



SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

SURVEY SPECIFICATIONS

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S1000 GENERAL

S1100 GENERAL REQUIREMENTS FOR SURVEY WORK

S1110 SCOPE

This section supplements Chapter 1 of the TMH11 Standard Survey Methods.

S1120 INSURANCE

The amount of insurance required shall be stipulated in the Contract Data.

S1120(a) PROGRESS AND TECHNICAL REPORTS

Monthly reports of the progress made with surveys, shall be prepared for each of the Employer's Provincial Offices, as required in TMH11 Standard Survey Methods, Clause 1.11. The report shall be provided in the latest version of Microsoft Excel spreadsheet and shall include details such as, but not limited to the Route, Section and km distance (if applicable), the project name, the property parcel name, the survey type, whether the data has been entered into the Employer's database or not, and remarks about the progress of each survey, for the week under review.

Technical reports shall be submitted to the Employer for each survey completed, as required under TMH11, Clause 1.12.

S1130 CHECKS TO BE UNDERTAKEN PRIOR TO SUBMISSION

The requirements under Clause 1.14 of TMH11 shall apply to all surveys conducted and shall be paid for under the relevant survey items, as may be determined under the relevant specifications.

S1140 DELIVERY NOTES

A detailed list of all items delivered to the Client must be provided. Where the progressive submission of items is envisaged then such list must be provided with each submission.

All items should be submitted in good order.

Where progressive submissions have been made, then on completion of the survey project the entire data set must be submitted such that the Client is able to disregard previous submissions. The final submission should then comprise of the entire survey project data sets.

Storage devices containing the project survey data must be clearly labelled with the project number, project description, date of submission and the data set version number. All data versions, whether submitted on storage devices or electronically, should be numbered in accordance with the example below:

First submission Version 1.0 (5 March 2023)

Second submission	Version 1.1 (10 March 2023)
Third submission	Version 1.2 (25 March 2023)
Final Submission	Final Version (1 April 2023)

A digital submission to the client via a digital platform or online data transfer utility that the client can easily access, can also be used to submit interim information, provided that the above requirements are also met. The Employer shall shortly deploy a new version of SAP, which may change the naming convention and/or file structure for all data submission. Until this system is deployed, the Service Provider shall, wherever further specified, load survey data into the ITIS system of the Employer.

The Service Provider and Employer shall agree from time to time which method of data delivery shall be used.

S1150 PROGRAMME FOR THE EXECUTION OF THE WORKS

The Service Provider shall perform its duties in accordance with the programme outlined in the Table below.

Table: Programme of Works

FUNCTION	PROGRAMME
Assisting the Employer to maintain and update pro-forma documentation.	Continuous
The undertaking of subdivision surveys emanating from the clearance of title deeds and the acquisition of land	Programming in accordance with LAC programme, or as instructed by the Employer or the Employer's designated Service Provider
Comprehensive administration and co-ordination of subcontracts	Continuous
The maintenance of all survey registers	Continuous. Monthly reporting required
The updating and maintenance of the Employer's Spatial Database on ITIS with all survey and related data	Continuous. Monthly reporting required

FUNCTION	PROGRAMME
Assistance of the Employer to maintain standards and specifications	Continuous

S1160 STANDARD OF WORK

All engineering, topographical and photogrammetric survey tasks and quality control shall be executed in accordance with latest version of the Technical Methods for Highways TMH11: Standard Survey Methods, and the Guidelines to Formalise SANRAL's Jurisdiction on National Roads (in terms of Act 7 of 1998 (as amended)), or any other requirement specified in writing. All cadastral surveys shall be executed in accordance with the Land Survey Act, as amended.

S1170 SAFEGUARDING DATA

The Service Provider shall take all reasonable precautions to preserve the integrity of its data and also prevent any corruption or loss of the Employer's data.

The Service Provider shall ensure that a regular back-up copy of its data is made, so that any loss of the Employer's data in ITIS can be reconstructed from the Service Provider's data.

In the event that the Employer's data in ITIS is corrupted or lost as a result of any fault by the Service Provider the Employer shall have the option, in addition to any other remedies that may be available to it either under this Contract or otherwise, to select either of the following remedies:

- a) The Employer may require the Service Provider to restore or procure the restoration of the Employer's data using the back-up copy referred to above, or,
- b) the Employer may itself restore or procure restoration of its data using the back-up copy referred to above and shall be compensated by the Service Provider for all cost related thereto.

