Civil Aviation Authority of Fiji

GUIDANCE MATERIAL

Runway Friction Characteristics and Friction Testing

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PREFACE

This Guidance Material (GM) is published by the CAAF for purposes of promulgating supplementary guidance material to that published in the Authority's Standards Documents. This GM provides guidance to aerodrome operators and regulatory staff on the functional measurement of friction-related aspects related to runway construction and maintenance.

Excluded from this section is the operational, as opposed to functional, measurement of friction for contaminated runways. However, the devices used for functional measurement could also be used for operational measurement, but in the latter case, the figures given in Airport Services Manual (Doc 9137), Part 2, Table 3-1 are not relevant.

This GM explains certain regulatory requirements by providing interpretive and explanatory materials.

CIVIL AVIATION AUTHORITY OF FIJI CHIEF EXECUTIVE

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ACTING CHIEF EXECUTIVE

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1. INTRODUCTION

1.1 Overview

1.1.1 The SD-Aerodrome Appendix 10 details requirements for aerodrome maintenance for aerodromes operating under an aerodrome operator certificate. Section 2.14.2 requires that the certificate holder's maintenance programme "provide for the surface of paved runways to be maintained in a condition that provides good surface friction characteristics and low rolling resistance for aircraft".

1.1.2 This guidance provides details on the friction levels that should be used by aerodrome operators for runway friction testing and guidance on the processes to be used.

1.1.3 The purpose of this advisory circular is to—

(a) outline the procedures that should be used for undertaking runway surface friction assessments; and

(b) to define the criteria by which friction values should be assessed on runways under specified conditions.

1.1.4 Runway friction testing may be carried out by contractors unfamiliar with aerodrome operational requirements, therefore an outline of requirements when working on aerodromes has been included in this guidance material along with the training requirements for contractor's personnel to give potential contractors an appreciation of their responsibilities when working on an operational aerodrome.

1.1.5 These requirements are based on international best practice using material and requirements prescribed by the International Civil Aviation Organisation (ICAO) as well as other civil aviation authorities.

1.1.6 The procedures in this guidance are only for testing of runway friction levels of a runway surface for maintenance purposes. Results should be made available to aerodrome users on application. They should not be communicated to the crews of aircraft intending to use the runway during periods of surface contamination. Contaminated runways should be assessed and the surface conditions reported in accordance with SD-AD APP 10.

1.2 Abbreviations and Glossary

CFME	Continuous Friction Measuring Device
DOL	Design Objective Level
MFL	Maintenance Friction Level
MPL	Maintenance Planning Level

Continuous friction measuring equipment (CFME)
A device designed to produce continuous measurement of runway friction values.

Design objective level (DOL)
The friction level to be achieved or exceeded on a new or resurfaced runway.

Maintenance planning level (MPL)
The friction level below which corrective maintenance action should be initiated.

Minimum friction level (MFL)
The friction level below which information that a runway may be slippery when wet should be made available

Portions of the pavement
A rectangular area of the runway width running the declared length, referred to as the 'central' trafficked portion and two 'outer' portions.

Runway surface friction testing
The assessment of friction carried out under conditions of self-wetting using a CFME.

2. REQUIREMENT FOR FRICTION TESTING

2.1 Introduction

2.1.1 SD-AD para 1.6 refers to requirements the applicant must meet before a certificate is issued. In this guidance, reference may be made to the certificate holder, not the applicant as stated in the SD-AD, because the holder must continue to comply with the same requirements that were met before the certificate was issued.

2.1.2 All matters are applicable to holders of an aerodrome operator certificate, but only those specifically included in a determination made by the Authority are applicable for holders of an aerodrome operator certificate. The SD-AD references are those applicable for aerodrome operator certificate holders.

2.1.3 The surface condition of a runway has a major safety impact on aircraft operations in particular on aircraft landing performance. Low friction levels and contaminated runway surface can result in aircraft overruns and run-off incidents.

2.1.4 In Fiji there are a range of runway surface types each with different characteristics requiring individual aerodrome operators to closely monitor the friction levels. This monitoring assists in ensuring that the runway friction levels are kept to an acceptable level and assists in the planning of maintenance.

2.1.5 A runway surface friction test is conducted under controlled conditions using self-wetting equipment to establish the friction characteristics of a runway and to identify those areas of a runway surface that may require attention.

2.2 Friction deterioration

2.2.1 The skid-resistance of runway pavement deteriorates due to a number of factors, the two predominant ones being mechanical wear and polishing action from aircraft tyres rolling or braking on the pavement, and the accumulation of contaminants, chiefly rubber, on the pavement surface. The effect of these factors is directly dependent upon the volume and type of aircraft traffic.

2.2.2 Other influences on the rate of deterioration are local weather conditions, the type of pavement, the materials used in original construction, any subsequent surface treatment and airport maintenance practices.

2.2.3 Structural pavement failure such as rutting, cracking, joint failure, settling, or other indicators of distressed pavement can also contribute to runway friction losses. It is important that runway inspections identify any changes in surface condition so that appropriate and timely remedial action can be undertaken.

2.2.4 Contaminants, such as rubber deposits, jet fuel, oil spillage, moss, algae, water, snow, ice, and slush, all cause friction loss on runway pavement surfaces. The most persistent contaminant problem is deposit of rubber from tyres of landing aircraft. This happens predominately at the touchdown areas on runways and can be quite extensive. Heavy rubber deposits can completely cover the pavement surface texture causing loss of aircraft braking capability and directional control, particularly when runways are wet.

