Road Management Office

Road Network Machine Survey Services

General Requirements and Specification

Road Management Office
January 2023

Document Control Sheet

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Contents

1 Introduction

The Road Management Office, is a Local Authority shared service which assists and supports local authorities with the procurement of surveys to collect various datasets on transport assets in Ireland, including but not limited to the Regional and Local Road Networks. Data collected is used for the assessment of transport infrastructure to determine asset type, location, condition status, maintenance, and rehabilitation needs. This data is analysed to facilitate the planning and delivery of required asset maintenance and improvement interventions. Data is also used for the preparation of asset condition reporting, cost projection and analysis and other associated outputs.

To facilitate efficient data capture, upload to MapRoad, and its analysis, this multi-supplier framework shall be used to procure data capture, analysis, reporting and technical support services. This framework will run from 2023 until 2025 with the option to extent for two additional years until 2027. Future contracts are open to any new equipment and processes which can collect the specified data in accordance while travelling at prevailing traffic speeds. Any such new methods of data capture and processing must deliver data that is satisfactorily correlated and compatible with the existing data and imagery to ensure continuity of condition criteria and performance monitoring of the roads network.

1.1 Scope and Implementation

This specification shall be used forthwith for the procurement of machine surveying, data analysis and reporting services under this Framework. Table 1 lists all Framework Clients who can procure data and services under same. This specification details the requirements for Service Providers responsible for collecting asset condition data using machine and visual techniques. For condition surveying on the Regional and Local Road networks this specification is to be read in conjunction with the protocols detailed in the Department of Transport's Pavement Survey Standard for Regional and Local Roads, Second edition (February 2018) and any future amendments to same during the lifespan of the Framework.

Local Authority / Road Authority / Organisation	Code
Cork County Council	C
Carlow County Council	CW
Cavan County Council	CN
Clare County Council	CE
Cork City Council	CB
Donegal County Council	DL
Dublin City Council	DB
Dun Laoghaire - Rathdown County Council	DR
Fingal County Council	F
Galway County Council	G
Galway City Council	GB
Kerry County Council	KY
Kildare County Council	KE
Kilkenny County Council	KK
Laois County Council	LS
Leitrim County Council	LM
Limerick City and County Council	LK
Longford County Council	LD
Louth County Council	LH
Mayo County Council	MO
Meath County Council	MH
Monaghan County Council	MN
Offaly County Council	OY
Roscommon County Council	RN
Sligo County Council	SO
South Dublin County Council	SD
Tipperary County Council	TY
Waterford City and County Council	WD
Westmeath County Council	WH
Wexford County Council	WX
Wicklow County Council	WW
Department of Transport	DoT
Road Management Office	RMO
National Transport Authority	NTA

Table 1: Framework Clients

2 Pavement Survey Specification

2.1 General Requirements

It is envisaged that condition surveys are generally conducted on the following assets:

- The Regional & Local Road asset
- The Road Infrastructure asset

Condition survey data capture and reporting may also be required on other transport infrastructure assets. In such cases a specific specification may be created for the procurement of same under this Framework. Likewise, specific research, reporting and technical support services may be required for the purposes of road infrastructure asset management. In such cases a specific specification may be created for the procurement of same under this Framework

Each and every time a Framework Client acting as the Contracting Authority wish to procure services, they must do so by using either the **Mini-Competition (SRFT) or Direct Drawdown Contract** options. The Framework Client must specify the asset or section thereof over which condition surveys are required. The Service Provider must deliver the services in accordance with this specification and/or any SRFT specific specification. The Framework Client shall be the exclusive owner of survey results, the survey data and results of any data processing, analysis and reporting carried out by the Service Provider. All survey data procured under this Framework is to be uploaded to the MapRoad Pavement Management System and provided in accordance with Table 4.

2.2 Surveys General

The RMO as the Central Coordinating Body or any Framework Client in their own right may procure surveys under this Framework. Each time a Framework Client procures surveys they must provide the Service Provider with a list of sections of the road network to be surveyed in GIS Shapefile format. At a minimum the following information shall be provided for each section:

- Road number and/ or name
- Co-ordinates for the start and end points (ITM)
- Section or route length
- Survey type (Network Machine Survey, Before/After Works Machine Survey or Network PSCI Survey)
- Any additional information the Service Provider may require for the surveys

Surveys may only be carried out using survey equipment which has passed a correlation test and has a currently valid accreditation certificate.

For a single carriageway road, one lane in the preferred direction is surveyed. Where the carriageways are physically separated i.e., Dual Carriageways, the lane subjected to the heaviest loading, generally the left or slow lane is surveyed. Surveys shall be carried out in the direction of traffic flow with measurements normally taken over the maximum legal width of the vehicle. Vehicle operators shall ensure that the lateral position of the vehicle is such that the longitudinal measurements are centred in the middle of the wheel path.

Data captured is to be uploaded at **intervals as outlined in Table 2** unless otherwise specified by the Framework Client.

Where industry standards have been referenced in this specification and have been superseded during the lifespan of the Framework, the Service Provider shall inform the Contracting Authority of the updated standard and, upon agreement with the Contracting Authority, use the updated and adopted version of that standard to carry out services under this Framework.

2.3 Data Location Referencing

The Service Provider shall reference all data collected to the MapRoad AMS Network Referencing System, to be provided by the Contracting Authority in Shapefile format in advance of the commencement of any full or part network or works survey.

The referencing shall be in accordance with IPAG Pavement Asset Management Guidance Section 2 Network Referencing v1.0 Dec. '14.

The Service Provider shall reference all data collected during the survey uniquely in relation to distance travelled within Section and Lane. The Contactor shall ensure the accuracy of the Location Referencing shall be unaffected by operating speed or by road geometry.

All survey vehicles shall be equipped with an accurate distance-measuring instrument (DMI) which is calibrated and maintained throughout the contract so that all measured data is referenced to a longitudinal position on the road to an accuracy of 0.1% or better from the start location of that survey. This accuracy shall be independent of vehicle speed and road geometry.

If a section start point requires identification manually, the Service Provider shall locate the section start point accurate to within ±5.0m.

If a Section start point is reported using Longitude/Latitude Co-ordinates provided by the Contracting Authority (and the Contracting Authority and the Service Provider have agreed that these are to be used for location referencing), the Service Provider shall locate the Section start points accurate to within ±5.0m.

For elapsed distances within a Section of up to 1,000m from the recorded start of a Section, the Service Provider shall reference the longitudinal position of all data measured within the Section accurate to within ±1.0m from the recorded start of the Section.

For elapsed distances within a Section greater than 1,000m from the recorded start of a Section, the Service Provider shall reference the longitudinal position of all data measured within the Section accurate to within ±0.1% from the recorded start of the Section.

2.4 GPS Co-ordinates

Survey vehicles shall be equipped with GPS technology so that all recorded data is referenced to 3-dimensional spatial co-ordinates. The GPS data shall be differentially corrected in order to improve accuracy. The GPS equipment shall be integrated with an inertial measurement system to allow for Longitude/Latitude co-ordinates to be derived from the GPS data irrespective of the quality of the satellite coverage. The minimum requirements for GPS data is:

- Longitude/Latitude co-ordinates derived from the GPS are provided over no less than 950 meters in any 1 km length.
- Longitude/Latitude co-ordinates to be provided to a coverage requirement of at least 99% of the total length surveyed.
- 95% of the measured positions in any 1 km length shall be within a horizontal error of 1 metre or better from the true position.
- 95% of the measured positions in any 1 km length shall be within a vertical error of 2 metres or better from the true position.
- The horizontal error between the measured and the true position shall never to exceed 10metres.
- The vertical (altitude) error between the measured and true position shall never to exceed 20 metres.