S1180 PAYMENT

General requirements for survey work

Item	Unit
S11.1 Obtain permission to enter on land for surveying	No.
S11.2 Obtain approval for the destruction of property	No.
S11.3 Monthly survey reports	No.
S11.4 Technical reports	No.

Where a general introduction letter issued by the Employer is not accepted by a landowner and a special permission is required, obtaining permission to enter upon land outside of the road

reserve for surveying shall be remunerated for each landowner for which written permission is obtained. Advising the Employer's Provincial office shall also be required but shall not be paid for separately.

Payment for obtaining approvals and keeping records of destruction of property as provided for in TMH11, clause 1.7 shall paid for at the tendered rate.

Payment for Monthly reports submitted to the relevant Provincial Offices shall be made for each Provincial Office, per month. For the avoidance of doubt, for each month that acceptable, accurate reports are submitted to each Provincial Office, payment shall be made at the tendered rate.

Payment shall be made for each Technical Report that satisfies the requirements of TMH11, clause 1.12.

S1200 TECHNOLOGY AND FILE MANAGEMENT

S1210 SCOPE

This section covers the responsibilities of the Service Provider with respect to the storage of documentation over and above the requirements contained in the Property Specifications.

All documentation and scanned, approved (signed) documents in .pdf format relating to the work done by Service Provider shall be entered by the Service Provider into the Employer's electronic document management system or, if applicable, the ITIS system.

S1220 INFORMATION TECHNOLOGY PROVIDED BY THE EMPLOYER

The Employer shall provide the Service Provider with access to ITIS system and the Electronic Document Management System and the necessary software to access the two systems. All cost will be for the Service Provider's cost.

The Employer will provide licences for GIS software. Any other software packages will be for the Service Provider's account. The Service Provider will also be responsible for any software developments costs as a result of this additional software. Any other software package must support Oracle 19 64 bit encoded or later spatial and Oracle Workspace Management via an Oracle SQLnet connection directly or any other specifications as specified from time to time by the Employer.

S1230 FILES

The document management system assigns a unique document number to any newly added document. This document number must be used as the reference number of the document itself e.g. the document number attribute on a subdivision diagram must be this same document number. Refer to the LIS Specifications.

Other files, for example CAD drawings, orthophotos, and DTM's shall be entered by the Service Provider into ITIS, EDMS and/or any other platform instructed by the Employer and be linked to the land parcel. Training of the Service Provider in the use of ITIS shall be provided shortly after the commencement of the contract.

S1240 AERIAL IMAGES

The Service Provider shall ensure that all aerial images are ortho-rectified and correctly geo-referenced prior to entering them into ITIS, EDMS or other platform instructed by the Employer.

S1240(a)

CAD DRAWINGS

From time to time it may be required of the Service Provider to import CAD data from survey drawings, projects, etc. The Service Provider shall validate the co-ordinate system used and

import the CAD data into ITIS and/or EDMS, correctly geo-referencing it prior to doing so. The data must be imported by copying the CAD layers according to the correct ITIS/EDMS feature class.

S1240(b) DIGITAL TERRAIN MODELS

From time to time it shall be required of the Service Provider to validate and import digital terrain models (DTMs) received. The Service Provider shall validate the co-ordinate system used and ensure that the DTM file is otherwise valid and of the type specified.

S1250 SCANNING OF DOCUMENTS

The scanning of all acquisition diagrams, subdivision SG Diagrams, Published Declarations and other documents shall comply with the following requirements;

S1250(a) ACCEPTANCE TEST PROCEDURE

The Contractor shall provide a detailed step-by-step Acceptance Test Procedure to the Employer for approval within 30 days of commencement of the contract, and shall demonstrate to the Employer;

- a) That documents are kept together and returned to the same directory and in the same order that they were retrieved in,
- b) Black Edge removal,
- c) Document de-speckling and de-skewing, - see figure below.

De-speckling operation



- d) The accuracy of the optical character recognition process in the case of text documents,
- e) Converting the document to the latest Microsoft Word format,
- f) Referencing and entering the documents into the document management system.

Measurement and payment shall be subject to the acceptance of the quality of workmanship as measured against the Acceptance Test procedure.