2.3 ICAO requirement

2.3.1 ICAO Annex 14 Chapter 10 - Aerodrome Maintenance details the requirement for friction characteristics of runways under section 10.2 - Pavements. The Annex requirements cover measurement of friction characteristics and corrective maintenance action. These requirements are further detailed in the ICAO Doc 9137 - Airport Services Manual – Part 2.

2.3.2 Friction measurements are specified for all hard-surfaced runways serving turbojet aeroplanes because the higher weights and operating speeds of turbojet versus turboprop aeroplanes make turbojet-braking performance on runway surfaces, particularly when wet, a significant safety concern.

2.3.3 Consideration should also be given to measuring the friction characteristics of runways serving heavy turboprop aeroplanes (MCTOW 15,000 kg or greater), that have runway take-off and landing distance requirements close to the limits of available runway length.

2.4 Friction testing frequency

2.4.1 Regular friction testing enables an aerodrome operator to build up an overview of the runway condition over a period of time to identify any deterioration. This enables runway maintenance to be planned and targeted to enable levels to remain above the specified minimum friction level (MFL). The testing should be performed on a regular basis with accurate readings performed on the same calibrated device.

2.4.2 Initially, when setting up a runway friction testing programme, the frequencies outlined in Table 1 and Table 2 are recommended. Aerodrome operators should monitor the results of friction tests and, if necessary, vary the interval between assessments based on the results.

2.4.3 If historical data indicates the surface is deteriorating faster or slower than the rate used to establish the testing frequency, the frequency can be adjusted taking into account—

(a) the type, mix and frequency of aircraft operating on the runway;
(b) the specific micro- and macro-texture characteristics of the pavement surface;

(c) the presence, extent and severity of surface contaminants especially rubber build-up;
(d) the existence of pavement surface problems which may directly affect friction levels;
(e) pilot reports of low friction levels being experienced during aircraft braking;
(f) the frequency of past programs for the removal of surface rubber contaminants;
(g) any recent construction or maintenance of the pavement surface, and
(h) the results of past friction measurements.

2.4.4 The objective is to ensure that, when the friction level has reached the maintenance planning level (MPL), maintenance can be arranged and completed efficiently and in a timely manner, to ensure the friction characteristics do not deteriorate below the minimum friction level (MFL).

2.4.5 The aerodrome operator should record the justification for any variation from the recommended periodicity for assessments.

2.4.6 When it is suspected that a runway has become slippery under other than normal wet conditions, or due to unusual surface conditions, additional friction testing may need to be undertaken. Information detailing the nature, extent and severity of any unusual slippery runway conditions should be promulgated by NOTAM to provide a cautionary warning.

2.5 Turbojet aircraft operations

2.5.1 The operator of an aerodrome with significant jet aircraft traffic should schedule periodic friction testing of each runway that accommodates jet aircraft. It is recommended that every runway for jet aircraft be tested at least annually. Depending on the volume and type (weight) of traffic using the runway, testing may be needed more frequently, with the most heavily used runways needing testing as often as monthly, as rubber deposits build up.

2.5.2 Each runway end should be evaluated separately, for example: Runway 02 and Runway 20.

2.5.3 Runway friction measurements take time, and while tests are being conducted, the runway will be unusable by aircraft. Since this testing is not time critical, a period should be selected which minimizes disruption of air traffic.

2.5.4 Table 1 details the recommended frequency for friction testing for runways where turbojet aircraft operate. It is important the aerodrome operator assesses their own individual aerodrome needs.

Table 1 Friction testing frequency – Turbojet aircraft

Average number of turbojet movements on the runway per day	Minimum frequency of friction testing
Less than 15	1 year
16 to 30	6 months
31 to 90	3 months
91 to 150	1 month

2.6 Turboprop aircraft operations

2.6.1 A few aerodromes in Fiji have exclusively, or a high proportion of, turboprop aircraft operations. Although the operational landing speeds of these aircraft is less than a turbojet the friction levels of the runway are still very important.

2.6.2 The recommended frequency depends on aircraft type, weight and number of movements. Table 2 details the recommended friction testing for runways where turboprop aircraft with a MCTOW of 15,000kg or greater operate. It is recommended that for aerodromes serving turboprops less than this weight perform friction testing at least once every 5 years.

2.6.3 Each runway end should be evaluated separately, for example: Runway 02 and Runway 20.

Table 2 Friction testing frequency – Turboprop aircraft (MCTOW 15,000kg or greater)

Average number of turboprop operations on the runway per day	Minimum frequency of friction testing
Less than 15	5 years
16 to 30	3 years
31 to 90	1 year

2.7 Testing following maintenance activities

2.7.1 The friction characteristics of a runway can alter significantly following maintenance activities, even if the activity was not intended to affect the friction characteristics. Therefore, a runway surface friction assessment should be conducted as soon as practicable, following any significant maintenance activity conducted on the runway. If possible, this should be done before the runway is returned to service.

2.7.2 If the runway surface friction assessment indicates that the friction characteristics of an area of the runway, that has been subject to maintenance work are poorer than anticipated or fall below the acceptable levels additional assessments, testing should be performed over a period of time to ascertain whether the friction characteristics remain stable, improve, or if additional work should be carried out.

2.8 Testing following reports of poor braking action

2.8.1 Runway surface friction assessments should also be conducted following a period of poor braking action reports on a dry, damp or wet run surface, if there are visible signs of runway surface wear, or for any other relevant reason.

3. FRICTION TESTING PROCESS

3.1 Introduction

3.1.1 Runway friction testing requires the use of continuous friction measuring equipment (CFME) together with trained personnel to conduct the tests. If an aerodrome operator does not have CFME and trained staff to operate it, arrangements should be in place to access a unit with trained operators whenever testing is required.