The Service Provider shall measure the 3-Dimensional Spatial Co-ordinates of the position of the equipment during the survey at points separated by no more than 5.0 m of distance travelled.

The Service Provider shall report the 3-Dimensional Spatial Co-ordinates as ITM (Irish Transverse Mercator) Co-ordinates and Altitude, where the Altitude measurement describes the Altitude of the surface of the road being surveyed.

The Service Provider shall report the availability of the signal from which the 3-Dimensional Spatial Co- ordinates have been derived with each reported ITM Coordinate.

Where the equipment is unable to meet the accuracy requirements the Service Provider shall label the 3- Dimensional Spatial Co-ordinate data as invalid.

The Service Provider shall monitor the coverage of Longitude/Latitude Co-ordinates achieved in the surveys, including altitude. Invalid measurements of Longitude/Latitude Co-ordinates will result in reduced survey coverage where coverage is defined as the total length within any predetermined length over which valid measurements of longitudinal profile variance are provided. The Service Provider reports any survey lengths greater than 1km over which 95% by length of valid co-ordinate measurements could not be delivered.

2.5 Pavement Data Collection

The following pavement parameters are included in this specification:

Item	Data Parameter / Service Paramater	Unit	Upload Interval Network (m)	Upload Interval Before / After Works(m)
1	Skid Resistance (SCRIM)	CSC	10	1
2	Surface Texture Depth (Micro Texture & Macro Texture)	mm	10	1
3	Transverse Profile (Rut Depth)	mm	10	1
4	Ride Quality (International Roughness Index - IRI)	mm/m	10	1
5	Enhanced Longitudinal Profile Variance (LPV) - LPV3 & LPV10	mm^2	10	1
6	Crossfall / Super-elevation Geometry	%	10	1
7	Gradient Geometry	%	10	1
8	Radius of Curvature Geometry	m	10	1
9	Rise and Fall Geometry	Absolute value	10	1
10	Cracking type, severity, and intensity	Area, length(m). report. shapefile	10	1
11	Falling Weight Deflectometer	Deflection(µm), Load (KN)	10	1
12	Pavement Surface Condition Index (PSCI)	Rating categories	Per Rating	Per Rating
13	Drainage Survey Condition Index (DSCI)	Rating categories	Per Rating	Per Rating
14	Surface Material Type	Material type	Per Survey	Per Survey
15	Pavement width	m	10	1
16	Road Infrastructure Asset Identification and Assessment Survey - Digital Imagery	M, .jpg, Mp4, HD, report, Shapefile	50, Per Survey	50, Per Survey
17	Ground Penetrating Radar (GPR)	Layer thickness in mm	10	1
18	Pavement coring	Layer thickness in mm, Report, Shapefile	N/A	N/A
19	Ravelling-automated detection	m^2, Report, Shapefile,	N/A	N/A
20	Patching-automated detection	m^2, Report, Shapefile,	N/A	N/A
21	Road markings - Centreline & Edge Markings	M, Report, Shapefile	N/A	N/A
22	Retro-reflectivity of line markings	R^L, Report, Shapefile	N/A	N/A
23	3-D Photogrammetry	Macrotexture, Report	N/A	N/A
24	Volumetric Patch Testing	Mm, Report	N/A	N/A
25	Automated Measurement of Chip Distribution	m^2, Report, Shapefile,	N/A	N/A
26	Assessment of Footways	Rating categories	Per Rating	Per Rating
28	Site Categorisation of Networks-Assessment of Investigatory Levels (IL's)-SCRIM	Report, Shapefile	N/A	N/A
29	Visual Assessment of HRA-Site Inspection	Report, Shapefile	N/A	N/A
30	Accident Site Investigation	Report, Shapefile	N/A	N/A
31	Technical Support, Data Analysis and Report Writing	Report, Shapefile	N/A	N/A

**** Framework Purchasers may procure bespoke datasets and reports in addition to the above data under this Framework, the requirements of which shall be outlined in the detailed specification documents accompanying that Mini-Competition / Direct Drawdown procurement option.***

Table 2: Data Parameters

2.6 SCRIM

2.6.1 Purpose

Skid resistance shall be measured using a Sideway Force Coefficient Routine Investigation Machine (SCRIM). SCRIM measures the frictional resistance generated between the road surface and a tyre under wet conditions. The micro-texture on the surface of the aggregate particles and also provided by the fines in the mixture is the main contributor to skid resistance at low speeds and the main property measured in SCRIM tests. In combination with the specification of surfacing materials the skid resistance of roads is monitored to identify areas where micro texture is lost and treatment might, therefore, be needed to improve skid resistance.

2.6.2 Measurement

The testing speed for SCRIM surveys shall be 50kph. The Sideways Force Coefficient (SFC) shall be measured. SFC is a ratio of the sideway-force to the vertical load on the test wheel i.e., the frictional resistance generated between the road surface and a tyre under wet conditions. Data is typically collected every 25mm to 125mm and averaged over 1m intervals.

2.6.3 Recording & Averaging of Data

SFC shall be used to calculate the characteristic SCRIM coefficient (CSC). CSC is the measured SFC factored by the Index of SCRIM and corrected for speed and seasonal effects where applicable. As SCRIM is a coefficient, there is no unit of measurement.

The testing speed on single carriageways where the radius of curvature is 150m or less shall be 30km/hr. The locations on the network that this testing speed applies to are to be identified by the Service Provider as an attribute in any data provided to the Contracting Authority.

The equipment shall provide the following Survey Data for each sub-section length:

- SCRIM Reading
- Average speed (km/h)
- Elapsed distance (m)
- Dimensional Spatial Co-ordinates
- The sub-section length shall be 10m
- Forward view High-Definition Video (minimum 720x1080P)

After collection, survey data shall be validated and subject to processing. SCRIM Survey data shall be processed and imported as CSC for all sections on the Road Network.

Survey results shall be processed and imported into MapRoad at 10m intervals. Data to be geo-referenced to national grid co-ordinates in accordance with 2.4 above. All data uploaded to MapRoad shall be provided to the RMO in the agreed Shapefile format. Data upload notifications and reports to be provided to each Local Authority / Contracting Authority in excel (.xls) format.

For standardised tests, measurements shall be made during the testing season, defined as the summer period 1 May – 30 September.

The SCRIM machine shall conform to the general characteristics of the SCRIM designed by the Transport Research Laboratory. The test equipment, calibration, operation, and testing procedures shall be as set out in TII AM-PAV-06045 "Management of Skid Resistance".

The SCRIM machine shall also be capable of measuring the SFC in both wheel paths simultaneously, as measurements in both wheel paths may be requested by the Contracting Authority.

2.6.4 Quality Assurance

In advance of SCRIM surveys commencing, the Service Provider shall provide a certificate from the U.K. - Highways Agency confirming that the SCRIM machine(s) to be used in the surveys has performed within the set limits of the SCRIM Correlation Trial for that year. The SCRIM machine(s) identified in the certificate shall be used for all surveys in that year.

