.423	\$ 0.431	\$ 0.440	\$ 0.449	\$ 0.458	Total Revenue = EDA
Total Rental Revenue - EDA		\$ 11,888	\$ 12,126	\$ 12,388	\$ 23,231	\$ 23,735	\$ 26,250	\$ 26,775	\$ 27,111	\$ 41,785	\$ 42,621	\$ 43,473	\$ 44,343	
TOTAL RENTAL REVENUE		\$ 310,693	\$ 318,847	\$ 327,202	\$ 346,362	\$ 358,348	\$ 371,846	\$ 378,964	\$ 381,668	\$ 405,254	\$ 413,359	\$ 423,945	\$ 434,789	
Incremental Growth		2.0%	2.6%	2.6%	5.9%	2.6%	2.6%	2.0%	2.6%	6.2%	2.0%	2.6%	2.6%	
Cumulative Growth		37.2%	40.8%	44.5%	53.0%	57.0%	61.0%	64.2%	68.5%	79.0%	82.6%	87.3%	92.0%	

Figure A-7: Low Growth Land Development Scenario

Low Growth Scenario		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Incremental Lease Revenue												
SWDA		\$ -	\$ -	\$ -	\$ (1,656)	\$ (3,378)	\$ (5,168)	\$ (7,029)	\$ (8,962)	\$ (10,969)	\$ (11,188)	\$ (48,350)
EDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (11,426)	\$ (11,655)	\$ (23,081)
Subtotal		\$ -	\$ -	\$ -	\$ (1,656)	\$ (3,378)	\$ (5,168)	\$ (7,029)	\$ (8,962)	\$ (22,395)	\$ (22,843)	\$ (71,431)
Change in capital program												
SWDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
EDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Figure A-8: Low Growth Land Development Scenario

High Growth Scenario		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Incremental Lease Revenue												
SWDA		\$ -	\$ -	\$ -	\$ 3,312	\$ 3,378	\$ 3,445	\$ 3,514	\$ 3,585	\$ 3,656	\$ 3,729	\$ 24,620
EDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 11,426	\$ 11,655	\$ 23,081
Subtotal		\$ -	\$ -	\$ -	\$ 3,312	\$ 3,378	\$ 3,445	\$ 3,514	\$ 3,585	\$ 15,083	\$ 15,384	\$ 47,701
Change in capital program												
SWDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
EDA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Subtotal		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Appendix B: Operating Projections

Details on the operating projections are provided below.

	10-Year Projection										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Revenue (excluding Municipal Grants)	Budget										
Lease/Rentals	226,400	230,928	235,547	243,569	251,818	260,300	269,021	277,986	296,800	304,601	2,596,969
Fuel	12,000	12,240	12,485	12,734	12,989	13,249	13,514	13,784	14,060	14,341	131,397
Landing and parking fees	16,500	16,748	16,999	17,254	17,512	17,775	18,042	18,312	18,587	18,866	176,595
Interest	1,000	1,015	1,030	1,046	1,061	1,077	1,093	1,110	1,126	1,143	10,703
Events	8,000	8,120	8,242	8,365	8,491	8,618	8,748	8,879	9,012	9,147	85,622
Miscellaneous	12,200	12,444	12,693	12,947	13,206	13,470	13,739	14,014	14,294	14,580	133,587
Subtotal	276,100	281,495	286,995	295,915	305,078	314,490	324,157	334,085	353,880	362,678	3,134,872
Operating Expenses											
Salaries, wages & benefits	339,900	346,698	353,632	360,705	367,919	375,277	382,783	390,438	398,247	406,212	3,721,810
Operations	205,200	197,064	201,005	205,025	209,126	213,308	217,575	221,926	226,365	230,892	2,127,486
Repairs and maintenance											
Building and Property	26,200	26,724	27,258	27,804	28,360	28,927	29,505	30,096	30,697	31,311	286,883
Vehicles and Equipment	61,200	62,118	63,360	64,628	65,920	67,239	68,583	69,955	71,354	72,781	667,138
Subtotal	632,500	632,604	645,256	658,161	671,324	684,751	698,446	712,415	726,663	741,196	6,803,317
Net Operating Surplus/(Deficit) - before muni	(356,400)	(351,110)	(358,261)	(362,246)	(366,246)	(370,261)	(374,289)	(378,330)	(372,784)	(378,518)	(3,668,445)
Municipal Grants	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	378,518	3,668,445
Net Operating Surplus/(Deficit)	-	-	-	-	-	-	-	-	-	-	-

Appendix C: Capital Projection

Details of the Capital Plan are provided on the following pages.