Prior to commencing with the works, the Service Provider shall prove to the Employer that he is capable of completing the work timeously and satisfactorily and;

- a) That the scanned and cleaned images are of the highest quality,

- b) That the character recognition is capable of achieving at least 95% accuracy,
 - c) Demonstrate to the Employer how conformation of scanned pages will be ensured in cases of being double fed, or should a jam occur and pages be skipped.
- a) The Service Provider’s equipment and software shall have the following capabilities;
- a) Scan pages ranging in size from A6 up to and including A3- size documents, including non- ISO standard sizes of sizes in between A6 and A3, in colour and at a minimum of 200 dpi,
 - b) Scan one-sided and two-sided pages,
 - c) Scan pages of varying thickness,
 - d) Scaling and fitting documents to A4 or A3-size paper,
 - e) Scan photo reports,
 - f) Generating code from 3D files and print 3D models,
 - g) Scan old and brittle paper of varying sizes ranging in size from A6 to A3, without damaging the paper,
 - h) Cleaning the document by removing black edges caused by the scanning of the document and de-speckling, de-skewing and rotation of the document;
 - i) “Rotation” means rotating the image in such a way that the document image is turned right side up from upside down or on its side,
 - ii) “De-skewing” means rotating the image in order to get the lines of text or drawn lines to be completely parallel with the edges of the electronic document pages,
 - iii) “De-speckle” means removing all unwanted spots and marks after scanning of the paper document.
 - i) Saving the scanned document in a multi-page .tiff compression format file (in the latest format),
 - j) Perform optical character recognition on the .tiff file and saving the text in the latest Microsoft Word format.

After the scanning and cleaning is complete, the multi-page .tiff file and the Microsoft Word text file shall be imported into the Employer’s electronic document management system.

S1260 PAYMENT

Technology and file management

Item	Unit
S12.1 Aerial Images	No.
S12.2 CAD Drawings	No.
S12.3 Digital Terrain Models	No.

S12.4 Scanning of documents

No.

Payment shall be made for each ortho-rectified and correctly geo-referenced aerial image entered into ITIS/EDMS.

Payment shall be made for importing each set of CAD data from survey drawings, projects, etc. after validating the co-ordinate system used and importing the CAD data into ITIS/EDMS, correctly geo-referenced prior to doing so. The data must be imported into ITIS/EDMS by copying the CAD layers according to the correct ITIS/EDMS feature class.

Payment shall be made for each DTM received and validated to ensure that the co-ordinate system used is correct and that the DTM file is otherwise valid and of the type specified. Payment includes entering the data into ITIS/EDMS.

Payment shall be made for each document scanned and corrected in accordance with the requirements and entered into ITIS/EDMS.

S1300 DATA TYPES, FORMATS AND CAPTURING OF DATA

S1310 SCOPE

This section covers the various data types, their formats and the entry of data into ITIS.

S1320 EMPLOYER'S CADASTRAL DATA

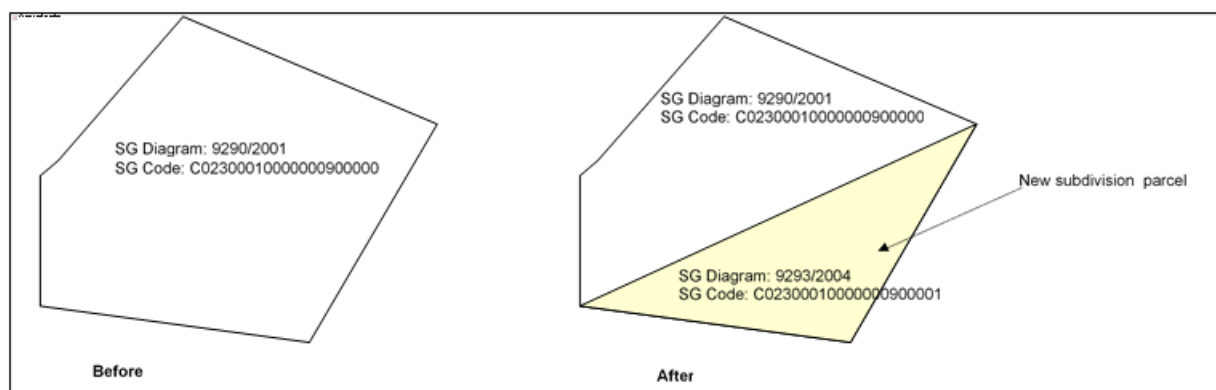
Land information in the form of cadastral polygons is stored on the ITIS system of the Employer, which must be maintained by the Service Provider. Any subdivisions or updated SG diagram information must be maintained on these parcel polygons. All land parcels must at all times be spatially correct and not display any slivers, duplicate points, kickbacks, etc. All parcels are to be maintained from the originally calculated survey coordinates contained in the subdivision or cadastral key plans.

