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Building Nunavut Together
Nunavuliuqatigiingniq
Bâtir le Nunavut ensemble

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Department of Economic Development and Transportation
Pivalliayuliqiyikkut Ingilrayuliqiyitkullu
Ministère du Développement économique et des Transports

NUNAVUT AIRPORTS

20-YEAR CAPITAL NEEDS ASSESSMENT UPDATE

2020-2040

TABLES

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1 EXECUTIVE SUMMARY

The Department of Economic Development and Transportation retained WSP Canada Group Limited (WSP) to update the Government of Nunavut's 2014 20-Year Capital Needs Assessment. This update serves two purposes:

1. To document the current condition of infrastructure at 24 airports owned by the Government of Nunavut, and
2. To establish a realistic needs assessment and capital renewal program to ensure the continued viability and safety of the airports.

The GN owns and operates 24 public airports through the Department of Economic Development and Transportation's Nunavut Airports Division, as follows:

Kitikmeot	Kivalliq	North Baffin	South Baffin
1. Cambridge Bay	6. Arviat	13. Arctic Bay	19. Kinngait
2. Gjoa Haven	7. Baker Lake	14. Clyde River	20. Kimmirut
3. Kugaaruk	8. Chesterfield Inlet	15. Grise Fiord	21. Pangnirtung
4. Kugluktuk	9. Coral Harbour	16. Igloolik	22. Qikiqtarjuaq
5. Taloyoak	10. Naujaat	17. Pond Inlet	23. Sanikiluaq
	11. Rankin Inlet	18. Resolute Bay	24. Sanirajak
	12. Whale Cove		

Airports are key pieces of transportation infrastructure for their respective communities, supporting inter-community passenger flights, the movement of freight, air ambulances, and other critical functions. Since there are no road connections to Nunavut communities and sealift re-supply is only possible in the summer and early autumn, airports provide the only dependable year-round transportation option.

Airports require ongoing maintenance and routine capital investment to maintain their operational capabilities and meet regulatory safety and certification standards. Airports in Nunavut face unique additional challenges due to their remote locations and challenging climate; these challenges are exacerbated by the changing climate in the north. By investing proactively in ongoing infrastructure maintenance, the GN can prolong asset lifecycles and limit prohibitively expensive rehabilitation and replacement projects. Given the scale of the Nunavut Airports portfolio (24 airports), capital planning is a fiscal best practice given the system-wide costs associated with widespread rehabilitation projects. Further, capital investments will be required to meet the needs of Nunavummiut and to facilitate the social and economic functions of the 24 airports.

The first objective of the 20 Year Capital Needs Assessment update for 2020-2040 is to gather information on the base infrastructure and mobile equipment needs for each of the airports. Input from Nunavut Airport staff established a benchmark for the requirements of the maintenance and operations at each of the 24 airports. Priorities were determined by focusing on the airside pavements, airside electrical assets, airport buildings and other structures, facilities as well as the mobile equipment servicing each airport. Many of the airports require immediate rehabilitation investments to support safe operations.

The option of establishing additional hub airports in Nunavut is also examined. By definition, a hub airport is an airport at which passengers and/or cargo arrive from one region and then can be distributed to other intra- and inter-regional airports. Factors considered in the assessment of a potential hub range from observed or projected increases in demand, the need for emergency services and geographical

advantages to the community's ability to support the hub. The needs assessment provides a general guideline for evaluating potential new hub airport candidates.

The 20-Year Capital Needs Assessment presents an overview of relevant Transport Canada regulations and their impacts on Nunavut airports. Transport Canada Civil Aviation has adopted or is in the process of adopting several significant changes to regulations which may have financial impacts related to capital expenditures at Nunavut Airports. All twenty-four (24) airports handle scheduled passenger service and must be certified by Transport Canada. Most Nunavut airports currently operate under TP 312 4th Edition certification, however any new construction or major update to the airport infrastructure will trigger the need for 5th Edition certification. Transport Canada has indicated that routine maintenance activities such as runway grading, crack sealing or repairs to existing electrical assets will not trigger this requirement. It is anticipated that the greatest costs associated with Nunavut's potential compliance with TP 312 5th Edition may stem from the updated and expanded requirements for larger protective areas surrounding the runway surface.

In the 2014 Capital Needs Assessment, two (2) of the Nunavut Airports were identified as candidates for relocation: Kimmirut and Pangnirtung. Kimmirut is among the most physically challenged certified airports. It faces a number of violations dealing with the take-off/approach surfaces, runway slopes, OLS, and inadequate runway graded area and runway strip. Pangnirtung has a number of safety-related concerns including poor weather, adjacent mountainous terrain impacting navigation aids, and location concerns.

Another significant capital consideration involves runway rehabilitation and extension requirements at Nunavut airports. Rehabilitation projects are required at airports with poor runway surface conditions, while runway extensions may be required to address payload or aircraft restrictions resulting from insufficient take-off and landing distances. Clyde River, Kinngait, Kugluktuk and Pangnirtung. Currently eight (8) airports in Nunavut have payload restrictions in place for incoming and outgoing flights due to current runway lengths.

Future economic development in Nunavut is reliant on a safe, effective, and reliable air transportation system. Airports facilitate the transportation of business and government travelers for a wide range of purposes, leisure travelers, and transportation in support of fisheries, mineral exploration or mining. Nunavut's air transportation system is essential to the growth and diversification of the territorial economy. The GN aims to implement appropriate policies to ensure that the Nunavut Airports system can support current and future economic development.

It is recommended that the GN consider adopting a policy for the preparation of Master Plans for the Nunavut Airports portfolio. This policy would include requirements for the planning process, stakeholder consultation standards and prescribe mandatory sections. For more critical airports such as hubs and larger communities, or where a large or complex capital project is planned, a triggered approach for preparing or updating Master Plans would yield the greatest positive impact on the development of the airport.

The impacts of climate change on the Nunavut Airports System range from impacts of thawing permafrost on operating surfaces and buildings to impacts on declared distances, ceilings, and visibility. Climate change is well documented and can be expected to have significant impacts on the Nunavut Airports portfolio; it is recommended that the GN forecast these impacts and consider strategies for adaptation.

Capital projects that have been identified in the Nunavut Airports 20-Year Capital Needs Assessment Update 2020-2040 are expected to be funded through two principal sources:

1. Government of Nunavut; and
2. Government of Canada.

Capital projects are approved by the territorial government through the annual Capital Estimates or through Supplementary Appropriations if more funds are required. When funding from the Government of Canada or alternative sources cannot be secured, the GN continues to be responsible for the capital projects of the Nunavut Airports. Challenges exist in funding Nunavut Airports capital projects without external assistance.

In recent years the department has administered $4 million annually in predictable, discretionary capital funding. Funds are for mobile equipment purchases, lifecycle replacement expenditures (e.g., fuel tank

replacements), facility rehabilitation, engineering studies, and various small capital projects consisting of airside accessibility ramp installations, demolitions and minor stockpile production.

Nunavut Airports could generate additional revenue from leasing, fees and other user sources, which could be directly or indirectly returned to the system. Current annual revenues are approximately $1.3 million, but could be increased significantly across the system without exceeding national norms for such airport charges.

Federal funding sources for capital infrastructure projects applicable to Nunavut Airports are as follows:

1. Airports Capital Assistance Program (Transport Canada);
2. National Trade Corridors Fund (Transport Canada); and
3. Various proposal-based, special purpose programs (e.g., Infrastructure Canada's Disaster Mitigation and Adaption Fund).

The Airports Capital Assistance Program (ACAP) was created in 1995 as a complement to the National Airports Policy, which was the basis for the transfer of airports to the territorial government. ACAP has an annual budget of $39 million, allocated to approximately 200 eligible airports across Canada. Despite this limited national budget, ACAP is integral to the financial sustainability of the Nunavut Airports system. The Government of Nunavut's position - consistent with the 2015 *Canada Transportation Act* Review, Pathways: Connecting Canada's Transportation System to the World – is that Transport Canada should develop a Northern ACAP that would be predictable and more responsive to northern realities. The need for the Northern ACAP was also echoed in the spring 2017 Report of the Auditor General of Canada to Parliament's chapter titled Civil Aviation Infrastructure in the North.

Public-Private Partnerships, as successfully implemented at the Iqaluit International Airport, could be a financing option for major airport projects, as could financing arrangements enabled by the Canada Infrastructure Bank.

Capital Needs

The Nunavut Airports Regional Transportation Programs Managers provided input into the 20-Year Capital Needs Assessment, which details the needs of each airport and the anticipated expenditures for capital projects over the next 20-year period, from 2020 to 2040. The projects range in scope from minor rehabilitation of existing facilities to complete airport relocations.

Approximately 370 needs have been identified over the 20-year period, which translates into an average of 18 capital projects per year. The total capital cost of the 20-year program is $744 million or approximately $37.2 million per year. These figures include the costs of three major projects: the relocation of Kimmirut Airport, the relocation of Pangnirtung Airport, and the rehabilitation of the Rankin Inlet Air Terminal Building including public airport access and parking lot works (federal and Government of Nunavut funds have been secured for the Rankin Inlet project). Without these three projects, the total capital cost would be reduced from $744 million to $416 million, or $21 million per year.

The annual capital budget for Nunavut Airports for the period of 2011 to 2018 was in the range of $3.7 million to $10.4 million. The capital budget for 2019 was $6 million, which is below the annual average of $7 million from 2011 to 2018. With a historic average annual capital budget of $7 million and excluding major new projects, the Nunavut Airports budget is underfunded by approximately $30.2 million versus the average annual requirement of $37.2 million per year for 2020-2040.

Some airports have not had any significant capital work undertaken since the completion of the 2014 Capital Needs Assessment. The Nunavut Airports 20-Year Capital Needs Assessment Update 2020-2040 recommends a substantial increase in capital expenditures in the early years to address the backlog and return airport infrastructure to a cost-efficient lifecycle pattern.

1 BASE INFRASTRUCTURE NEEDS

This section establishes the baseline requirements for the maintenance of existing airport infrastructure including buildings, airfield electrical and movement surfaces. A summary of the condition assessments of the 24 airports is also attached in this study.

1.1 CURRENT ASSET MANAGEMENT APPROACH

The Transportation Programs Regional Managers provided input into the current condition of each of the 24 airports. The input is documented in the Airport Operations Inspection Report. The Report is based on field inspections that are to be performed and recorded semi-annually for each airport. The Airport Operations Inspections Report covers multiple aspects of the airport infrastructure and operations that includes, but is not limited to:

- → Airside pavements;
- → Groundside pavements;
- → Field Electric Centres and Airfield Lighting Systems;
- → Air Terminal Buildings and Maintenance Buildings; and
- → Mobile equipment

The Transportation Programs Regional Managers provided the information to establish a benchmark for the existing conditions at each airport, included in Appendix A. This information was used to identify the needs at each of the airports over the next 20-year period. Where current information was not available, information was carried forward from the 2014 Capital Needs Assessment. Additional inputs were provided by airport and airline staff to assist in determining the current needs of each facility. Many of the airports require immediate rehabilitation projects to maintain safe operations. Based on input provided by Nunavut Airports staff, the following sections identify the major five-year needs of the airports.

1.2 AIRSIDE PAVEMENTS

Gravel runways are typical of airports in Nunavut. Transport Canada defines a gravel runway as *"A type of runway with an unpaved surface constructed from a pavement with an unbound granular surface composed of sand, clay, crushed stone or other soil materials."* Nunavut airports' gravel runways are primarily made up of crushed stone, with an on-site stockpile of crushed aggregate maintained for regular airfield and runway maintenance.

The surface conditions of gravel runways are subject to many variables that include the local climate, aircraft operations, and maintenance practices. These variables may impact the quality of the surface resulting in a variety of defects over time. The most common defects that occur with gravel surfaces are ruts, frost heaves, depressions, potholes, soft spots, and loss of aggregates. Periodic grading, compaction, and the addition of new material is required to maintain the integrity of the gravel surface, proper drainage, and ensure safe aircraft operations.

Extremely cold weather is also a contributing factor to the surface conditions of gravel runways. Transport Canada Advisory Circular (AC) No. 700-011 explains that when gravel runways are exposed to approximately two weeks of ambient temperatures below -20°C, the strength characteristics of the runway are similar to that of a paved runway. This condition will prevail until ambient temperatures increase to above freezing. These surfaces have improved strength characteristics due to being frozen for significant portions of the year, but it remains necessary to ensure that the runway meets all other condition requirements, including smoothness and braking performance.

1.2.1 MAINTENANCE AND REPAIR OF GRAVEL SURFACES

The majority of the aircraft movement surfaces at the Nunavut Airports consist of gravel pavement surfaces. As identified in Section 8.0 of Transport Canada AC No. 300-004, gravel pavement surface maintenance primarily involves periodic grading to remove surface irregularities and to re-establish grades for drainage purposes. Occasionally, new gravel must be added to replace lost material. Although the overall (lifecycle) cost is significantly lower, a gravel runway surface requires significantly more frequent routine maintenance when compared to a flexible or rigid pavement (i.e., asphalt or concrete). Regular maintenance, such as grading and compaction, is necessary to maintain proper airfield conditions and must be done regularly as described in Transport Canada AC No. 300-004. Annual maintenance includes reshaping runway transverse slopes and repairing depressions, traverse cracks, and culverts. The gravel surface material is generally lost due to grading operations and the erosion effects of aircraft operations and weather. The depth of the surfacing material may be contaminated by the subgrade soil.

Due to the existing conditions and geographic locations at most Nunavut community airports, gravel replacement is required to maintain adequate airfield conditions during the summer months. Repair materials should be aggregate consisting of clean, hard and durable particles of crushed or uncrushed gravel, stone, or slag. The aggregate should also be free from soft, thin, elongated, or laminated particles, and organic or other deleterious substances.

The availability of aggregate supply in communities across Nunavut communities is inconsistent. Challenges in this regard include:

- → depletion of existing quarries and identification of new quarries;
- → permitting and up-to-date quarrying agreements;
- → availability of appropriate crushing equipment; and
- → absence of adequate access road to the quarry.

These factors can make small aggregate production projects inefficient or even impossible, and can make larger supply projects complex and risky.

Based on similar community airports in the northern territories, the maintenance gravel requirement for all airfield surfaces at each site is approximated at 250 m^3 per year as identified by Airport staff for planning purposes. A 100mm overlay is recommended to re-establish airfield surface strength every seven (7) to eight (8) years. The frequency of overlays is dependent on surface shear strength measurement results, which are expressed as California Bearing Ratio (CBR). CBR is the ratio of the load bearing capacity of a given sample of soil to that of crushed limestone. Per AC No. 300-004, the minimum recommended frequency of CBR testing is every three (3) years. The CBR testing is budgeted outside of the capital program but is an input to capital planning.

Each airport should maintain a Critical Stockpile Volume (CSV), which is the amount of gravel required for a 5-year maintenance period and a 100mm lift of gravel for all airfield surfaces, including full width and length of the runway, taxiway, apron, and graded areas. For planning purposes, a CSV of 5,250 m^3 is required for each airport, as shown in Table 2.1.

Table 2.1 – Critical Stockpile Volumes

GRAVEL MAINTENANCE & REPAIR TYPE	VOLUME
5-Year Maintenance (5 x 250 m^3)	1,250 m^3
100 mm Airfield Overlay	4,000 m^3
Total Critical Stockpile Volume	5,250 m^3

Table 2.2 identifies the current gravel stockpile quantities and status at each airport, where available, as reported by Nunavut Airports Regional Managers. Unless associated with pavement rehabilitation projects identified in the capital plan, the replenishment of stockpiles is considered a consumable expense and should be planned in operating budgets.

Table 2.2 – 2020 Gravel Stockpile Status at Nunavut Airports

REGION	AIRPORT	STOCKPILE / STATUS
South Baffin	Kinngait	No estimate of quantity
	Kimmirut	500 m^3 produced in 2020 (High Priority)
	Pangnirtung	No stockpile – ACAP proposal being prepared (High Priority)
	Qikiqtarjuaq	Stockpile is sufficient for one (1) more major overlay
	Sanikiluaq	Stockpile low – crushing took place in 2020, interrupted by storm but will continue in 2021
North Baffin	Arctic Bay	Stockpile owned by contractor
	Clyde River	Major runway rehabilitation completed in 2020, including stockpile production of 1600 cubic metres.
	Grise Fiord	6,000 m^3 – Major overlay and repairs scheduled (High Priority)
	Sanirajak	Major runway rehabilitation underway in 2020 and to be completed in 2021, including stockpile production.
	Igloolik	No stockpile – Forecast to be replenished (High Priority)
	Pond Inlet	No stockpile – Stockpile needs to be replenished
	Resolute Bay	No stockpile – Stockpile needs to be replenished for minor overlay
Kivalliq	Arviat	4,000 m^3 – Stockpile is adequate for current needs
	Baker Lake	100 m^3 – Stockpile needs to be replenished
	Chesterfield Inlet	2,000 m^3 – Stockpile needs to be replenished for minor overlay
	Coral Harbour	2,000 m^3 – Minor overlay on runway required
	Rankin Inlet	Stockpile replenished in 2020
	Naujaat	Stockpile adequate for current needs
	Whale Cove	No stockpile – New stockpile and major overlay in planning stage (High priority)
Kitikmeot	Cambridge Bay	Major runway rehabilitation nearing completion including stockpile production
	Gjoa Haven	No stockpile – Stockpile needs to be replenished for major overlay (High Priority)
	Kugaaruk	2,000 m^3 – Adequate for current needs, minor runway overlay (High Priority)
	Kugluktuk	Gravel is provided from the Hamlet stockpile; major runway overlay in planning stage (High Priority). ACAP funding in place.
	Taloyoak	2,000 m^3 – Adequate for current needs, minor runway overlay (High Priority)

1.2.1.1 DUST CONTROL (DUST SUPPRESSANTS)

As part of the gravel runway pavement surface maintenance program, it is recommended that a dust control suppressant (e.g., EK-35) be included in the process. There are many benefits to a product like EK-35, these consist primarily of:

- → increased surface strength (more similar to asphalt) -
- → decreased maintenance grading requirements by approximately 50%
- → resilience in extreme temperatures as those found at the Nunavut Airports and
- → is also ecofriendly being biodegradable and non-corrosive to aircraft and equipment.

The initial application is to be included as part of each major or minor overlay project; this application process consists of a 100% product application made up of 4 to 5 light passes on the gravel surface over a 2 to 3-day period. Once the initial application is in place, annual or bi-annual maintenance is recommended by the current supplier at a rate of 50% product of the normal initial application.

The recommended product application rates are at follows:

- → 1 litre of product for 1 square metre of gravel surface during a 100% application.
- → ½ litre of product for 1 square metre of gravel surface during a 50% application.

The maintenance requirements are different at each airport. Many factors need to be considered in determining the maintenance needs and application rate of a binding dust suppressant for each airport, including the following:

- → Frequency of runway use (traffic);
- → Type of aircraft which use the runway (wake turbulence impact gravel runway and are factors of aircraft weight and engines (jet or propeller driven);
- → Runway surface snowpack during winter;
- → Seasonal moisture condition and runoff; and
- → Frequency of runway grading program.

Looking at these and other factors will help in determining the frequency that dust control applications will need to take place. It will also allow the airport operator to determine their annual maintenance application rate of approximately 50% of the recommended application rate and if it can be further reduced to 25 or 30% on airports that are not heavily used.

Regardless, including a dust suppressant in the overlay process will aid in maintaining the surface conditions on the airfield.

1.2.2 MAINTENANCE AND REPAIR OF ASPHALT PAVED SURFACES

Rankin Inlet is the sole facility in the Nunavut Airports portfolio with asphalt paved surfaces. The asphalt runways, aprons and taxiways are maintained on an annual basis with Operations & Maintenance (O&M) funds. The O&M work typically includes crack sealing, the removal of weed growth and maintaining lateral support by shoulder maintenance. Crack sealing significantly extends the life of asphalt surfaces, if completed on an annual basis.

After a certain number of crack sealing cycles, the asphalt pavement requires an overlay to refurbish it. Typically, the life cycle of an asphalt runway pavement surface ranges from 10 to 15 years between overlays, depending on numerous conditions and usage factors. The impacts of a changing climate may shorten the interval between overlays and full-depth reconstruction projects (Section 8).