3.1.2 If a contractor is used it is important that that the CFME is appropriate for runway surface testing, and the operators are trained to perform runway friction testing.

3.2 Equipment requirements

3.2.1 There are a variety of CFME on the market, however, all use on the same principles to determine the runway friction characteristics. The Mu-Meter and the Grip Tester are the predominant makes used in Fiji.

3.2.2 Irrespective of whether the aerodrome owns the CFME or has hired a contractor, before conducting friction surveys the aerodrome operator should ensure—

(a) the equipment has been serviced and maintained in accordance with the manufacturer's requirements, and is in full working order; and

(b) the friction measuring system and components have been calibrated in accordance with the manufacturer's instructions and its performance has been confirmed to be within the manufacturer's specified tolerances; and

(c) for CFME fitted with self-wetting systems—

(i) the water flow rate is correct; and
(ii) the amount of water produced for the required water depth is consistent and applied evenly in front of the friction measuring wheel(s).

3.2.3 It is recommended that, before and after undertaking the runway friction tests, the CFME is checked on a defined test strip of pavement that is not used for aircraft operations. Comparison of the sample readings with previous results will quickly verify the CFME performance.

3.2.4 Additional information on specifications for CFME can be found in the ICAO Airport Services Manual Part 2, Chapter 5, and the FAA advisory circular AC150/5320-12C Appendix 3.

3.3 Personnel working on aerodromes

3.3.1 All personnel undertaking runway friction tests need to comply with the general requirements for personnel working on operational areas of an aerodrome, or be accompanied and supervised at all times by someone who does. In particular they must—

(a) be familiar with, and follow the established procedures for working on an operational aerodrome; and

(b) be trained in radio procedures, including ATC phraseology and the importance of complying immediately with any instructions to vacate the manoeuvring areas; and

(c) be provided with a two-way radio for communications with the air traffic services unit at the aerodrome; and

(d) have a vehicle equipped with a flashing or rotating beacon or a chequered flag for day time testing, or a flashing or rotating beacon for night time testing.

3.3.2 Before any work starts personnel should be fully briefed operational procedures, method of work plans (MOWP) and safety plans, and any other matters relevant to the work being carried out.

3.4 CFME operators

3.4.1 The success of friction measurement in delivering reliable friction data depends heavily on the personnel, who are responsible for operating the equipment. It is important that CFME operators are fully trained and competent, to use the equipment and are aware of the critical factors affecting the accuracy of friction measurements.

3.4.2 Where a contractor carries out the testing it is the responsibility of the aerodrome operator to be satisfied as to the competency and experience of the CFME operator.

3.4.3 CFME operators should have been—

(a) trained to—

(i) service and maintain the equipment; and

(iii) check its calibration and verifying it is working properly; and

(iv) operate the machine and carry out friction testing; and

(b) understand—

(i) runway friction testing procedures; and

(ii) requirements and procedures when working on operational areas; and

(c) assessed as competent to carry out runway friction testing; and

(e) where appropriate, have received recurrent training and assessments.

3.4.4 Records must be kept as evidence that training and competency assessments have been completed.

3.5 Environmental conditions for friction testing

3.5.1 Environmental conditions can affect the friction testing results. The test should be conducted when—

(a) the runway surface is dry, free from precipitation, and has no wet patches; and

(b) the ambient air temperature is above 2° C.

3.5.2 Dampness, fog and mist conditions may affect the outcome of the test and cross-winds may affect self-wetting testing.

3.5.3 Where necessary, aerodrome operators should seek advice on any environmental issues from the CFME manufacturer.

3.6 Runway surface friction testing procedure

3.6.1 Friction readings for the survey run are collected by the CFME along the entire pavement length. Several runs are made along the runway, offset on either side of the centreline, and in both directions.

3.6.2 The runway is normally divided into zones 100 metres in length with an average friction value determined every 10 metres along a run, enabling a 100-metre rolling average to be calculated. Another method uses discrete averaging for interpretation immediately after the testing.

3.7 Location of friction testing runs

3.7.1 The friction measurements are to be taken on tracks parallel to the runway longitudinal centreline, at right and left offsets, and in both landing directions.

3.7.2 The right and left offsets from runway centreline specified for friction measurements are based on the type and/or mix of aircraft operating on the runway. The lowest friction levels will generally occur in the wheel path areas, as a result of the wearing action of aircraft tires on the pavement surface texture characteristics, and the build-up of surface contaminants such as tire rubber.

Runways serving only narrow body aircraft: Friction testing should be conducted 3 metres from the runway centreline.

Runways serving narrow body and wide body aircraft: Friction testing should be conducted at both 3 and 6 metres from the runway centreline, to determine the worst-case condition. If, due to the undercarriage widths of certain aircraft operating, measurements at 5 and 7 metres can be used.

If the worst-case condition is found to be consistently limited to one track, future surveys may be limited to this track. Care should be exercised, however, to account for any future and/or seasonal changes in aircraft mix.

3.7.3 It is recommended that two friction measurement runs be performed at each of the right and left three and six metre offsets, as applicable. Results of the four measured runs can be averaged to determine "100 Metre Section Average Friction" values along the length of the runway and the overall "Runway Average Friction" value. The use of discrete values can be applied if the software is available, allowing a quick assessment of problem areas.

3.8 Friction testing work schedule

3.8.1 Ideally each runway direction should be tested separately, with friction test runs on either side of the runway centreline. The practice of one circular run for the whole runway results in only the friction values for one side of each direction of a runway being assessed.