Prior to the start of any survey, test tyres conforming to the specification in BS 7941-1:2006 shall be tested on the control sites and only tyres which fall within an agreed range are to be used in the surveys. The results of this test shall be forwarded to the Contracting Authority for approval prior to starting any survey.

Control sites covering a range of SFC values shall be identified in consultation with the Contracting Authority. The purpose of these sites is to ensure consistency of results over the testing period. The selected sites shall conform to the general requirements in BS 7941-1. The control sites shall be surveyed immediately following the SCRIM correlation trials to establish baseline data and to evaluate the repeatability of the equipment. These sites shall be at least twice weekly in the case of a continuous survey programme. The control site data shall be checked to ensure that the machine is measuring SFC accurately and that the DMI and GPS are performing within specifications. The control site data and a report summarising the results shall be forwarded to the Contracting Authority within 7 days and prior to commencement of any survey. The Service Provider is responsible for ensuring that control site data verifies that SCRIM systems are operating within specifications. Reports where the control site data covering that cycle is missing or suspect shall not be accepted by the Contracting Authority.

2.6.5 Other requirements

The Service Provider shall obtain water for all surveying machines and shall pay all charges associated herewith.

2.7 Surface Texture Depth (Micro & Macro Texture)

2.7.1 Purpose

Texture Depth or macro-texture is a measure of the coarse surface texture. Macro-texture provides the majority of friction at higher speeds. In addition to providing friction benefits, good macro-texture provides drainage channels for water expulsion between the tyre and the pavement to reduce splash and spray as well as headlight glare.

2.7.2 Measurement

The macro texture shall be measured continuously in both right and left wheel path using a laser system to the specification necessary to enable the Mean Profile Depth (MPD) to be calculated at 1.0mm intervals in accordance with IS EN ISO 13473-1:2004.

2.7.3 Recording & Averaging of Data

The texture profile shall be used to calculate MPD values over 10m lengths and geo-referenced to national grid co-ordinates in accordance with 2.3 & 2.4 above. These results shall be provided to the Contracting Authority in excel (.xls) format.

The accuracy of the measured texture profile shall be unaffected by the texture or profile of the pavement over the full range of profiles and textures that can reasonably be expected to be encountered on the road network.

The Service Provider shall label any texture depth data that fail to meet the specified requirements as invalid. The Service Provider shall check the Survey Data for any conditions that may result in invalid measurements of texture profile. These conditions may include but would not be limited to drop-outs (missing data points), and failures in any of the measurement devices. The Service Provider shall monitor the coverage achieved in the surveys of texture profile. Invalid measurements of texture profile (and hence MPD) will result in reduced survey coverage, where coverage is defined as the total length within any predetermined length over which valid measurements of texture profile (and/or MPD) are provided.

2.7.4 Quality Assurance

The surveys may only be carried out using survey equipment which has a valid accreditation certificate. Upon request by a Contracting Authority the Service Provider shall provide said certificate(s).

The Service Provider shall monitor the coverage achieved in the surveys of texture profile. Invalid measurements of texture will result in reduced survey coverage, where coverage is defined as the total length within any predetermined length over which valid measurements of texture are provided.

The Service Provider shall report any survey lengths greater than 1.0 km over which less than 95% by length of valid MPD measurements can be delivered to the Contracting Authority. The Service Provider shall carry out repeat surveys of these lengths and shall be carried out until a valid length of MPD measurements is delivered.

The Service Provider shall provide the Contracting Authority with a summary report of the coverage achieved in the measurement of texture profile. This report shall be provided in excel (.xls) format and shall include:

- The total length surveyed within each Section of the road network,
- The total length within each Section for which the Service Provider is unable to provide valid MPD data.
- The locations within each Section of the network over which the Service Provider is unable to provide valid texture profile data.

The Service Provider shall collate all confirmed data from permitted sources to ensure a complete set of network results are available at the end of each survey in accordance with section 2.1.

2.8 Transverse Profile (Rut Depth)

2.8.1 Purpose

Rutting is formed along pavement wheel paths under repeated traffic loading. Rut depth is a measure of this deformation in the transverse pavement profile. Rutting can be a safety hazard because it can cause steering instability of vehicles, furthermore, they collect water during wet weather, which can lead to skidding or hydroplaning.

2.8.2 Measurement

Transverse profile shall be measured in both left and right wheel path using non-contact sensors. The equipment shall be capable of measuring and storing transverse profile data at a maximum longitudinal spacing of 100mm.

2.8.3 Recording and Averaging of Data

Rut depths in both wheel paths shall be calculated from the measured transverse profile over longitudinal lengths of 1m. Units are expressed in 1/100mm. These ruts shall be used to calculate the rut depth values at 10m intervals in both wheel paths.

These results shall be provided to the Contracting Authority in excel (.xls) format.

The accuracy of the rut depth measurements shall be such that the difference between the measured rut depth and the true rut depth is less than 3 mm for 95% of readings.

The Service Provider shall label any rut depth data that fail to meet the specified requirements as invalid.

The Service Provider shall monitor the coverage achieved in the surveys of rut depth. Invalid measurements of rut depth will result in reduced survey coverage, where coverage is defined as the total length within any predetermined length over which valid measurements of rut depth are provided.

The Service Provider shall collate all confirmed data from permitted sources to ensure a complete set of network results are available at the end of each survey in accordance with section 2.1.

The Service Provider shall provide the Contracting Authority with a summary report of the coverage achieved in the measurement of transverse profile and rut depth. This report is provided as a comma delimited text file including:

- The total length surveyed within each Section of the road network,
- The total length within each Section for which the Service Provider is unable to provide valid rut depth and/or transverse profile data (as applicable).
- The locations within each Section of the Network over which the Service Provider is unable to provide valid rut depth and/or transverse profile data (as applicable).

The Service Provider shall monitor the measurement of transverse profile and reports in the Survey Data, where possible, individual measurements of transverse profile subject to error as values outside the permitted range.

The accuracy of the measured transverse profile shall be unaffected by the profile of the pavement over the full range of profiles that can reasonably be expected to be encountered on the road network.

The Service Provider shall monitor the coverage achieved in the surveys of transverse profile. Invalid measurements of transverse profile will result in reduced survey coverage, where coverage is defined as the total length within any predetermined length over which valid measurements of transverse profile are provided.

2.9 Ride Quality - International Roughness Index (IRI)

2.9.1 Purpose

IRI (International Roughness Index) is a measurement of pavement roughness of the longitudinal profile. Roughness evaluation is extremely important as it provides a direct measurement influencing the public's perception of the quality of service provided by the pavement i.e., ride quality.

2.9.2 Measurement

Longitudinal profile measurements are required in both wheel paths. The profiling system shall meet ASTM E 950-98(2004) Class 1 requirements for the measurement of Longitudinal Profile. The profile measurements shall be independent of vehicle speed and vehicle acceleration over the normal range of traffic speeds. Measurements shall be accurate and repeatable down to speeds of 10 km/h due to nature of urban environment and the particular characteristics of lower volume routes in Ireland. Units are expressed as m/km.