1.2.2.1 RANKIN INLET

The last asphalt overlay at Rankin Inlet Airport was completed in 2014. **The GN retained EXP Services Inc (EXP) in 2019 for an assessment of the distress manifestations on the Rankin Inlet Airport airside pavements.** Despite the formation of several transverse cracks, the pavement is in average to good condition. A major crack repair project to address large transverse cracks was initiated in 2020 and will conclude in 2021. A full asphalt overlay for the main runway has been included in the 20-Year Capital Needs Assessment.

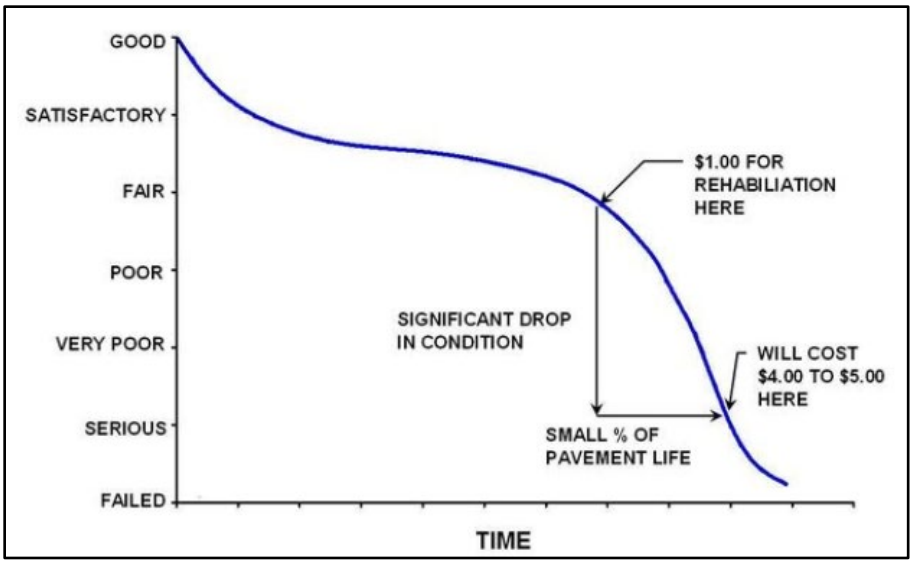
1.2.3 AIRPORT PAVEMENT MANAGEMENT SYSTEM

Standard 9.1.1.1. of TP312 5th Edition provides the direction that a maintenance program be established for airside surfaces. There are several options to demonstrate compliance with Standard 9.1.1.1, one of which is the implementation of an Airport Pavement Management System (APMS). Transport Canada defines an APMS in AC No. 302-016 as a set of *"…procedures for collecting, analyzing, maintaining, and reporting pavement data to assist airport operators in finding optimum strategies for maintaining pavements in a serviceable condition for the least cost."* APMS can be implemented for both paved and gravel airfield surfaces.

Generally, it is less costly to maintain airside surfaces in good condition versus allowing continued deterioration to the point where a full rehabilitation is required. Airside surfaces generally deteriorate in a gradual, linear manner until a critical point, after which deterioration accelerates and rehabilitation becomes required. This concept is illustrated in Figure 2.1. Therefore, the ideal time to complete preventive maintenance is prior to the point of accelerated degradation. This critical point cannot be generalized across all airports and depends on a range of contextual factors, including the quality of the original surface construction and the frequency of aircraft movements.

An APMS has several benefits for airport operators. First, an APMS assists with the tracking of airfield surfaces to make informed decisions on preventive maintenance and rehabilitation. An APMS can be a tool for improved fiscal responsibility by more accurately timing maintenance efforts and decreasing the need for major rehabilitation projects. Performing regular, less intrusive maintenance works can limit the large-scale disruptions to airport operations that are typical of full rehabilitation projects. Finally, ongoing inspections and condition tracking can be used for life cycle analyses and to determine the success of maintenance and rehabilitation projects.

Figure 2.1 - Pavement Management Financial Curve



Source: U.S. Federal Aviation Administration

An APMS includes three (3) primary elements: a technical inventory of all airfield surfaces, a pavement structural condition survey, and a pavement management plan. These elements are summarized as follows:

1. **Technical Inventory:** Serves as a comprehensive overview of the airside surfaces to be maintained and includes a site plan, pavement dimensions, and information on surface strength, construction history, and other relevant data.
2. **Structural Condition Survey**: A visual inspection completed on a regular basis to identify defects with an associated survey report that makes recommendations for maintenance works. Comprehensive structural condition surveys should be completed at least once per year, with supplementary inspections on a monthly basis to identify significant changes.
3. **Pavement Management Plan**: This document should apply to all surfaces identified in the technical inventory and be informed and updated based on the findings of the structural condition survey. At a minimum, this plan should include the maintenance projects to be completed, their timing, and project costs to inform the annual GN capital budget.

Specialized software is available to support the development of an APMS for the Nunavut Airports portfolio, such as the Federal Aviation Administration's PAVEAIR platform and the Deighton Pavement Management System used by the Government of Northwest Territories. **The implementation of an APMS was a recommendation of the 2014 Capital Needs Assessment. This recommendation is carried forward in the 2020 update**, as the GN has not procured or implemented such a system. A standard APMS, including consistent reporting, inspection, and maintenance planning methodologies, should be implemented for each GN airport.

1.3 AIRSIDE ELECTRICAL

1.3.1 FIELD ELECTRICAL CENTRES

Field Electrical Centres (FECs) control the power for all electrical components of an airport including airfield lighting, guidance signs, navigation aids, and other facilities. FECs are usually a small standalone building or portable prefabricated structure, and at times they may be in a maintenance building or combined services facility. Table 2.3 identifies the existing conditions of the FECs for the Nunavut Airports portfolio.

Multiple airports have FECs that are at the end of their life cycle or will be within the next five years. These facilities need major upgrades or replacement to serve the airport in an efficient manner. Some airports are operating their FEC out of a combined facility with inadequate space and require a dedicated building to house the electrical infrastructure. The airports in need of major FEC upgrades or replacement are:

- → Grise Fiord
- → Sanirajak
- → Qikiqtarjuaq
- → Sanikiluaq
- → Kugaaruk
- → Kugluktuk
- → Cambridge Bay
- → Kimmirut

In addition to the major FEC work required for the airports listed above, multiple airports require a back-up generator to provide electrical redundancy in the event of power outages. Kugluktuk Airport will receive a new ATB along with Chesterfield Inlet, Naujaat, Whale Cove and Kimmirut all will include back-up generators. These airports are:

- → Sanirajak
- → Gjoa Haven
- → Chesterfield Inlet
- → Whale Cove
- → Naujaat
- → Kimmirut
- → Kugaaruk
- → Kugluktuk

Design work is underway for Sanirajak, including a new FEC with a back-up generator and a full airfield lighting system upgrade. This work is expected to be completed by 2021-2022.

Table 2.3 – 2020 Field Electrical Centre Conditions

Field Electrical Centre	Last Rehabilitated or Constructed	Current Condition	Priority	General Comments
SOUTH BAFFIN				
Kinngait	1996	Good	Low	Estimated 4 years of use remaining
Kimmirut	1976	Poor	High	Decommission when new airport constructed
Pangnirtung	1997	Good	Low	Adequate until new airport is constructed
Qikiqtarjuaq	1997	Poor	High	Replace the FEC and relocate it away from the shoreline
Sanikiluaq	1997	Average	Medium	Replace the FEC
NORTH BAFFIN				
Arctic Bay	2011	Good	Low	Replace at end of life (25 years)
Clyde River	1998	Unknown	Medium	Replace at end of life (25 years)
Grise Fiord	1983	Very Poor	High	Requires replacement
Sanirajak	1982	Poor	Medium	Design of a new FEC and back-up generator (included with airfield lighting upgrade) is in progress
Igloolik	2003	Good	Medium	Estimated 7 years of use remaining
Pond Inlet	1998	Unknown	Medium	Estimated 3-4 years of use remaining
Resolute Bay	1998	Unknown	Low	Estimated 11 years of use remaining
KIVALLIQ				
Arviat	Unknown	Good	Low	Replace at end of life (25 years)
Baker Lake	2013	Good	Low	Replace at end of life (25 years)
Chesterfield Inlet	2013	Good	Low	Rehabilitated in 2013 using ACAP funds
Coral Harbour	2006	Good	Low	Rehabilitation to FEC and electrical required
Rankin Inlet	2015	Good	Low	FEC upgraded in 2015
Naujaat	2012	Unknown	High	Estimated 2-3 years remaining. No updated provided.
Whale Cove	2000	Unknown	High	Replace the FEC
KITIKMEOT				
Cambridge Bay	1993	Poor	High	Currently in poor shape. A number of repairs and replacements required.
Gjoa Haven	1999	Good	High	Back-up generator is required but has not been installed; originally scheduled for 2015
Kugaaruk	1997	Poor	High	FEC replacement and new back-up generator required

Kugluktuk	1997	Poor	High	FEC replacement and new back-up generator required
Taloyoak	2013	Good	Low	FEC was replaced in 2013. Replace at end of life (25 years)

1.3.2 AIRFIELD LIGHTING SYSTEMS

Airfield lighting systems provide improved visibility for aircraft and vehicles during low visibility and nighttime operations. Lighting is used to identify runways, taxiways, and aprons. It also provides pilots with visual information and guidance for take-off, landing, and taxiing on the airport maneuvering surfaces.

Airfield lighting systems consist of multiple components, including:

- → Approach Lighting Systems;
- → Runway End Lights;
- → Runway Threshold Lights;
- → Runway Edge Lights;
- → Runway Guard Lights;
- → Precision Approach Path Indicators (PAPIs);
- → Taxiway Edge Lights; and
- → Apron Flood Lighting.

Many of the airfield lighting systems at Nunavut airports have been rehabilitated through the Airports Capital Assistance Program (ACAP). The construction is currently underway for a full airfield lighting upgrade at Sanirajak Airport, including a new FEC and back-up generator. The airfield lighting systems at seven Nunavut airports are in very poor condition and need immediate upgrades. These airports are:

- → Grise Fiord
- → Resolute Bay
- → Gjoa Haven
- → Qikiqtarjuaq
- → Kugaaruk
- → Kugluktuk
- → Sanikiluaq

2.5 BUILDINGS AND FACILITIES

2.5.1 AIR TERMINAL BUILDINGS

Air Terminal Buildings (ATBs) are an essential element of the passenger experience. ATBs function as an interface between groundside and airside operations and are used for the processing of passengers and baggage. ATBs should be as accessible as practicable to passengers with all levels of mobility. Airports served by scheduled air services must have functional and reliable ATBs. Many of the ATBs in the Nunavut Airports portfolio require refurbishment or replacement. The existing conditions of the ATBs are summarized in Table 2.4. and should be considered a high-level overview. Many of the ATB facilities should be evaluated in greater detail.

Five airports require the replacement of their ATBs as a result of mechanical and electrical system failures, inadequate space, and failing structural components. Taloyoak Airport began operation of its new ATB in 2018. The Taloyoak ATB will be the model for new ATBs at other Nunavut airports. The airports that have been identified for a new ATB in the 20-Year Capital Needs Assessment are as follows:

- → Whale Cove
- → Kimmirut
- → Chesterfield Inlet
- → Naujaat
- → Kugluktuk

Several ATBs require minor upgrades, with the majority of the improvements including: interior and exterior painting, new flooring, airside accessibility ramps, and new doors. Five (5) airports require major upgrades to their existing ATBs to address failing building systems and structural concerns:

- → Baker Lake
- → Kugaaruk
- → Arviat
- → Gjoa Haven
- → Kinngait

Table 2.4 - 2020 Air Terminal Building Conditions

Air Terminal Building	Floor Area	Last Rehabilitated or Constructed	Current Condition	Priority	General Comments
SOUTH BAFFIN					
Kinngait	316 m^2	1995	Poor	Medium	Minor rehabilitation required – flooring / paint
					Major refurbishment required including fuel tank replacement.
Kimmirut	Unknown	1976	Poor	High	Construct New ATB
					New airport
Pangnirtung	Unknown	1994	Good	Medium	Minor rehabilitation required – flooring / paint
Qikiqtarjuaq	Unknown	2013	Good	Low	Minor rehabilitation required – flooring / paint Airside accessibility ramp required.
Sanikiluaq	206 m^2	Unknown	Unknown	High	Minor rehabilitation of ATB not completed in 2015. Front porch required as strong south winds open doors. Airside accessibility ramp completed in 2020.
NORTH BAFFIN					
Arctic Bay	Unknown	Unknown	Good	Low	Replacement required outside of the 20-year timeline
Clyde River	206 m^2	Unknown	Unknown	High	Airside accessibility ramp required. Fuel tank replacement required.
Grise Fiord	146 m^2	2018	Poor	High	Windows replaced in 2016/2017, interior painted in 2018. Exterior is scheduled to be painted
					Airside accessibility ramp required. Fuel tank replacement required.
Sanirajak	Unknown	1982	Poor	Medium	Minor exterior rehabilitation required.
					Airside accessibility ramp required. Fuel tank replacement recently completed.
Igloolik	Unknown	Unknown	Poor	High	Rehabilitation required, including airside accessibility ramp.
Pond Inlet	Unknown	2007	Good	Low	Minor rehabilitation required including an airside accessibility ramp
Resolute Bay	648 m^2	1998	Good	Low	Replacement required outside of the 20-year timeline
KIVALLIQ					
Arviat	309 m^2	1993	Poor	Medium	Foundation shoring project is currently underway, high priority. Rehabilitation required: internal and external painting, fuel tank replacement required. Airside accessibility ramp completed in 2019.
Baker Lake	534 m^2	1986	Poor	High	Major rehabilitation required. Fuel tank replacement in planning.
Chesterfield Inlet	Unknown	1984	Poor	High	New ATB in progress. Existing ATB is at the end of its life cycle and does not meet the existing

					needs of the community or future economic growth.
Coral Harbour	Unknown	2007	Unknown	High	Airside accessibility ramp required. Replacement required outside 20-year timeline.
Rankin Inlet		1995	Poor	High	Major ATB expansion project budgeted/funded and design is currently underway. Upgrades to groundside flood lighting required
Naujaat	Unknown	Unknown	Poor	High	New ATB in process
Whale Cove		In progress	Very Poor	High	New ATB in progress
KITIKMEOT					
Cambridge Bay	Unknown	2019	Good	Low	ATB renovations and expansion completed in 2019
Gjoa Haven	Unknown	2009	Poor	High	Upgrades to the mechanical and electrical systems are required to address heating concerns. Airside accessibility ramp required.
Kugaaruk	Unknown	1976	Poor	High	Upgrades and repairs are required for the walls, mechanical, and electrical systems. Airside accessibility ramp required.
Kugluktuk	Unknown	N/A	Poor	High	ATB replacement in progress.
Taloyoak	Unknown	2018	Good	Low	New ATB was completed in 2018

2.5.2 MAINTENANCE EQUIPMENT SHELTERS

These buildings provide the shelter, service areas, and storage required to maintain airport mobile equipment. Without proper shelter, equipment stored outside is exposed to extreme weather conditions which will shorten the life cycle of the equipment. Very limited information is available on the existing conditions of the maintenance buildings at the Nunavut airports. The condition of the buildings and projected replacement dates in the Capital Needs Assessment are generally based on recommendations from Nunavut Airports staff, as summarized in Table 2.5.

The following airports are either in need of a new maintenance building or equipment shelter, or the replacement or expansion of their existing facility:

- → Arviat – 3 Bay Garage
- → Kinngait – 2 Bay Extension
- → Clyde River – Needs extension or replacement
- → Gjoa Haven – 4 Bay Shelter
- → Grise Fiord – 3 Bay Shelter
- → Kugaaruk – 3 Bay Shelter
- → Kugluktuk – 3 Bay Shelter
- → Pond Inlet – 3 Bay Shelter
- → Taloyoak – 3 Bay Shelter

Several other airports also require minor upgrades or repairs to their maintenance buildings and equipment shelters to restore the facility to an acceptable condition, including concrete flooring in the facilities. The identified upgrades and repairs could be completed as part of ongoing maintenance operations at these airports.

Table 2.5 – 2020 Maintenance Equipment Shelter Conditions

Maintenance Building	Last Rehabilitated or Constructed	Current Condition	Priority	General Comments
SOUTH BAFFIN				
Kinngait	1975	Medium	High	Expansion of 2 additional bays required
Kimmirut	1976	Unknown	High	To be completed as part of new airport
Pangnirtung	Unknown	Unknown	Low	2 Bay Garage
Qikiqtarjuaq	2004	N/A	Low	Hamlet facility used. Dedicated 3-bay shelter required.
Sanikiluaq	2010	Poor	High	2 Bay Garage
NORTH BAFFIN				
Arctic Bay	2011	Good	Low	Equipment shelter completed in 2019; concrete floor required.
Clyde River	1978	Unknown	High	Existing 2-bay facility requires expansion or possible new building.
Grise Fiord	N/A	N/A	High	New 3-bay building required with concrete flooring
Sanirajak	1982	Medium	High	Rehabilitation required.
Igloolik	2018	Good	Low	Equipment shelter completed
Pond Inlet	N/A	Unknown	High	New 3-bay parking shelter required.
Resolute Bay	1999	Good	Unknown	Unknown
KIVALLIQ				

Arviat	Unknown	Unknown	High	New 4-bay garage required with concrete floor
Baker Lake	1986	Unknown	Unknown	Condition of existing 7-bay garage should be evaluated.
Chesterfield Inlet	Unknown	Poor	High	Shelter requires concrete floor.
Coral Harbour	2003	Unknown	Low	No airport maintenance building; Hamlet facility used
Rankin Inlet	2020	New	Low	New shelter completed in 2020.
Naujaat	2020	New	Low	New 3 Bay shelter completed in 2014.
Whale Cove	2013	Good	Low	New parking shelter built in 2013. Concrete floor required.
KITIKMEOT				
Cambridge Bay	1985	Poor	High	Major upgrades required - maintenance building currently under assessment
Gjoa Haven	N/A	N/A	High	New 4-bay parking shelter required, with concrete floor.
Kugaaruk	N/A	N/A	High	New 3-bay parking shelter required.
Kugluktuk	N/A	N/A	High	New 3-bay parking shelter required.
Taloyoak	N/A	N/A	High	New 3-bay parking shelter required with concrete floor.

2.5.3 DECOMMISSIONED (LEGACY) BUILDINGS

Nunavut Airports' Regional Managers have identified that many airports have several legacy buildings and assets that are no longer in use or of benefit to the airport. These facilities and assets vary from old Air Terminal Buildings, maintenance sheds, fire halls, garages, field electrical centres and deposits of garbage that have been abandoned on airport sites by past airport owners, operators or users. Besides representing environmental and financial liabilities, these items often occupy scarce airport land that may be required for other uses.

Table 2.6 identifies the current inventory of these assets that are no longer of use to the airport and should be decommissioned and removed. The input provided below should be considered a high-level overview. To properly assess the requirements for the removal of the facility assets identified, a detailed review will be required for each facility including environmental assessments as needed. The costs associated with fully remediating such items are understood to be considerable, and would seriously undermine the department's routine capital renewal and replacement activities if drawn from the same finite funding sources. Cost estimates for remediation projects have not been included in this document's financial projections or discussion.

As some of these legacy items have been inherited from previous military and Transport Canada operations, once the required remediation has been clearly identified, the Government of Nunavut may be able to recuperate some of the costs from those organizations.

