

## **ANNEXURE A – SCOPE OF WORK**

**The scope of work will entail but not be limited to the following:**

### **1.1 RAMS IMPLEMENTATION**

#### **1.1.1 Existing System Familiarization**

The current RAMS comprises of the following sub-systems:

- Road Network Information Module **(RNIM)**
- Geographic Information System **(GIS)**
- Surfaced Road Pavement Management System **(S/PMS)**
- Gravel Road Pavement Management System **(G/PMS)**
- Asset Management Reporting System **(AMRS)**

The service provider is required to familiarize themselves with the current system including GIS, database(s), software, interfaces, reporting and all other processes required to operate the system. The rate tendered for undertaking familiarization of the existing system will be a Person/Hour and shall include all labour, materials, equipment, travel, disbursements and other items necessary to carry out the system familiarization process.

#### **1.1.2 Existing System Upgrade**

The service provider is required to familiarize themselves with the current system, further develop the above and possibly other new modules / sub-systems in consultation with the Employers staff and integrate them to the existing system.

In addition to the above, the service provider is to ensure that the system outputs must comply with the TMH 18 data electronic exchange formats.

The rate tendered to upgrade the existing RAMS will be a Lump Sum and shall include all software development and purchase costs, end user licensing and technical support for the duration of the contract and all labour, materials, equipment, travel, disbursements and any other necessary items to provide a fully functional system.

### **1.1.3 Provision of System Hardware and Maintenance**

The service provider will be required to source and maintain hardware related to the RAMS, as and when directed by the Department of Police Roads and Transport.

The rate tendered will be a Prov. Sum and the service provider must produce at least three comparative quotes of SITA approved service providers on RFB1183 and RFB 2003 for submission to the Department of Police Roads and Transport prior to procuring any system hardware and/or maintenance related activities.

## **1.2 FIELD DATA ACQUISITION**

### **1.2.1 ESTABLISHMENT**

#### **1.2.1.1 CONTINUOUS DEFLECTION MEASUREMENT DEVICE**

The rate tendered to establish the Continuous Deflection Measurement Device will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the equipment on site. The amount will be paid once only following establishment of the equipment.

#### **1.2.1.2 FALLING WEIGHT DEFLECTOMETER (FWD)**

The rate tendered to establish the Falling Weight Deflectometer will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the equipment on site. The amount will be paid once only following establishment of the equipment.

#### **1.2.1.3 DIGITAL LASER PROFILER CLASS 1 (3 LASERS)**

The rate tendered to establish the 3 laser Digital Profiler will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the

equipment on site. The amount will be paid once only following establishment of the equipment

#### **1.2.1.4 RESPONSE TYPE ROUGHNESS METER**

The rate tendered to establish the Roughness Meter will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the equipment on site. The amount will be paid once only following establishment of the equipment

#### **1.2.1.5 TRAFFIC CONTROL**

Traffic control will be undertaken strictly in terms of the relevant specification in the latest edition of SARSTM Chapter 13. A detailed traffic management plan is to be submitted to the Employer for approval prior to any work being undertaken. **Non-compliance with the approved traffic management plan will result in a fixed penalty of R 5 000.00 per occurrence and a time related hourly penalty of R 1 000.00 measured from the time of non-compliance notification to the time of rectification**

##### **1.2.1.5.1 Deflections**

The rate tendered to implement the approved traffic management plan and to undertake the traffic control measures will be a Lump Sum and shall include all costs for labour, materials, equipment, travel, disbursements, sub-contractors and other necessary items to undertake this task. The amount will be paid in two (2) equal portions, the first part will be paid following commencement of the work in accordance with the traffic management plan with the second installment being due once the task is completed.

##### **1.2.1.5.2 Visuals and Profiles (Paved)**

The rate tendered to implement the approved traffic management plan and to undertake the traffic control measures will be a Lump Sum and shall include all costs for labour, materials, equipment, travel, disbursements, sub-contractors and other necessary items to undertake this task. The amount will be paid in two (2) equal portions, the first part will be paid following commencement of the work in accordance with the traffic management plan with the second instalment being due once the task is completed.

#### **1.2.1.5.3 Visuals and Profiles (Unpaved)**

The rate tendered to implement the approved traffic management plan and to undertake the traffic control measures will be a Lump Sum and shall include all costs for labour, materials, equipment, travel, disbursements, sub-contractors and other necessary items to undertake this task. The amount will be paid in two (2) equal portions, the first part will be paid following commencement of the work in accordance with the traffic management plan with the second instalment being due once the task is completed.