2.9.3 Recording and Averaging of Data

The International Roughness Index (IRI), calculated for consecutive 10 m lengths, is one parameter currently used by Contracting Authorities to categorise the condition of the network. It will be necessary for the Service Provider to establish a satisfactory correlation between the IRI values derived from their equipment and IRI values derived from ARAN/RSP.

The profiling software shall calculate IRI values at 10m intervals in accordance with World Bank Specifications. The raw profile data shall be saved and delivered in csv file format as per data specification sheets and shall be uploaded into MapRoad AMS system at intervals of 10m or as requested by the Contracting Authority.

2.10 Longitudinal Profile Variance (LPV)

2.10.1 Purpose

Longitudinal Profile Variance (LPV) is a measurement of the shape (ride quality). TRL studies have shown that enhanced LPV better correlates with road users' perception of ride quality.

2.10.2 Measurement

The Service Provider may use HRM or GM method to measure LPV. The Service Provider shall measure the longitudinal profile during the survey in the nearside and offside wheel path at points separated by no more than 0.01m of longitudinal distance travelled. The profile measurements shall be independent of vehicle speed and vehicle acceleration over the normal range of traffic speeds. Measurements shall be accurate and repeatable down to speeds of 10 km/h due to nature of urban environment and the particular characteristics of lower volume routes in Ireland. Units are expressed as mm^2.

2.10.3 Recording and Averaging data

The Service Provider shall calculate 3m and 10m variance parameters at 10m intervals. This Enhanced (LPV) requires the collection of the short and medium wavelength features (3m and 10m variance). The Service Provider filters the measured longitudinal profile from each wheel path to attenuate wavelengths in excess of 100m using a filter that attenuates the amplitude of wavelengths greater than 150m by at least 50% without distorting the phase of any profile features with wavelengths shorter than 100m.

The Service Provider averages the measured profile points over 0.1m and expresses the value in units of 1/10mm^2 for each wheel path.

The Service Provider shall monitor the coverage achieved in the surveys of longitudinal profile. Invalid measurements of longitudinal profile will result in reduced survey coverage, where coverage is defined as the total length within any predetermined length over which valid measurements of longitudinal profile variance are provided.

The Service Provider shall provide the Contracting Authority with a summary report of the coverage achieved in the measurement of longitudinal profile (and hence longitudinal profile variance). This report shall be provided as a comma delimited text file including:

- The total length surveyed within each Section of the road Network.
- The total length within each Section for which the Service Provider is unable to provide valid longitudinal profile and or variance data (as applicable).
- The locations within each Section of the Network over which the Service Provider is unable to provide valid longitudinal profile and or variance data (as applicable).

The Service Provider shall collate all confirmed data from permitted sources to ensure a complete set of network results are available at the end of each survey in accordance with section 2.1.

2.11 Geometry - Crossfall, gradient and radius of curvature

Measurements of crossfall, gradient and radius of curvature data are required at longitudinal intervals not exceeding 0.5 meters. Calculated values shall be averaged, imported at 10m intervals and geo-referenced to national grid co-ordinates in accordance with section 2.3 and 2.4.

The measured crossfall is required to be within ±1.5 or ± 10% of the true crossfall, whichever is greater for 95% of the readings.

The measured gradient is required to be within ±1.5 or ± 10% of the true gradient, whichever is greater for 95% of the readings.

The measured radius of curvature is required to be within ± 50 metres or ± 25% of the true radius of curvature, whichever is greater for 95% of the readings.

2.12 Rise and Fall

Pavement rise and fall is defined as the sum of the absolute values of total vertical rise and total vertical fall of the original ground, in metres, along the road section divided by the total section length, in km. Units are measured in m/km. All calculated parameters shall be reported at 10m intervals. All calculated parameters shall be delivered to the Contracting Authority in Microsoft Excel data files.

2.13 Cracking Type, Severity & Intensity

The Contracting Authority may require an automated survey of cracking. The equipment shall be capable of gathering the required data at normal traffic speeds or as otherwise agreed with the Contracting Authority.

The automated system required shall be composed of two high performance 3D laser profilers that are capable of measuring complete transverse road profiles with 1mm resolution at normal traffic speeds. The high-resolution 3D data acquired by the automated system shall be processed using algorithms developed to automatically extract crack data including:

- **Crack Type**
    - linear - discrete transverse and longitudinal,
    - Interconnected – widely spaced block cracking and closely spaced fatigue cracking,
- **Severity**
- **Intensity**

The automated system shall meet the following specification unless otherwise agreed with Contracting Authority:

- Number of Laser Profiles 2
- Sampling Rate (max) 11,200 profiles
- Vehicle Speed 100Km/hr (maximum)
- Profile spacing Adjustable
- 3D Points per Profile 4160
- Transverse field of view 4m
- Depth range of operation 250mm
- Z axis Range of accuracy 0.5mm
- X Axis Resolution 1mm

The reported subsection length shall be 100m. Network cracking shall be quantified in terms of the dominant crack type, severity, and extent for each segment over the sample lengths and widths, or as otherwise agreed with the Contracting Authority.

It is a requirement that cracking data will be reported as a summary for a network or a portion of a network, and in detail for each subsection. Guidelines for data reporting are summarised below.

Crack type: All crack type's present.

Cracking severity: Average crack width in mm. See table 3 below. Severity rating may be influenced by pavement type and environment.

Cracking intensity: The area affected by cracking as a percentage of lane area (lane width by length).

Crack Type	Severity			Location
	Name	Width Range	Category	
Longitudinal (m) Transverse (m) Pattern/Alligator (m2)	Fine Medium Wide	< 10mm 10mm - 25mm > 25mm	1 2 3	B1 (Left Edge) B2 (Left wheel path) B3 (Central Band) B4 (Right wheel path) B5 (Right Edge)

Table 3a – Cracking Type, Severity and Location Reporting Format

Distress Type	Location
Ravelling (m2)	B1 (Left Edge) B2 (Left wheel path) B3 (Central Band) B4 (Right wheel path) B5 (Right Edge)

Table 3b – Ravelling Reporting Format

Cracking Intensity	Ravelling Intensity	Overlapping Ravelled and Cracked Areas	Pavement Area
< 1% 1% - 5% >5% - 10% >10% - 25% >25% Or Exact %	< 1% 1% - 5% >5% - 10% >10% - 25% >25% Or Exact %	< 1% 1% - 5% >5% - 10% >10% - 25% >25% Or Exact %	m2

Table 3c – Cracking Intensity Reporting Format

Cracking reports shall show all crack type's present, severity (average crack width) and extent (percentage of area affected) using Tables 3a, b and c above, or as otherwise agreed with the Contracting Authority.

The Service Provider shall indicate if cracking is load or non-load-related cracking.

Control sites covering a range of cracking types and levels shall be identified in consultation with the Contracting Authority. The purpose of these sites is to ensure consistency of results over the testing period. The length and type of these sites shall be agreed in advance with the Contracting Authority.

Verification testing is based on fresh surveys of a length of road with known cracking characteristics. The aim is to confirm that the measuring system has not changed. However, it is noted that due to temperature and other effects it cannot be expected that a reference section can be maintained where cracking will be constant over time. It is therefore necessary to concentrate on repeatability and to keep some record of observed cracking, also with recording of environmental conditions, particularly temperature.

Suitable verification sections shall be located where crack types and cracking levels (severity and extent) are known.