The history of all changes made to any specific parcel is stored in ITIS. This enables a user to retrospectively view the original parcels and the changes made over time.

The Service Provider is also responsible for maintaining the attribute information for these parcels.

In the example below, a new subdivision is made on an existing cadastral polygon,

New subdivision example



The Service Provider shall be responsible for capturing the new sub-divided parcel and all attributes for the new parcel (note that some attributes are only able to be captured when the approved diagram is received back from the SG office). The Service Provider must then cleanly merge the new parcel with the existing cadastral polygon once the subdivision has been approved.

The Employer's cadastral data shall be maintained in the ITIS system which contains spatial data columns for storing the spatial polygons.

For entering cadastral parcels into ITIS refer to S2200.

S1330 OTHER CADASTRAL DATA

Cadastral polygons of land not belonging to the Employer, but which fall alongside National Roads are stored in ITIS in order to indicate both the road reserve and severed land.

There are two usual sources of the information;

- a) The one source is the cadastral polygons in at least a 5 km buffer either side of the Employer's roads. This data is obtained monthly by the Employer and will not need to be maintained by the Service Provider other than to link any identified or acquired land parcels to the land parcel shown in the database.
- b) The other source will be the calculated polygons for cadastral key plans. These calculated polygons, with their attributes shall be maintained by the Service Provider and stored in ITIS.

S1340 DECLARATION POINTS AND POLYGONS

NOT USED IN THIS TENDER

S1350 FORMAT REQUIREMENTS FOR INDIVIDUAL LAND PARCELS

Although SANRAL requires of the Service Provider to have GIS software, it will also accept individual land parcel spatial data in .dxf format that is compatible with the latest version of Auto CAD, if provided by sub-contractors. Due to the stringent requirements of GIS, the .dxf data must be carefully constructed exactly to this specification.

ArcView Shape files will be accepted by SANRAL.

The Service Provider therefore has a choice of delivery format from one of the two below;

S1350(a) DRAWING EXCHANGE FORMAT

Multiple (or all) properties may be included in a single Drawing Exchange Format (.dxf) file.

The .dxf data must be 100% "clean" and free of any undershoots, overshoots and duplicate lines. All lines must intersect with zero tolerance.

Circles showing beacon positions must not be included. Only the lot boundaries (i.e. the actual lines excluding the directions, distances and any other text) as well as the lot descriptions must be supplied. The line styles of all lines must solid, and the weight of all lines must be 1.

Compound or complex elements may not be used and the CAD file should be broken down into its simplest form before exportation to .dxf. Polylines are acceptable but CAD "shapes" are not. In Microstation CAD, for example, a "drop complex" command must be run on the file before exportation.

Drawings must not be scaled and no constants are to be used.

No annotation text is required in the .dxf data, except for the cadastral description and grid co-

ordinates. The cadastral must only include the portion number (or sub number) and the lot number (or farm number in the rural case) of the property.

The portion number must be placed above the lot number and must be on a different CAD layer to the lot number. The portion number is to be denoted with a “PTN” prefix followed by a single space and then the number. E.g. “PTN 3”. Only the latest portion number is to be displayed with no history of its parent i.e. PTN 2 (of 1) is not acceptable. Old cadastral descriptions such as “SUB A of B of X” are obviously also not acceptable.

The lot number or farm number is to be placed below the sub number as a separate text entity i.e. a carriage return when keying in the data is not acceptable. The number must be simply recorded e.g. “16851”.

Finally, in the case of a farm, the farm name must also appear below the farm number. The name should appear in upper case e.g. STERKFORTEIN. In the case of a township, the township name must appear below the lot number, also in upper case e.g. UMLAZI A.

All text must appear wholly inside the portion to which it relates regardless of text size necessary to accomplish this. The tenderer must remember that this deliverable is not intended to be a plan pleasing to the eye, but rather a dataset ready for GIS conversion.

Grid references must appear in the DXF files with a minimum of four grid cross points and their full WGS 84 Lo co-ordinates displayed on the X and Y lines. No true north arrows are to be inserted and no map borders, titles or scale bars are required.

Finally, servitudes are to be recorded as closed polygons (figures) on the appropriate level with a single label “SERVITUDE” wholly inside the polygon. Orientation of the text does not matter. This applies to all text in the DXF file, except for the grid reference text, which must run parallel to the line that it pertains to.