Table 2.6 – 2020 Decommissioned (Legacy) Buildings

Airport	Description of Building	Notes (location, size, age, etc.)
SOUTH BAFFIN		
Kinngait	Old ATB	Environmental Study has been completed. Space needed for maintainer's equipment.
Qikiqtarjuaq	Old ATB	Environmental Study has been completed. 50 ft. from ATB, impinges on parking space.
NORTH BAFFIN		
Clyde River	Old ATB	Not used for years. In area next to FEC. About 20'x20' with electrical service.
Pond Inlet	Two Small Sheds	Each approximately 8'x 10', located under apron flood lights; electrical service. Previously used as plug in area and First Air storage.
Nanisivik	Airport	Airport is fully decommissioned, but site needs extensive remediation.
KIVALLIQ		
Baker Lake	Old Airport Garage/FEC	Steel structure in poor condition. Used for cold storage by airport and hamlet. Unknown contaminants.
Chesterfield Inlet	Old Transport Canada trailer	Located on North side of runway near stockpile Previously used for storage but no longer needed
	Old Field Electrical Centre	Located on North side of runway near stockpile
Coral Harbour	Old TC Fire Hall/Airport Garage	Assessment completed 2020
	Old storage facility	Assessment completed 2020
	Old FEC (Red building)	Steel framed; structure in very good condition. Contaminants presumed.
	Miscellaneous Items: - Old fuel tanks - Drums of tar - Old equipment/garbage	Ownership unknown. Thought to have been left by DND/Transport Canada
KITIKMEOT: No assets to be decommissioned or removed.		

2.5.4 SECURITY SYSTEMS

Introduction and enhancement to airport security systems is critical for the safety of airport users and staff as well as the protection of key airport assets. Currently at most Nunavut Airports there are no security systems, with the exception of the following airports which have limited security measures in place:

- → Rankin Inlet (YRT)
- → Cambridge Bay (YCB)
- → Kinngait (YTE)
- → Arviat (YEK)
- → Pond Inlet (YIO)
- → Baker Lake (YBK)

The limited measures at these airports consist of minimal CCTV camera installations and some porous winged security fencing along the public groundside of the terminal buildings. There is a need to have the fencing conditions cataloged and to improve security and fencing measures. When planning for the future of the Nunavut Airports, the goal is to have a more robust security system in place at all airports that can meet the local needs of each airport. The following is a list of anticipated security requirements for the Nunavut Airports:

- → Video Surveillance (CCTV) on both groundside and airside at all airports;
- → Air Terminal Buildings to be equipped with building alarm systems (doors, windows and motion sensors);
- → Remote CCTV Monitoring capability for all Nunavut Airports at Nunavut Airports Headquarters and for regional airports at the Regional Offices;
- → For YRT, YCB, Resolute Bay (YRB), YEK and YBK: enhanced CCTV system to include video monitoring capability of the runways, taxiways, apron and the external and internal terminal areas; and
- → For YRT, YCB and YRB: perimeter winged fencing including four (4) secured airside access points.

With the implementation of the above noted security assets, the Government of Nunavut will be able to mitigate costs due to damage and theft and provide communities and people a safer, more efficient and more reliable airport experience.

2.5.5 ACCESSIBILITY

Many existing air terminal buildings in Nunavut have barriers to accessibility. Addressing these accessibility barriers is a priority for the Government of Nunavut, but it must be noted that installing accessibility ramps into existing buildings can be complex and must meet all building codes and regulations.

Moving forward, all new air terminal buildings and all major renovations of existing terminal buildings will include improved accessibility on both airside and groundside. Nonetheless, there are a number of air terminal building ramp projects which may need to be undertaken as standalone construction projects.

Table 2.7 – 2020 Nunavut Airport Accessibility Ramps

Terminal Buildings in need of Airside Ramps		Terminal Buildings on Grade or with Airside Ramps	
Community	**Notes**	**Community**	**Notes**
Clyde River		Arctic Bay	Original construction
Coral Harbour		Arviat	Installed 2019
Gjoa Haven	Design underway	Baker Lake	Installed 2019
Grise Fiord		Cambridge Bay	Ground flush
Hall Beach	Design underway	Kinngait	Ground flush
Igloolik	Design underway	Pangnirtung	Ground flush
Kugaaruk		Rankin Inlet	Ground flush
Pond Inlet	Planned for 2021	Resolute Bay	Ground flush
Qikiqtarjuaq		Sanikiluaq	Installed 2020
		Taloyoak	Ground flush

Projects are underway to replace the terminal buildings in Chesterfield Inlet, Naujaat, Whale Cove, Kugluktuk and Kimmirut. The new buildings will be accessible on groundside and airside.

3 BASE MOBILE EQUIPMENT NEEDS

Mobile equipment is required for the year-round maintenance of airports. Vehicles must be provided for airport operations staff, the clearing of contamination (snow and ice) from airfield surfaces, and for general maintenance such as grading and levelling gravel surfaces. The maintenance of the Nunavut Airports portfolio is contracted to private firms and Hamlet administrations using equipment supplied by Nunavut Airports, which is supplemented where necessary by renting community or contractor-owned equipment. The 24 facilities in the Nunavut Airports portfolio each have unique operational requirements and varied equipment needs, based on factors that include the size and type of airfield surfaces to be maintained.

This section reviews the age and replacement requirements for the mobile equipment fleet and provides the minimum equipment required for each of the 24 GN airports. Immediate capital expenditures are needed to address existing deficiencies with the Nunavut Airports mobile equipment fleet. Mobile equipment costs are based on GN capital equipment database valuations, as well as recent procurement costs where available. Since each piece of equipment must be transported from the supplier to the destination airport, the cost of shipping must be considered when assessing the capital costs. Nunavut Airports staff provided mobile equipment inventory information in support of the analysis below.

3.1 FLEET AGE AND HISTORICAL REPLACEMENT

Tracking the age and condition of mobile equipment is a best practice for capital asset management. Mobile equipment used to support the Nunavut Airports portfolio can be grouped into eight fleet types, as shown in Table 3.1. Across the eight fleets, the average unit age ranged from 9.0 years (Sweepers and Wheel Loaders) to 24.0 years (Packers – Wobbly Wheel).

Nunavut Airports has established recommended replacement ages for the mobile equipment types, as shown in Table 3.1. The recommended replacement ages are used in capital planning across the 20-year horizon. Based on the average ages of Table 3.1, the following fleets generally exceed the recommended replacement age: Truck – Runway and Truck – Dump / Plow. However, as identified in Section 3.3, mobile equipment units across all categories need to be purchased to address existing deficiencies.

Table 3.1 – Major Mobile Equipment Fleet Synopsis

Fleet Item / Category	Average Age of Units in 2019	Recommended Replacement Age (yRs) – GN
Truck – Runway (pickup/other)	11.0	8.0
Truck – Dump / Plow (S/A, T/A)	18.0	15.0
Wheeled Loader	9.0	15.0
Motor Grader	11.0	17.0
Snowblower	10.5	15.0
Packer (Wobbly Wheel)	24.0	25.0
Sweeper	9.0	15.0
Dozer	13.5	20.0

3.2 MINIMUM MOBILE EQUIPMENT NEEDS

Nunavut Airports staff prepared a minimum mobile equipment system for its portfolio in 2000. Mobile equipment needs can be classified according to airports with paved runways (Table 3.2) and gravel runways (Table 3.3), acknowledging the unique maintenance needs of the two facility types. The equipment required for each airport can be estimated based on the Airside Surface Priority Area, or the total area of airfield surfaces to be maintained in support of reliable airport operations, using the following calculation:

Airside Surface Priority Area = Runway Area + Taxiway Area + (25% of Apron Area)

Equipment needs for airports with paved runways and gravel runways are presented in Tables 3.2 and 3.3, respectively. As Rankin Inlet is the only Nunavut Airports facility with a paved runway, discrete Airside Surface Priority Area categories are not provided.

Table 3.2 – Minimum Mobile Equipment for Paved Runways

Airports by Category	Priority Area (sq. ft.)	Mobile Equipment on Site or Required	Notes/Accessories/Conditions
Rankin Inlet	1,066,071	Truck – Administrative (pickup/suburban/other)	Chevrolet Silverado
		Truck – Dump/Plow S/A	Ford F250 Heavy Duty Work Vehicle
		Truck – Pickup	Ford F150
		Truck – Pickup	Chevrolet Silverado
		Truck – Dump/Plow S/A	IHC
		Plow/Dump	Mauler PV350
		Truck-Plow	PV400
		Wheel Loader	CAT 950F
		Wheel Loader	CAT 950H
		Motor Grader	CAT 140M
		Snowblower – Mounted	Vohl DV4000
		Snowblower – Mounted	Tenco 202
		Sweeper – Towed Behind	Vohl Towed
		Sweeper – Towed Behind	Vohl Towed
		Sweeper – Towed Behind	MB4600
		Sweeper	MB4600
		Skid Steer	299D
		Generator Set	Yamaha
		Tar Kettle	Craftco 100DC
		Tar Kettle	Craftco EZ100
		Joint Router	Craftco 200
		Hopper/Spreader	Highway P8
		Hopper/Spreader	Batts T110C
		Hopper/Spreader	Trackless MT5TD
		AMSCR/CRFI Dedicated Access Vehicle (Pick up)	For more accurate and consistent surface readings and to increase the runway availability and decrease flight cancellations.
		Dozer	With the increase of apron surfaces in 2015, there is a need to push more snow a further distance. Currently airport has no dozer.

Table 3.3 – Minimum Mobile Equipment for Gravel Runways

Category Based on Priority Area (sq. ft.)	Airports by Category	Priority Area (sq. m)	Priority Area (sq. ft.)	Mobile Equipment Required
100,000 – 199,999	Grise Fiord	16,362	176,119	Truck – Runway Truck – Dump / Plow S/A Motor Grader Packer – Wobbly Wheel Dye Marker Slip-in Water Tank
	Kimmirut	14,667	157,874	
200,000 – 299,999	N/A			All above No additional equipment
300,000 – 399,999	Pangnirtung	31,325	337,179	All above + Snowblower
	Qikiqtarjuaq	36,907	397,263	
	Naujaat	37,155	399,933	
400,000 – 499,999	Arctic Bay	46,000	495,139	All above + Wheel Loader 2nd Packer – Wobbly Wheel
	Kinngait	44,040	474,042	
	Chesterfield Inlet	39,360	423,667	
	Clyde River	40,290	433,678	
	Igloolik	42,300	455,313	
	Pond Inlet	45,195	486,474	
	Sanikiluaq	43,620	469,521	
	Whale Cove	43,248	465,517	
	Taloyoak	41,775	449,662	
500,000 – 699,999	Arviat	48,700	524,202	All above No additional equipment
	Gjoa Haven	47,160	507,626	
	Kugaaruk	53,305	573,770	
	Coral Harbour	55,600	598,473	
700,000 – 899,999	Baker Lake	73,000	785,765	All above No additional equipment
	Cambridge Bay	83,334	896,999	
900,000 – 1,099,999	Kugluktuk	83,770	901,692	All above No additional equipment
	Sanirajak	100,837	1,085,399	
1,100,000 – 1,299,999	N/A			All above No additional equipment
1,300,000 – 1,499,999	N/A			All above + 2nd Snow Blower
1,500,000 – 1,999,999	Resolute Bay	177,461	1,910,172	All above No additional equipment

3.3 CURRENT EQUIPMENT NEEDS

Each of the 24 facilities in the Nunavut Airports portfolio have one or more deficiencies in their mobile equipment fleets relative to departmental guidelines. These deficiencies include:

→ Equipment units that are overdue for replacement, based on the recommended replacement ages of Table 3.1; and

→ Airports that are missing one or more equipment units specified in Tables 3.2 and 3.3.

The equipment acquisitions required to bring the Nunavut Airports mobile equipment fleet in line with GN guidelines are identified in Table 3.4. Within the 20-Year Capital Needs Assessment, the 61 units needed are presented to document existing deficiencies. Table 3.4 only identifies mobile equipment acquisitions required to correct existing deficiencies as of 2019. Ongoing unit replacement costs, based on the recommended replacement ages of Table 3.1, are incorporated in the financial projections presented in Section 8.

Table 3.4 – Major Mobile Equipment Requirements

Equipment	Number Required in 2019	Airport	
Truck – Pickup	12	Cambridge Bay Igloolik Kimmirut Kugaaruk Pangnirtung	Rankin Inlet (4) Naujaat Sanikiluaq Whale Cove
Truck – Dump / Plow	12	Arctic Bay Chesterfield Inlet Coral Harbour Grise Fiord Sanirajak Igloolik	Kimmirut Kugaaruk Qikiqtarjuaq Rankin Inlet Taloyoak Whale Cove
Wheel Loader	2	Clyde River	Rankin Inlet
Motor Grader	8	Arctic Bay Cambridge Bay Clyde River Gjoa Haven	Grise Fiord Pangnirtung Qikiqtarjuaq Resolute Bay
Snowblower - Mounted	3	Rankin Inlet Resolute Bay	Taloyoak
Snowblower – Self Propelled	5	Arviat Kinngait Chesterfield Inlet	Naujaat Sanikiluaq
Packer – Wobbly Wheel	17	Baker Lake Cambridge Bay Kinngait Chesterfield Inlet Clyde River Coral Harbour (2) Gjoa Haven Sanirajak	Igloolik Kugaaruk Kugluktuk Pangnirtung Resolute Bay Sanikiluaq Taloyoak Whale Cove
Sweeper	1	Rankin Inlet	
Dozer	1	Rankin Inlet	
TOTAL	61 Units		

4 TRANSPORT CANADA REGULATIONS

Since the preparation of the 2014 Capital Needs Assessment, Transport Canada Civil Aviation has adopted or is in the process of adopting several significant changes to regulations which may have financial impacts for capital expenditures at Nunavut's airports. Transport Canada regulatory considerations that may impact the capital plan are summarized as follows:

- → Regulations for Transport Canada's airport funding in Nunavut are not expected to change; operational and capital funding will continue to come from within the Government of Nunavut. Transport Canada is not expected to provide regular capital funding to sustain the Nunavut Airports portfolio in the long term.
- → New Runway End Safety Area (RESA) regulations may require the eventual implementation of RESAs at Nunavut airports, however, it is unlikely this will result in immediate large-scale capital expenditures.
- → A Safety Management System (SMS) has been in place since 2008/2009 and is currently under the management of Winnipeg Airport Services Corporation. It is not expected that significant SMS capital investments will be required within the 20-year planning horizon.
- → New TP312 5th Edition aerodrome standards do not require immediate capital investments. However, these updated standards and best practices will be applied in new or major airport projects (e.g., airport relocation projects).
- → New Aerodrome Work Consultation Regulations may require additional expenditure during the pre-construction phase of major aerodrome projects.

4.1 AIRPORT CERTIFICATION

Transport Canada regulates certified airports in Canada under the authority of the *Aeronautics Act* and the Canadian Aviation Regulations (CARs). Transport Canada requires aerodromes to achieve certification when one of the following criteria is met:

- → The airport provides scheduled passenger air services;
- → The airport is in a built-up area; and / or
- → The certification of an aerodrome is deemed by the Minister to be in the best interest of the public.

Nunavut's communities rely on airports to facilitate the movement of goods and people throughout the territory. As a result, most Nunavut airports facilitate scheduled passenger services and therefore must be certified by Transport Canada. The intent of certification is to ensure that all airports satisfy national standards in the interest of public safety. Airport certification requires the compliance of Nunavut airports with Transport Canada's *TP312 5th Edition – Aerodrome Standards and Recommended Practices.*

4.2 AIRPORT SYSTEM FUNDING

The Government of Nunavut funds both operational and capital costs for the Nunavut Airports portfolio. Airport revenues accrue to the Government of Nunavut general revenues, rather than the airport system specifically. These revenues are currently quite low. Transport Canada funding has remained unchanged since the divestiture of arctic airports to the territorial government in 1991 and 1995. The financial support for these airports was incorporated into the Federal government's contribution to territorial funding and is no longer uniquely identifiable. It is not anticipated that Transport Canada will alter its policy on continued funding of the Nunavut Airports system; funding is described further in Section 9.1.

4.3 CURRENT DEVIATIONS

Nine of Nunavut's airports have approved deviations from Transport Canada standards which are documented in each airport's respective Airport Operations Manual (AOM). Some of these airports require infrastructure modifications, however most deviations can be addressed by operational solutions to ensure compliance with the Operator's Obligations. Table 4.1 presents the current approved deviations with the Nunavut Airports portfolio and associated mitigations.

Table 4.1 – 2019 Aerodrome Deviations

No.	Location	Deviation	Mitigation
1	Cambridge Bay	→ Aircraft parked on private apron may penetrate the transitional surface. Letter of agreement required regarding operational constraints of south apron.	Ensure that private operators adhere to operational restrictions
2	Kinngait	→ Take-off / Approach Surface of Runway 307T is violated by terrain.	Notes identifying the terrain in the Canadian Flight Supplement (CFS) (Terrain)
		→ Transitional Surfaces are violated by mountains on both sides of the runway.	Terrain features highlighted in the CFS (Terrain)
3	Clyde River	→ Power poles penetrate the Transitional Surfaces on each side of the Runway 024T threshold.	Relocate the power poles.
		→ The location of the apron means that the Transitional Surface may be penetrated by the tail of a parked aircraft.	Ensure that operators adhere to operational restrictions
4	Kimmirut	→ Inadequate graded area and runway strip.	Relocate the airport Included in Needs Assessment
		→ Violation of Transitional Surfaces on both sides of the runway by terrain, power lines, buildings, and antenna.	Do nothing (Terrain)
		→ No graded area at the end of Runway 17, inadequate graded area at the end of Runway 34.	Relocate the airport Included in Needs Assessment
		→ Violation of the Take-off/Approach Surface at both ends of the runway.	Do nothing (Terrain)
		→ A portion of the runway exceeds the allowable slope (4% versus 2%).	Relocate the airport Included in Needs Assessment
5	Kugaaruk	→ Runway length is Code 3, deviation approved for physical characteristics and Obstacle Limitation Surfaces (OLS) to Code 2 standards which limits scheduled passenger service.	Do nothing (Terrain)
		→ Approach Surface of Runway 23 is occasionally violated by vehicles driving on the road to the northwest of the Runway 23 threshold. Two stop signs located on road approaching the runway Approach Surface require vehicles to yield to approaching aircraft.	Enforce traffic compliance to the stop signs.

6	Pangnirtung	→ Mountains rising to 500 m within 150 m of the runway.	Do nothing (Terrain)
		→ Reduction in strip width from 60 m to 45 m.	Relocate the airport
		→ The location of the apron means that Transitional Surface may be penetrated by the tail of a parked aircraft.	Relocate the airport
		→ Inadequate graded area at both runway ends.	Relocate the airport
7	Qikiqtarjuaq	→ Mountains penetrate the Outer Surface to the southeast of the airport.	Do nothing (Terrain)
		→ Approach and Transitional Surfaces for Runway 21 are penetrated by terrain.	Do nothing (Terrain)
		→ The location of the apron means that the Transitional Surface may be penetrated by the tail of parked aircraft.	Develop operational solution to ensure aircraft remain clear of the Transitional Surface
8	Resolute Bay	→ The graded area of Runway 17/35 is undersized.	Increase graded area
		→ Antennae penetrate the Transitional Surface.	Relocate antennae
9	Sanikiluaq	→ Runway 27 windsock is located on right side of the runway instead of left.	Install second windsock

4.4 RUNWAY END SAFETY AREA REGULATIONS

Runway End Safety Areas are prepared areas beyond the runway ends that can support an aircraft in the event of an overrun or undershoot. The RESA will reduce the severity of an aircraft accident in either situation. RESAs are not required to be constructed to the same structural standards as a runway; however, they must be clear of obstacles and be capable of supporting the weight of emergency response vehicles.

RESAs were first introduced to the international community in 1999 by the International Civil Aviation Organization (ICAO). ICAO`s Standards and Recommended Practices requires a RESA extending 90 m in length beyond the 60 m runway strip length, for a total length of 150 m from the runway threshold. However, ICAO recommends that RESAs be extended to a length of 240 m beyond the 60 m runway strip, for a total length of 300 m. As an ICAO member, Canada is expected to implement ICAO standards. Changes to TP312 5th Edition are expected to be published by Transport Canada requiring airports that handle significant amounts of passengers annually to provide RESAs.