		White cell	Tetra Tech Estimated Costs. Tetra Tech costs include a 10% design fee and a 25% contingency										
			Costs from 2014 Explorer Study										
			Taken from the NDA Capital Plan										
			Costs are in 2016 Dollars										
AIRFIELD ASSETS		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
Runways													
	Runway 01-19 rehabilitation				\$55,000	\$681,000							
	Runway 11-29 rehabilitation					\$70,000	\$879,000	Note: this is only required if the runway continues to be used					
Taxiways													
	Taxiway D rehabilitation					\$7,000	\$93,000						
	Taxi access east of tower									\$40,000			
	Apron 1 asphalt rehabilitation						\$23,000	\$303,000		\$23,000	\$303,000		
	Allied Aviation Apron		\$26,000										
	East Apron												
	SCFC Apron												
	Taxi access old taxi C			\$45,300				\$49,000		\$209,000	\$62,000	\$53,000	
GROUNDSIDE ASSETS													
Terminal Building													
	Office furniture	\$14,000											
	Terminal entrance	\$92,000											
	Terminal and Office Furniture/garbage bin						\$87,000						
	Parking lot upgrade												
	AV System												
Maintenance Garage													
	Maintenance garage expansion (assume a 50% increase									\$60,000	\$750,000		
	Maintenance garage doors												
FEC Modifications													
	Emergency Power			\$550,000									
Access Road													
	Main Airport Road											\$275,000	
	Hangar Road (east and west)											\$307,000	

June 2, 2016

[illegible]

Appendix D: Sensitivity Analysis

Scenario 1: Solar Panels

a) Overview: Development of a solar panel field. This is already planned.

b) Operating Impact (excluding capital financing)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Base Case Scenario - Municipal Grant Required	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	378,518	3,668,445
Revenue		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	405,000
Fee for solar field											-
Change in Revenue / Expenditures	-	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	405,000
Revised Municipal Grant Required	356,400	306,110	313,261	317,246	321,246	325,261	329,289	333,330	327,784	333,518	4,073,445
c) Capital Impact - none anticipated											

Scenario 2: Major Maintenance Site Development

a) Overview: One major new tenant on greenfield land.

b) Operating Impact (excluding capital financing)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Base Case Scenario - Municipal Grant Required	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	378,518	3,668,445
Revenue		-	-	-	-	-	-	-	-	-	120,000
Lease Rentals		-	-	-	-	-	-	-	-	-	4,000
Landing Fees		-	-	-	-	-	-	-	-	-	-
Change in Revenue / Expenditures	-	-	-	-	-	-	-	-	-	-	124,000
Revised Municipal Grant Required	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	254,518	3,544,445
c) Capital Impact - none assumed											

Scenario 3: Loss of Key Tenant

a) Overview: Loss of key activity centre

b) Operating Impact (excluding capital financing)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Base Case Scenario - Municipal Grant Required	356,400	351,110	358,261	362,246	366,246	370,261	374,289	378,330	372,784	378,518	3,668,445
Revenue			(50,000)	(51,000)	(52,020)	(53,060)	(54,122)	(55,204)	(56,308)	(57,434)	(429,148)
Lease Rentals											-
Change in Revenue / Expenditures	-	-	(50,000)	(51,000)	(52,020)	(53,060)	(54,122)	(55,204)	(56,308)	(57,434)	(429,148)
Revised Municipal Grant Required	356,400	351,110	408,261	413,246	418,266	423,321	428,411	433,534	429,092	435,952	4,097,593
c) Capital Impact - none assumed											



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