#### **1.2.1.6 CONTINUOUS SURFACE FRICTION TESTER (AUTOMATED)**

The rate tendered to establish the automated Surface Friction Tester (ASFT, Griptest SCRIM, or similar approved) will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the equipment on site. The amount will be paid once only following establishment of the equipment

#### **1.2.1.7 VISUAL ASSESSORS – PAVED AND UNPAVED ROADS**

The rate tendered to establish the Visual Assessors will be a Lump Sum for the duration of the contract and shall include all costs for labour, materials, equipment, travel, disbursements, and other necessary items to establish the required number of assessors on the project. All costs associated with the 3 day calibration and accreditation session, is also to be included under this item. Only staff who have successfully attended and passed the calibration session and have been formally approved in writing by the employer may undertake visual assessments. Should any of the originally proposed visual assessors not pass the calibration and accreditation process, replacement persons with comparable experience are to be established to undertake the calibration/accreditation until the requisite number of assessors are accredited – the establishment and calibration session costs of replacement persons will be for the contractor's account. The Lump Sum amount will be paid once only following successful accreditation of the requisite visual assessors

### **1.3 DATA COLLECTION – ROAD NETWORK**

The standard operational procedures as given in Draft TMH 13 Part A to G are to be strictly adhered to. Prior to data collection being undertaken, the service provider shall submit the following documentation for the Employer's approval:

- All activities : Contract Quality Plan – refer Draft TMH 13 Part A and Draft TMH 22
- Automated / Instrument Data collection : Current (not more than 12 months) minimum Class 2 Calibration Report – refer to Draft TMH 13 Part A to G
- Automated / Instrument Data collection : Current (not more than 3 months) minimum Class 2 Validation Report – refer to Draft TMH 13 Part A to G

The above documents are to be submitted for each individual data collection facet listed below. In addition to these requirements, “on site” calibration / validation together with control testing during the data collection operation will be required as per the stipulations of Draft TMH 13 Part A to G.

#### **1.3.1 Continuous Deflection Measurement Device**

The undertaking of continuous deflection measurements is to be carried out on the major portion of the paved road network as directed. The device is to be equipped with positioning system(s) meeting the requirements of Draft TMH 13 Part B.

The unit of measurement to undertake this testing will be a Lane.Km and shall include all costs for labour, materials, equipment, taking the continuous deflection measurements, quality plan, control testing, calibration and verification costs and all other necessary actions to undertake this task.

#### **1.3.2 Falling Weight Deflectometer (FWD)**

Falling weight deflectometer (FWD) measurements are to be undertaken on minor portions of the road network as directed. The maximum longitudinal distance between adjacent measurements shall be 100m (staggered between the left and right lanes) but this is to be reduced if directed by the Employer. The condition of the pavement at the test position is to be recorded, eg “severe crocodile cracking”

The FWD equipment is to comply with the technical standards stipulated in the Draft TMH 13 Part F as is the survey methodology (in conjunction with TMH 22). The FWD vehicle must be equipped with calibrated distance measuring instrument (DMI) and global positioning system device meeting the requirements of TMH 13 Part B.

Operators must be fully conversant in the use of the deflection measurement equipment and follow the manufacturer's instructions for use of the equipment. Proof must be supplied that Operators have undergone training in the use and operation of equipment offered.

Traffic control will be undertaken strictly in terms of the relevant specification in the latest edition of SARSTM Chapter 13. A detailed traffic management plan is to be submitted to the Employer for approval prior to any work being undertaken. **Non-compliance with the approved traffic management plan will result in a fixed penalty of R10 000 per occurrence and a time related hourly penalty of R 5 000 measured from the time of non-compliance notification to the time of rectification.**

The unit of measurement to undertake this testing will be Lane.km and shall include all costs for labour, materials, equipment, disbursements, measuring the deflections at 3 “drops” per test point, calibration and verification costs, traffic control, quality management and control testing and other necessary items to undertake this task.

