Airfield Pavement Condition Survey
For
Ignace Municipal Airport
Ignace, Northern Ontario

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Submitted To:

MINISTRY OF TRANSPORTATION OF ONTARIO

Transportation Policy Branch
777 Bay Street, 30th Floor
Toronto, Ontario
M7A 2S8

Forward

AMEC Earth & Environmental was awarded the contract to undertake Airfield Pavement Conditions Survey/Reports for 41 Municipal Airports in Ontario.

This work is in support of the recently created Minister's Air Advisory Panel of which the Airport Management Conference of Ontario (AMCO) and the Community Airports Group of Ontario (CAGO) are members.

The Air Advisory Panel was created by the Minister of Transportation to provide information and advice on the development of an Air Transportation Policy for the province of Ontario. At the first meeting of the Panel, it was recommended that a geotechnical pavement assessment or survey of airfield pavement conditions be undertaken for a number of Ontario's Municipal Airports. The survey results will give Panel members an understanding of the resources required for any future rehabilitation work.

The following are the list of airports where survey work has been undertaken:

Northern Ontario (18 airports):

Atikokan, Chapleau, Cochrane, Earlton-Timiskaming, Elliot Lake, Gore Bay, Geraldton (Greenstone Regional), Hornepayne, Ignace, Iroquois Falls, Killarney, Kirkland Lake, Manitoulin East, Manitouwadge, Marathon, Parry Sound, Hearst (Rene Fontaine), Wawa.

Southern Ontario (23 airports):

Arnprior/South Renfrew, Brantford, Brockville, Carp, Chatham-Kent, Cornwall, Goderich, Haliburton-Stanhope, Hanover/Saugeen, Kincardine, Barrie-Orillia (Lake Simcoe Regional), Lindsay, Muskoka, Welland/Niagara Central, St. Catharines (Niagara District), Oshawa, Owen Sound, Pembroke, Peterborough, Smiths Falls-Montague, St. Thomas, Tobermory, Wingham

Additional southern Ontario airports (5):

Five airports that have recently completed Airfield Pavement Studies (Collingwood, Midland/Huronia, Stratford, Tillsonburg, Wiarton-Keppel) will be included in the final summary report.

The survey work is intended for informational purposes only and does not reflect the views or positions of the Government of Ontario.

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APPENDICES

1.0 INTRODUCTION

AMEC Earth and Environmental, a division of AMEC Americas Limited (AMEC), Consulting Geotechnical, Materials Quality Control and Environmental Engineers, was retained by MTO Central Region to carry out a visual inspection of airside pavements and the completion of a Pavement Condition Survey for 41 Municipal Airports in Ontario. This Assignment includes: runway(s); the main aircraft parking apron(s); the main connecting taxiway(s).

2.0 METHODOLOGY PAVEMENT VISUAL SURVEY AND EVALUATION

AMEC completed a pavement condition survey of the airside at Ignace Municipal Airport on June 3rd, 2008. The identification and classification of the pavement distresses was in accordance with the Transport Canada procedures and included photographs of typical conditions. A site plan of the airport is presented in Appendix 'A'.

3.0 PAVEMENT HISTORY

Main Runway 05-23 measures 1,070.5 m X 23 m.
Taxiway measures 172 m X18 m
Apron measures 100 m X 51 m.

MTO Pavement Expenditures for Ignace Municipal Airport

- Initial funding approval/agreement 1978.
- Municipal Airport Development Agreement June 21, 1982.

June 1996: Runway pavement repairs. Cost estimate - $30,000.

4.0 CONDITION SURVEY

Main Runway 05-23 and the taxiway and apron surveyed in 3rd June 2008. For details of the current pavement condition, we refer to Table 1 appended. Table 1 provides a summary of the condition rating of each airside pavement area. Pavement distress Terminologies are illustrated in Appendix 'A' and condition survey photos are presented in Appendix 'B'.

Main Runway rated in a 'good condition' as shown on Photo Nos. 1 to 3.
Main Taxiway rated in a 'fair to poor condition' as shown on Photo Nos. 4 and 5.
Main Apron rated in a 'poor condition' as shown on Photo Nos. 6, 7 and 8.

5.0 RECOMMENDATIONS

As a general rule, in order to ensure long-term performance, cracks in the pavement must be sealed to prevent moisture penetration into the regular base/subbase layers. This moisture penetration causes loss of support as well as erosion or loss of material through the crack. Normally, cracks should be routed and sealed as they form. Sealing of the cracks helps to minimize their propagation and also minimizes the potential for Foreign Object Damage (FOD) as a result of deterioration of the cracks. Once cracks become either too large, or too frequent, sealing of cracks becomes impractical and it then becomes necessary to either reconstruct the pavement or provide an overlay. Placing the overlay at the correct time is critical. Postponing placement of an overlay allows the pavement to continue to crack and/or the existing cracks to become more severe. These cracks will then quickly reflect through the new overlay.