TP312 5th Edition outlines the RESA standards for 5th Edition certified facilities. At the time of this report`s preparation, airports "grandfathered" to be certified and operate under 4th Edition standards are not yet required to adopt RESAs until they upgrade their certification to 5th Edition. Some of Nunavut's airports are currently exempt from RESA standards altogether; Standard 3.2.1.2 states:

> *This section (3.2 Runway End Safety Areas) does not apply to aerodromes located north of the 60th degree parallel that only serve air carrier operations utilizing aircraft with less than 31 passenger seats."*

Looking to the future, Transport Canada is studying what circumstances in which to require mandatory compliance to RESA standards. The Notice of Proposed Amendment (NPA) on RESAs (Notice No. 2016-007, May 2016) utilizes a threshold approach based on passenger volumes versus runway length. Four passenger volume thresholds were outlined in the NPA as potential triggers for RESAs:

1. Over 1 million passengers per annum.
2. Over 500,000 passengers per annum.
3. Over 325,000 passengers per annum.
4. Over 200,000 passengers per annum

Although Transport Canada has provided no formal guidance to date regarding the passenger threshold none of the facilities within the Nunavut Airports system exceed the lowest passenger threshold (200,000 per annum). For this reason, it is not anticipated that Nunavut's airports will be required to comply with upcoming RESA regulations. The necessary implementation of RESAs in Nunavut would likely stem from the relocation of airports (Pangnirtung and Kimmirut) and by voluntary changes in certification to TP312 5th Edition. Table 4.2 outlines potential triggers and the required actions to ensure compliance is maintained.

Table 4.2 - Triggers for Runway End Safety Areas in Nunavut

Trigger	Action	Number of Nunavut Airports Impacted
→ Maintain grandfathered certification per TP312 4th Edition → Annual passenger movements below NPA threshold (200,000 passengers per annum)	No RESA implementation required	22
→ Maintain grandfathered TP312 4th Edition certification → Annual passenger movements above NPA threshold (200,000 passengers per annum)	Forced RESA implementation as per NPA	0
→ Voluntary change to TP312 5th Edition certification → Airport serves aircraft with more than 31 seats	Implementation of RESA required as per TP312 5th Edition Standard 3.2	0
→ Voluntary change to TP312 5th Edition Certification → Airport serves aircraft less than 31 seats	No RESA implementation required.	0
→ New airport certified to TP312 5th Edition → Airport serves aircraft less than 31 seats	No RESA implementation required.	2*
→ New airport certified to TP312 5th Edition → Airport serves aircraft with more than 31 seats	Implementation of RESA required as per TP312 5th Edition Standard 3.2	2*

** Pangnirtung and Kimmirut Airports are identified as candidates for relocation. The requirement for RESA will be determined in the detailed design phase of these new facilities, based on the anticipated aircraft types and number of passenger seats on the design aircraft.*

A preliminary investigation of implementing RESAs in the *Runway End Safety Areas, Options and Impacts Assessment* has determined that, given the unique topographical conditions that exist at most Nunavut airports, the construction of new full-size RESAs may be challenging. Two options have been suggested by Transport Canada to accommodate RESAs within the current airfield footprint:

1. Adjust the airport's declared distances; and / or
2. Install an Engineered Materials Arrestor System (EMAS).

The reduction of declared distances is a viable option for Sanirajak, Gjoa Haven, Resolute Bay, and Kugluktuk. However, it is not expected that these airports will require RESAs as there is no intention to voluntarily certify the airports under TP312 5th Edition, and their passenger traffic is not expected to exceed the lowest bracket defined in the NPA.

EMAS use low strength materials to bring fast moving aircraft to a stop in the event of an overrun. EMAS installations are useful in some cases; however, their high capital development costs and special maintenance considerations make this solution less feasible in northern climates.

4.5 SAFETY MANAGEMENT SYSTEM REGULATIONS

In 2008/2009, Transport Canada enacted legislation which required that certified airports implement and maintain a Safety Management System. Nunavut Airports has an established SMS which has been fully implemented and approved by Transport Canada.

In 2016, Winnipeg Airport Services Corporation (WASCO) was retained to develop, implement, administer and manage the SMS for all 24 certified airports operated by the Government of Nunavut. In addition to the management of SMS, WASCO also provides independent quality assurance audits on the airports' SMS programs and infrastructure. The outputs of the SMS and quality assurance audits help to inform the GN on spending decisions.

4.6 CURRENT AERODROME STANDARDS

4.6.1 BASIS FOR CURRENT STANDARDS

Effective September 15, 2015, Transport Canada's TP312 5th Edition became the standards document for airport planning and design in Canada. In previous versions of TP312, including 4th Edition, airport design and infrastructure requirements were determined based on the physical characteristics of runway length and aircraft size. The 5th Edition of TP312 revises this approach to associate airport design requirements with aircraft performance and type of operation, in addition to the physical characteristics of aircraft.

The 5th Edition of TP312 aims to address issues commonly experienced at Canadian aerodromes. These include challenges associated with changing levels of service and the type of traffic using airport facilities. The modifications contained in TP312 5th Edition were made to ensure consistency in the operational concepts within North America and to harmonize, where possible, with current ICAO specifications, modern instrument procedure design criteria, and advances in airfield technology.

TP312 5th Edition contains 'standards' only. The 'recommendations' of TP312 4th Edition have either been removed or adopted as standards. Where certain recommendations are found to be of use to airports in adopting a best practices approach, the information is released in the form of Advisory Circulars or by referencing ICAO Annexes and Aerodrome Design / Service Manuals.

The key principle of 5th Edition is that the certification level of service will be established based on the aircraft using the facility or in some cases planned usage, as declared by the airport operator. Runway length will no longer be of prime consideration in the application of the standards. The certification level of service will be published in the Aeronautical Information Publication (AIP), Canada Flight Supplement (CFS), and Canada Air Pilot (CAP) for use by aircrews in determining the suitability of the aerodrome for the intended operation pursuant to CAR 602.96(2b).

4.6.2 TP312 5TH EDITION COMPLIANCE

TP312 5th Edition was enacted via Section 302.07 – Obligations of Operators of the Canadian Aviation Regulations, which states:

The operator of an airport shall:

A. Comply;

i subject to subparagraph (ii), with the standards set out in the aerodrome standards and recommended practices publications, as they read on the date on which the airport certificate was issued;

ii in respect of any part or facility of the airport that has been replaced or improved, with the standards set out in the aerodrome standards and recommended practices publications, as they read on the date on which the part or facility was returned to service; and

iii *with any conditions specified in the airport certificate by the Minister pursuant to subsection 302.03(3).*

Section 302.07 is generally referred to as the "grandfathering" clause. Compliance with the most recent edition of TP312 has not typically been required until the operator undertakes the reconstruction, replacement, or improvement of the specific facility (i.e., airfield electrical rehabilitation, taxiway reconstruction) to which the standard is applicable. Transport Canada has indicated that routine maintenance activities such as crack sealing and repaving are not considered triggers for compliance with the latest edition of TP312.

Since the official release of TP312 5th Edition in September 2015, Transport Canada has provided some clarification regarding the applicability of the new standards. This clarification is found in AC No. 302-018 – *Grandfathering at Airports Pursuant to Canadian Aviation Regulation (CAR) 302.07*. The AC identifies which specific activities will trigger compliance with TP312 5th Edition. In addition to AC No. 302-018, Transport Canada has published the following ACs to clarify the implementation process and advise airports on the major changes to standards as contained in TP312 5th Edition:

- AC No. 302-021 – Introduction of TP312 5th Edition;
- AC No. 302-019 – Methodology for the Identification of the Aircraft Group Number; and
- AC No. 302-020 – Mixed Operations at an Airport.

It is expected that most of Nunavut's airports will continue to operate under TP312 4th Edition certification until a major upgrade to the respective airport triggers the need for certification to 5th Edition.

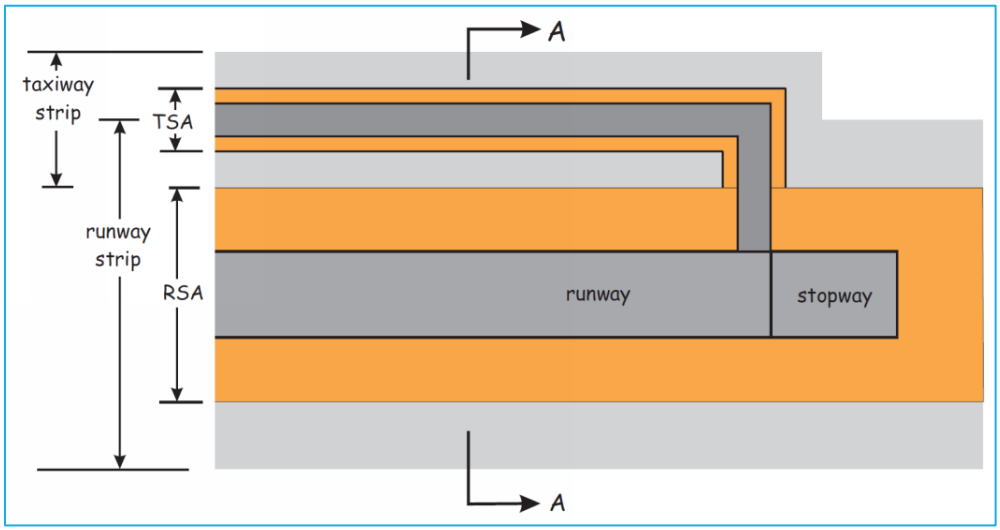
4.6.2.1 PROPOSED AMENDMENT TO TP312 5TH EDITION

Transport Canada publicly released the first amendment to TP312 5th Edition in August 2019. The proposed amendment includes over 200 changes which are mainly editorial in nature, to provide additional clarity on the standards and to facilitate their application. The timeline for the approval of this amendment and its coming into force is unknown. In the interim, the changes should be reviewed in detail and considered during the design of new infrastructure projects to ensure future compliance. Additionally, the GN should monitor the amendment process for further revisions. From an initial review, the amendment does not contain any major technical changes from the pre-amendment version of TP312 5th Edition. This suggests that there will be minimal capital expenditure implications.

4.6.3 NUNAVUT AIRPORTS 5TH EDITION IMPACTS

The greatest costs associated with Nunavut's potential compliance to TP312 5th Edition may stem from the updated and expanded requirement for larger protective areas surrounding the runway surface. Both the requirements for runway strip and runway graded area (or Runway Safety Area in 5th Edition) have increased in the new standards.

Figure 4.1 - Runway Strip and Runway Safety Area



4.6.3.1 RUNWAY STRIP

The runway strip is a defined area that includes the runway, which is intended to protect aircraft during take-off and landing (Figure 4.1). TP312 4th Edition recommends that all objects situated on a runway strip which may endanger an aircraft should be regarded as an obstacle and be removed. However, 5th Edition prohibits any fixed objects within the strip with the exception of specific visual aids, navigation aids, animal control devices, and arrestor beds.

Under the 5th Edition, the width of the runway strip will increase in many cases. For example, Sanirajak Airport is certified as Code 3C-Non-Precision (NP) under TP312 4th Edition and satisfies the 150 m strip width requirement. Under 5th Edition standards, Sanirajak Airport would be required to meet Aircraft Group Number (AGN) IIIB standards as the critical aircraft is the B737-200. Should the runway be altered after the publication of 5th Edition, it would be required to widen the runway strip width from 150 m to 244 m. In some instances, fixed objects that were once outside of the runway strip, such as terminal buildings and hangars, may be within the strip.

The grandfathering of TP312 4th Edition airport certification until a major upgrade is completed, as described in Section 4.6.2, means that the Runway Strip changes explained in Table 4.3 are not included in the 20-Year Capital Needs Assessment.

4.6.3.2 RUNWAY GRADED AREA/RUNWAY SAFETY AREA

The Runway Safety Area (RSA) is an area located within the runway strip intended to reduce the risk of damage to an aircraft running off a runway (Figure 4.1). In TP312 5th Edition, the Runway Safety Area is equivalent to the graded portion of a runway strip, or the “graded portion of the runway strip” defined in 4th Edition. Consistent with runway strips, RSAs are offset a greater distance than the corresponding graded areas defined in TP312 5th Edition. For example, the graded portion of the runway strip at Chesterfield Inlet Airport is currently 46 m wide and meets 4th Edition standards for a Code 2C - Non-Instrument (NI) facility. Under 5th Edition standards, the RSA will increase to 80 m wide. This increased width would require sourcing large quantities of granular material at many Nunavut airports and could conflict with watercourses near runways. The potential impacts to runway strips and RSAs are presented in Table 4.3.

As identified in Section 4.6.2, most of Nunavut’s airports are anticipated to continue to operate under TP312 4th Edition certification until a major upgrade to the respective airport triggers the need for certification to 5th

Edition. Accordingly, the RSA changes contemplated in Table 4.3 will not have significant capital planning impacts and are not included in the 20-Year Capital Needs Assessment.

Table 4.3 - Comparison of Runway Strip and Safety Areas, TP312 4th vs 5th Edition

Airport	TP312		Runway Strip			Graded Area/Runway Safety Area		
	4th Edition Runway Code	5th Edition AGN	Current Width (m)	Width (m) - TP312 4th Edition	Width (m) - TP312 5th Edition	Current Width (m)	Width (m) - TP312 4th Edition	Width (m) - TP312 5th Edition
Arctic Bay[1]	2C-NI	IIIA-NI	60	60	80	46	46	80
Arviat[1]	2C-NP	IIIA-NP	90	90	150	46	46	80
Baker Lake	2C-NI	IIIA-NI	60	60	80	46	46	80
Cambridge Bay	3C-NP	IIIB-NP	150	150	244	90	90	150
Kinngait	2C-NP	IIIA-NP	90	90	150	46	46	80
Chesterfield Inlet	2C-NI	IIIA-NI	60	60	80	46	46	80
Clyde River	2C-NP	IIIA-NP	90	90	150	46	46	80
Coral Harbour	3C-NP	IIIA-NP	150	150	150	90	90	80
Gjoa Haven	2C-NI	IIIA-NI	60	60	80	46	46	80
Grise Fiord	1B-NI	II-NI	120*	60	80	38	38	80
Sanirajak	3C-NP	IIIB-NP	150	150	244	90	90	150
Igloolik	2C-NI	IIIA-NI	60	60	80	46	46	80
Kimmirut	1B-NI	II-NI	26*	60	80	26*	38	80
Kugaaruk	2C-NI	IIIA-NI	60	60	80	46	46	80
Kugluktuk	3C-NI	IIIB-NI	90	90	150	80	80	150
Pangnirtung	2C-NI	IIIA-NI	45*	60	80	45	46	80
Pond Inlet	2C-NI	IIIA-NI	60	60	80	46	46	80

Airport	TP312		Runway Strip			Graded Area/Runway Safety Area		
	4th Edition Runway Code	5th Edition AGN	Current Width (m)	Width (m) - TP312 4th Edition	Width (m) - TP312 5th Edition	Current Width (m)	Width (m) - TP312 4th Edition	Width (m) - TP312 5th Edition
Qikiqtarjuaq	2C-NI	IIIA-NI	60	60	80	46	46	80
Rankin Inlet	3C-NP	IIIB-NP	152*	150	244	90	90	150
Naujaat	2C-NI	IIIA-NI	60	60	80	46	46	80
Resolute Bay	4C-P	IIIB-P	300	150	244	122	90	150
Sanikiluaq	2C-NP	IIIA-NP	90	90	150	46	46	80
Taloyoak	2C-NI	IIIA-NI	60	60	80	46	46	80
Whale Cove	2C-NI	IIIA-NI	60	60	80	46	46	80

[1] *No changes to runway graded area or strip width since 2014.*

4.6.4 COST OF NEW AERODROME STANDARDS

It is anticipated that it would be cost prohibitive to bring all 24 study airports to TP312 5th Edition compliance. Further study will be required to provide cost estimates to certify each airport to 5th Edition. The Nunavut Airports system is grandfathered to 4th Edition standards and can maintain that certification until major altering work is completed or level-of-service is changed. Therefore, the coming into force of TP312 5th Edition poses no significant capital costs.

It is recommended that the Government of Nunavut complete a TP312 5th Edition gap analysis for each airport to further understand the existing deficiencies in attaining compliance to 5th Edition, and to develop rough-order-magnitude cost estimates to attain TP312 5th Edition compliance.

4.7 NEW AERODROME WORK CONSULTATIONS

In 2017, Transport Canada introduced a new regulation (CAR 307) for stakeholder consultations prior to the commencement of aerodrome work. The new regulation states that aerodrome work is considered as:

> *(a) building a new aerodrome; or*
>
> *(b) at an existing aerodrome,*
>
> > *(i) building a new runway for aeroplanes, or*
> >
> > *(ii) increasing the length of an existing runway for aeroplanes by 100 m or by 10%, whichever is greater.*

Aerodrome relocations, such as those proposed at Kimmirut and Pangnirtung, will be required to demonstrate that sufficient consultation has been completed. Additionally, extensions to existing runways will trigger new aerodrome work consultations. These new regulations may result in additional costs to complete the required community engagement.

5 AIRPORT RELOCATIONS

In the 2014 Capital Needs Assessment, both Kimmirut Airport and Pangnirtung Airport were identified as candidates for relocation. Since 2014, relocation studies have been undertaken for both airports.

5.1 KIMMIRUT AIRPORT

Kimmirut Airport is among the most physically challenging airports in Canada with scheduled air services; mountainous terrain and proximity to the community prevents the expansion of the Airport. While Kimmirut is a certified airport, it has major deviations from Transport Canada's safety standards including:

- → Violation of the Take-off/Approach Surfaces at both ends of the runway.
- → Inadequate Runway Graded Area and Runway Strip.
- → Violation of the Transitional Surfaces on both sides of Runway 16-34 by terrain, power lines, buildings and an antenna.
- → A portion of the runway exceeds the allowable longitudinal slope (4% versus 2%).

MMM Group Limited prepared a preliminary siting study for a new Kimmirut Airport in 2015. In 2017, WSP completed a Preliminary Design and Cost Estimate Report that advanced the analysis of the 2015 report. This study provided sufficient information to evaluate different airport design concepts and to prepare a Class 'D' cost estimate. An analysis of existing and future air services was completed to select an appropriate design aircraft. This selection process also included technical reviews of the requirements of each aircraft type. The conceptual airport design addressed considerations that included, but were not limited to:

- → Regulatory standards;
- → Physical zoning;
- → Airfield characteristics (e.g., runway length and strength);
- → Navigational aids; and
- → The Air Terminal Building.

A Class 'D' cost estimate was developed to provide a reasonable estimate of the capital costs required to develop the new airport. The pricing reflected the probable construction costs obtainable in Kimmirut and was based, in part, on recent construction costs for similar projects in Nunavut. Quantities of the major elements were assessed from the design drawings prepared for both the airport and road route. Allowances were made for items such as mobilization costs and project contingencies. The Class 'D' cost estimate for the relocation of Kimmirut Airport, including both the new airport and the access road from the community, is an **estimated $73 million (2017)**, inclusive of all aviation support services required to operate and maintain a certified airport in accordance with TP312 5th Edition.

5.2 PANGNIRTUNG AIRPORT

Pangnirtung Airport is situated at sea level in Pangnirtung Fiord on Baffin Island. Located at the Arctic Circle north of Iqaluit, Pangnirtung has a slightly warmer climate due to the ocean's influence and lies in a region of continuous permafrost. Year-round access can only be provided by air; however, the airport cannot be enlarged to meet access needs, new safety standards, and operations by modern, cost-efficient aircraft. Community growth has created demand for land that is unavailable along the fiord shoreline, but can be provided by using the fiord-side airport site. The Class 'D' cost estimate for the relocation of Pangnirtung Airport, including both the new airport and the access road from the community, is an **estimated $189 million (2015)**, inclusive of all aviation support services required to operate and maintain a certified airport in accordance with TP312 5th Edition.