3.8.2 If there are operational difficulties in conducting bi-directional tests, the aerodrome operator may implement a series of single direction tests to complete the testing programme. Appropriate processes should be in place to ensure the tests in both directions are completed.

3.9 Low friction values

3.9.1 When friction values below maintenance planning levels are measured, additional friction runs should be performed outside the wheel path area in order to assess the degree to which wear and contaminants have lowered friction levels in the centre trafficked area. A test track profile located 5 to 10 metres from the outer edge of the paved runway surface is normally optimum for the purposes of wear and contaminant comparison tests.

3.10 Vehicle testing speed

3.10.1 The tests should cover the maximum area of the runway, subject to the test vehicle having sufficient area to accelerate to the required speed and decelerate and stop safely. Standard runs should be carried out along the entire pavement length at a constant speed, starting with the run closest to the runway edge.

3.10.2 The friction test runs should be performed at two speeds, 65 km/h (40 mph) and 95 km/h (60 mph). The lower speed determines the overall mix of macro-texture and micro-texture/contaminant/-drainage condition of the pavement surface. The higher speed provides a further indication of the condition of the surface's macro-texture alone.

3.10.3 A complete survey should include tests at both speeds although operational requirements may limit this.

4. EVALUATION OF FRICTION TESTING RESULTS

4.1 Friction assessment levels

4.1.1 There are three published friction levels for runways—

(a) (Design objective level (DOL) - The friction level to be achieved or exceeded on a new or resurfaced runway.

(b) Maintenance planning level (MPL) - The friction level below which a corrective maintenance action should be initiated.

(c) Minimum friction level (MFL) - The friction level below which information that a runway may be slippery when wet should be made available.

4.1.2 Differing values for these friction levels are specified by different civil aviation authorities. It is recommended that the ICAO standards be used as the primary reference by the aerodrome operators, and other standards are only used if there are compelling reasons why ICAO should not be used.

4.1.3 The standard adopted by an aerodrome operator must be specified in the operator's Part 139 exposition.

4.1.4 Table 3 details the ICAO friction level standards for the Mu-Meter and the Grip Tester. Levels for other CFME can be found in ICAO Annex 14 - Volume 1, Attachment A-7.

Table 3 - CFME Friction Level Values

Friction level	Mu-Meter		GripTester	
	65kph	95kph	65 kph	95 kph
DOL	0.72 or greater	0.66	0.74 or greater	0.64
MPL	0.52	0.38	0.53	0.36
MFL	0.42	0.26	0.43	0.24

4.2 Action following a runway friction assessment

4.2.1 The raw data from the friction test should be interpreted by trained maintenance personnel familiar with friction testing requirements.

4.2.2 A report should be compiled from the raw data and compare the friction levels from the test against the published required friction levels. The report should also identify any areas where there are deficiencies, and make recommendations to address these.

4.2.3 The aerodrome operator should review the results of each runway friction assessment and where appropriate take the following action—

(a) If the friction level is below the MPL, maintenance should be arranged to restore the friction level, ideally to a value equal to or greater than the DOL.

(b) If the friction level is trending downwards, the aerodrome operator should consider increasing the frequency of assessments to ensure any further or rapid deterioration is identified in time for appropriate remedial action to be taken.

(c) If the friction level is below the MFL, maintenance should be arranged urgently to restore the friction level. In accordance with SD-AD APP1 para 11.7 a NOTAM should be issued advising that the runway may be slippery when wet.

(d) If the friction level is significantly below the MFL, the aerodrome operator should consider withdrawing the runway from use for take-off and/or landing when wet.

4.2.4 If there is any reason to doubt the accuracy of a runway surface friction assessment, it should be repeated.

4.3 Trend analysis

4.3.1 Friction testing results should be systematically recorded to allow the results to be monitored to identify trends and patterns. This enables analysis of the condition of the runway surface so timely preventative and/or corrective actions can be taken and, where appropriate, adjustments to the intervals between friction testing can be made. (See paragraph 2.4).

4.3.2 Any trend analysis must take into account the effects of using different CFME, equipment tyre wear and environmental factors. Effective interpretation of results can require normalization of test result data and factoring in issues that might affect the measurement data.

4.4 Rubber removal

4.4.1 One of the main causes of reduced runway friction levels is rubber deposits on the runway surface. There are various methods for rubber deposits removal, depending on the level of rubber deposits and the type of runway surface. Guidance on the removal of rubber can be found in ICAO Airport Services Manual Part 2, Chapter 8.

4.4.2 Rubber deposit removal processes can impact on other aspects of the runway surface condition. Aerodrome operators should get specialist advice when necessary to ensure that rubber removal does not adversely affect other characteristics of the runway surface.

4.5 Records

4.5.1 Aerodrome operators should keep records of all runway surface friction tests. The friction tests should be incorporated into the aerodrome maintenance plan, and used to monitor the overall health and condition of the runway surface.

The following items should be recorded for each assessment—

(a) Date and time of assessment.
(b) Type of CFME used.
(c) Name of operator.
(d) Runway assessed.
(e) Runway number and runway direction.
(f) Distance from the centreline and which side of centreline the run was performed.
(g) Distance from threshold the run was performed.
(h) Constant run speed (Km/h) for each run.
(i) Runway length.
(j) Amount of water film used.
(k) Surface condition (dry/damp/wet).
(l) Weather conditions and ambient temperature, and the runway surface and measuring wheel temperatures if available.
(m) Friction levels for each portion of the pavement. This can include average friction level for each third of the runway at each offset, direction, and speed.
(n) Overall friction level for full length of the runway and, if required the 10m friction averages in the touchdown zones.
(o) A comparison of the results with any previous surveys conducted, providing the same CFME has been used.
(p) Evaluation of friction levels between the reference non-trafficked test strip and the trafficked runway during the current survey.
(q) Any evaluations of the reference non-trafficked test strip between successive surveys.
(r) Any additional comments.