### **1.3.3 Surface Profiles including IRI, RUT, MPD Texture, ACD and Geometry**

#### **1.3.3.1 IRI (International Roughness Index) – Class 1**

The measurement of Class 1 riding quality testing is to be undertaken on portions of the road network as directed with the data being recorded as follows:

- Wheel path: two per lane
- Profile sampling interval:  $\leq 25\text{mm}$
- IRI reporting interval:  $\geq 10\text{m}$  and  $\leq 100\text{m}$

A high precision profiler (Class 1) is to be used for the measurement of the riding quality and the equipment is to comply with system operational and

calibration / verification requirements stipulated in Draft TMH 13 Part C. In addition, the profiling vehicle is to be equipped with a positioning system complying with Draft TMH 13 Part B

Factors that may influence IRI shall be recorded during the survey and the data corrected accordingly. These include, but are not limited to, traffic congestion, pavement condition, having to travel off the carriageway, etc. There are some practical operation practices that the operator should avoid such as sudden acceleration or braking during surveys. Where survey speeds cannot be maintained this must be noted

If road conditions are extremely rough that the collection of riding quality data as prescribed above is not practical or safe; the service provider shall provide an alternative means for estimating pavement roughness for use in such areas, calibrated by ASTM E 1364-95 or a similarly acceptable standard, and subject to Employer approval.

#### **1.3.3.2 Rutting**

Rutting shall be measured either using a point laser or transverse profile laser. The undertaking of continuous wheel track rutting measurements will be done on portions of the road network as directed by the Employer. The rut data is to be collected using a high speed profiler using laser point sensors. The measurement process, system capabilities and calibration / verification requirements are as per the stipulations of the Draft TMH 13 Part D. The profiling vehicle must be equipped with calibrated linear distance measuring device meeting the requirements of TMH 13 Part B.

The undertaking of continuous transverse profile wheel track rutting measurements will be done on portions of the road network as directed by the Employer. The rut data is to be collected using a high speed profiler using full width scanning lasers. The measurement process. System capabilities and calibration / verification requirements are as per the stipulations of the Draft TMH 13 Part D. The profiling vehicle must be equipped with calibrated linear distance measuring device meeting the requirements of TMH 13 Part B.

#### **1.3.3.3 Macro Texture**

Macro texture measurements shall be undertaken on portions of the road network as directed by the Employer. The measurements are to be carried out in each wheel path simultaneously using a high speed non-contact texture profiler. The measuring system is to be compliant with the technical standards stipulated in the Draft TMH 13 Part E, whilst positioning equipment must be according to Draft TMH 13 Part B

#### **1.3.3.4 Automated Crack Detection**

Automated crack detection imaging is to be undertaken as directed. This task is to be undertaken strictly in accordance with the requirements of the Draft TMH13 Part G document. The imaging system utilized is not restricted, but “scaled frame” is a minimum requirement with “range imaging” methods being preferred.

The measurement of crack detection will preferably be integrated and synchronized with the collection of other data, but if a “stand alone” vehicle is used, the positioning system is to comply with the requirements of Draft TMH 13 Part B.

#### **1.3.3.5 Geometry**

The automated collection of road geometry is to be undertaken on portions of the road network as directed. As a minimum, the road geometry is to be measured using differential global positioning system (DGPS) in combination with an inertial navigation system (INS) with the measurement systems meeting the requirements of Draft TMH 13 Part B. The collection of geometry data is to be synchronized with other condition measurement activities.

The collection of the above parameters shall be undertaken using a road surface profiler with all data collected in an integrated manner in a single pass. The unit of measurement to undertake this testing will be a Lane.Km and shall include all costs for labour, materials, equipment, taking the continuous measurements, all calibration and verification costs, quality plan, control testing plus other necessary items to undertake this task.

#### **1.3.4 IRI (International Roughness Index) – Class 3**



The measurement of Class 3 riding quality on unsurfaced roads is to be undertaken on gravel road network as directed. A response type device, calibrated to known IRI in accordance with ASTM E1448-92/98, is to be used for the measurement of the riding quality and the equipment is to comply with system operational and calibration / verification requirements stipulated in Draft TMH 13 Part C. In addition, the profiling vehicle is to be equipped with a positioning system complying with Draft TMH 13 Part B

Factors which may influence the IRI shall be recorded during the survey and the data corrected accordingly. These include, but not limited to, traffic congestion, pavement condition, travel off the carriageway, etc.

If road conditions are extremely rough that the collection of riding quality data as prescribed above is not practical or safe; the service provider shall provide an alternative means for estimating pavement roughness for use in such areas, calibrated by ASTM E 1364-95 or a similarly acceptable standard, and subject to Employer approval.