From 2014 to 2017, MMM Group Limited completed several projects in support of the development of a new airport in Pangnirtung, including:

Airport Relocation – Conceptual Design

- → Helicopter Route Reconnaissance
- → Photogrammetry Data Collection
- → Lower Valley Access Road – Realignment
- → Airport Power Supply Strategy
- → Road Safety Study
- → Stormwater Management Report
- → Geotechnical Design Report – Airport and Access Road
- → Nunavut Impact Review Board Application
- → Detailed Design of Access Road

The current airport has a number of safety-related concerns, including: poor weather (high wind speeds, low cloud ceilings, and limited horizontal visibility); mountains with elevations of up to 1,000 m (3,200 ft.) adjacent to the 2 km (1.25 mi.) wide fiord; mechanical turbulence such that pilots will not approach if crosswinds exceed 5 knots; limited navigation and communication aids due to the surrounding mountains; limited weather observations at the fiord level; limited natural light as Pangnirtung is located adjacent to the Arctic Circle; and limited reliability due to rapidly changing weather conditions.

The new airport design meets all the standards contained within TP312 5th Edition. The relocated airport would be served by visual and electronic navigation aids including a Non-Precision GPS approach down to an altitude as low as 250 ft. with visibility of 1 statute mile. The airfield design includes one apron and two taxiways to accommodate independent aircraft power-in and power-out operations. The apron could flexibly accommodate the parking and operations of ATR72, RJ85, C-130 Hercules, and helicopters. The Airport Concept Design includes a 314 m^2 Air Terminal Building with public areas, concessions, passenger services, future security functions, administration offices, and a Community Aerodrome Radio Station. The airport would include a maintenance garage and provisions for an air cargo building for food imports and fish exports.

The new airport design meets all physical zoning and safety requirements, considers applicable weather conditions, avoids permafrost areas and achieves many economies in construction costs. Construction at an elevation of approximately 2,100 ft. above the community requires major rock excavation and gravel fill to achieve level surfaces and an obstacle-free environment for safe and certifiable airport operations. The ATB site will be constructed on rock and the site will serve as the rock quarry for runway granular materials. The runway will be constructed on rock fill from the air terminal site.

The construction of an access road to the new airport site is supportable with a modification of traditional roadway drainage design. The local conditions are sufficiently different from typical roadway conditions in more populated areas of Canada that traditional drainage methods will likely be ineffective at providing robust drainage performance at this site. As such, alternative approaches that account for the local conditions and anticipated climate change impacts have been considered. In this manner, the anticipated use of the roadway is not likely to introduce significant maintenance burdens on the roadway corridor from insufficient drainage capacity.

6 RUNWAY REHABILITATIONS AND EXTENSIONS

Runway rehabilitation and extension requirements at community airports in Nunavut represent a significant capital consideration. Rehabilitation projects are required at airports with poor runway surface conditions, while runway extensions may be required to address payload or aircraft type restrictions resulting from insufficient take-off and landing distances.

6.1 RUNWAY REHABILITATION REQUIREMENTS

Runways are the most critical piece of infrastructure at airports. Maintaining adequate runway surface conditions is vital to aviation safety. Runway pavement structure systems can be classified into two categories: rigid pavements and flexible pavements. Rigid pavement is constructed from cement concrete or reinforced concrete slabs, while flexible pavement can be constructed from a mixture of asphaltic and bituminous materials, and / or gravel. All facilities in the Nunavut Airports portfolio have gravel (flexible pavement) runways, with the exception of Rankin Inlet. Over the life cycle of a runway pavement structure, failures may occur from factors that include, but are not limited to: weather conditions, pavement aging, and aircraft loading. Examples of pavement failures include alligator cracking, shear cracking, longitudinal cracking, depressions, rutting, frost heaves, and bleeding. Depending on the severity of the pavement failure, there are multiple possible maintenance solutions such as minor spot repairs, large-scale repairs, and complete runway rehabilitation.

Based on consultations with air carriers currently serving the studied airports, the following facilities require short-term corrective actions and subsequent runway maintenance works:

- → CLYDE RIVER: Air carriers have reported challenging runway conditions during the winter months due to inadequate runway maintenance. The airside surfaces rehabilitation project has just completed and will improve the overall drainage of the airfield. Regular maintenance following this project will be necessary for continued safe operations.
- → KINNGAIT: Air carriers have reported spring thaw water pooling on the runway surface. This pooling is generally a result of factors that include inadequate snow clearing, insufficient grading, and irregular airfield maintenance.
- → KUGLUKTUK: Air carriers have reported water pooling on the runway surface.
- → PANGNIRTUNG: The strength of the runway is reported to be gradually deteriorating, with year-over-year decreases in the CBR values of the thresholds and turnaround bays. Further degradation may necessitate changes in air carrier take-off and landing performance calculations, and subsequent payload restrictions. A runway rehabilitation is recommended to increase the pavement strength.

6.2 RUNWAY EXTENSION REQUIREMENTS

Runway length requirements depend on factors such as aircraft performance, payload, temperature, and runway condition (i.e. frozen, gravel). Air carriers seek to maximize aircraft payloads when transporting passengers, fuel, and cargo, however payloads may be restricted because of the runway length available for take-off and landing. Consulted air carriers have indicated that flights to and from the airports identified in Table 6.1 incur payload restrictions due to their runway lengths.

Table 6.1 – Airport Runway Extension Candidates

Airport	Current Runway Length (ft.)
Arctic Bay	3,935
Kinngait	3,988
Clyde River	3,501
Gjoa Haven	4,400
Kimmirut	1,899
Pangnirtung	2,920
Qikiqtarjuaq	3,803
Taloyoak	4,009

The ATR 42-300 is commonly used by air carriers at community airports in Nunavut. This aircraft fleet, with an average age of 28 years, will be due for retirement in the coming years. It is expected that air carriers will replace these aircraft with the newer ATR 42-500. From consultations with air carriers, the ATR 42-500 will not be able to serve Pangnirtung due to its runway length. Clyde River can only be served by the ATR 42-500 in the winter when the runway is frozen, as the combination of gravel performance penalties and inadequate runway length during the remainder of the year will prohibit operations. To ensure future ATR 42-500 operations at Clyde River and Pangnirtung, runway extensions at both airports may be required.

WSP recommended that the GN commission a detailed runway length requirement study for the Nunavut Airports portfolio. This study would investigate current and future requirements to sustain viable air services, and address factors such as runway surface structure, aircraft take-off and landing performance, approach procedures, and current and future critical aircraft. This report would be in addition to the Usability Study that was completed in 2014.

7 ECONOMIC DEVELOPMENT, POLICY AND PLANNING

7.1 ECONOMIC DEVELOPMENT

Future economic development in Nunavut will be reliant on a safe, effective, and reliable air transportation system. From the transportation of delegates to conferences to the shipping of product from territorial fisheries, the importance and value of Nunavut's air transportation system is clear. Ensuring that appropriate airport policies are implemented will ensure that the Nunavut Airports system can support current and future economic development.

7.2 POLICY DEVELOPMENT

The Department of Economic Development and Transportation currently has no published policies specific to Nunavut Airports. However, current actions and resource allocation decisions suggest a set of implied policies are followed, even if these are not published. For example, the department has a clear practice of entering into contracts with municipal governments and private businesses for the operations and maintenance of airports in the system. It is recommended that the GN review its current operations and develop clear and concise policies with an emphasis on safety, reliable operations, and economic development. Six (6) policies that the department may wish to document and implement include:

1. The Government of Nunavut will continue to own and operate airports in Nunavut.
2. The Government of Nunavut is prepared to enter into partnership arrangements to fund and operate airports. These arrangements should be encouraged when determined to be in the best interest of the Government of Nunavut and Nunavummiut.
3. The Air Transportation System in Nunavut is part of the Canadian System and therefore should be organized to integrate into the national system as best possible.
4. Safety, security, reliability, economic development, and service are the highest priorities of the airport system.
5. In seeking and allocating funding, the priorities are to improve airport safety and security, regulatory compliance, protect airport assets (such as equipment and runways), reduce operating costs, and seek efficiencies.
6. Long-term capital planning will be based on current and approved site, master, and development plans.

The GN may also wish to prepare policies for the promotion of the joint use of resources (e.g., physical, and human) with Hamlets, and the use of the airport system as a training opportunity to develop skills for Nunavummiut.

7.3 MASTER AND DEVELOPMENT PLANNING

The preparation and updating of Master Plans for all airports in Canada, including the Arctic A, B and C airports, was a Transport Canada policy prior to the transfer of the Arctic Airports to the Government of Northwest Territories and later to the Government of Nunavut. The original Transport Canada policy required the preparation of a Master Plan for all airports with a 15 to 20-year planning horizon, and with regular reviews and updates undertaken every 5 years. The GN has not consistently followed this practice in recent years and does not maintain Master Plans for all 24 facilities in the Nunavut Airports portfolio.

The 20-Year Capital Needs Assessment serves a valuable role in identifying overall funding priorities and needs across the entire Nunavut Airports system. While there are similarities among the 24 facilities, each airport is inherently unique as a function of the needs of the respective community, the type and number of aircraft movements, the local climate and meteorological conditions, and the infrastructure inventory. This granularity of detail cannot be captured in the Capital Needs Assessment, and generalizations must be

made across the entire airport system. Master Plans therefore are a valuable tool to examine each airport's needs separately, acknowledging the intricacies of each facility.

The preparation of Airport Master Plans can follow a process that includes:

- → The consideration of the airport's role and purpose in the community.
- → The identification of existing infrastructure and review of its condition.
- → The determination of future conditions, considering factors such as aircraft movement and passenger activity forecasts, the impacts of a changing climate, and community needs.
- → The analysis of deficiencies in supporting future conditions.
- → The preparation of a phased Development Plan for capital needs.
- → The consideration of airport operations, governance, environmental and social impacts, and economic development.

The preparation of a Master Plan can be supported by consultations with stakeholders such as on-site airport staff, GN representatives, residents and community leaders, and aviation industry contacts. This approach emphasizes local knowledge as a "bottom-up" approach to planning, improving validity and transparency and improving community attachment.

It is acknowledged that the preparation of Master Plans across the 24-airport system represents a significant upfront capital expense, and a recurring expense through their review and updating. However, through proactive planning, capital needs will be identified early on, allowing for improved long-range fiscal awareness. **It is recommended that the GN consider adopting a policy for the preparation of Master Plans for the Nunavut Airports portfolio**. This policy should include review and update periods, requirements for the planning process, stakeholder consultation standards, and mandatory sections. A staggered approach to preparing and updating Master Plans across the Nunavut Airports portfolio, for example preparing four Airport Master Plans per year, will decrease the overall capital funding needs incurred in each fiscal year, with funding instead spread evenly over multiple years. This staggered approach will also benefit the GN in subsequent years when costs must be incurred to review and update the Master Plans. For more critical airports such as hubs and larger communities with more aircraft movements a triggered approach for preparing and updating the Master Plans will be used. These triggers will consist of airports requiring large capital projects (i.e. major civil work, ATB replacement, etc.) when the Master Plans will have the greatest impact on the development.

7.4 PRINCIPLES FOR THE ASSESSMENT OF HUB DEVELOPMENT PROPOSALS

A hub airport is a place where passengers and/or cargo arrive from one region and can then be distributed to other intra regional and inter regional airports, as necessary. The Iqaluit and Rankin Inlet airports are the only designated hubs servicing Nunavut. Cambridge Bay is also recognized as having some of the characteristics of a regional hub in the Kitikmeot region, mostly due to the presence of regional government services and Inuit organizations based in the community rather than due to route connectivity or the availability of airport-related services.

Key considerations for the investment and development of a hub airport in Nunavut include, but are not limited to:

- → Observed or projected increase in aircraft movements or passenger volumes
- → Who is currently using the airport and for what purposes
- → Airline(s)'s views on possible hub development
- → Airport's role in support of emergency services (medical, firefighting or police) in the region
- → Benefits to the GN's Medical and Duty Travel system of hub development
- → Airport capacity and potential for expansion of the current level of service
- → Community and regional support for a hub

- → Community ability to support a hub including staffing, logistics, and infrastructure
- → Private sector investments in infrastructure and facilities supporting hub operations
- → Employment opportunities associated with a hub
- → Economic impact analysis
- → Geographical advantages of the airport
- → Airport access (e.g., roads)
- → Potential impact of a hub on current airport expenditures, revenue and operations
- → Hub investments must be assessed against other airport infrastructure needs and priorities
- → Viability of a self-supporting hub model

The listed considerations provide a general guideline in determining potential Airport Hub candidates, which the Government of Nunavut will typically use to complete an in-depth review of a community's proposal for a Hub Airport. Generally, the proposal should demonstrate long-term viability and overall benefit to Nunavut.

8 20-YEAR CAPITAL EXPENDITURE PLAN

8.1 FUNDING THE CAPITAL NEEDS

Capital projects identified in this document can be funded through three (3) potential sources:

1. Government of Nunavut;
2. Government of Canada; and
3. Public-Private Partnerships.

These funding sources are described in the following sections.

8.1.1 GOVERNMENT OF NUNAVUT FUNDING

The Nunavut Airports portfolio is the responsibility of the Department of Economic Development and Transportation. Capital projects are approved by the territorial government through the annual Capital Estimates document or through Supplementary Appropriations if increases are required to the Department's level of funding. When funding from the Government of Canada (Section 9.1.2) or alternative sources cannot be secured, the GN will continue to be responsible for the capital projects of Nunavut Airports. However, Nunavut Airports is one of several departmental divisions, each with varied and competing priorities. Therefore, it is understood that challenges exist in funding Nunavut Airports capital projects without external assistance.

The Nunavut Airports Division does have $3 million annually in predictable, discretionary capital funding. This was increased to $4 million in recent years but is set to drop back to $3 million beginning 2022-2023. These funds are used for mobile equipment purchases, facility rehabilitation (e.g., painting, flooring, fuel tank replacement), engineering studies, small capital projects ranging from airside ramp installations, demolition to minor aggregate stockpile acquisitions.

The concept of airports earning revenues from leasing, fees, etc. should be considered as these funds could be invested into the system to address capital needs. At present annual revenues are approximately $1.3 million, and this money goes into the Government of Nunavut general revenues. It is possible that revenues could be increased significantly across the system without exceeding national norms and that if these funds were kept within the system this could be part of a solution to the capital funding deficit.

8.1.2 GOVERNMENT OF CANADA FUNDING

Federal funding sources for capital infrastructure projects were reviewed for their applicability to the Nunavut Airports portfolio. Four (4) potential funding sources were identified at the time of this report's preparation:

1. Airports Capital Assistance Program (Transport Canada);
2. National Trade Corridors Fund (Transport Canada);
3. Disaster Mitigation and Adaptation Fund (Infrastructure Canada); and
4. Climate Change Preparedness in the North Program (Indigenous and Northern Affairs Canada).

8.1.2.1 AIRPORTS CAPITAL ASSISTANCE PROGRAM (ACAP)

The Airports Capital Assistance Program (ACAP) was introduced in 1995, concurrent with the National Airports Policy. ACAP provides funds to finance capital projects that will maintain and improve safety, which generally excludes projects such as expanding facilities and buying land. Transport Canada specifies three (3) eligibility criteria for airports to receive ACAP funding:

1. Airports cannot be owned or operated by the Government of Canada;
2. Airports must meet certification requirements; and

3 Airports must have year-round commercial passenger service with a minimum of 1,000 passengers per year, unless designated as a Remote Airport per the National Airports Policy.

Funds are provided at Transport Canada's discretion for projects on a priority basis. Projects that are eligible for ACAP funding are categorized into three (3) priority areas, as shown in Table 9.1.

Table 8.1 - ACAP Priority Areas

	PRIORITY 1	PRIORITY 2	PRIORITY 3
Description	Projects to rehabilitate airside facilities or buy equipment for aircraft rescue and firefighting	Projects to buy heavy mobile equipment	Projects to improve the safety of air terminals
Examples of Eligible Projects	→ Runway, taxiway, and apron rehabilitation → Airfield lighting and visual aids → Aircraft rescue and firefighting equipment	→ Snow blowers → Snow plows → Sweepers and spreaders	→ Upgrading sprinkler systems → Removing asbestos → Creating barrier-free access

The proportion of the project costs that will be funded depends on the number of regularly scheduled commercial passengers per year. This variable funding structure for Priority 1 and 3 projects is shown in Table 9.2. Priority 2 projects are funded in the same manner as Priority 1 projects, however ACAP funding will be decreased if the equipment is not dedicated solely for airport use. Transport Canada will contribute at least 85% of total project costs for airports north of the 60th Parallel. Therefore, all facilities in the Nunavut Airports portfolio are eligible for at least 85% of project costs, subject to the other criteria noted above.

The Government of Nunavut holds a position in agreement with the 2015 *Canada Transportation Act* Review, Pathways: Connecting Canada's Transportation System to the World (also know as the *Emerson Report*) that Transport Canada should develop a Northern ACAP that would be more predictable and more responsive to northern realities (seasonality, sealift resupply, etc.).

The Emerson Report recommends, to facilitate improvements, an investment of $50 million per year over ten years to address the most significant infrastructure gaps, either by augmenting the Airports Capital Assistance Program, or by creating a new "Northern Airports Capital Assistance Program."

The need for a program such as a Northern ACAP was echoed in the spring 2017 Report of the Auditor General of Canada to Parliament's chapter titled Civil Aviation Infrastructure in the North.

Table 8.2 - ACAP Proportional Funding Structure

YEAR-ROUND REGULARLY SCHEDULED COMMERCIAL PASSENGERS	% FUNDS ALLOCATION
1,000 - 49,999	100%
50,000 - 74,999	95%
75,000 - 99,999	90%
100,000 - 124,999	85%
125,000 - 149,999	80%
Note: For airports north of the 60th Parallel, the minimum contribution is 85%	

ACAP funding is distributed nationally, creating a situation in which a high number of project requests across the country compete for limited annual funding. The GN has been moderately successful in obtaining

ACAP funding in recent years, primarily for airside rehabilitation and airfield lighting projects. Recent ACAP funding awards include:

- → Airfield lighting at Baker Lake Airport (2012);
- → Airfield lighting at Chesterfield Inlet Airport (2012);
- → Rehabilitation of airside surfaces at Clyde River Airport (2018); and
- → Rehabilitation of airside surfaces and airfield lighting at Sanirajak Airport (2019).

8.1.2.2 NATIONAL TRADE CORRIDORS FUND

The National Trade Corridors Fund (NTCF) allocates $2 billion over 11 years (ending March 2028) as part of the $180 billion Investing in Canada Plan. The NTCF is a merit-based program that focuses on investing in the critical assets that support economic activity and the movement of goods and people in Canada. Territorial governments, including the GN, are invited to submit proposals to Transport Canada. The NTCF focuses on projects that:

- → Improve the movement of goods and people in Canada;
- → Improve international trade;
- → Help the transportation system withstand the effects of climate change; and
- → Help the transportation system adapt to new technologies and innovation.

The GN received funding in May 2018 for the replacement of the Kugluktuk, Naujaat, Kimmirut, Whale Cove and Chesterfield Inlet Air Terminal Buildings through the NTCF with construction scheduled to begin in 2021.However, a funding application for the relocation of the Pangnirtung and Kimmirut Airports was rejected.

The GN also received funding for the Rankin Inlet Air Terminal Building Expansion. This project is now in the initial phases and will run through 2024/2025.

The Continuous Call is open at the time of this report's preparation and will continue to be open until funds are depleted. The Continuous Call focuses on projects that improve the performance of the transportation system as it relates to exporting Canadian goods internationally, improve existing international trade flows, or generate new trade flows. Securing funding through the Continuous Call for the Nunavut Airports portfolio may be difficult, given the limited international trade flows that originate from each airport and the primary role of Iqaluit Airport in goods movement.

8.1.2.3 DISASTER MITIGATION AND ADAPTATION FUND

The Disaster Mitigation and Adaptation Fund (DMAF) is a grant program aimed at increasing resilience to natural hazards and extreme weather events, including the construction of new infrastructure and modifying or reinforcing existing infrastructure. The 2017 federal budget allocated $2 billion until March 2028 for projects across Canada. The GN is an eligible recipient, with federal cost sharing capped at 75% for territorial projects. Projects have a minimum threshold of $20 million in total eligible costs, must address at least one natural hazard, and must meet at least one national significance criteria. Given the essential services that airports in Nunavut provide for their respective communities, airport projects could qualify as critical infrastructure and be deemed nationally significant. The federal government will also offer climate change related programs from time to time which is separate from DMAF.