APPENDIX A – SAMPLE FRICTION TEST REPORT

A.1 Sample report

A sample friction test report showing typical test results follows.

2.0.1 Table: ICAO Friction Levels

	Design Objective Level	Above Maintenance Planning Level	Maintenance Planning Level	Minimum Friction Level
65 km/h	Greater than **0.73**	Between **0.73 & 0.52**	Between **0.52 & 0.42**	Less than **0.42**
95km/h	Greater than **0.63**	Between **0.63 & 0.36**	Between **0.36 & 0.24**	Less than **0.24**

*Swedish rounding has been used on the values presented in this report

5.1 Runway 02/20 65km/h

5.1.1 Table: Thirds averages Runway 02/20 - Testing at 65km/h

20/02 L6m 65km	20/02 L3m 65km	Zone	02/20 L3m 65km	02/20 L6m 65km
0.68	0.71	First Third	0.70	0.70
0.54	0.52	Mid Third	0.52	0.54
0.47	0.47	Last Third	0.50	0.51

5.1.2 Table: 100m averages Runway 02/20 - Testing at 65km/h

20/02 L6m 65km	20/02 L3m 65km	Chainage (m)	02/20 L3m 65km	02/20 L6m 65km
		02 End		
0.93	0.78	0 > 100	0.75	0.70
0.80	0.85	100 > 200	0.68	0.76
0.78	0.82	200 > 300	0.69	0.72
0.72	0.79	300 > 400	0.78	0.73
0.67	0.68	400 > 500	0.71	0.75
0.66	0.63	500 > 600	0.72	0.68
0.60	0.64	600 > 700	0.73	0.71
0.58	0.65	700 > 800	0.70	0.65
0.59	0.61	800 > 900	0.65	0.65
0.60	0.66	900 > 1000	0.66	0.69
0.60	0.66	1000 > 1100	0.67	0.63
0.62	0.58	1100 > 1200	0.60	0.57
0.56	0.58	1200 > 1300	0.56	0.57
0.55	0.55	1300 > 1400	0.55	0.54
0.57	0.54	1400 > 1500	0.57	0.61
0.49	0.53	1500 > 1600	0.52	0.52
0.49	0.47	1600 > 1700	0.48	0.48
0.48	0.47	1700 > 1800	0.46	0.47
0.54	0.51	1800 > 1900	0.48	0.49
0.54	0.54	1900 > 2000	0.51	0.56
0.55	0.51	2000 > 2100	0.53	0.56
0.54	0.50	2100 > 2200	0.46	0.58
0.55	0.49	2200 > 2300	0.48	0.51
0.50	0.52	2300 > 2400	0.49	0.47
0.42	0.45	2400 > 2500	0.47	0.51
0.51	0.51	2500 > 2600	0.63	0.47
0.49	0.46	2600 > 2700	0.53	0.50
0.47	0.48	2700 > 2800	0.50	0.47
0.47	0.46	2800 > 2900	0.46	0.49
0.42	0.45	2900 > 3000	0.47	0.49
0.41	0.38	3000 > 3100	0.51	0.53
0.45	0.43	3100 > 3200	0.50	0.61
		20 End		

Sample friction test report – Page 1 of 6

5.2 Runway 02/20 95km/h

5.2.1 Table: Thirds averages Runway 02/20- Testing at 95km/h

20/02 L6m 95km	20/02 L3m 95km	Zone	02/20 L3m 95km	02/20 L6m 95km
0.59	0.58	First Third	0.61	0.59
0.49	0.50	Mid Third	0.47	0.48
0.45	0.44	Last Third	0.50	0.45

5.2.2 Table: 100m averages Runway 02/20 – Testing at 95km/h

20/02 L6m 95km	20/02 L3m 95km	Chainage (m)	02/20 L3m 95km	02/20 L6m 95km
		02 End		
0.73	0.66	0 > 100	0.72	0.74
0.65	0.75	100 > 200	0.70	0.72
0.68	0.71	200 > 300	0.67	0.63
0.57	0.64	300 > 400	0.61	0.66
0.53	0.52	400 > 500	0.62	0.61
0.55	0.43	500 > 600	0.51	0.50
0.57	0.44	600 > 700	0.58	0.56
0.54	0.53	700 > 800	0.59	0.55
0.57	0.57	800 > 900	0.55	0.52
0.58	0.56	900 > 1000	0.57	0.57
0.56	0.56	1000 > 1100	0.54	0.48
0.55	0.54	1100 > 1200	0.54	0.61
0.53	0.52	1200 > 1300	0.51	0.51
0.49	0.49	1300 > 1400	0.49	0.48
0.51	0.49	1400 > 1500	0.49	0.49
0.45	0.48	1500 > 1600	0.46	0.44
0.45	0.46	1600 > 1700	0.44	0.46
0.46	0.44	1700 > 1800	0.42	0.43
0.47	0.51	1800 > 1900	0.41	0.45
0.50	0.51	1900 > 2000	0.52	0.50
0.47	0.59	2000 > 2100	0.46	0.43
0.50	0.46	2100 > 2200	0.42	0.50
0.48	0.44	2200 > 2300	0.52	0.49
0.47	0.45	2300 > 2400	0.48	0.43
0.48	0.52	2400 > 2500	0.43	0.53
0.52	0.51	2500 > 2600	0.53	0.49
0.48	0.43	2600 > 2700	0.55	0.48
0.46	0.45	2700 > 2800	0.47	0.43
0.43	0.42	2800 > 2900	0.44	0.44
0.43	0.42	2900 > 3000	0.50	0.45
0.36	0.36	3000 > 3100	0.61	0.46
0.43	0.39	3100 > 3200	0.50	0.31
		20 End		