The documented distress on these airside pavement areas is generally associated with ageing and thermal effects. Consequently, future pavement rehabilitation is required to improve the surface/ride condition.
It is our opinion that the pavement of Taxiway and the Main Apron are experiencing significant distress and some form of rehabilitation is now required. If nothing is done at the airport, the existing cracks will continue to propagate and deteriorate causing an increasing Foreign Object Damage (FOD) hazard.

An overlay can be considered for the main Runway, but not for Taxiway and Apron due to the ravelling/extensive crack pattern that will reflect up through the new surface within a few years and then ongoing crack maintenance will be required.

As an alternative, considering site conditions, we believe that the most suitable method of rehabilitation of Taxiway and Apron would be in-place pulverization of the asphalt and mixing with the existing granular base. The exposed granular base could then be regraded / reshaped to allow for grade adjustments, followed by placement of a minimum 100 mm of Granular A base and 80 mm of new HMAC placed in two lifts. This process would eliminate the potential for reflection cracking of the existing crack pattern through the new asphalt (compared to simply providing an overlay).

Based on our assessment of the pavements, we would recommend the following activities be considered for future planning purposes.

Year	Activity	Budget Estimate ($)
Runway 05-23 Year 2008 Year 2010-2013*	Rout and Seal Cracks Overlay 50 mm of HMAC	$5,000 $223,000
Taxiway Alpha Year 2008	Pulverize existing asphalt Add 100 mm of Granular A Overlay 80 mm of HMAC	$68,500
Main Apron Year 2008	Pulverize existing asphalt Add 100 mm of Granular A Overlay 80 mm of HMAC	$110,000
	Totals	**$406,000**

The Rehabilitation Year is 2010 – 2013; the cost was discounted for 5 years and the discount rate was 5.0% as determined by the Ministry of Finance.

The above estimate is based on the current 2007 draft estimated unit for the use of life cycle cost analysis on MTO projects. The unit rates is used for general planning purposes only and does not include any engineering design or contract administration fees. The cost includes only paving related expenses and does not include lighting and navigation modifications or line painting.

Prior to detail design of any pavement rehabilitation, **a geotechnical program** involving boreholes and cores should be carried out to assess existing asphalt and granular thicknesses and confirm subgrade strength and frost susceptibility as well as verify if any pavement strengthening is required. Following completion of the borehole program, detailed construction recommendations can be provided.

6.0 REPORT LIMITATIONS

The Limitations of Report forms an integral part of this report.

The airfield pavement condition evaluation and recommendations given in this report are based on our site visit and our general experience with pavement of this type. While the comments and recommendations given reflect this methodology in an objective fashion, assessing the severity of distresses and determining pavement damage is still somewhat subjective. The recommendations given in this report are based on the current visual condition of the pavements. It must be recognized that additional pavement distress may develop before the rehabilitation work is initiated.

The recommendations included in this report, although site specific, have a general nature. Once the intended design details and construction methods are available, we recommend a geotechnical consultant be retained to review this information to ensure conformance with the assumptions and limitations considered.

We trust that the information presented in this report is complete within our terms of reference. If you have any questions, please do not hesitate to contact our office.

Respectfully submitted,

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Table 1
2008 Pavement Condition Survey Report - Asphalt Surfaces

	General Condition	Alligator Cracking	Map/Block Cracking	Transverse Cracking	Longitudinal Cracking	Rutting	Ravelling	Bleeding	Frost Heaving	Subgrade Settlement	Patching	Potholes	Smoothness
Runway	7		2/0	3/2	2/2					0/0			6-7
Taxiway	4 - 5			3/2	3/2								5
Apron	3 - 4		3/2	4/2	4/1				1/0	1/0			5

General Condition Rating

General Condition Rating
Excellent (Rating 9-10)
Good (Rating 7-8)
Fair (Rating 5-6)
Poor (Rating 3-4)
V. Poor (Rating 1-2)

Severity/Density (Rating)

0	1	2	3	4	0	1	2	3	4
Severity of Distress					Density of Distress				
Very Slight/None	Slight/Minor	Moderate	Severe/Major	Very Severe/extreme	Few	Intermittent	Frequent	Extensive	Throughout
<2mm	2-12mm	13-19mm\	20-25mm	>25mm	<10%	10-20%	20-50%	50-80%	80-100%

TRANSPORT CANADA TERMINOLOGY FOR STRUCTURAL DEFECTS FOUND IN ALL TYPES OF AIRFIELD PAVEMENTS

Alligator Cracking

Alligator cracking is a very serious load-associated defect normally found in the aircraft wheelpaths. It is caused by severe structural overloading and poses an immediate FOD hazard. In the initial stages, only fine hairline cracks may be evident. As development of the defect progresses, the cracks will widen and begin to interconnect to form a series of small polygons resembling the hide of an alligator. Spacing between cracks is usually 50 to 300 mm.