Detailed verification testing is necessary to assess a new system before it is commissioned for use in cracking surveys. After initial calibration and verification has been undertaken the following additional verification is required:

- After changes to hardware and software.
- At the beginning of a Network Survey.
- At intervals not exceeding six months.
- At intervals not exceeding 2750km of survey, whichever of these comes first.
- At the end of a Network Survey.

Verification of distance measurement; The accuracy of distance outputs from the crack measuring device shall be verified:

- Before each cracking survey commences.
- At intervals not exceeding one month during each survey.
- After the completion of each survey.
- Immediately after any change is made to the distance measuring features of the measuring device or its host vehicle during a survey.

Repeatability and bias are important factors in ensuring that changes in cracking can be identified over relatively short time spans. Repeatability is the variation between repeated measurements of the same distress using the same survey personnel with the same data collection procedure. Bias error indicates whether a device is systematically measuring high or low when compared to a reference set of measures. Reproducibility is the variation between measurements of the same pavement distress parameter using different survey personnel with the same data collection procedure.

Data shall be properly referenced in order to be meaningful for use in decision making processes.

Accordingly, cracking data shall be reported using the IPAG Network Referencing System.

It shall be the responsibility of the Service Provider to establish appropriate health and safety practices and determine the applicability of any regulatory limitations related to and prior to its use.

Further information on the capture of cracking data can be obtained in section A3.2 of TII Publication '*Pavement Assessment, Repair and Renewal Principles AM-PAV-06050 March 2020*': https://www.tiipublications.ie/library/AM-PAV-06050-01.pdf

2.14 Falling Weight Deflectometer

Falling Weight Deflectometers (FWD) are used to evaluate the in-situ performance and strength of pavements and their foundations. The FWD testing is typically deployed at a project level and can be used to assist with treatment selection i.e., to determine what structural capacity exists within a pavement and therefore identify what strengthening may be required. Generally, it is not appropriate for local roads.

FWD testing shall be conducted in accordance with TII Publication '*Guidelines for the use of the Falling Weight Deflectometer in Ireland*' publication number CC-GSW-04008. This publication is available at http://www.tiipublications.ie/library/CC-GSW-04008-01.pdf

2.15 Pavement Surface Condition Index (PSCI)

PSCI is the national standard for recording the visual condition rating on the regional and local road network and is a requirement of the Pavement Survey Standard for Regional and Local Roads released by DTTaS. PSCI is a visual assessment of road conditions using a 1 to 10 rating system in accordance with the DTTaS pavement condition manuals for pavement surface evaluation and rating on Irish Roads. There are three manuals in the series, namely;

- Rural Flexible Roads Manual (Volume 1 of 3)
- Urban Flexible Roads Manual (Volume 2 of 3)
- Urban Concrete Roads Manual (Volume 3 of 3).

The PSCI scale ranges from 10 for a pavement in excellent condition to 1 for a pavement in failed condition. The road pavement is rated using the 1 to 10 scale based on visible pavement defects to visually rate pavement surface condition in accordance with the appropriate manual. The 1 to 10 system is colour-coded with ratings 1 to 4 coloured Red, rating 5 and 6 coloured Amber, rating 7 and 8 coloured Blue, and rating 9 and 10 coloured Green.

The rating manual for each road type provides details of distress descriptions, how to link them to the 1 to 10 visual rating scale, with high resolution colour photographs of distress types and road pavements in each of the 1 to 10 rating categories. There is typically four major categories of common road surface defects on Irish roads outlined in each manual comprising Surface Defects, Pavement Deformation, Cracks and Surface Openings. The significance of surface-related, structural-related, and other-related pavement defects in the 1 to 10 rating system shall be identified and used to evaluate and rate pavement surface condition.

The PSCI 1 to 10 rating is directly linked to maintenance treatment categories specified for use on roads by the DTTAS. The typical maintenance treatment categories are Routine Maintenance, Restoration of Skid Resistance, Surface Restoration, Structural Overlay/Inlay and Road Reconstruction.

The visual rating for rural flexible, urban flexible or urban concrete roads shall only be carried out by trained personnel who have completed the Road Pavement Condition Rating Surveyor training for each manual.

The PSCI 1 to 10 rating is a continuous driven visual condition survey consisting of a two-person team, the driver, and the assessor. A rating is applied to a road segment based on its overall condition and the defects present on the road. The rating is assigned on the MapRoad Mobile App using a tablet with an Android operating system. The 1 to 10 rating and associated GPS data is recorded in real-time using the road schedule. The PSCI data can be subsequently uploaded to the Local Government Management Agency (LGMA) MapRoad AMS system.

Alternatively, the 1 to 10 visual rating can also be assigned to the pavement from geo-referenced digital imagery recorded in the field. The PSCI visual rating data from video can be subsequently post-processed and uploaded to the MapRoad AMS system.

All service provider personnel must have completed the PSCI training course prior to capturing any PSCI data to condition rate the road network. Copies of training certificates must be provided to the Contracting Authority prior to the commencement of any PSCI surveys. Further details on PSCI training and participation in training courses can be obtained from the LASNTG here: https://www.lasntg.ie/master-courses/pavement-condition-index-visual-survey-urban-concrete/7141

2.16 Drainage Survey Condition Index (DSCI)

The Drainage Survey Condition Index (DSCI) is a mechanism to aid the management of drainage routine maintenance programmes and project works cycles. DSCI surveys can be carried out at both project and network level. The DSCI rating is captured via the MapRoad Pavement Management System Field Apps. The DSCI allows the road drainage condition to be systematically identified and monitored. Further details can be found in the Guidelines for Road Drainage, Second Edition (March 2022), Table 4.2.

2.17 Surface Material Inventory

The Service Provider shall record the road surface material continuously using the MapRoad Mobile App or alternatively it may be recorded as a desktop exercise provided a Contracting Authority permits a Service Provider to access their MapRoad AMS system. Surface material is required for the portion of a road which is provided primarily for the use of vehicles. Road surface materials displayed on MapRoad AMS are as follows;

- Surface Dressing
- Micro surfacing – Slurry seal
- High Friction Surfacing
- HRA (Hot Rolled Asphalt)
- SMA (Stone Mastic Asphalt) – Clause 942
- Surface Course Asphalt Concrete
- Cobbles
- Concrete
- Modular Paving
- Other

2.18 Pavement Width

The Service Provider shall record the road pavement width at longitudinal intervals not exceeding 100 metres. Measurements of width are required for the portion of a road which is provided primarily for the use of vehicles. However, at some locations this may include cycle lanes. Road width shall be imported at 10m intervals. See section 3.1 also.

2.19 Road Infrastructure Asset Identification and Assessment Survey - Digital Imagery

A road is defined under the roads Act (1993) as;

- any street, lane, footpath, square, court, alley, or passage,
- any bridge, viaduct, underpass, subway, tunnel, overpass, overbridge, flyover, carriageway (whether single or multiple), pavement or footway,
- any weighbridge or other facility for the weighing or inspection of vehicles, toll plaza or other facility for the collection of tolls, service area, emergency telephone, first aid post, culvert, arch, gulley, railing, fence, wall, barrier, guardrail, margin, kerb, lay-by, hard shoulder, island, pedestrian refuge, median, central reserve, channelliser, roundabout, gantry, pole, ramp, bollard, pipe, wire, cable, sign, signal, or lighting forming part of the road, and
- any other structure or thing forming part of the road

necessary for the safety, convenience, or amenity of road users or for the construction, maintenance, operation, or management of the road or for the protection of the environment or prescribed by the Minister.