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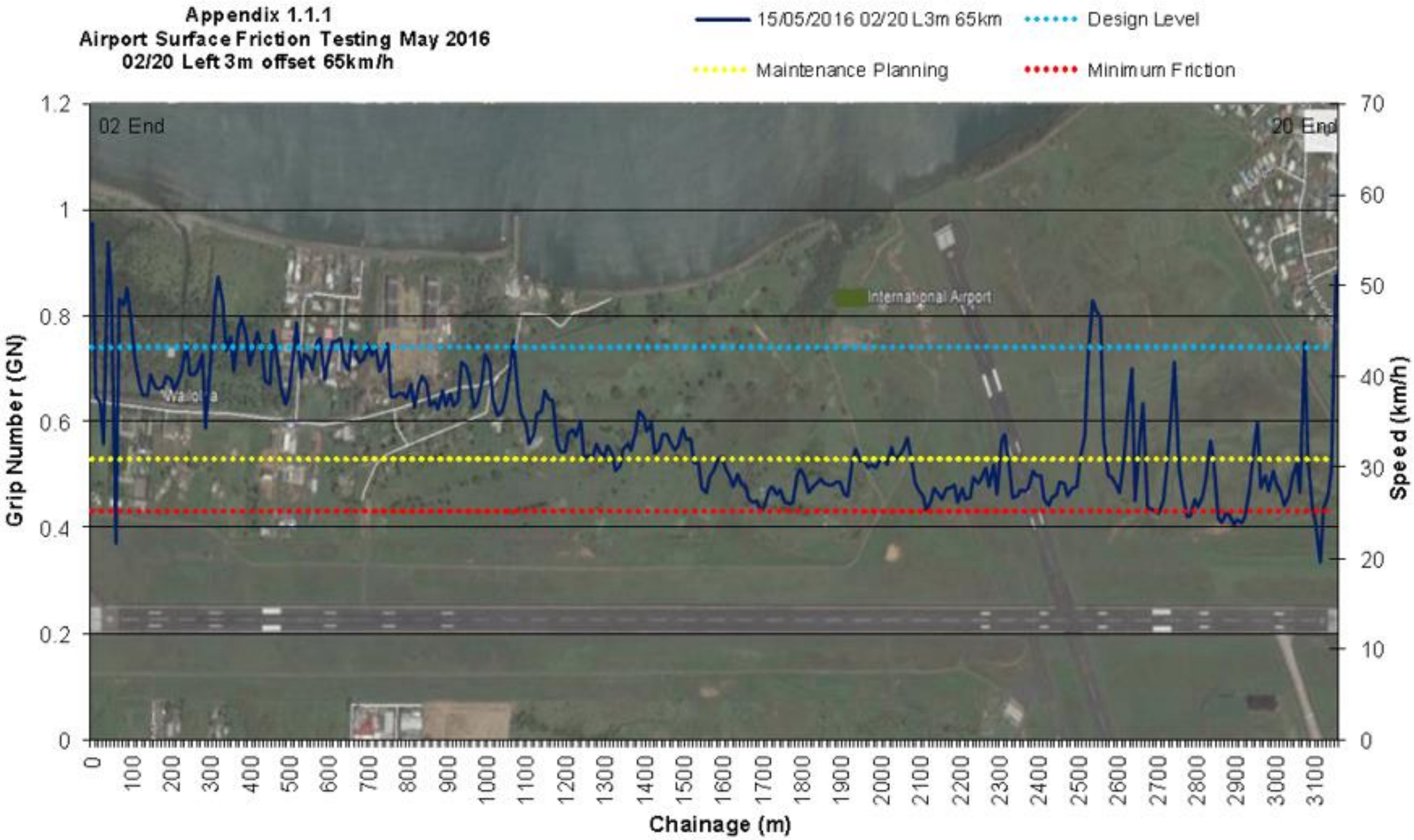
Appendix 1 Runway 02/20