The unit of measurement to undertake this testing will be a carriageway.km and shall include all costs for labour, disbursements, materials, equipment, taking the roughness measurements, quality management, control testing, calibration and verification costs plus other necessary items to undertake this task.

### **1.3.5 Continuous Digital Imaging (Quantitative)**

The undertaking of continuous “quantitative” digital imaging (i.e. images that are calibrated such that measurements can be obtained e.g. road widths) shall be carried out on portions of the paved road network as directed. The imaging equipment will, as a minimum, be capable of DMI triggered 160 degree scaled frame imaging at 20m intervals maximum and is to comply with the technical specifications of Draft TMH 13 Part G. The imaging vehicle must be equipped with calibrated linear distance measuring device and global positioning system meeting the requirements of TMH 13 Part B.

The unit of measurement to undertake this testing will be a lane.km and shall include all costs for labour, materials, equipment, disbursements, taking the images at 10m intervals, calibration and verification costs, quality management, control testing and all other necessary items to undertake this task

### **1.3.6 Continuous Digital Imaging (Standard)**

The undertaking of continuous “standard” digital imaging shall be carried out on portions of the road network as directed. The imaging equipment will, as a minimum, be capable of DMI triggered 160 degree frame imaging at 20m intervals maximum and is to comply with the technical specifications of Draft TMH 13 Part

G. The imaging vehicle must be equipped with calibrated linear distance measuring device and global positioning system meeting the requirements of TMH 13 Part B.

The unit of measurement to undertake this testing will be a Test Point and shall include all costs for labour, materials, equipment, disbursements, taking the images at 10m intervals, quality management, control testing, calibration and verification costs, together with all other necessary items to undertake this task.

### **1.3.7 Surface Friction Testing (Automated)**

Continuous surface friction testing is to be undertaken on portions of the paved road network as directed and is to be carried out by purpose built equipment such as Side Force Testers or Fixed Slip Testers.

Whichever system is employed, it is to be strictly compliant with the technical standards stipulated in the Draft TMH 13 Part E as is the survey and calibration / validation methodology. The testing system must also be equipped with calibrated linear distance measuring device and GPS meeting the requirements of TMH 13 Part B.

The unit of measurement to undertake this testing will be a Lane.Km and shall include all costs for labour, materials, disbursements, equipment, undertaking the friction measurements, quality management, control testing, calibration and verification costs plus other necessary items to undertake this task.

## **1.4 DATA ANALYSIS / VERIFICATION**

### **1.4.1 Continuous Deflection Measurement Device**

Both normalized and raw deflection bowl data is to be captured to the RAMS within 4 weeks of completing the field work. Prior to the data capture, the service

provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- a) Positioning checks
- b) Check for non-decreasing deflections, ie deflections do not decrease as distance from the load increases
- c) Out of range deflections
- d) Integrity check on inventory data, ie positive and negative direction corresponds to GPS
- e) Cross check comparatively high (+97 percentile) and low (-3 percentile) with the other data for the same (or closest) position eg, visual condition images, crack detection, rutting etc

The checks above are to be done on the 10m deflections and any "outlier" deflection bowls are to be discarded prior to the uploading of the data at 50m spacing. Once the service provider's RAMS pavement engineer is satisfied with the data integrity he/she will issue a data verification certificate. Deflection data is to be issued in excel format inclusive of required normalization(s), deflection bowl parameters and structural number calculations.

The unit of measurement to undertake the data analysis/verification is a Lane.Km and shall include all costs for labour, materials, equipment, capture and verification of the continuous deflection data, quality management, and all other necessary actions to undertake this task.

#### **1.4.2 Falling Weight Deflectometer (FWD)**

Both normalized and raw deflection bowl data is to be captured to the RAMS within 4 weeks of completing the fieldwork. Prior to the data capture, the service provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- a) Confirmation of positional data integrity
- b) Review condition and other comments as noted during the field testing.
- c) Check for non-decreasing deflections, ie deflections do not decrease as distance from the load increases
- d) Incomplete data
- e) Out of range deflections

- f) Integrity check on inventory data, ie positive and negative direction corresponds to GPS
- g) Load variations
- h) High deflection variation at same test point
- i) Deflection bowl “spikes”
- j) Cross check comparatively high (+97 percentile) and low (-3 percentile) with the other data for the same (or closest) position eg, visual condition images, crack detection, rutting etc

Refer to Draft TMH 13, Part F for additional requirements.