Road Asset identification surveys shall provide a detailed report in a format agreed with the Contracting Authority on the type, location, geometry, and condition of road assets. Data captures is to be provided in a Shapefile format agreed with the Contracting Authority and also in an agreed format for upload into MapRoad. Asset locations are to be compliance with section 2.3. Contracting authorities may require additional Road Asset attribute data capture, analysis, reporting and technical support services. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

Road Infrastructure Asset Identification and Assessment Surveys shall include Digital Imagery and Shapefile data as part of the report. Shapefile attribute requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process. Digital Imagery shall be recorded using the predominant mode of transport of the asset being surveyed for example walking a footway, cycling a cycleway, driving a motor vehicle and so on. Each survey shall be carried out as a minimum with two digital cameras. One camera is to provide a forward view of the asset and one camera with a rear view of the asset to enable road infrastructure asset identification and assessment surveys to be subsequently carried out using the video images. Video resolution on the camera system to be a minimum of 1280 x 720 High Definition (HD) The camera software system shall be capable of adding a header with relevant information e.g. Survey Date, Route Surveyed, Chainage along route, GPS co-ordinates etc. while collecting the video information. The header shall not obscure any portion of the video image. The Service Provider shall be able to add/remove/alter the header post-survey when required by the Contracting Authority.

As part of any digital imagery survey the Contracting Authority may require road infrastructure asset inventory capture including asset geometry and type. Asset Geometry is to be provided in Shapefile format. The ArcGIS Quick Capture Application, or similar approved by the Contracting Authority, in conjunction with a GPS receiver that supports differential corrections shall be used for any such surveys. Contracting Authorities may require the Service Provider to carry out a road infrastructure asset survey and prepare a subsequent report. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

All video files to be stored in .jpeg format. All associated telemetry data for each video frame to be stored in Access .mdb files. Video quality from the digital camera system is extremely important. Shall the ambient survey visibility be reduced for example by adverse weather conditions, shade/shadow, sun-glare, so as to detract from the image quality of the video survey, then the survey shall be abandoned until such time as conditions improve.

If the quality of the video image is not clear, then the sub-standard video survey for the section in question shall be rejected and the Service Provider shall re-survey the roads at no extra cost to the Contracting Authority.

Forward view digital imagery to be uploaded to MapRoad AMS at 50m intervals, see section 3.2.

2.20 Ground Penetrating Radar

Ground Penetrating radar (GPR) is a non-destructive tool that can be used to obtain information about the construction of a pavement and its internal features. GPR describes a device that uses radio waves for the purpose of detecting or obtaining images of buried objects or determining the physical properties beneath the ground. GPR operates by transmitting a pulse of electromagnetic radiation from an antenna into a pavement. The electromagnetic radiation penetrates down into the pavement as an energy wave, with an envelope in the shape of a cone. As the wave travels through the various pavement layers, its velocity is changed, and its strength attenuated. Part of the signal will be reflected back to the GPR receiver at buried discontinuities or interfaces between different materials such as different pavement layers. These reflected signals and the two-way travel time contain the information about the interior of the pavement. The strength of the reflected wave depends mainly on the difference in dielectric constant of the adjacent materials in the pavement, the greater the difference the stronger the reflection.

GPR measuring systems are generally defined by the:

- Channel configuration (Single or multi-channel system)
- Measured points per waveform
- Sampling rate
- Method of sampling (per fixed interval of time or distance)
- Antenna operating frequency
- Antenna signal coupling
- Antenna type

A digital system shall be used that will allow storage of data direct to hard disk with the capability of using various filtering processes to remove noise and digitising data. The equipment shall have 512 samples/scan capability, thus producing a high resolution of data.

The Service Provider is required to carry out all GPR surveying in accordance with The European Telecommunications Standards Institute ETSI EG 202 730 V1.1.1 (2009-09).

Further information on GPR testing can be obtained in TII Publication '*Pavement Assessment, Repair and Renewal Principles AM-PAV-06050 March 2020*': https://www.tiipublications.ie/library/AM-PAV-06050-01.pdf

2.21 Pavement Coring

Coring on road pavements must always be carried out in accordance with Health and Safety Legislation and with appropriate traffic management in accordance with the Traffic Signs Manual Chapter 8. Cores should be taken at defect locations over the whole survey length however a minimum of one core per 200m per lane is required. Ideally, coring of the pavement should be carried out after the visual, FWD and GPR surveys have been completed. Cores should normally extend the full thickness of bound layers to determine the total thickness and to ensure that the full depth of cracking is recorded. Cores should indicate any loss of integrity of materials, such as stripping of the binder. Core logs are recorded by a competent person and include an accurate location relative to the network sections. The strategy for deciding the locations for coring is dependent on the specifics of each site. Factors for consideration include:

- The availability of existing information
- Consistency of construction throughout the core survey area
- GPR layer thickness profile (if available)
- Types, locations, frequency, consistency, and severity of defects
- Locations of high and low FWD deflection (assuming that the FWD survey has already been carried out)
- Proximity of live traffic lanes and the safety of operatives and road users

Pavement Coring shall be carried out in accordance with TII Publication '*Pavement Assessment, Repair and Renewal Principles AM-PAV-06050 March 2020*': https://www.tiipublications.ie/library/AM-PAV-06050-01.pdf

2.22 Ravelling – Automated Detection

Ravelling is a progressive loss of binder and aggregate chippings from the pavement surface. The causes of ravelling can be stripping of bituminous binder from aggregate, binder hardening, insufficient binder content, poor compaction, cold weather construction or poor-quality materials. Ravelling can also be caused by the action of tracked vehicles or oil spillage on the pavement sur face. Ravelling can occur on any part of the roadway. Contracting Authorities may require the Service Provider to carry out an automated ravelling survey and prepare a subsequent report. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

2.23 Patching – Automated Detection

A patch is an area where the original pavement has been removed and replaced with new material. This indicates a pavement defect or utility cut excavation which has been repaired. A utility cut is a patch that has replaced the original pavement to allow the installation or maintenance of underground utilities. Patches may show cracking, settlement, distress under continued traffic loading indicating that the underlying causes still remain. Patches can be both small (< 1 m 2) or large in size such as utility cut repairs. Patches or may be in good condition, may be moderately deteriorating or badly deteriorating. Contracting Authorities may require the Service Provider to carry out an automated patching survey and prepare a subsequent report. Any such requirements will be set out

in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

2.24 Road Markings – Centreline & Edge Markings

IS EN 1436 specifies test methods and conditions for the performance of white and yellow road markings, as expressed by their reflection in daylight or under road lighting, retroreflection in vehicle headlamp illumination, colour and skid resistance is set out in. Surveying of Road Markings – Centreline and Edge Markings is to be carried out in compliance with the requirements of *'IS EN 1436 - Road marking materials - Road marking performance for road users and test methods'.*

2.25 Retro-reflectivity of Line Markings

IS EN 1436 specifies test methods and conditions for the performance of white and yellow road markings, as expressed by their reflection in daylight or under road lighting, retroreflection in vehicle headlamp illumination, colour and skid resistance is set out in. Retro-reflectivity testing of Line Markings is to be carried out in compliance with the requirements of *'IS EN 1436 - Road marking materials - Road marking performance for road users and test methods'.*