Examples of other airport projects that have made use of the DMAF include the construction of a new Air Terminal Building in Thompson, Manitoba to address foundation degradation resulting from permafrost thaw, and the widening of the runway and taxiway embankments in Inuvik to limit permafrost degradation.

8.1.3 PUBLIC PRIVATE PARTNERSHIPS

Public-Private Partnerships are arrangements between a government and one or more private companies for the provision of infrastructure. The respective governmental body defines its needs and the project, while the private sector is generally responsible for the implementation of the project. Properly executed Public-Private Partnerships can have several benefits for governmental bodies, including access to the project-specific expertise of the private sector and shared or delegated risk between the two parties. The intent is that value will be realized by relying on the respective expertise of the government and private-sector parties. The value and usefulness of Public-Private Partnerships may vary depending on the given capital project, and thorough analysis should precede the decision to enter into such an agreement.

The Iqaluit Airport Improvement Project is a recent example of a Public-Private Partnership in Nunavut. The private-sector entity, Arctic Infrastructure Partners, was responsible for the development of a new Air Terminal Building and other airfield improvements, such as an apron expansion and runway upgrades. Arctic Infrastructure Partners is now responsible for the post-construction operations of Iqaluit Airport for a period of 30 years. The GN retains ownership of the airport throughout the duration of the agreement. The result is that significant improvements to key public infrastructure were made through the course of a single project. The GN was able to complete the works with limited annual investment over 30 years, during which the life cycle planning, maintenance costs, and resulting facility condition are predictable.

8.1.3.1 CANADA INFRASTRUCTURE BANK

The Canada Infrastructure Bank (CIB) was established in 2017 as a crown corporation that operates at arms-length from the federal government. The CIB uses federal support to attract private-sector and institutional investment to new revenue-generating infrastructure projects and is mandated to invest up to $35 billion. The CIB works with partner governments to efficiently provide infrastructure, with delivery models including co-investments, Public-Private Partnerships, and traditional investment.

Projects must satisfy public interest requirements and should fall within one of three priority areas: airports could qualify as trade and transportation projects. CIB investments are not based on a regional allocation system, and each project is evaluated on its own merits for its investment potential. Therefore, the CIB could be a resource to the GN in securing funding for airport capital projects under the Public-Private Partnership delivery model.

8.2 20-YEAR CAPITAL NEEDS ASSESSMENT

The 20-Year Capital Needs Assessment has been developed with input provided from Nunavut Airports' regional Transportation Programs Managers. Appendix A details the needs of each airport and the predicted expenditures for capital projects over the next 20-year period, from 2020 to 2040. The projects range in scope from minor rehabilitation of existing facilities to complete airport relocations.

Approximately 370 needs have been identified over the 20-year period. It should be noted that many airports have surplus equipment, or equipment in addition to the minimum requirements noted in Section 3.2. The replacement of surplus equipment is not included in the forecast.

The total capital cost of the 20-year program is $744 million or approximately $37.2 million per year. This translates into an average of 18 capital projects per year. These figures include the costs of three major projects: the relocation of Kimmirut Airport, the relocation of Pangnirtung Airport, and the rehabilitation of the Rankin Inlet Air Terminal Building including public airport access and parking lot works. Without these three projects, the total capital cost would be reduced from $744 million to $416 million, or $21 million per year.

8.3 UNDER-FUNDED LIABILITY

The annual capital budget for Nunavut Airports has been in the range of $3.7 million to $10.4 million (excluding Iqaluit Airport) for the period of 2011 to 2018. The capital budget for 2019 is set at $6 million which is below the annual average of $7 million from 2011 to 2018. With a historic average annual capital budget of $7 million and excluding new major projects, the GN budget is underfunded by approximately $30.2 million versus the average annual requirement of $37.2 million per year for 2020-2040.

In reviewing the input from the Nunavut Airports Regional Managers, it was found that certain airports have not had any capital work undertaken since the completion of the 2014 Capital Needs Assessment. Therefore, the forecast shows a very large increase in recommended spending in the early years to reduce the backlog and return airport infrastructure to a cost-efficient life cycle.

9 IMPACTS OF CLIMATE CHANGE

This section discusses the potential impacts of climate change on the Nunavut Airports system, including but not limited to:

→ The impacts of thawing permafrost on runways, taxiways, aprons and airport buildings; and

→ Changing weather patterns, resulting in reduced ceilings and / or visibility, and increased need to improve visual aids.

9.1 OVERVIEW OF CLIMATE CHANGE

9.1.1 CLIMATE PROJECTIONS FOR THE ARCTIC

There is overwhelming evidence that the Earth's atmosphere and oceans are warming since the beginning of the Industrial Era, and that this warming is primarily due to human activity, particularly the burning of fossil fuels that produce greenhouse gases.

Examining historical trends is helpful for understanding the changing climate, but this is insufficient to accurately predict the future climate. To more accurately predict the climate near the end of the 21st century, climate specialists use climate models that are designed to reflect changes in the climate as global greenhouse gas emissions change. The 2016 Paris Climate Agreement established three emission scenarios, each of which is called a Representative Concentration Pathway (RCP):

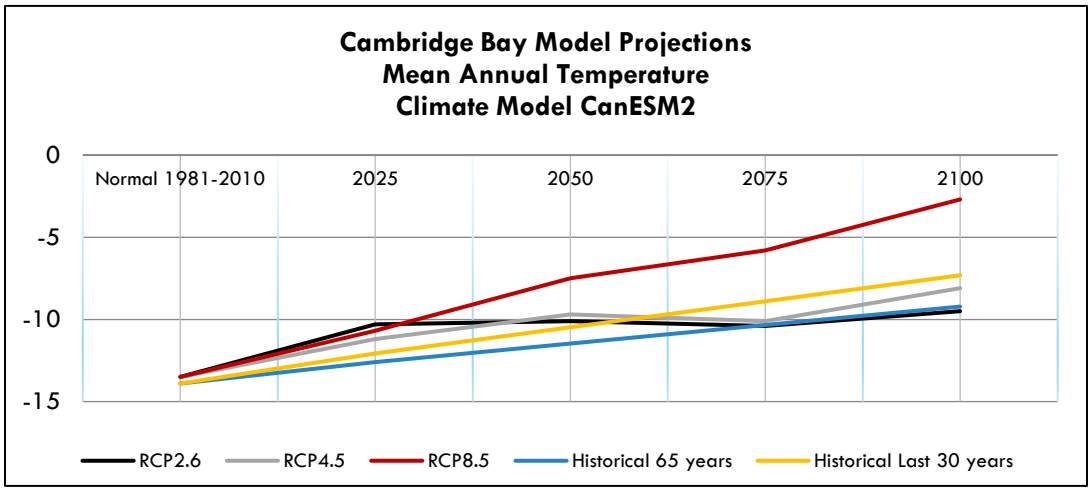
— RCP 2.6: Reflects success in reducing global carbon emissions, stabilizing temperature increases in the 2°C range.

— RCP 4.5: Modest success is achieved in controlling emissions, but the concentration of greenhouse gases has accumulated to a high level, resulting in continued warming beyond the current targets.

— RCP 8.5: Little or no progress in controlling emissions is made; under this scenario, global temperatures continue to rise unabated.

Figure 9.1 is an example of modelled projections of mean annual temperature at Cambridge Bay. In the RCP 8.5 scenario, the mean annual temperature rises from approximately -14°C to -3°C by the end of this century.

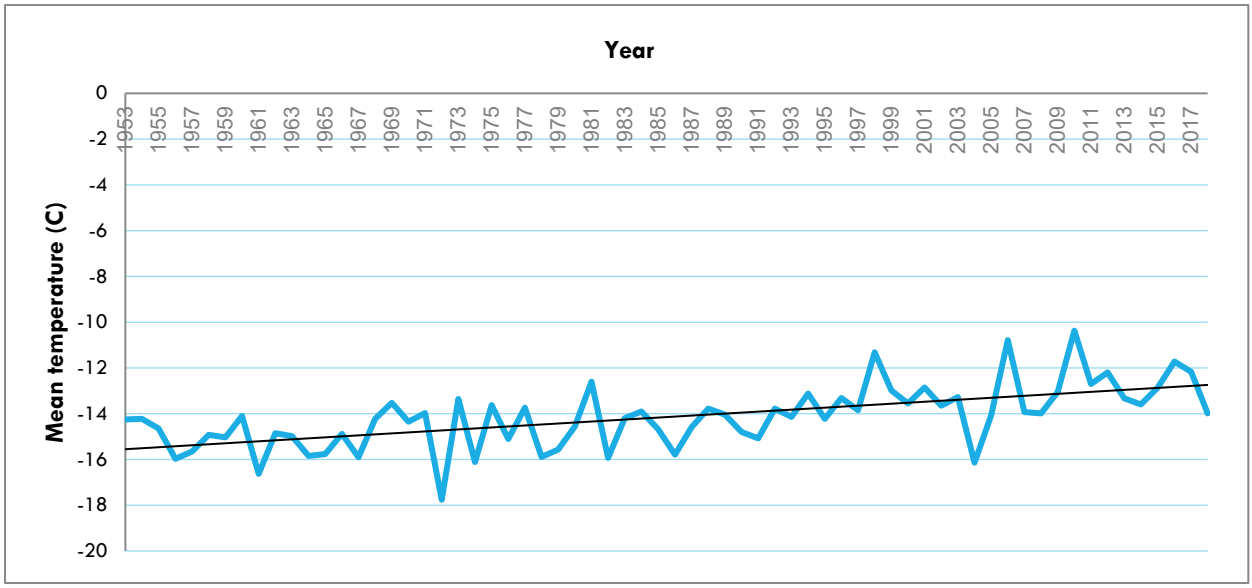
Figure 9.1 - Model Projections Mean Annual Temperature YCB



The Arctic is especially impacted by climate change, possibly at twice the extent compared to points further south. The clearest example of major climate change is displayed in Figure 9.2: the historical trend at Cambridge Bay is a 1°C rise in temperature every 23 years. If the rate of warming continues, that would result in a rise of almost 4°C in the mean temperature at Cambridge Bay by the year 2100.

Under an RCP 8.5 emissions scenario, the warming in the Arctic is very severe, with some climate models projecting an increase in mean annual temperatures by as much as 11°C.

Figure 9.2 - Mean Annual Temperature Cambridge Bay 1953-2017



Increases in mean annual temperatures of 4°C impact the Arctic in significant ways. The most pronounced impacts on the Arctic include the loss of sea ice cover for much of the year and the thawing of permafrost. Arctic experts are planning on much of the Northwest Passage becoming navigable for most of the year in one or two decades. The second most significant impact is the thawing of permafrost, jeopardizing the stability of road infrastructure and building foundations. Other impacts of climate change are significant, such as the increase in frost and icing of infrastructure due to the proximity to more open water. The increase in low-level moisture due to open water may also contribute to fog and low cloud formation.

Although sea levels are expected to rise throughout much of the world this century by one meter or more, due to isostatic (or post-glacial) rebound Nunavut is not expected to be adversely affected by sea level rise.

9.1.2 ARCTIC AMPLIFICATION

Arctic amplification refers to the faster rate of warming that characterizes Arctic regions relative to the rest of the world. While many factors contribute to this phenomenon, one key factor is the increased surface absorption of heat associated with reductions in snow and sea ice cover. Snow and ice are highly reflective, whereas the darker surfaces of open water and tundra absorb heat, causing increased warming. Studies show that the Canadian Arctic is warming at almost twice the rate of the rest of Canada; the increase in mean annual temperature between 1948 and 2016 was 1.3°C in Ontario and 2.3°C in the North.[1]

[1] Canada's Changing Climate, Government of Canada, 2019. p. 128

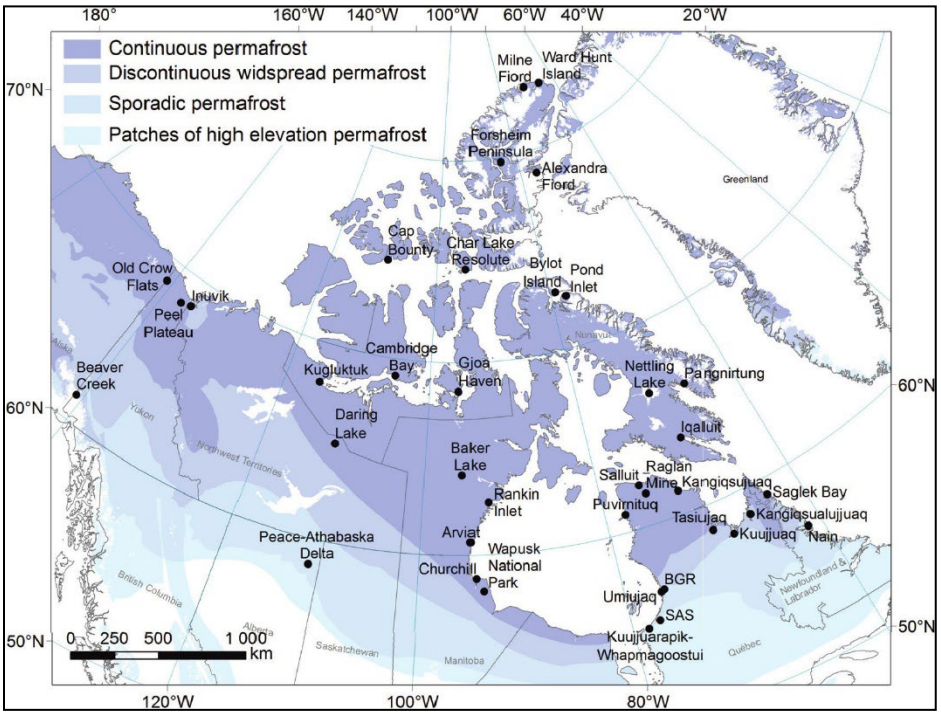
The area of sea ice cover in the Arctic has continually declined for several decades, at a rate of between 5% and 20% per decade depending on the region. In addition to the extent of sea ice decreasing, the perennial sea ice in the Canadian Arctic is being replaced by thinner seasonal sea ice. Most Canadian Arctic marine regions could be free of sea ice for at least one summer month per year by 2050. As the extent of sea ice declines, the increase in open water accelerates Arctic warming through the absorption of heat from solar radiation

9.1.3 THE THAWING OF PERMAFROST

All airports operated by the Government of Nunavut are impacted by permafrost. The different types of permafrost are shown in the map displayed in Figure 9.3. The Nunavut Airports system is located within the Continuous Permafrost region. Permafrost is defined by the International Permafrost Association as land that remains at or below 0°C for two consecutive years. Continuous permafrost is defined as land that is at least 90% covered by permafrost.[2] The composition of permafrost varies. It is a mixture of soil, ice, air, unfrozen water, and organic content, depending on how it formed originally.

Permafrost lands are described as a two-layer system that during the summer comprises the thawed active layer overlying the frozen permafrost beneath. The characteristics of the active layer are very important to the stability of the land and its ability to support physical structures. The thickness of the active layer can vary from a few centimeters to several meters, depending on the climate. As the climate warms, the active layer tends to become thicker.

Figure 9.3 - Permafrost Regions in Canada



[2] Arctic Science, Vol. 3, 2017 National Research Council Research Press

Image Credit: Arctic Science, Vol. 3, 2017 published by NRC Research Press

As permafrost thaws, the active layer remains unfrozen for longer periods, and the active layer goes deeper. In addition, the boundaries of permafrost regions change, with sporadic permafrost becoming less frequent. Significant volumes of ice can thaw, leading the structure of the active layer to collapse. When building roads or other structures on permafrost, from a stability perspective, engineers must insulate the permafrost to keep the active layer more stable.

Under certain models and scenarios, communities such as Arviat, Whale Cove, Baker Lake, Rankin Inlet and Kugluktuk could find themselves within the discontinuous or even sporadic permafrost regions, a development which can be expected to have significant impacts on existing infrastructure.

9.2 VULNERABLE NUNAVUT AIRPORT INFRASTRUCTURE AND OPERATIONS

9.2.1 AIRPORT INFRASTRUCTURE

9.2.1.1 RUNWAYS, TAXIWAYS, APRONS, ACCESS ROADS

Permafrost thaw threatens prepared surfaces used for aircraft and vehicle movement and parking. Runways are particularly vulnerable as surface irregularities impact aircraft movement, take-offs, and landings. Cavities of ice are embedded in permafrost, and the melting of ice pockets can create a sudden and sharp change in the runway surface. If the runway is paved, it can result in cracks and gaps in the paved surface.

Of the 24 studied airports, 23 have gravel runways which makes the problem more easily remedied through regular grading, although even with gravel major permafrost thaw can complicate runway rehabilitation projects by requiring the production of additional quantities of aggregate.

Taxiways, aprons, and access roads are also prone to collapse and erosion due to thawing permafrost. Their vulnerability is somewhat less than runways due to the greater flexibility to manoeuvre at slower speeds across a section of a taxiway that has deteriorated.

Although access roads may not be part of the airport property, they serve to make the airport operational. An airport without a viable access road has limited use.

9.2.1.2 AIRPORT BUILDINGS, NAVIGATIONAL AIDS PLATFORMS

Most buildings in the Arctic are sited on a concrete pad or are supported by a grid of supports that sits on top of the permafrost layer. Often, the permafrost may not thaw seasonally if the building or structure shelters or insulates the frozen permafrost beneath it from warmer temperatures. However, if the warming persists for longer than normal, the frozen permafrost can thaw and the supporting pad may become unstable. All Nunavut Airports facilities have basic infrastructure such as an Air Terminal Building and maintenance building, while some also have aircraft hangars.

There are also navigation aids and weather instruments on steel towers or housed in small buildings throughout the airfield. Permafrost thaw is especially critical for these facilities in cases where navigation aids and equipment must be fixed in position to function correctly. Misalignment as a result of changing surface conditions may negatively impact their usability. Figure 9.4 illustrates the challenges of maintaining the approach lighting at Rankin Inlet.

Figure 9.4 - Runway 13 Approach Lighting Rankin Inlet Airport (2010)

9.2.1.3 ELECTRICAL AND COMMUNICATIONS INFRASTRUCTURE

Most of airfield cabling and electrical and communications conductors is buried underground or is carried on poles throughout the airfield. The thawing of permafrost exposes buried cables to water and stresses from collapsing terrain. Towers and poles carrying power and communication lines may also become unstable. The increased frequency of freezing precipitation and hoar frost threatens suspended power and communication lines, although the degree and extent of the threat is location dependent.

9.2.2 AIRPORT OPERATIONS

In addition to the vulnerability of airport infrastructure, there is a significant risk that climate change will impact airport operations. First, increased open water due to sea ice degradation will add moisture to the lowest levels of the atmosphere. This could lead to increased fog and stratus clouds, reducing airport availability as a result of low ceilings and visibility. The extent to which lower ceilings and visibilities may occur is unclear, but if the impact is significant, improvements to electronic and visual navigation aids may be required.

Second, low-level moisture in below-freezing temperatures can also lead to increased icing of runways, communication and navigation structures, and suspended cabling. Anecdotal reports have identified that black ice on runways and taxiways is more common at certain times of the year, requiring increased anti-icing treatment and a larger inventory of anti-icing supplies.

Third, a warmer climate may result in less snowfall and less snow-clearing efforts required. However, warmer temperatures may result in the more frequent occurrence of freezing precipitation, requiring greater efforts in removing the accumulation of ice, rather than snow. An analysis of annual rain and snow at Cambridge Bay for the period of 1953 - 2018 indicates that annual snowfall is decreasing at a rate of one less centimeter every nine years, while annual rainfall is increasing at a rate of one additional millimeter every three years.

The fourth impact is that the warming atmosphere has a greater capacity to hold moisture, meaning that greater rainfalls, or in the right conditions greater snowfalls, can occur. The pooling of water or slush may require additional operational attention to sweeping and drainage.

Fifth, most climate models project more frequent wind extremes as the climate changes. In an analysis of the last 66 years of data at Cambridge Bay, the frequency of peak winds over 80 km/h has declined. As climate warming is underway at Cambridge Bay, evidence of more frequent extreme winds should be apparent. Despite this trend, there is a risk of more extreme winds and crosswinds that could impact airport operations.