Unlike continuous deflection data, FWD testing is widely spaced and, as such, the discarding of suspect test point(s) can create significant gaps in the data set. The RAMS pavement engineer should use engineering judgement to manually adjust erroneous data if possible. Where adjustment is not possible, the Employer may instruct that these sections are re-measured at the service provider’s cost.

Once the service provider’s RAMS pavement engineer is satisfied with the data integrity, he/she will issue a data verification certificate. Deflection data is to be issued in F25 and excel format, the latter inclusive of required normalization(s), deflection bowl parameters and structural number calculations.

The unit of measurement to undertake data analysis/verification is a Lane.Km and shall include all costs for labour, materials, equipment, verification/analysis of the deflections, re-measurement of road sections with incomplete or non-compliant data, quality management, and all other necessary undertake this task.

### **1.4.3 Surface Profiles including IRI, RUT, MPD Texture, ACD and Geometry**

#### **1.4.3.1 IRI, RUT, MPD Texture**

The capture of Class 1 riding quality data, Rutting data and MPD texture to the RAMS is to be completed within 4 weeks of the data collection exercise

Prior to the data being captured, the service provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- a) Positioning cross checks of field co-ordinates with GIS and a secondary geo-spatial reference source
- b) Review comments "flags" noted during the field work
- c) Cross check very poor and very good sections against imaging data
- d) Cross check against rutting and transverse profile data
- e) Cross reference roughness measurements with texture/friction data
- f) Compare random selection (+/- 5% of the riding quality results) to the visual condition
- g) Check inventory details, eg road name/number, date, link/segment reference etc

Refer to Draft TMH 13 for additional requirements.

Once the service provider's RAMS pavement engineer is satisfied with the data integrity, he/she will issue a data verification certificate.

#### **1.4.3.2 Automated Crack Detection (ACD)**

Automated crack detection imaging and raw data files are to be uploaded to the RAMS within 4 weeks of completing the fieldwork. Prior to the data being captured, the service provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- a) Inventory data, ie positive and negative direction corresponds to GPS
- b) Compare random selection (+/- 5%) of crack data with the visual condition
- c) Check for "false positives"
- d) Logical checks

Once the service provider's RAMS pavement engineer is satisfied with the data integrity he/she will issue a data verification certificate.

#### **1.4.3.3 Geometry**

The road geometry is to be uploaded to the RAMS within 4 weeks of completing the fieldwork.

Prior to the data being captured, the service provider's RAMS engineer will undertake data integrity checks including, but not limited to:

- a) Positioning cross checks of field co-ordinates with GIS and a secondary geo-spatial reference source
- b) Compare random selection (+/- 5% of the geometry data) to scaled imaging
- c) Logical checks, eg the grade of the positive and negative sides of the road should be comparable

Refer to Draft TMH 13, Part B for additional requirements

Once the service provider's RAMS engineer is satisfied with the data integrity he/she will issue a data verification certificate.

The unit of measurement to undertake the surface profile data analysis/verification is a Lane.Km and shall include all costs for labour, materials, equipment, upload and verification of the geometry data, quality management, and all other necessary actions to undertake this task.

#### **1.4.4 IRI (International Roughness Index) – Class 3**

The capture of Class 3 surfaced riding quality data to the RAMS is to be completed within 4 weeks of the data collection exercise.

Prior to the data being captured, the service provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- a) Positioning cross checks of field co-ordinates with GIS and a secondary geo-spatial reference source
- b) Review comments "flags" noted during the field work
- c) Cross check very poor and very good sections against imaging data
- d) Cross check against rutting and transverse profile data

- e) Cross reference roughness measurements with texture/friction data
- f) Compare random selection (+/- 5% of the riding quality results) to the visual condition as derived.
- g) Check inventory details, eg road name/number, date, link/segment reference etc

Refer to Draft TMH 13, Part C for additional requirements Once the service provider's RAMS pavement engineer is satisfied with the data integrity he/she will issue a data verification certificate.

The unit of measurement to undertake this testing will be a Lane.Km and shall include all costs for labour, disbursements, materials, equipment, taking the roughness measurements, calibration and verification costs plus other necessary items to undertake this task.

#### **1.4.4.5 Visual Condition**

The visual condition of the paved and unpaved road network shall be undertaken using the “**post rating**” method ie, applying the stipulations of the Draft TMH 9 (Parts A to E as applicable) to the images obtained during the data acquisition process The paved and unpaved **visual assessors** must also attend the compulsory annual calibration and accreditation sessions before being permitted to undertake any visual assessments.