2.26 3-D Photogrammetry

The service provider shall carry out 3D Photogrammetry testing in accordance with the test method for characterising the surface macrotexture of a pavement surface as positive or nonpositive set out in TII publication '*CC-PAV-04010 The Use of Close Range Photogrammetry to Characterise Texture in a Pavement Surfacing Material'.*

2.27 Volumetric Patch Testing

Volumetric patch testing is to be carried out in compliance with the requirements of TII publication *CC-SPW-00900 Specification for Road Works Series 900 - Road Pavements - Bituminous Materials* and *IS EN 13036-1.* This standard specifies a method for determining the average depth of pavement surface macrotexture by careful application of a known volume of material on the surface and subsequent measurement of the total area covered. The technique is designed to provide an average depth value of only the pavement macrotexture and is considered insensitive to pavement microtexture characteristics. This test method is suitable for field tests to determine the average macrotexture depth of a pavement surface. When used in conjunction with other physical tests, the macrotexture depth values derived from this test method can be used to determine the pavement skid resistance capability, noise characteristics and the suitability of paving materials or finishing techniques. When used with other tests, care should be taken that all tests are applied at the same location.

2.28 Visual assessment of HRA – Site Inspection

Visual assessment to assess whether the coated chippings are above the level of the HRA mastic (positive) or at the same level or below the level of the HRA mastic (non-positive) shall be carried out in accordance with TII publication *CC-SPW-00900 Specification for Road Works Series 900 - Road Pavements - Bituminous Materials* and *CC-GSW-00900 Notes for Guidance on the Specification for Road Works Series NG 900 - Road Pavements - Bituminous Bound Materials, NGA 10.1.11.1 Surface Macrotexture Specific to Hot Rolled Asphalt Mixtures.* Visual Assessment shall be carried out at the same location and at the same frequency as the macrotexture measurements under Clause *10.1.11.1 of TII publication CC-SPW-00900 Specification for Road Works Series 900 - Road Pavements - Bituminous Materials.*

2.29 Automated measurement of Chip Distribution

Contracting authorities may require the service provider to capture chip distribution and prepare a subsequent report. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

2.30 Accident Site Investigation

Contracting authorities may require the service provider to capture data and prepare Road Traffic Accident reports to include pavement surface condition. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

2.31 Assessment of Footways

Assessment of Footways is to be carried out using the Footway Surface Condition Index (FSCI) rating system. The service provider is to carry out all Assessment of Footways surveys in compliance with the requirements of the 'DoT *Footway Rating Manual (2017)'*.

2.32 Site Categorisation of Networks – Assessment of Investigatory Levels

The purpose of this data capture process is to inform how to provide and manage appropriate levels of skid resistance on in-service roads. Skid Resistance refers to the characterisation of the friction of a road surface when measured using a specific device, in accordance with a standardised method. These measurements are used to characterise the road surface and assess the need for maintenance but cannot be related directly to the friction available to a road user making a particular manoeuvre at a particular time. Site Categorisation of Networks is to be carried out in accordance with TII Publication *AM-PAV-06045- Skid Resistance Assessment*.

2.33 Technical Support, Data Analysis and Report Writing

Contracting Authorities may require technical support, data analysis and report writing services. Any such requirements will be set out in bespoke dataset specification documents accompanying that Mini-Competition / Direct Drawdown procurement process.

3 Data Collection and Processing

3.1 Data Collection and Processing

After collection, survey data shall be validated to verify calculation software and is subject processing. All data shall be sense/logic checked for any anomalies. Data cleaning may be required for any anomalies that can result in invalid measurements or readings. Anomalies may include but are not limited to drop-outs (missing data points), and failures in any of the measurement devices. In these circumstances, the Service Provider labels the data as invalid. The invalid data caused by such dropouts do not contribute to the coverage requirements and if necessary, rejected and replaced with relevant updated data. The Service Provider is responsible for the quality and accuracy of the data supplied and shall ensure data supplied is accurate.

3.2 Data Uploading

Data collected and subsequently processed shall be uploaded to the MapRoad Pavement Management System by the Service Provider in accordance with table. All data is to be uploaded at 10m intervals unless otherwise agreed with the Road Management Office (RMO). MapRoad AMS can facilitate the upload of the following data;

- SCRIM - CSC
- Texture Depth – MPD left, MPD right and MPD average
- IRI
- Rut Depth
- LPV
- Video Imagery
- Road Width
- Surface Material
- PSCI
- FWD

The above is not an exhaustive list. The Road Management Office (RMO) together with the LGMA will facilitate the importation of additional data parameters as/when required.

The Road Management Office (RMO) together with the LGMA facilitate the importation of the road condition data and subsequently manage the data imported to MapRoad AMS on behalf of local authorities. A copy of the upload format is available from the RMO/LGMA. The Service Provider must ensure they use the latest version of the data upload format for each and every upload. Note that this format may be updated periodically, and it is the responsibility of the Service Provider to ensure that they have the latest version available when uploading the data.

The Road Management Office (RMO) requires all data uploaded into MapRoad to be provided in Shapefile format. This will be facilitated via a Road Network Machin Survey Services GIA data portal.

Data is to be uploaded to MapRoad and provided by the Service Provider as outlined in Table 4:

1. Survey Type	2. Upload Timeframe	3. Data Provision Requirement
Before Works Machine Survey	Data uploaded to MapRoad no later than **1 month** from the date of data capture	• Data Uploaded to MapRoad • Provision of a Shapefile containing all relevant survey parameters as set out in Section 2 as point data attributed with survey type, actual survey date, upload date, project ID, LA Code and segment code **by the end of September of survey year** • Polyline indication location of all surveys conducted and attributed with project ID and survey type
After Works Machine Survey	Data uploaded to MapRoad no later than **1 month** from the date of data capture	• Data Uploaded to MapRoad • Provision of a Shapefile containing all relevant survey parameters as set out in Section 2 as point data attributed with survey type, actual survey date, upload date, project ID, LA Code and segment code **by the end of March of the following year** • Polyline indication location of all surveys conducted and attributed with project ID and survey type
Network Machine Survey	Data uploaded to MapRoad no later than **1 month** from the date of data capture	• Data Uploaded to MapRoad • Provision of a Shapefile containing all relevant survey parameters as set out in Section 2 as point data attributed with survey type, actual survey date, upload date, LA Code and segment code **by the end of December of the survey year** • Polyline indication location of all network surveys conducted and attributed with route number and survey type
Other	Data uploaded to MapRoad no later than **1 month** from the date of data capture	• Provision of a Shapefile containing all relevant survey parameters as set out in Section 2 as point data attributed with survey type, actual survey date, upload date (where applicable), LA Code and segment code **at a timeframe agreed with the RMO** • Polyline indication location of all surveys / data capture conducted and attributed with route number and survey type

Table 4: Data Upload Requirements

3.3 Quality Assurance

The Service Provider shall ensure that all personnel are properly trained and experienced in the operation of the equipment and understand the requirements of the contracting authority. The drivers of the vehicles shall ensure that the lateral position of the vehicle is such that the longitudinal measurements are centred in the middle of the wheel path.