Finally, runways are oriented to prevailing wind directions. It is not clear if prevailing winds at a location may change due to a warming climate. This is an area requiring further study, as the impact of changing wind directions could increase the frequency of excessive crosswinds, affecting airport availability.

9.3 CLIMATE CHANGE SUMMARY AND CONCLUSIONS

9.3.1 CLIMATE CHANGE SUMMARY

Climate change is well-documented on the global scale and is caused primarily by the release of greenhouse gases into the atmosphere through human activity. The extent of climate warming in the Arctic is accentuated by the lower reflectivity of open water and open tundra as sea ice and snow cover is reduced. As a result, annual mean temperatures are projected to rise in the Arctic between 4°C and 11°C by 2100. This trend will have significant impacts on the Nunavut Airports system.

9.3.2 CLIMATE CHANGE CONCLUSIONS

Climate change will likely impact the Nunavut Airports system in the following ways:

- → Continued warming of temperatures will result in extensive permafrost thaw, particularly at airports near the southern edge of the continuous permafrost region. Permafrost thaw will lead to instability in runways, taxiways, aprons, access roads, and foundations for buildings and supporting structures.
- → Extensive sea ice loss will result in more open water with increased moisture in the lower atmosphere. The additional low-level moisture will result in greater frequencies of lower ceilings and visibilities through stratus clouds and fog, and in increased occurrences of icing of runways, taxiways, aprons, access roads and equipment. Greater de-icing resources may be required.
- → The global rise in sea levels by as much as a meter by 2100 will be offset by rising land levels in the Arctic. As a result, sea level rise will not have significant impacts on Nunavut Airports.
- → Changing precipitation patterns will result in more rainfall and less snow for airports in Nunavut. As an example, approximately 10 cm less snow may be expected each winter, and approximately 35 mm of additional annual rainfall is projected at Cambridge Bay based on current trends. The greater frequency of freezing precipitation is expected, requiring additional attention and resources dedicated to de-icing.
- → Climate scientists project increasingly frequent extreme weather events, including wind, temperature and precipitation. The extent of weather extremes is difficult to predict for specific airports.
- → Historical prevailing winds may change with differing weather patterns and the seasonal variation in sea ice cover. Wind directions could vary from the present, resulting in more frequent crosswinds and decreased airport availability.
- → The air transportation sector may face increased pressure to reduce its carbon emissions, as it is responsible for a significant proportion of global greenhouse gas emissions. This could result in controls or extra costs incurred by or assigned to the air transportation sector. Arctic air carrier operations at present are largely exempt under the carbon tax.

Appendix A

Nunavut Airports Condition Assessments

Table CA-1 Arctic Bay

Item/Facility	Last Rehabiltated or Constructed	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Apron (8,100 m2)	2011	Good	Low	Stockpile owned by contractor. Needed for yearly maintenance
Taxiway (2,000 m2)	2011	Good	Low	Minor Overlay Runway
Runway (35,900 m2)	2011	Good	Low	Major Overlay Runway+Replenish Stockpile
				Minor Overlay Runway
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road	2011	Good		Hamlet
Parking lot	2011	Good		Maintain with O&M funds
Airside Electrical				
FEC	2011	Good	Low	Replace at end of life (25 years)
Airfield Lighting	2011	Good	Low	
Buildings & Other Facilities				
ATB:		Good	Low	Replacement required outside of 20 year timeline
Building Envelope				ATB Security System
H & V	2011			
Finishes	2011			
Electrical	2011			
Maintenance Building	2019	New		Equipment Shelter completed in November 2019. Equipment shed should have concrete floor, maintenance of systems very difficult with a gravel floor. It has implications in addtion to environmental concerns.
Mobile Equipment				
Truck - Runway (pickup/other)	2012		High	Ford F-150
Truck - Runway (pickup/other)	2019			Ford F-150
Truck - Plow	2020			Western Star 4900
Truck - Plow	2000			Freightliner FL80
Motor Grader	1999		Low	160 H Caterpillar
Snow Blower - Mounted	2015			D50 Larue
Caterpillar Loader	2005		Medium	950G Caterpillar Loader
Packer - Wobbly Wheel	2016			WRT
Trailer	1995			TA20 Craig Trailer

Table CA-2 Arviat

Item/Facility	Last Rehabiltated or Constructed	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (12,100 m2)	2013 - Last known overlay, done by addendum to AOM. Contractor for equipment and manpower			Stockpile adequate currently at 4000 m3
Runway (36,600m2)		Fair	Low	Minor Overlay Runway
				EK-35 Full Application Minor and Major Runway Overlay
				Major Overlay Runway + Replenish Stockpile
				Minor Overlay Runway
				Apron Expansion and including Lighting
Groundside Pavements				
Access Road				Hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
FEC	Unknown	Good		Replace at end of life (25 years)
Runway Edge Lighting	2010			Airfield Lighting Replaced in 2010.
Approach Lighting				
ODALS	2010	Good		
Buildings & Other Facilities				
ATB (309 m2):	1993 (1992)	Poor	Medium	ATB Renovation, fuel tank replacement, shoring project underway in mechanical room
Building Envelope				Building requires internal and external painting
H & V				
Finishes				Advanced Security System at ATB and Airfield (Runway and Taxiways)
Electrical				Back-Up Generator
Maintenance equipment shelter			High	New 4 Bay Garage Required, with concrete floor.
Mobile Equipment				
Truck - Runway (pickup/other)	2020			Ford F-150
Wheel Loader	2009		medium	Case 821E
Packer - Wobbly Wheel	2015			WRT PT13
Truck - Plow	2013			Freightliner 108SD
Blower	2014			
Motor Grader	2014			Cat 140M

Table CA-3 Baker Lake

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Apron (32,200 m2)	2012			Apron Expanded by 16,500 sq.m in 2012
Taxiway (2,400 m2)		N/A	High	Stockpile Required only 100m3 available
Runway (38,400 m2)	2015	Fair		Minor overlay runway
				Replenish Stockpile. Major Overlay
				Minor overlay runway
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road		N/A		Hamlet
Parking lot		N/A		Maintain with O & M funds
Airside Electrical				
FEC	2013	Good		Replace at end of life (25 years)
Runway Edge Lighting	2013			Apron flood lighting recently upgraded to LED. Also some outdoor receptacles were added for vehicles.
Buildings & Other Facilities				
ATB:				Fuel tank replacement required
Building Envelope				Advanced Security System at ATB and Airfield
H & V				Fuel Tank Issues
Finishes				
Electrical				
Maintenance Building	1986			Large 7 bay garage. Condition should be evaluated, currently not connected to standby power. No fire alarm. Upgrade lighting and add some plugs.
Legacy Abandoned Buildings/Assets				
Old Garage and FEC		Poor		Assessment Required to determine removal costs
Mobile Equipment				
Truck - Pickup	2012			Ford F-150 (on order for 2021)
Truck - Dump/Plow T/A	1991			Ford LT8000
Truck - Dump/Plow T/A	2017			Western Star
Wheel Loader	2014			Cat 950K
Motor Grader	2017		Low	Cat 140 M
Motor Grader	1981			Champion 740A
Water Pump	1986		Low	Wisconsin 40MGV Water Pump
Crawler Tractor	1986		Low	Caterpillar D7G
Snowblower - Self-Propelled	2007			Larue 7460
Packer - Wobbly Wheel	2003		Low	Pneumatic Tire Compaction Roller WRT PT13

Table CA-4 Cambridge Bay

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (13,230 m2)	2015	Good		Current Gravel stockpile is part of ongoing work
Runway (70,104 m2)]	1988	Poor	N/A	Runway ongoing for 2021, Taxiway and Apron last resurface 2015. Project completion 2015
				Minor Overlay
				Replenish Stockpile and Major Overlay
				EK-35 Full Application Minor and Major Runway Ove
Groundside Pavements				
Access Road	N/A			Road may be re-routed under current airport improvements project.
Parking lot	N/A			Access road from community to airport is being turned over to community for maintenance.
Airside Electrical				
FEC	1993	Poor		Runway lights are currently operating on 2 new CCRs. PAPI's operate on two old CCR's. Repairs required on N/S ODALS. Plans in place for interim repairs to some cabling to PAPIs.
Runway Edge Lighting	2017/2018	Good		Airfield Lighting upgraded in 2017/2018. Ongoing issues. To be upgraded with rest of infrastructure. Current LEDs are obsolete.
Buildings & Other Facilities				
ATB:	2015/2016	Good		
H & V				
Finishes				Advanced Security System at ATB and Airfield
Electrical				
Baggage Carousel	N/A			
Maintenance Building	1959/1985	Poor		Maintenance garage upgrade required. Assessment underway.
Perimeter Security Fencing				Perimeter Security Fencing (5km)
Equipment				
Truck - Runway (pickup/other)	2015			GMC Sierra 1500 (runway inspection vehicle)
Truck - Runway (pickup/other)	2009			Ford F-150
Truck - Pickup	2009			GMC Sierra
Truck - Dump/Plow S/A	1994			International Plow Truck
Truck - Dump/Plow T/A	2011			International Plow Truck
Water Truck	1976			Weststar
Wheel Loader	2010			950H Caterpillar
Motor Grader	2020			
Motor Grader	1994			720R
Dozer	1973			Caterpillar D7F
Ramp Hog	2020			Caterpillar 150-15AWD
Skid Steer	2018			Caterpillar 299 D2 Skid Steer
Snowblower	1993			
Snowblower - Mounted	2017			Tenco 202
Packer - Wobbly Wheel	2015			WRT
Packer - Wobbly Wheel	2000			WRT PT13

Table CA-5 Chesterfield Inlet

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (6,450 m2)	2017			Culvert required to address drainage issues
Runway (32,910 m2)	2017	Fair	Medium	Currently Stockpile 2000 m3. Minor Runway Overlay. Surfaces no longer have a proper crown or drainage, dust control problems are a yearly issue.
				Stockpile + Major Runway Overlay
				Minor Runway Overlay
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road		N/A		Relocate Airport Access Road
Parking lot		N/A		Maintain with O & M funds
Airside Electrical				
FEC	2013	Good		Rehabillitated under ACAP in 2013
Runway Edge Lighting	2013	Good		Replace at end of life (25 years)
Buildings & Other Facilities				
ATB:	1984	Poor	High	New Air Terminal Building Required: IN PROGRESS.
Building Envelope				ATB Security System
H & V				
Finishes				
Electrical				Currently no back-up/emergency power available
Maintenance Building	N/A			Equipment shed should have concrete floor, maintenance of systems very difficult with a gravel floor. It has workplave health and safety implications in addition to environmental concerns.
Legacy Abandoned Buildings/Assets				
Old Transport Canada Trailer		Poor		Assessment Required to determine removal costs
Old FEC		Poor		Assessment Required to determine removal costs
Mobile Equipment				
Truck - Runway (pickup/other)	2014			Ford F150
Loader	2013			Caterpillar 938K
Truck - Plow	2020			Western Star 4900XD
Snowblower	2014			Attachment Larue D50
Motor Grader	2009			Volvo
Packer - Wobbly Wheel	2001			WRT PT13
Packer - Wobbly Wheel	2014			WRT

Table CA-6 Clyde River

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Runway (32,010 m2)	2020	New	Low	Major rehabilitation project completed 2020.
Taxiway/Apron (8,280 m2)		New	Low	Minor Overlay from Stockpile
				Major Overlay and stockpile
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road		N/A		Hamlet
Parking lot		N/A		Maintain with O & M funds
Airside Electrical				
				Airside Electrical cost includes items below
FEC	1998	unknown		Replace at end of life (25 years)
Airfield Lighting	1998			Replace at end of life (25 years)
Buildings & Other Facilities				
ATB:				206 m2 - Minor Remodel required.
Building Envelope		unkown	High	Investigate ATB condtion
				Fuel Tank Replacement Required
Finishes				Airside Accessibility Ramp Required
Electrical				ATB Security System
Maintenance Building	1978			New Building or expansion required;existing has only 2 bays.
Access Road	2004			O & M
Legacy Abandoned Buildings/Assets				
Old ATB		Poor		Onsite Assessment Required to determine removal costs
Mobile Equipment				
Truck - Runway (pickup/other)	2020			Ford F150
Truck - Runway (pickup/other)	2013			Ford F150
Truck - Dump/Plow S/A	2016			Western Star
Wheel Loader	2020			Caterpillar 938M
Motor Grader	2000			Caterpillar 140H
Snowblower	2010	Good		Laure T60
Packer - Wobbly Wheel	2003	Good		WRT PT13

Table CA-7 Coral Harbour

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (9,800 m2)			High	Apron and Flood Lighting Upgrade: Doesn't meet TP312 requirements, Apron dimensions are not defined, poor draingage, and lack/broken flood lighting poles.
Runway (45,800 m2)	2013	Fair	Low	Minor Overlay - No Crown. Also recommended EK 35 dust control. Replenish granular stockpile
				Replenish Stockpile and Major Runwaay Overlay
				Minor Overlay Required
				EK-35 Full Application Minor and Major Runway Overlay
				Existing Stockpile is 2000 m3
Groundside Pavements				
Access Road				Hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
				Airside Electrical cost includes items below
FEC	2006	Good	Low	
Runway Edge Lighting	2006	Good	Low	
Buildings & Other Facilities				
ATB:	2007			Airside Accessibility Ramp Required
				ATB Security System
Building Envelope				Replacement required outside of 20 year timeline
H & V				
Finishes				
Electrical				
Maintenance Building	2003			None. Housed in hamlet
Old Garage				Gravel floors requires minor repairs overall
Legacy Abandoned Buildings/Assets				
Old Transport Canada Fire Hall and Garage		Poor		Onsite Assessment Required to determine removal costs
Old Storage Facility		Poor		Onsite Assessment Required to determine removal costs
Old FEC (Red Building)		Poor		Onsite Assessment Required to determine removal costs, can be rehabilitated to storage
Old Fuel Tanks		Poor		Onsite Assessment Required to determine removal costs
Drums of Tar		Poor		Onsite Assessment Required to determine removal costs
Old Equipment/Garbage		Poor		Onsite Assessment Required to determine removal costs

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Mobile Equipment				
Truck - Runway (pickup/other)	2019			Ford F150
Truck - Dump/Plow S/A	2001			IHC 5600i 4x4
Wheel Loader	2020			Caterpillar 950M
Wheel Loader	2005			Volvo L110E
Snowblower - mounted	2017			Larue D50
Motor Grader	2018			Cat 140M2
Dozer	2010			D6T Caterpillar
Snowblower - Self-Propelled	2002			Vohl DV904
Packer - Wobbly Wheel	1968			Pneumatic WP67

Table CA-8 Gjoa Haven

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (6,930 m2)	1997	Poor	High	Replenish Stockpile + Major Overlay
Runway (40,230 m2)	1997	Poor	High	Minor Overlay from Stockpile
				Major Overlay + Stockpile
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road				Hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
FEC	1999	Good	High	Back-up generator for FEC - Has not happened
Runway Edge Lighting	1999	Poor	High	Airfield lighting repairs + PAPI replacement - has not happened, ACAP funding should be applied for after Engineering Design Work done.
Buildings & Other Facilities				
ATB:	2009	Poor	High	Air Terminal Building Repairs - Old Terminal still in poor condition
Building Envelope				Cold inside of ATB
H & V				Need to upgrade mechanincal and electrical systems
Finishes				Airside Accessibility Ramp Required
Electrical		Poor	High	ATB Security System
Maintenance Building	N/A		High	New 4 Bay Parking Shelter required with concrete floor - has not taken place yet
Equipment				
Truck - Runway (pickup/other)	2017			Ford F-150
Snowblower - Mounted	2013			Laure D60
Packer - Wobbly Wheel	1975			WRT
Packer - Wobbly Wheel	1998			WRT PT13
Truck - Plow	2007			IHC 5600I
Packer - Vibratory	1993			Bomag
Loader	2012			938K Caterpillar
Grader	2020			Caterpillar 150-15AWD

Table CA-9 Grise Fiord

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
				Approximately 6000m3 stockpile is on site. Runway remains in very poor condition
Taxiway/Apron (2,700 m2)	1992	Poor	High	major overlay from stockpile + runway repairs
Runway (13,662 m2)	1992	Poor	High	Minor Overlay and New Stockpile
				Major Overlay and New Stockpile
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road				hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
			High	Airside Electrical cost includes items below
FEC	1983	Very Poor	High	Requires replacement
Runway Edge Lighting	1983	Very Poor	High	Requires replacement
				Requires replacement
Threshold lighting	1970	Very Poor	High	Engineering design work has been completed, RFQ should go out to determine costs. Project should coincide with Resolute Bay. Some interim minor repairs will be done summer 2021.
Buildings & Other Facilities				
ATB:	2018	Poor	High	ATB windows replaced in 2016/2017, ATB interior was repainted in 2018 and the exterior painted in 2019. ATB is approximately 146 sq. m.
				Fuel Tank Replacement
H & V				Replace ATB, planning required
Finishes				Airside Accessibility Ramp Required
Electrical				ATB Security System
Maintenance Building	N/A		High	New 3 Bay Parking Shelter Required including concrete floor.
Mobile Equipment				
Truck - Runway (pickup/other)	2018			GMC Silverado
Loader	2015			Cat 938K
Motor Grader	1997			Champion 710A
Screen Plant	2010			Vibroscreen SCM-40
Packer - Wobbly Wheel	2003			WRT PT13
Snow blow attachement	2017			Tenco 202

Table CA-10 Igloolik

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (7,560 m2)	1997	Poor	High	Major Overlay and Replenish Stockpile
Runway (34,740 m2)	1997	Poor	High	Minor Overlay
				Major Overlay and Replenish Stockpile
				No stockpile currently available
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road				Hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
				Airside Electrical Costs includes items below
FEC	2003			Should have engineered drawings done to apply for ACAP to proceed in 2028
Runway Edge Lighting	2003			
Buildings & Other Facilities				
ATB:				
Building Envelope		Poor	High	Rehab ATB
Finishes				Airside Accessibility Ramp Required
Electrical				ATB Security System
Maintenance Building	2018	New	Low	Equipment shelter completed in Nov 2018
Mobile Equipment				
Truck - Runway (pickup/other)	2011			GMC Silverado (Runway Vehicle on order 2021)
Truck - Dump/Plow S/A	1998		Fair	Ford L8513
Snowblower - Loader mount	2016			D50
Packer - Wobbly Wheel	2003			WRT PT13
Packer - Vibratory	1992			Bomag BW6
Plow - One Way	1998			Tenco TC95
Motor Grader	2021			New addition to inventory
Loader	2014			Cat 938K

Table CA-11 Kimmirut

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
New Airport				
Airside Pavements				
Taxiway/Apron (1,350 m2)	2012	N/A	High	Apron Rehabilitated commenced in 2012
Runway (13,317 m2)	2012	Good		Runway Rehabilitation commenced in 2012
				Stockpile and Major Overlay
Groundside Pavements				
Access Road				Hamlet
Parking lot				Maintain with O & M funds
Airside Electrical				
FEC	1976	Poor	High	Decomission when new airport constructed
Runway Edge Lighting	1976			Lighting Upgrading to be done 2021 w/ARCAL
Buildings & Other Facilities				
ATB:	1976	Poor	High	Construct Temporary ATB with Back-Up Generator
Building Envelope				ATB Security System
Finishes				
Electrical				
Maintenance Building	1976			
Mobile Equipment				
Truck - Runway (pickup/other)	2018			Chevrolet Silverado 1500
Truck - Dump/Plow S/A	1992			Ford LS9000 (on order)
Motor Grader	2003			Volvo G720B
Wheeled Loader	2011			Caterpillar 938H
Snow Blower - Mounted	2012			Laure Snowblower
Packer - Wobbly Wheel	2010			WRT
Snow Bucket	2011			5 YRD
Snow Bucket	2011			3.45 YRD
Forks	2011			
Dozer Plow	2011			