Any inventory errors / additions noted during the field data collection operations will be corrected or added to the RAMS/GIS during this task. For electronic data exchange, the stipulations of Draft TMH 18 will apply.

The post rating and capture of visual condition data to the RAMS is to be completed within 8 weeks of the field work being concluded. Any emergency works identified by this exercise are to be escalated to the relevant management of the Employer

The unit of measurement to undertake this work will be a Lane.Km and shall include all costs for labour, materials, equipment, rating the pavement distress and data capture to the PMS, quality management and data verification/quality control as per points a) to e) above and all other necessary actions to undertake this task.

#### **1.4.4.6 Road Safety Assessments (IRAP or Similar)**

Network Level Road Safety Assessments are to be undertaken on portions of the road network as directed by the Employer. The road safety assessments are to be directly managed by the Road Safety Survey Project Manager and only be carried out by persons accredited as road safety surveyors/assessors with IRAP or similar body approved by the Employer.

The network level road safety field assessments are to be uploaded to the RAMS Road Safety Management module or to proprietary software as applicable. Prior to this, a quality audit shall be undertaken by the Road Safety Survey Project Manager on a random selection of 5% of the safety assessments to verify the original findings

The unit of measurement to undertake this task is km and shall include all costs for labour, materials, equipment, and capturing the safety assessment data.

#### **1.4.4.7 Surface Friction Testing (Automated)**

The uploading of continuous surface friction testing is to be completed within 4 weeks of the field work for this item being concluded.

Prior to the data being uploaded, the service provider's RAMS pavement engineer will undertake data integrity checks including, but not limited to:

- 1) Positioning cross checks of field co-ordinates with GIS and a secondary geo-spatial reference source
- 2) Review comments "flags" noted during the field work
- 3) Compare with manual (pendulum test) data
- 4) Compare left and right wheelpath for anomalies
- 5) Cross check against imaging data and macro texture data
- 6) Check inventory details, e.g. road name/number, date, link/segment reference etc.

Refer to Draft TMH 13, Part E for additional requirements.

Once the service provider's RAMS pavement engineer is satisfied with the data integrity he/she will issue a data verification certificate.



The unit of measurement to undertake the data analysis/verification is a Lane.Km and shall include all costs for labour, materials, equipment, upload and verification of the macro texture data, quality management, and all other necessary actions to undertake this task.

## **1.5 REPORTING**

### **1.5.1 Flexible Surfaced Road Network**

Upon completion of data acquisition, data analysis, data verification and uploading of the data to the RAMS a network report is to be prepared on the status quo of the surfaced road network condition. The report will discuss, inter alia, current condition, deterioration, trends, maintenance and rehabilitation strategies/plans, optimization analysis and prioritization of maintenance and rehabilitation actions, budget needs versus budget allocations, emergency interventions and improvement projects.

The report will include current unit rates and validate the planned budget expenditure illustrating how proposed rehabilitation and maintenance plans will improve the condition of the surfaced road network and mitigate risk. The content of the annual Surfaced Road Network Report will include, but not limited to:

- Executive Summary
- Introduction and Terms of Reference
- Inventory Data
- Inspections Undertaken
- Discussion on Inspections and Quality Control Procedures
- Instrument/Automated Surveys Undertaken
- Discussion on Instrument/Automated Surveys and Quality Control Procedures
- Detailed Discussion on results of Instrument/Automated Survey
  - Deflection (Continuous deflections and/or FWD)
  - Crack Detection
  - Riding Quality
  - Rutting
  - Texture
  - Friction
  - Geometry
  - Traffic

- Inspection Results in terms of Condition Index, Prevalent Modes of Distress and Trends
- Prioritisation and Optimization Analysis
- Discussion on Identified Remedial Interventions and Trends
- Summary of Maintenance/Rehabilitation/Improvement Needs
- Economic Analysis and Budgetary Requirements
- Asset Register
- Proposed Emergency Projects
- Critical Route Identification
- Special Inspections Required
- Future Surfaced Road Network Inspections