In addition to the regular monitoring and checking of the control site data as outlined the Service Provider shall ensure that the daily calibrations and equipment checks recommended by the equipment manufacturer are carried out and the calibration data is forwarded to the Contracting Authority together with the survey data for that period.

The Service Provider shall have calibration procedures and system checks in place to ensure the integrity of network surveys. The Service Provider shall check that the IRI, Rut Depth, Texture Depth, and Cracking readings are within the expected range daily and that valid data for the total route is recorded. The procedures shall also ensure that GPS coverage is in accordance with section 2.4.

The Service Providers shall be capable of monitoring data collection in real time in the data collection vehicle. In addition, vehicle operators shall spot check real time data to ensure that equipment is operating properly.

The Contracting Authority will require the Service Provider to resurvey at their own expense any significant lengths with invalid or missing data.

The Service Provider shall ensure that good quality video images are provided in accordance with section 2.10.

Processed data shall be uploaded to MapRoad AMS system as requested by the Contracting Authority. This shall be completed within 7 days from the end of the week in which the survey was carried out unless otherwise agreed with the Contracting Authority. Prior to submitting data, all processed files shall be edited to remove data which is not part of that survey route including calibration files.

3.4 Control Sites

One or more suitable control sites covering a range of IRI, rut depth, surface texture, LPV3 and LPV10, SCRIM and Cracking values shall be selected by the Service Provider and approved by the Contracting Authority. Such sites shall demonstrate the repeatability and satisfactory operation of the survey equipment over the contract period.

Weekly control site checks;

- The Service Provider selects a suitable site (ideally greater than 1km in length) and conducts a survey with an accredited survey vehicle within 7 days.
- This data is then used as a benchmark dataset to compare future surveys against.
- At intervals not exceeding 7 days, each accredited device conducts a repeat survey.
- This data is compared to the benchmark survey by the Service Provider to ensure the survey equipment is operating correctly.

Daily control site checks;

- The Service Provider selects a suitable site (a minimum of 400m in length) and conducts a survey with an accredited survey vehicle before and after each day's work.
- These two data sets are compared by the Service Provider to ensure the survey equipment is operating correctly.

The control site data shall be checked to ensure that the machine is measuring all parameters accurately and that the DMI and GPS systems are performing within specifications. It is the responsibility of the Service Provider to ensure that the control site data verifies that all measuring systems are operating within specifications before undertaking a main survey.

The data and a report summarising the results shall be sent to the Contracting Authority upon completion of the contract or monthly whichever comes first. The Contracting Authority will not accept survey data if the control site data covering that survey cycle is missing or suspect.

3.5 Documentation

The Service Provider shall provide and operate an effective and documented Quality Assurance regime, including, but not limited to:

- Equipment calibration, testing/certification, and correlation trials.
- Vehicle operation and maintenance.
- Vehicle operator and operative training and instruction.
- Survey operation and record keeping.
- Data recording, processing, and analysis.
- Delivery of survey results.

The Service Provider shall deliver all Quality Assurance tests and data required by the specification within the overall price agreed with the Contracting Authority for surveys on the road Network.

The Service Provider shall deliver any reports required by the Specification to the Contracting Authority promptly in accordance with the timescales defined in the contract or, if the contract defines no timescales, defined by this Specification.

The Service Provider shall report any repairs or alterations carried out on the equipment within 7 days to the Contracting Authority. The successful tenderer shall be INAB accredited by the Irish National Accreditation Board for the Measurement of Skid Resistance or similarly approved.

3.6 Survey Procedures

Surveys shall generally be carried out throughout the year to a schedule agreed with the Contracting Authority. SCRIM surveys shall only be carried out in accordance with best practice.

Surveys shall not be carried out in any weather conditions that could adversely affect the accuracy of the data or the quality of the video images. In particular surveys shall not be carried out in the direction of a low sun which may render video footage unusable.

The road network has a range of route lengths. The Service Provider may survey a route continuously which is the preferred option particularly for the shorter routes. If a route is surveyed in sections, the surveys shall be overlapped, and the operator shall record all relevant information to enable the data from the overlaps to be edited efficiently.

The driver of the vehicle shall ensure that the lateral position of the vehicle is such that longitudinal measurements are centred in the middle of the wheel path.

The surveys shall be carried out in the same direction as previous surveys on the same road section. Directional data can be clarified by the Contracting Authority upon request prior to commencement of surveys.

The surveys shall be carried out in the left-most traffic lane, unless otherwise agreed with the Contracting Authority.

Where there are a significant number of parked cars the survey shall follow the left most path taken by normal traffic flow.

The Contracting Authority may require surveys in urban areas to be carried out during off peak times to ensure the collection of sufficient valid data. Where daytime surveys are not feasible on urban roads, the Service Provider shall;

1. Draft proposals for alternative survey arrangements for approval of the Contracting Authority.
2. Liaise with the Contracting Authority and An Garda Siochana to agree the alternative survey arrangements.

The operator shall record the following information and report in an agreed electronic format:

- Operator Name.
- Route and Survey direction.
- Survey Type.
- Survey Date
- Survey start and end locations.
- Weather conditions detailing changes to survey progress.
- Problems encountered with plate markers, e.g., plate missing/incorrect location.
- Description of Detours encountered, and incorrect routes taken.
- Location of any unusual surface conditions encountered such as the surface contaminated by materials, which could invalidate the measured data.
- Start and end chainages and description of any road works encountered, and action taken that could influence measured data.

3.7 Survey Progress Reporting

The Service Provider shall provide a schedule for the surveys and deliver a progress report at monthly progress meetings with the RMO unless otherwise agreed following the start of the surveys. The report shall be delivered by electronic mail and shall provide the following information:

- A list of the routes and lengths surveyed since the previous report.
- Reports of any accidents, incidents, failures, or breakdowns.
- Progress against the schedule and the proposed future schedule.

The Service Provider shall provide details of the location of the equipment at any time, if requested by the Contracting Authority.

The Service Provider shall report all deviations from the survey route. Survey data collected during deviations from the survey route may be considered invalid in terms of the specified coverage requirements. Deviations as a result of parked vehicles shall not deem data invalid.

The Service Provider shall provide road survey equipment with the ability to identify and record lengths containing features placed in or on the road surface for the purposes of traffic control (e.g., speed humps and traffic "chicanes"). Where these features are present the Service Provider shall record their presence in the survey data and the Service Provider shall label any of the parameters of survey data that is affected by these features (for example longitudinal profile) as invalid and will not be used to evaluate data compliance.

3.8 Traffic Management and Health and Safety Requirements

The Service Provider shall plan the surveys in such a manner that the safety of the operators and public is not compromised.

The Service Provider is solely responsible for all requisite traffic management and shall comply with all statutory health and safety requirements. The Contracting Authority requires all survey work to be carried out in compliance with the Safety, Health, and Welfare at Work Act 2005; Safety, Health and Welfare at Work (General Application) Regulations 2007, the Safety, Health and Welfare at Work (Construction) Regulations 2013 and all other current applicable Regulations, Codes of Practice and Guidance.

The Contracting Authority or its representative may carry out safety audits to monitor and check the performance of the Service Provider working on contracts. The Contracting Authority will work closely with Service Providers to ensure health and safety requirements are being adhered to during the duration of the contracts.