The CAD layer structuring must be as follows;

- a) Layer 1- Cadastral,
- b) Layer 2- Portion text,
- c) Layer 3- Erf or farm number,
- d) Layer 4- Farm Name,
- e) Layer 5- Servitude Text,
- f) Layer 6- Grid reference lines and text,
- g) Layer 7- Surrounding cadastral lines (optional),
- h) Layer 8- Surrounding cadastral text (optional).

A schedule of absolute spatial accuracies of each lot in the delivered data set must be provided. This can be expressed as ranges e.g. Lot 1 – 234, 0,01 m accuracy (surveyed), Lot 235, 1.5 m (River boundary digitised) etc. The schedule can be in a hard copy or digital (preferably Microsoft Excel) format.

S1350(b) ARCVIEW FORMAT

Multiple (or all) properties may be included in a single GIS file.

The data must be 100% “clean” and free of any undershoots, overshoots and duplicate entities. All lines must intersect with zero tolerance should the data be line data. All polygon data sets shall be free of “sliver” polygons i.e. thin or tiny polygons that have been unintentionally created.

The attribute data accompanying the spatial data should be delivered in DBASE IV (.dbf) file format or any other file format as prescribed from time to time by the Employer.

S1360 BORROW PIT POLYGONS AND ACQUISITION DIAGRAMS

NOT BE USED IN THIS TENDER

S1370 PERMANENT SURVEY CONTROL

The NRB points are the set of control points used for road surveys. These points shall be saved in ITIS and it is the responsibility of the Service Provider to maintain the spatial and attribute information for these points.

S1400 SURVEY RELATED LEGAL AND OTHER SERVICES

SURVEY RELATED LEGAL AND OTHER SERVICES

S1410 SCOPE

This section covers the obligations of the Service Provider in respect of work of a legal support nature. It must be noted that the outcome of these services may or may not impact upon the Specifications.

As this section describes work that is subcontracted or is undertaken by specialists, payment shall be made in terms of the General Specifications.

S1420 LAND LEGAL MATTERS AND ADVICE

Previously provided specialist land and legal advice concerning various issues arising out of the Employer's obligations in terms of legislation is provided in Volume 3.

The Service Provider may be required to obtain further legal advice with respect to current and new legislation that may affect the Employer's survey related obligations.

If the work is to be done by the Service Provider, payment shall be made using the payment item below. If the work is to be subcontracted, G1600 of the General Specifications must be used, or as indicated by the Employer.

General Duties;

- a) Identification of possible land legal problems,
- b) Identification of the Employer's responsibilities with respect to any amendment of existing legislation and new legislation pertaining to surveying,
- c) Advise the Employer on the subdivision and transfer of Unalienated State or Tribal land and land situated in the former homelands and self-governing territories,
- d) On behalf of the Employer, liaise with statutory bodies to ensure that the Employer's land legal concerns are correctly dealt with.

Duties in respect of Statutory Obligations concerning the Subdivision of Land;

- a) Provide legal input with respect to all laws that impact on the subdivision of land in each of the Provinces,
- b) Propose and formulate policies which must be applied nationally by the Service Provider in response to land use legislation,
- c) Compile and maintain policy on the subdivision of land,
- d) Assist the Employer overcome subdivision approval problems encountered at the local authorities.

S1430 STATUTORY FUNCTIONS IN RESPECT OF SURVEY

Duties;

- a) Deal with servitudes, rights of way, etc,
- b) Perform investigations to determine any statutory issues that affect the Employer's property, and advise the Employer accordingly,
- c) Study new land and surveying legislation and advise the Employer concerning any implications,
- d) Arrange for the withdrawal / cancellation of subdivision diagrams if so required,
- e) Obtain certified copies of SG diagrams upon request,
- f) Advise the Employer, private and in-house surveyors concerning legislation, subdivision standards, any Employer-specific requirements and specifications, statutory consents, street and road closures, etc,
- g) Advise the Employer concerning subdivision boundaries in order to facilitate subdivision applications,
- h) Inspect beacon certificates and advise the Employer if any matter of concern arises therefrom.

S1440 HANDLING QUERIES AND PROVIDING ASSISTANCE TO OTHERS

The Service Provider shall be required to extract, prepare and provide data to others and deal with queries from the Employer's consultants, contractors, Service Providers and private sector entities concerning land matters. Prior to supplying any data or information to such parties, the Service Provider shall always first obtain the consent of the Employer to do so.