Appendix A: Surface Road Inventory and Updates

Appendix B: Photographs

Appendix C: Priority Listings

Appendix D: Optimization Results

Appendix E: Remedial Intervention Algorithms and Indices Calculations

Appendix F: Repair Measure Listings: Routine Maintenance

Appendix G: Repair Measure Listings: Periodic Maintenance

Appendix H: Repair Measure Listings: Special Maintenance

Appendix I: Repair Measure Listings: Rehabilitation and Improvement

Appendix J: Budgets and Economic Analysis

Appendix K: Asset Register

Appendix L: Emergency Interventions

Appendix M: Specialist Inspections

Appendix N: Future Inspections

Appendix O: Panel Inspection and Quality Control

Appendix P: GIS Maps indicating Condition and Remedial Action Requirements

The unit of measurement to undertake this reporting will be a lump Sum and shall include all costs for labour, materials, equipment, disbursements, travel, compiling the report, printing 5 paper copies, 2 electronic copies on CD, and presenting the report to the Employer as instructed.

### **1.5.2 Unsurfaced Road Network**

Upon completion of data acquisition, data analysis, data verification and uploading of the data to the RAMS a network report is to be prepared on the status quo of the unsurfaced road network condition. The report will discuss, inter alia, current condition, deterioration, trends, maintenance/rehabilitation and

upgrading strategies/plans, prioritization of maintenance and rehabilitation actions, budget needs versus budget allocations and emergency interventions. The report will include updated unit rates and validate the planned budget expenditure and illustrate how the proposed rehabilitation, maintenance and upgrading plans will improve the overall condition of the unsurfaced road network and mitigate risks.

The minimum content of the annual Unsurfaced Road Network Report will include, but not limited to the following:

- Executive Summary
- Introduction and Terms of Reference
- Inventory Data
- Inspections Undertaken
- Discussion on Inspections and Quality Control Procedures
- Instrument/Automated Surveys Undertaken
- Discussion on Instrument/Automated Surveys and Quality Control Procedures
- Detailed Discussion on results of Instrument/Automated Survey - Riding Quality
- Inspection Results in terms of Condition Indices and Trends
- Prioritisation Analysis
- Discussion on Identified Remedial Interventions and Trends
- Summary of Maintenance/Rehabilitation/Improvement Needs
- Economic Analysis and Budgetary Requirements
- Asset Register
- Proposed Emergency Projects
- Critical Route Identification
- Special Inspections Required
- Future Unsurfaced Road Network Inspections

Appendix A: Unsurfaced Road Inventory and Updates

Appendix B: Photographs

Appendix C: Priority Listings

Appendix D: Remedial Intervention Algorithms and Indices Calculations

Appendix E: Repair Measure Listings: Routine Maintenance

Appendix F: Repair Measure Listings: Periodic Maintenance

Appendix G: Repair Measure Listings: Special Maintenance

Appendix H: Repair Measure Listings: Rehabilitation and Improvement

Appendix I: Budgets and Economic Analysis

Appendix J: Asset Register  
Appendix K: Emergency Interventions  
Appendix L: Specialist Inspections  
Appendix M: Future Inspections  
Appendix N: Panel Inspection and Quality Control  
Appendix O: GIS Maps indicating Condition and Remedial Action Requirements

The unit of measurement to undertake this reporting will be a lump Sum and shall include all costs for labour, materials, equipment, disbursements, travel, compiling the report, printing 5 paper copies, 2 electronic copies on CD, and presenting the report to the Employer as instructed.

### **1.5.3 Safety Assessments (IRAP)**

Upon completion of the safety assessment data acquisition, data verification and uploading of the data to the RAMS, a network report is to be prepared on the status quo of the road network in terms of safety.

The report will discuss, inter alia, current condition, trends, safety intervention strategies, costs and emergency projects. The report will validate the safety audit procedures and illustrate how the assessments will improve road safety and mitigate risks

The minimum content of the Road Safety Assessment Network Report will include, but not necessarily be limited to the following:

- Executive Summary
- Introduction and Terms of Reference
- Inspections Undertaken
- Methodology
- Discussion on Inspections and Quality Control Procedures
- Discussion on Network Attributes and Snapshot
- Inspection Results in Terms Safety Ratings
- GIS Maps illustrating Safety Ratings per Road Link
- Discussion on Identified Remedial Interventions and Trends
- Proposed Emergency Projects
- Critical Route Identification
- Special Inspections Required
- Future Safety Audits

The unit of measurement to undertake this reporting will be a lump Sum and shall include all costs for labour, materials, equipment, disbursements, travel, compiling the report, printing 5 paper copies, 2 electronic copies on CD, and presenting the report to the Employer as instructed.