Map Cracking

Map cracking is identified by large scale patterned cracks intersecting at a spacing of 500 mm to 2 metres. Map cracking occurs only in the wheelpaths (load associated) - otherwise the defect is block cracking (see below). Map cracking may be accompanied by wheelpath rutting or settlement.

Map cracking is caused by excessive deflection of the pavement under load. It is similar to alligator cracking but the yielding layer is at a much deeper level in the pavement, most likely in the subgrade.

Block cracking

Block cracking is identified by intersecting transverse and longitudinal cracks forming rectangular blocks that may vary in size with a spacing of up to 3 by 3 metres. Block cracking may appear to be similar to alligator cracking but it is not limited to wheelpath locations (i.e. block cracking is not load-related) and will frequently occur throughout the entire pavement surface. Block cracking is normally found in older asphalt surfaces.

Transverse and Longitudinal Cracking

Surface cracking is by far the most common defect found in pavements. Cracks can run perpendicular (transverse), parallel (longitudinal) to the direction of traffic or in a meandering random pattern across the surface.

Transverse, thermal cracks caused by cold temperature contraction of the surface layer will occur to some degree in all asphalt pavements.

Longitudinal cracks can be caused by opening of paving lane joints or by repeated over-stressing of the wheelpath area by heavy aircraft traffic.

Secondary cracking may eventually develop adjacent to the main crack which can lead to pieces of pavement dislodging from the surface and creating a FOD hazard for aircraft. Environmental factors also play a large role in the structural breakdown of pavement cracks. Water can enter the crack, washing out fines from underneath and eroding support for the pavement.

Just because a pavement is cracked does not mean that it has failed. A pavement is only considered to have failed when the cracking has become so severe that the structural integrity of the surface is jeopardized or the cracking creates a roughness problem.

Wheelpath Rutting

Rutting is a load-related depression found in the wheelpath area. Depending on the failure mode, rutting may be seen simply as the consolidation of pavement layers in the wheelpath or may be made worse by the upheaval of the pavement area adjacent to the wheelpath. A visual check for rutting can be made by placing a straight-edge across the wheelpath area. Rut depths exceeding 40 mm are considered excessive.

Ruts can cause problems with the directional control of aircraft which can become very critical should water accumulate in the ruts during rainstorms and lead to hydroplaning problems.

Ravelling

Ravelling is the disintegration and subsequent loss of the asphalt surface. It is evidenced by the pop-out of surface aggregates and/or the loss of surface fines from the asphalt mix. Severe cases of ravelling are characterized by loose gravel and fine pavement material lying on the surface representing a FOD hazard for aircraft.

Bleeding

Bleeding is a film of asphalt binder on the pavement surface. It usually creates a shiny, glass-like reflecting surface that can become quite sticky.

Bleeding is also accumulation of asphalt binder (cement) on the pavement surface - normally in the wheelpath areas. Bleeding can be caused by excess asphalt cement and/or insufficient voids in the asphalt mix, with the excess asphalt being flushed to the pavement surface by wheel loads during hot weather. Pavement areas affected by bleeding reduce the friction available for aircraft braking and can become very slippery - especially when wet.

Potholes

The usual end result of structural deterioration is the pop-out of surface material which creates a FOD (Foreign Object Damage) hazard for aircraft (right).

Frost Heave Damage

Frost heave is the vertical movement of the pavement surface during winter or early spring, with subsequent resettlement after subsurface thaw. Normally, only differential heaving is of concern.

Frost heave is caused by ice lenses forming in a frost-susceptible subgrade soil when a source of subsurface water and freezing temperatures are present. Surface water can reach the subsurface frozen zone through open cracks or joints in the pavement. Sometimes, the frost action forces are great enough to raise boulders located in the subgrade.

Frost heaving is considered more critical if it occurs in the wheelpath area as opposed to the pavement edge. The effect is increased roughness levels during aircraft operations over the affected area.

Subgrade Settlement/Depression and Surface Ponding

Subgrade settlement can occur in any type of pavement - but perhaps, more commonly in asphalt pavements. Subgrade settlement is evidenced as a depression in the pavement surface, usually over a fairly extended area, and may occur anywhere in the pavement surface. Pools of standing water (or "bird baths") may develop on the pavement surface during and after rainstorms in areas of settlement.

Depending on their location, pools of standing water on the surface may represent a potential hydroplaning problem.