S1450 PROFESSIONAL ASSISTANCE OF DESIGN ENGINEERS

NOT TO BE USED FOR THIS TENDER

S1460 PAYMENT

Survey related legal and other services

Item	Unit
S14.1 Land Legal Matters and Advice	Hr
S14.2 Statutory functions regarding surveying	Month
S14.3 Handling queries, assisting others with survey statutory functions	Month

S14.4 NOT TO BE USED.

Payment shall be made for every hour that the Service Provider is engaged in providing the Employer with land legal advice. The Service Provider must keep an ongoing detailed diary of matters referred to the Service Provider, the hours spent doing the work, and the name of the person(s) undertaking the work.

Payment for the handling of statutory functions and for the routine handling of queries and assisting others shall be paid for at the monthly rate tendered under S1402 and S1403, respectively.

The Service Provider shall be remunerated at the hourly rate tendered for assisting design engineers outside of routinely held meetings, with the approval of the Employer. The Service Provider must keep an ongoing detailed diary of the nature of assistance to consulting engineers, the hours spent doing the work, and the name of the person(s) undertaking the work.

**S1500 DECLARATIONS, PROCLAMATIONS AND
RELATED WORK**

S1510 SCOPE

S1500 IN ITS ENTIRETY NOT TO BE USED FOR THIS TENDER

S1600 DRAFTING, MAINTAINING AND UPDATING DOCUMENTATION

S1610 SCOPE

This section describes the responsibilities of the Service Provider with respect to tender documentation to be used primarily for procuring subcontractors.

S1620 DESCRIPTION

This function comprises the updating of pro-forma tender documentation. These documents must be amended and brought up to date whenever instructed by the Employer.

Tender Documents have been compiled for survey work. These must be revised and updated as the requirements for Supply Chain Management change, or as technological developments take place, or because of the development of the capacity of the Employer to measure and manage work.

The various categories of photogrammetric site and strip surveys are discussed in TMH11.

For these surveys, the Service Provider will be required to prepare a single proforma document that must be used for the procuring of subcontracted surveys and for addressing the requirements in respect of second-tier procurement.

The work to be done includes the following;

- a) Undertaking a comprehensive need assessment in consultation with all the Employer's Provincial Office to identify and formulate all the required types of proforma survey tenders to be updated to cover the full spectrum of works undertaken by the Employer,
- b) The update and maintenance of all pro-forma survey tender and quotation documentation in accordance the Employer's specification document for Roads and Bridge Works,
- c) All liaisons with the Employer in this regard,
- d) The provision of all pro-forma tender and quotation documentation in the latest version of Microsoft Word,
- e) The provision of one set of hard copies of all tender and quotation documentation.

S1630 PAYMENT

Drafting, maintenance and updating of documentation

Item	Unit
S16.1 Creation, maintenance and updating of documentation;	
S16.2 Photogrammetric surveys	Hr.
S16.3 Topographic surveys	Hr.
S16.4 Ad-hoc surveys	Hr.

S16.5 Construction progress surveys

Hr.

Payment will be made for creating or amending proforma documents.

Any reimbursable costs such as printing, binding etc. shall be in accordance with the General Specifications.

No payment shall be made for any minor amendments to the tender / quotation documentation after the final tender documents have been approved and signed off by the Employer.

S1700 SAFETY ADMINISTRATION

S1710 SCOPE

This section supplements Chapter 2 of the TMH11 Standard Survey Methods and covers the accommodation of traffic during surveys.

S1720 TRAFFIC ACCOMMODATION

In addition to the requirements of TMH11, Chapter 2, the Service Provider shall be responsible for accommodating traffic whenever surveys are undertaken within road reserves. Traffic shall be accommodated in accordance with the least delay to, and disruption of passing traffic.

In all dealings with the public, the Service Provider shall bear in mind the public's right to enjoy the use of the road conveniently and safely and shall be courteous and understanding in any discussions or interaction with road users or other contractors working on the Employer's roads.

The Service Provider shall notify the Employer and, if applicable, the Routine Road maintenance Contractor of its intention to work within the road. The Service Provider may not commence with surveying activities before adequate provision has been made to accommodate traffic in accordance with the requirements of these Specifications.

S1730 PROVISION OF ROAD SIGNS AND HIGH VISIBILITY TRAILERS

The Service Provider shall provide sufficient road signs to enable it to meet all of its surveying obligations and the requirements of accommodating traffic whilst undertaking surveying work.

The Service Provider shall provide high visibility trailers for use as traffic accommodation devices whilst performing surveys in terms of the contract.