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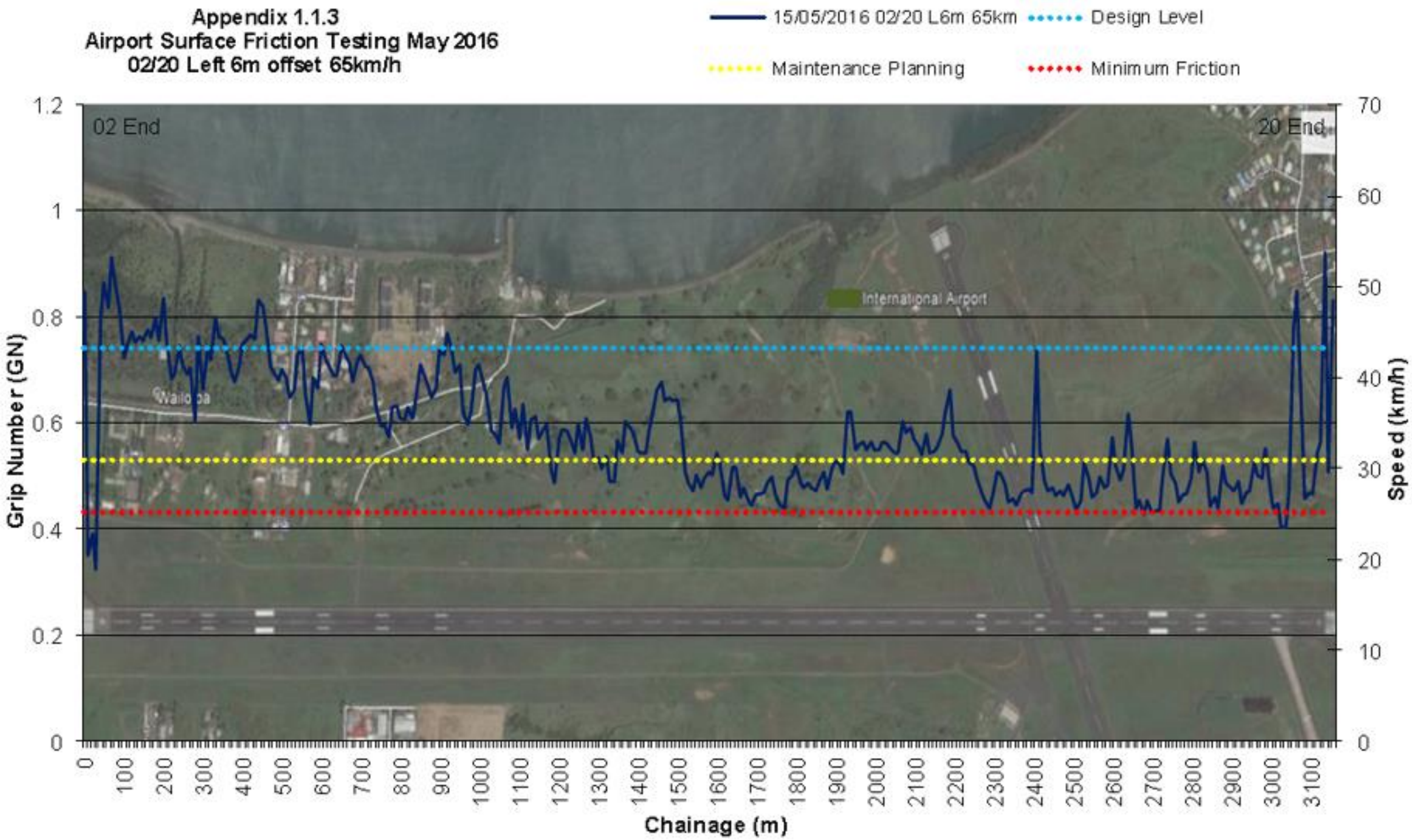

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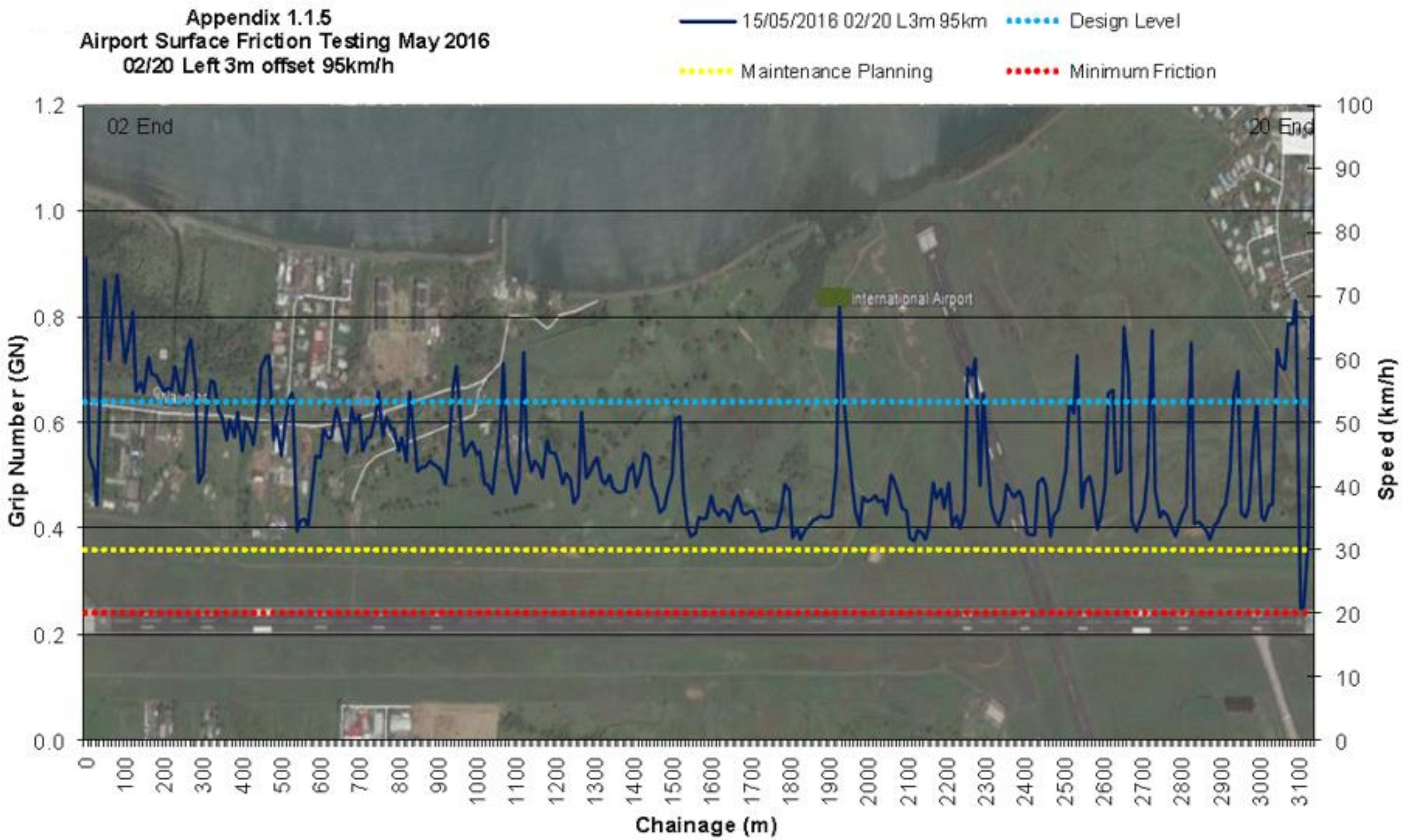