Table CA-12 Kinngait

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (7,470 m2)	2015			
Runway (36,570 m2)	2015	Poor	High	
				New Stock Pile and Minor Runway Overlay Required
				Replenish Stockpile + major Overlay Runway
				EK-35 Full Application Minor and Major Runway O
Groundside Pavements				
Access Road	N/A			Hamlet
Parking lot	N/A			Traffic Circulation issues with current layout. Adjust with O&M funds. Parking Lot needs expansion by 2022.
Airside Electrical				
				Airside Electrical cost includes items below
FEC	1996			Estimated 4 year life remaining.
Runway Edge Lighting	1996			Estimated 4 year life remaining.
Buildings & Other Facilities				
Building Envelope				
ATB (316 m2):	1995	Poor	Medium	Refurbish ATB - Flooring/Painting
				Fuel Tank Replacement Required
H & V				Refurbish ATB - Major
Finishes				ATB Security System
Maintenance Building	1975	Average	High	Extension by 2 bays required
Legacy Abandoned Buildings/Assets				
Old ATB		Poor		Onsite Assessment Required to determine removal costs
Mobile Equipment				
Truck - Runway (pickup/other)	2017			Ford F150 (Runway Inspection Vehicle on order)
Truck - Runway (pickup/other)	2012			Ford F150
Truck - Dump/Plow S/A	2005			IHC Dump/Plow Truck M5600 4x4
Loader mount snow blower	2016			Tenco 202
Loader Attachment	2018			Ramp Hog
Packer - Wobbly Wheel	2000			
Wheel Loader	2016			Caterpillar 983K Loader

Table CA-13 Kugaaruk

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (7,585 m2)	1995			Current stockpile 2,000 cu.m
Runway (45,720 m2)	1995	Poor	High	Minor Overlay from Stockpile
				Major Overlay + Replensih Stockpile
				Minor Overlay from Stockpile
				EK-35 Full Application Minor and Major Runway Overlay
				No work has happened at this airport since last update.
				300 cu m of Gravel a year being used for maintenance.
Groundside Pavements				
Access Road				Hamlet
Parking lot				Mainatain with O & M funds
Airside Electrical				**ACAP**
				Airsdie Electrical cost includes items below
FEC	1997	Good		Replace FEC + back-up generator
Runway Edge Lighting	1997			Replace Runway Edge Lighting
Buildings & Other Facilities				
ATB:	1976	Poor		ATB upgrade required
Building Envelope				ATB Security System
Finishes		Poor	High	Airside Accessibility Ramp Required
Electrical				Major mechanical and electrical upgrades required
Maintenance Building	N/A		High	New 3 Bay Parking Shelter - still required
Equipment				
Truck - Runway	2019			Ford F150 Crew Cab
Truck - Plow	1983			International Plow
Loader	2013			Truck Caterpillar
Packer - Wobbly Wheel	2016			938K
Packer - Wobbly Wheel	2003			WRT
Motor Grader	2015			PT13
Snow Blower Mounted	2017			WRT

Table CA-14 Kugluktuk

Item/Facility	Last Rehabilitated or	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (33,490 m2)	1995			
Runway (50,280 m2)	1995	N/A	High	ACAP project lined up,Major Overlay and Replenish Stockpile
				Minor Overlay
				Major Overlay + Replenish Stockpile
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road				Hamlet
Parking lot		Average		Maintain with O & M funds
Airside Electrical				**ACAP**
				Airside Electrical costs incudes items below
FEC	1997	poor		Repalce FEC + backup generator
Runway Edge Lighting	1997			Replace Runway Edge Lighting
NDB				
Buildings & Other Facilities				
ATB:		Poor	High	New Air Terminal Building with Back-Up Generator
H & V				ATB Security System
Finishes				
Electrical				
Maintenance Building	N/A			New 3 Bay Parking Shelter required - has not happened
Equipment				
Truck - Runway (pickup/other)	2016			Ford F1-50 (ED&T)
Truck - Plow	2007			IHC International Plow Truck
Snowblower - mounted	2016			D50
Packer - Wobbly Wheel	1999			WRT PT13
Motor Grader	2017			Cat 140M
Loader	2014			Cat 938K

Table CA-15 Naujaat

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (6,075 m2)	2013			Stockpile good for 10 years
Runway (31,080 m2)	2013	Good	Low	Minor Overlay
		Good		Major Overlay + Replenish Stockpile
				Minor Overlay
				No update provided, same input from 2014
Groundside Pavements				
Access Road	N/A			None
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				**ACAP**
				Airside electrical costs includes items below
FEC	1997			Replace FEC
Runway Edge Lighting	1997			Replace upgrade the PAPI, runway edge lights LED
Buildings & Other Facilities				
ATB:				New ATB required including backup generator
Building Envelope		Poor	High	ATB Securitiy System
H & V				
Finishes				
Electrical				
Maintenance Building	2014			3 Bay Garage
Mobile Equipment				
Truck - Runway	2014			Ford F-150
Truck - Plow	2009			Sterling L9500
Snowblower - attachment	2018			Larue D50
Packer - Wobbly Wheel	2010			WRT
Motor Grader	2016			Caterpillar 140M2
Loader	2015			Caterpillar 983K Loader

Table CA-16 Pangnirtung

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
New Airport				
				Airport Relocation Study Update
			High	New Airport Infrastructure & Road (unit costs increased from 2003 price to reflect increases in grannualr material). Also increase due to annual
Airside Pavements				
Taxiway/Apron (4,805 m2)	2013	Average		Runway recently resurfaced.
				Runway surface still requires further work
				Minor overlay
Runway (26,520 m2)	2013	Average		Granular Required
				Requires Ditching and few larger culverts
Groundside Pavements				
Access Road	N/A			None
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				
FEC	1997	Good	Low	Adequate until new airport is constructed
Runway Edge Lighting				Estimated 8 years of life remaining
Buildings & Other Facilities				
ATB:	1994	Good	Medium	Minor rehabilitation required
Building Envelope				Minor Rehab required - flooring/paint
H & V				ATB Security System
Finishes				
Electrical				
Maintenance Building	N/A			None. Housed in Hamlet
Mobile Equipment				
Truck - Runway (pickup/other)	2018			Chevrolet Silverado 1500
Loader	2012			938K
Truck - Dump/Plow S/A	2008			L9500 Sterling
Snowblower	2019			Laure D50 Loader Mount
Packer - Wobbly Wheel	2018			WRT PT13
Compactor	1997			Dynopac Vibratory compactor

Table CA-17 Pond Inlet

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (8,625 m2)	1990	Average	High	Major Overlay Required and Stockpile
				Minor Overlay
				Major Overlay and Replenish Stockpile
Runway (36,570 m2)	2018	Average		EK-35 Full Application Minor and Major Runway Overlay
				Runway conditions have been improving due to annual maintenance, but stockpile replenishment is required.
Groundside Pavements				
Access Road	N/A			Hamlet
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				**ACAP**
				FEC + Edge light replacement costs only
FEC	1998		Low	Replace at end of life
Runway Edge Lighting	1998		Low	Replace at end of life
ODALS				Required (per Richard Mackenzie) - both ends runway
Buildings & Other Facilities				
ATB:	2007	Good	Low	Replacement required outside 20 year timeline, minor rehab needed
Building Envelope				Airside Accessibility Ramp Required, parts on site but design is to be determined
H & V				ATB Security System
Finishes				
Electrical				
Maintenance Building	N/A		High	New 3 Bay Parking Shelter required, with concrete floor.
Legacy Abandoned Buildings/Assets				
2 Small Sheds		Poor		Assessment Required to determine removal costs
Mobile Equipment				
Truck - Runway (pickup/other)	2013			Ford F250 (on order)
Truck - Runway (pickup/other)	2003			Ford F150
Truck - Dump/Plow S/A	2011			International 5600
Snowblower - Mounted	2014			D50
Packer - Wobbly Wheel	2010			WRT PT13
Loader	2013			938K Caterpillar
Motor Grader	2018			Caterpillar 140M2

Table CA-18 Qikiqtarjuaq

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (5,137 m2)	2000		High	Apron juts into ocean; rapid deterioration. Emergency work done in 2013 to address runway flooding. Culverts on site to be installed.
Runway (31,770 m2)	2000	N/A	High	Stockpile good for 1 more major overlay
				Minor Overlay
				Major Overlay + Replenish Stockpile
				Minor Overlay
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road	N/A			Hamlet
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				**ACAP**
				Airside Electrical costs include items below
FEC	1997	Poor	High	Replace FEC (relocate away from shoreline)
Runway Edge Lighting	1997	Poor	High	Airfield Lighting Upgrade
Buildings & Other Facilities				
ATB:	2013	Poor	High	Replacement required outside 20 year timeline
Building Envelope				Requires minor rehab: flooring and painting
H & V				Airside Accessibility Ramp Required
Finishes				ATB Security System
Electrical				
Maintenance Building	2004	Good		Hamlet garage used. Standalone 3 bay garage needed.
Legacy Abandoned Buildings/Assets				
Old ATB		Poor		Assessment required to determine removal costs
Mobile Equipment				
Truck - Runway (pickup/other)	2019			Ford F-150
Truck - Dump/Plow S/A	2016			Western Star 4900
Motor Grader	2002			Volvo G730 VHP
Loader	2018			Caterpillar 983M
Snowblower	2011			T60 Laure
Packer - Wobbly Wheel	2010			WRT
Packer - Vibratory	2014			Dynapac CH47

Table CA-19 Rankin Inlet

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Apron A (16,500 m2)	2013	Good	Low	Apron Expanded in 2013. Rehab in 15 years
Runway (70,104 m2)	2009	Fair	Low	Assess Rwy in 10 years. Assume rehab required in 15 years
Taxiway A (3,979)	2013	Good	Low	Rehab in 15 years
Taxiway B (5,290)	2013	Good	Low	Rehab in 15 years
Granular Stockpile/Crushing and Runway/Tawiway Shoulder Overlay				Shoulders damaged during electrical upgrades in 2015, rocks penetrating surface and sink holes developed. Requires major overlay of shoulders.
				Tranverse Crack Repairs Runway
				100 m3 gravel stock pile currently available
Groundside Pavements				
Access Road	N/A	Average		Hamlet - Airport access included in ATB upgrades
Parking lot	1999	Good		Parking Area requires expansion, including flood lighting is part of ATB expansion plan.
Airside Electrical				
FEC	2015	Good	Low	FEC equipment upgraded in 2015
Runway Edge Lighting	2015	Good	Low	Runway lighting upgraded in 2015
Buildings & Other Facilities				
ATB:	1995	Poor	High	Major Rehab/Extension - ATB Upgrade/Expansion, including upgrading public airport access and parking lot. Upgrade to Groundside flood lighting (Design Building). Federal and Territorial Funds committed but not yet expended.
Building Envelope				Rehab and Expand ATB
H & V				Advanced Security System at ATB and Airfield (Runway and Taxiways)
Finishes				
Electrical				
Maintenance Building	1999	Good		
	2020			New 4 Bay Garage completed 2020
		Poor		Renovation of SNIC 3 Bay Topshop (Design/Build): Requires major repair to become fully functional, currently used as cold storage only.
Perimeter Security Fencing				Perimeter Security Fencing (8km)

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Mobile Equipment				
Truck - Runway	2016			Ford F250 Heavy Duty Work Vehicle (on ord
Truck - Dump/Plow S/A	2013			Ford F250 Heavy Duty Work Vehicle
Plow/Dump	2006			Mauler PV350
Truck- Plow	2017			PV400
Truck - Dump/Plow S/A	2001			IHC
Wheel Loader	1991			Cat 950F (on order)
Wheel Loader	2010			Cat 950H
Motor Grader	2013			CAT 140M
Snowblower - Mounted	2002			Vohl DV4000 (attachment on order)
Ice Breaker Attachment	2018			Raiko Ice Breaker
Sweeper - Towed Behind	2006			Vohl Towed
Sweeper - Towed Behind	2020			MB 4618TTB
Skid Steer	2015			299D
Snowblower - Mounted	2013			Tenco 202
Generator Set	1993			Yamaha
Tar Kettle	1994			Craftco 100DC
Tar Kettle	2010			Craftco EZ100
Joint Router	1996			Craftco 200
Hopper/Spreader	2002			Batts T110C
Sweeper	2017			MB4600
AMSCR/CRFI Dedicated Access Vehicle				Note: to have a more accurate and consistent surface readings and to increasing the runway availability and decreasing flight cancelations.
Dozer				Note: With the increase of surfaces "2015 Apron Expansion" increased need to push more snow at a further distance. Currently has no airport Dozer.

Table CA-20 Resolute Bay

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (56620 m2)	2008			Major Overlay and replenish stockpile
Runway (120,841 m2)	2008	N/A	High	Minor Overlay
New Taxilane C				Major Overlay and replenish stockpile
				EK-35 Full Application
				No condition changes from 2014 update.
Groundside Pavements				
Access Road	N/A			Maintain with O & M funds
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				**ACAP**
FEC	1998			good for another 11 years
Runway Edge Lighting				Airfield Lighting Upgrade
VASI	1991			Replace VASI with PAPI, need drawings
Buildings & Other Facilities				
ATB:	1998	Good	Low	648 sq. m in 1998
Building Envelope				
H & V				Security System, ATB and Airfield
Finishes				
Electrical				
Maintenance Building	1999	Good		
Old Fuel distribution System	N/A		Medium	Site remediation required, need to remove pipes equipment and tanks
Perimeter Security Fencing				Perimeter Security Fencing (8km)
Mobile Equipment				
Truck - Administrative (pickup/suburban/other)	1989			GMC Suburban
Truck - Runway (Admin pickup)	2016			Ford F-150
Truck - Runway (Admin pickup)	2003			Ford F-250
Truck - Trades (pickup/van/other) x 2	2008 and 2012			Ford F150
Truck - Dump/Plow S/A	1991			IHC Paystar 5070
Truck - Dump/Plow S/A	2012			Freightliner
Truck - Tractor	1979			GMC Brigadier J9500
Truck - Dump	1979			Arnes Dump
Water Truck	1983			F6000 Med Duty
Wheel Loader	2013			Caterpillar 950K
Wheel Loader	2006			Caterpillar 950H
Motor Grader	2019			Caterpillar 140M3 Grader
Motor Grader	1995			Champion 740
Snowblower - Self-Propelled	2017			T85
Snowblower - Self-Propelled	1985			Idaho Norland 2EC-52
Packer - Wobbly Wheel x 2	1981			
Packer - Wobbly Wheel	2010			WRT PT13
Plow – Special x 2	1991 and 1996			Frink R09M
Skid Steer	2020			Caterplillar 299D3XE
Welder	1978			Cannox BR300
Forklift	1973			Hyster H80C
Screening Plant	1990			Coney
Special	2008			Wausau WRO 10

Table CA-21 Sanikiluaq

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (8,880 m2)	2013	Average	Medium	Minor Overlay
Runway (34,740 m2)	2013	Average		Major Overlay and Gravel Stockpile
				Minor overlay
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road	N/A			None
Parking lot	N/A			Maintain with O & M funds: Needs to be expanded, currently to small
Airside Electrical				**ACAP**
				Airside Electrical costs includes items below
FEC	1997	Average	Medium	Replace FEC.
Runway Edge Lighting	1997			Replace Runway Edge Lighting
Buildings & Other Facilities				
ATB:				206 sq. m.
Building Envelope		Poor	High	Minor Rehab of ATB - Not done 2015. Front porch also required as strong south winds open doors
H & V	2020	New	Low	Airside Accessibility Ramp completed 2020
Finishes				ATB Security System
Electrical				
Maintenance Building	2010			
Mobile Equipment				
Truck - Runway (pickup/other)	2019			Ford F-150
Truck - Dump/Plow T/A	2013			Freightliner 108 SD
Motor Grader	2004			Caterpillar 140H
Snowblower	2019			Larue D50 Mount
Packer - Wobbly Wheel	2019			WRT PT13
Packer - Wobbly Wheel	2015			WRT PT13
Loader	2016			938K Cat

Table CA-22 Sanirajak

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (30,733 m2)	2002			
Runway (70,104 m2)	2002	Poor	High	Stockpile and major runway overlay.
				ACAP $10M project underway to produce gravel, major overlay and replace electrical.
				Minor Overlay from Stockpile
				Replenish Stockpile + Major Overlay
				EK-35 Full Application Minor and Major Runwa
Groundside Pavements				
Access Road				Hamlet
Parking lot				maintain with O & M funds
Airside Electrical				**ACAP**
				Airside Electrical cost includes items below
FEC	1982	Poor		New FEC + back-up generator included as part of $10M ACAP underway 2020.
Runway Edge Lighting	1982	Poor		Airfield lighting upgrade. Design Underway
				Costs included in approved Capital Project
Buildings & Other Facilities				
ATB (401 m2):	1982	Poor		ATB requires exterior rehabilitiation
Building Envelope				Airside Accessibility Ramp Required
H & V		Poor	High	Capital Project to Replace ATB
Electrical				ATB Security System
Maintenance Building	1982	Average	High	Needs rehab (may be done with O & M)
Mobile Equipment				
Truck - Runway (pickup/other)	2018			GMC Sierra
Truck - Runway (pickup/other)	2001			GMC Silverado
Truck - Dump/Plow S/A	2000			Freightliner
Wheel Loader	2014			Cat 938K
Wheel Loader	1995			Case 721B
Motor Grader	2006			Volvo G720B
Snowblower - Mounted	2013			D50 Laure
Packer - Wobbly Wheel	2019			WRT PT13
Packer - Wobbly Wheel	2001			WRT PT13
Skid Steer	2021			On Order
Plow - Angle/Dozer	2010			Caterpillar D6T
Water Tank - Trailered	1986			Westank

Table CA-23 Taloyoak

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (8,775 m2)	2013		Low	Minor overlay from stockpile
Runway (33,000 m2)	2013	N/A	Low	Major overlay and new stockpile
				Minor overlay from stockpile
				good stockpile in condition 2,000 cu. m
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road	N/A			None
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				
FEC	2013	Good		Replace at end of life (25 years)
Runway Edge Lighting	2013			
Buildings & Other Facilities				
ATB:	1980	New		New terminal was completed in 2018
Building Envelope				ATB Security System
H & V				
Finishes				
Electrical				
Maintenance Building	N/A			New 3 Bay Parking shelter w/ concrete floor - still required
Equipment				
Truck - Runway (pickup/other)	2016			Ford F150
Grader	2008			Volvo
Wheel Loader	2012			938K
Snowblower - mounted	2020			Larue D50
Packer - Vibratory	1997			Bomag BW6
Packer - Wobbly Wheel	1980			WRT PT13
Packer - Wobbly Wheel	2001			WRT PT13

Table CA-24 Whale Cove

Item/Facility	Last Rehabilitated or Constructed or Purchased	Current Condition 2020	Priority or Status	General Comments
Airside Pavements				
Taxiway/Apron (6,678 m2)	N/A	Very Poor	High	New Stockpile and Major Overlay Runway (ACAP Proposal in planning)
Runway (36,570 m2)	N/A	Very Poor	High	Minor Overlay from stockpile
				Replenish stockpile + major overlay
				Airfield Electrical Upgrade Required
				Currently Rocks penetrating surface, no crown, no shoulder, major over required.
				EK-35 Full Application Minor and Major Runway Overlay
Groundside Pavements				
Access Road	N/A			Full overlay (stockpile should cover)
Parking Shelter	N/A			Parking Shelter has a gravel floor and is an environmental hazard with the possibility of contamination
Parking lot	N/A			Maintain with O & M funds
Airside Electrical				**ACAP**
				Airside Electrical cost includes items below
FEC	2000	Good		Replace FEC
Runway Edge Lighting	2000			Replace Runway Edge Lighting
Buildings & Other Facilities				
ATB:	2019-2020	Very Poor	High	New ATB - In Progress with Back-Up Generator
Building Envelope				ATB Security System
H & V				
Finishes				
Electrical				Back-Up Generator - currently no back-up/emergency power available
Maintenance Building	2013	Good		Parking Shelter needs concrete floor
Mobile Equipment				
Truck - Runway (pickup/other)	2015			GMC Sierra
Truck - Runway (pickup/other)	2010			GMC Sierra
Wheel Loader	2006			Cat 950H
Truck - Plow	2019			Western Star 4900
Snowblower - Mounted	2017			Larue D50
Packer - Wobbly Wheel	2003			WRT PT13
Motor Grader	2018			Cat 140