#### **1.5.4 RAMS Asset Register and RAMP**

Upon completion of the FULL data acquisition, data analysis, data verification and uploading of the data to the RAMS a network report is to be prepared on the status quo of the Road Network Asset Register. The report will be comprehensive and fully compliant with the TMH 22 stipulations and will report on, inter alia, current component valuation, replacement cost, valuation/replacement ratios, discount rates and net present values, valuation trends and other statistics as required.

In addition to the above, the employers' annual road asset management plan report is also to be compiled.

The unit of measurement to undertake this reporting will be a lump Sum and shall include all costs for labour, materials, equipment, disbursements, travel, liaison with the Employers financial staff, compiling the reports, printing 5 paper copies of each report, 2 electronic copies of each report on CD in both \*.pdf and \*.doc format and presenting the reports to the Employer as instructed.

### **1.6 ADDITIONAL SERVICES**

#### **1.6.1 Attend Meetings**

Project meetings including the annual calibration and accreditation sessions will be either be held at the Employer's offices or Service Provider's offices. The unit of measurement to attend these regular meetings will be the Person Hour and shall include all costs for labour, materials, equipment, disbursements and travel, compiling of the meeting agenda, preparing Minutes and circulating such. All of the Service Provider's Key Persons (except the bridge / culvert inspector's and the paved / unpaved roads assessors), as listed in the Contract Data, are required to attend these meetings.

Attendance at meetings in addition to the above can be claimed for under disbursements. Expenditure for additional meetings shall only be undertaken on written instruction of the Employer.

### **1.6.2 Ad-hoc Support: Support Staff**

Ad-hoc support may be required periodically from the Service Provider. The unit of measurement is the hour of time spent on such services by Category A staff (as defined in the Engineering Profession Act (46/2000)) and shall cover all labour costs for time actually spent on the provision of the “ad-hoc” service. Payment for time spent travelling will not be made, but the costs of such travel and disbursements can be claimed under disbursements if pre-approved by the Employer.

Expenditure for the above shall only be undertaken on written instruction of the Employer.

### **1.6.3 Strategic Support**

This task will involve all activities associated with reviewing and assessing RAMS operations of data collection, evaluation, interpretation and decision support at a high level to maximize the cost / benefit of the system and the appropriateness of the information generated. The Service Provider will provide advice at strategic level in terms of improving the RAMS capabilities and operational effectiveness and will be responsible for reviewing annual reports for institutional and legislative compliance.

The unit of measurement to attend these regular meetings will be the Person Hour and shall include all costs for labour, materials, equipment, disbursements and travel, compiling of the meeting agenda, preparing Minutes and circulating such. The overall project manager, as listed in the Contract Data, is required to attend these meetings.

### **1.6.4 Training and Skills Transfer**

In addition to ad-hoc informal training provided during the various data collection activities, assessments and data analysis operations, the Service Provider will facilitate and manage formal trainings for the Employers staff and students identified by the Employer. The training plan must include but not limited to the following topics:

- COTO TMH9 : Manual for Visual Assessments (flexible, rigid, semi-rigid and un-surfaced roads)
- COTO TMH22 : Road Asset Management Manual
- COTO TMH19 : Manual for the Visual Inspection of Road Structures (Part A and B)
- COTO TMH3 and TMH8 : Manuals for Traffic Monitoring
- COTO TMH18 : Manual for Road Asset Data Electronic Exchange Form  
ats

The training programme must include theoretical and practical sessions and, for the road and structures assessment training, include formal testing for accreditation purposes. In addition to the above, workshops will be arranged to familiarize the Employers staff and designated students with the various RAMSs and sub-systems

A Provisional Sum has been included for training /skills transfer and the Service Provider will submit a detailed 3-year training plan, together with costs, for approval within 6 weeks of appointment. Expenditure under this item shall only be undertaken on written instruction of the Employer

## **1.7 DISBURSEMENTS**

### **1.7.1 Travel**

Travelling costs are only payable where the individual pay item description allows for such. The unit of measurement is the vehicle kilometre and shall include for all costs associated with the travel. Travelling by other means (air, rail etc.) will be pre-approved by the Employer. Expenditure under this item is to be pre-approved by the Employer.

### **1.7.2 Accommodation**

Accommodation costs are only payable where the individual pay item description allows for such. The unit of measurement is the person night and shall include for all accommodation costs including meals and any other subsistence expenses. Expenditure under this item is to be pre-approved by the Employer.