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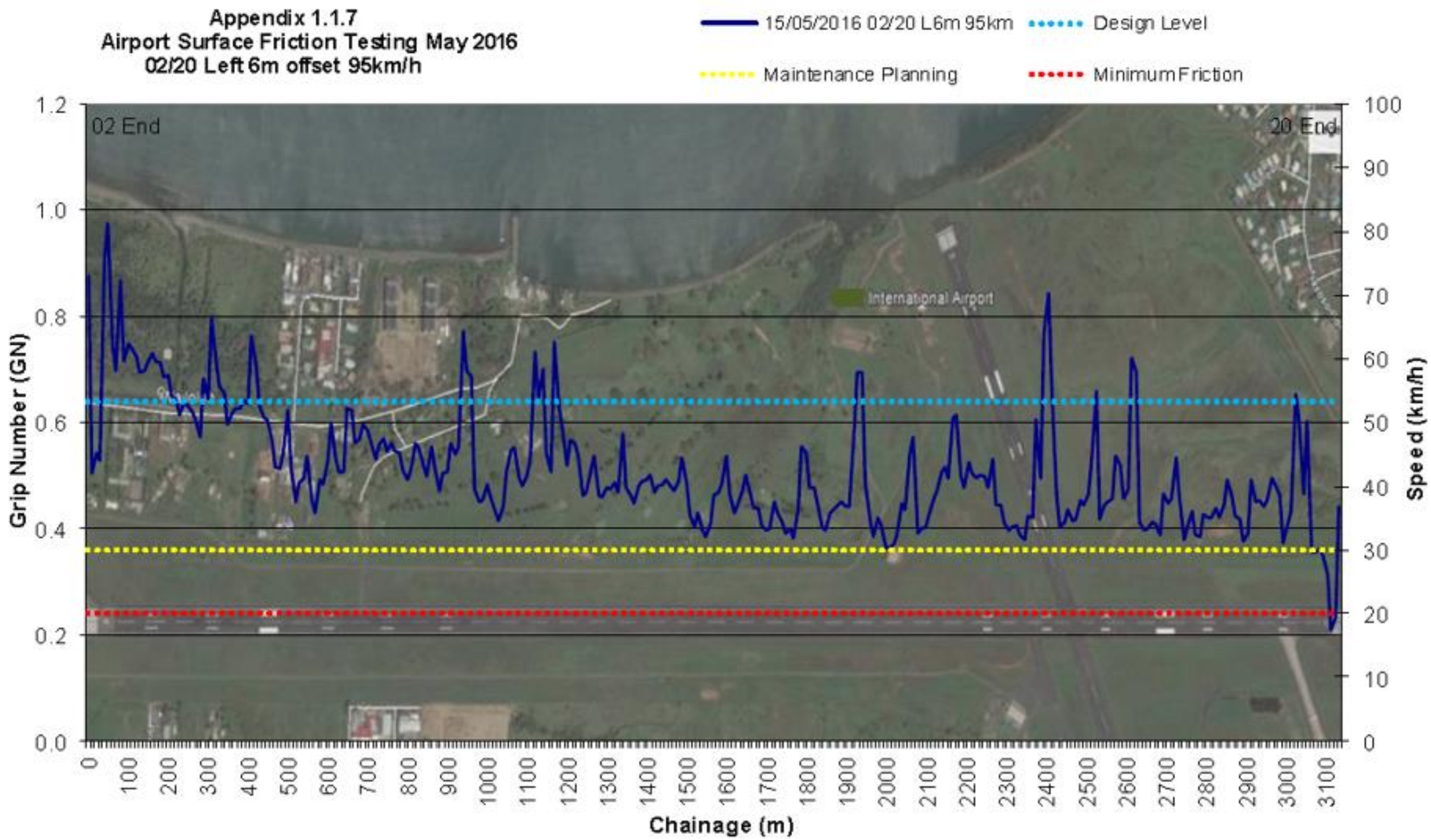

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APPENDIX B – RELATED INFORMATION

Documents

ICAO

Annex 14 - Part 1 - Aerodrome Design and Operations

Doc 9137 - Airport Services Manual - Part 2 - Pavement Surface Conditions

Doc 9137 - Airport Services Manual - Part 8 - Airport Operational Services

Doc 9157 - Aerodrome Design Manual - Part 1 – Runways

Other States

Federal Aviation Administration Advisory Circular AC150/5320-12C

Transport Canada Runway Friction Testing Programme ASC 2004-024

United Kingdom Civil Aviation Authority CAP 683

CAA

Advisory Circular AC139-3 - Aerodrome Inspection Programme and Condition Reporting

Advisory Circular AC139-5 - Operational Safety during Works on Aerodromes