S1740 SAFETY AND THE SUSPENSION OF WORK

Failure of the Service Provider to provide and maintain traffic control facilities in accordance with these requirements, or failure to take the necessary precautions for the safety and convenience of public traffic shall be sufficient cause for the suspension of work until the Service Provider has complied with all safety requirements to the satisfaction of the Employer and the Routine Road Maintenance Contractor.

Claims for compensation as a result of the suspension of the work under these circumstances will not be considered. Penalties for incompliance shall be applied in accordance with the General Specifications.

Note: The routine road maintenance contractors appointed by the Employer are authorised to stop all work and/or to impose penalties, should the survey Service Provider not adhere to these requirements.

S1750 PAYMENT

Safety Administration

Item	Unit
S17.1 Provision of road signs in compliance with TMH11	Lump Sum
S17.2 Provision of high visibility trailers	No.
S17.3 Monthly compliance with the OHS Act during surveys	Month
S17.4 Traffic accommodation of low volume single carriageway roads (<100 vph);	
S17.04(a) Establishment of permanent survey control only	Day
S17.04(b) Staking of kilometre markers only	Day
S17.04(c) Topographical and any other Engineering surveys	Day
S17.04(d) Surveying whilst driving with a GPS mounted on the vehicle	Day
S17.04(e) Bend Point Surveys	Day
S17.04(f) Sub divisional surveys	Day
S17.04(g) Structural survey	Day
S17.04(h) Monitoring surveys off the road surface	Day
S17.5 Traffic accommodation of medium volume traffic (>100 vph);	
S17.05(a) Establishment of permanent survey control only	Day
S17.05(b) Staking of kilometre markers only	Day
S17.05(c) Topographical and any other surveys	Day
S17.05(d) Surveying whilst driving with a GPS mounted on the vehicle	Day
S17.05(e) Bend Point Surveys	Day
S17.05(f) Sub divisional surveys	Day
S17.05(g) Structural survey	Day
S17.05(h) Monitoring surveys off the road surface	Day
S17.6 Working in the road prism on dual carriageway roads;	
S17.06(a) Establishment of permanent survey control only	Day
S17.06(b) Staking of kilometre markers only	Day
S17.06(c) Topographical and any other Engineering surveys	Day
S17.06(d) Surveying whilst driving with a GPS mounted on the vehicle	Day
S17.06(e) Bend Point Surveys	Day
S17.06(f) Sub divisional surveys	Day
S17.06(g) Structural survey	Day
S17.06(h) Monitoring surveys off the road surface	Day
S17.07 Working in the Road Surface / Pavement - All roads;	
S17.07(a) Payment of Registered Traffic Accommodation service provider (When RRM not available and Sourced by Quotation under item G21.03)	Prov. Sum
S17.07(b) Mark up on Payment of Registered Traffic Accommodation service provider	%
S17.07(c) On site Management of Traffic Accommodation service Provider	Day
S17.07(d) Topographical and any other Engineering surveys on the road surface	Day
S17.07(e) Structural survey (When the setup has to be on the road surface)	Day

S17.07(f)	Monitoring surveys on the road surface	Day
S17.08	Security	
S17.08(a)	Payment of Security Service Provider	Prov Sum
S17.08(b)	Mark Up	%
S17.08(c)	Onsite management of Security Service Provider	Day

Under S17.01, the Service Provider shall be remunerated once at the tendered rate for providing sufficient traffic signs to cover all work under the contract, regardless of the number of teams working in the field, or the number of sites at which traffic accommodation is required during the period of the contract.

Under S17.02, the Service provider shall be paid for each high visibility trailer acquired and made available for use on the contract, up to the maximum quantity shown in the pricing schedule. Should the Service Provider require further sign trailers, it shall acquire them at its own cost. The sign trailers must be available for the work of the Employer at all times, failing which, the payment made for each trailer found to be used elsewhere shall be deducted from any moneys due to the Service Provider.

The Service Provider shall be paid once per day for establishing traffic accommodation equipment on site to protect a surveying team from the dangers of passing traffic. Payment shall distinguish between the different risk environments covered by S17.04 (a) to (h) and S17.05 (a) to (h).

To avoid doubt, one day's traffic accommodation will be paid for, regardless of the number of similar sites at which work was conducted at in one day. If a team erects traffic accommodation covering more than one risk environment in a day, payment shall be made for each as if it had been erected for a day.

All costs of travelling and subsistence will be remunerated in terms of the General Specifications.