Surface Patching

Patching is the post-construction replacement of the pavement surface in a localized area usually to correct a pavement structural defect or deficiency. Patching can become a structural deficiency in itself if the patched area becomes extensive in size, begins to spall, or creates additional surface roughness.

Site Plan

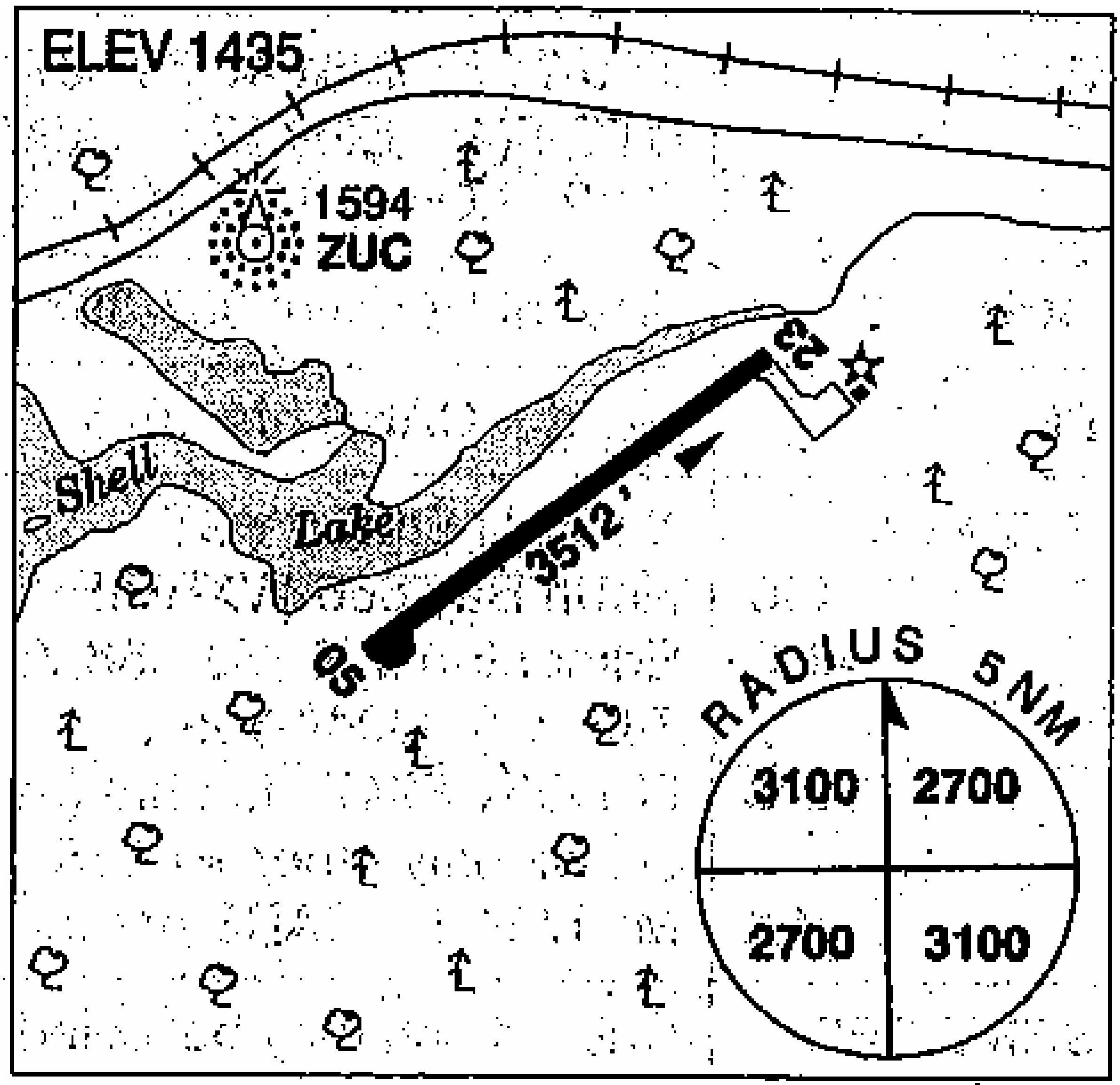
ELEV 1435
1594
ZUC
Shell
Lake
3512'
05
23
RADIUS 5 NM
3100
2700
2700
3100

Photo No. 1 Runway 05-23 – Longitudinal cracking (sealed)

Photo No. 2 Runway 05-23- Severe transverse cracking (sealed) with subgrade settlement.

Photo No. 3 Runway 05-23 – Typical surface defects

Photo No. 4 Taxiway - Longitudinal cracking (sealed)

Photo No. 5 Taxiway – Typical surface defects, (sealed block craks)

Photo No. 6 Apron – General View

Photo No. 7 Apron – Transverse cracking. (severe)

Photo No. 8 Apron – Typical surface defects.