S1800 INFORMATION SOURCING

S1810 SCOPE

This section covers the sourcing of property and property owner data.

In the case of construction and upgrading projects, the Service Provider will be provided with Property Reports, compiled by design engineers and approved by the Employer's project managers. Although these Property Reports should provide all information required to define the property to be acquired and include ownership details, in reality information may be missing such as servitudes, bonds, leases, land claims, mining rights or caveats registered over the property, any of which may affect the road design and subsequent acquisition of the property.

Land identification entails identifying properties underlying National Roads that were historically acquired by any one of several authorities and transferring it to the Employer.

THIS SPECIFICATION ONLY APPLICABLE IN AS MUCH AS IT RELATES TO THE SPLUMA PROCESS AND SUBDIVISION

S1820 GENERAL

The sourcing of detailed, correct and up to date information with regard to all properties affected by the construction or upgrading of a new or an existing national road, as well as new access roads, borrow pits, etc., or when the transfer of identified land is required to be done at the same time as a further acquisition, it shall be done timeously in accordance with the LAC programme.

Unless a landowner specifically agrees in writing that construction may commence, it shall be noted that construction may not take place on any property to be acquired prior to the finalisation of the acquisition. It therefore is of the utmost importance to carefully programme the sourcing, verifying and/or updating of data in order to not delay the rest of the acquisition process.

Sourcing of information shall be of such a standard as to ensure that the correct and most current information is used for acquisitions.

Property details and owner information will be required when Land Acquisition is performed or when a Donation Agreement (for a land identification transfer) needs to be negotiated or for any other purpose of carrying out a duty in terms of these Specifications.

Certain property owner information, as discussed further below, is available on ITIS and no further sourcing of this information will be required. However, verification of this information will still be required, as it may have occurred, for instance, that address and other contact details have changed and have not been updated at the Deeds Office.

As part of its Quality Management, the Service Provider shall develop and implement an internal verification system to verify that the correct information has been requested and received in order to safeguard against incorrect information being recorded on the Employer's database and in order to deal with audit queries.

The Service Provider shall develop and maintain an electronic register to record the dates that documentation was requested from various third parties as well as when it has been received. This register may serve to avoid penalties that may be imposed by the Employer for the late completion of its required duties and it is therefore in the Service Provider's own interests to keep the records up to date. This shall be made available to the Employer upon request.

The Service Provider shall maintain in the front of each file, a tick list of details that are required to be on the file, so that, at a glance, the user of the file is able to identify outstanding information and information that is already on the file.

Although much information will be made available on ITIS, a fee is likely to be payable to third parties for the provision of information. It is therefore advisable to make arrangements with the larger third-party entities, whose services will be used on a regular basis.

Upon receiving an instruction to acquire property, the Service Provider shall open a new case file (if no prior acquisition has been performed on the property). The file must be correctly referenced in accordance with the required filing system, complete with district number and case number. The case file must be entered into the File Register in accordance with the requirements of the National Archives and Records Services Act. The file shall also be recorded in the File Management System described in the General Specifications under Section G1400.

S1830 DATA MADE AVAILABLE BY THE EMPLOYER

The Employer purchases frequently updated data from a third-party vendor in respect of:

- a) Spatial cadastral data: all cadastral data in a buffer 5 km either side of national road centrelines in rural areas, and 500 m either side of national roads in urban areas, updated quarterly. This data must be maintained by the vendor independently of the Surveyor-General and be derived from Deeds Cadastral Data.
- b) Title Deeds: All data since April 2007, which includes owner data and cadastral changes. This data is to be sourced from the Deeds Office and updated monthly in the Employer's database.

The Service Provider shall however, at all times, ensure that the latest cadastral information is used in carrying out its duties.

S1840 SOURCING OF PROPERTY INFORMATION

The following third parties are potential sources of documents and information relating to property:

- a) ITIS, as described in S1830, above,
- b) Deeds of Registry, (see notes),
- c) Surveyor General, (see notes),

- d) Registrar of Companies,
- e) Bond Holders,
- f) Master of the High Court,
- g) Provincial Authorities,
- h) Local Authorities,
- i) Any other third parties not mentioned above,
- j) Design Engineers, who produce Property Reports.

Notes;

The Service Provider is required to source data monthly from third party data providers, containing SG diagrams as well as market information of all property within a buffer, either side of National Roads, and hand it to the Employer for loading onto the ITIS system, from where it will be made available to the Service Provider.

The following documents and information, wherever applicable to the transaction or duty being performed and the property in question, must be obtained from the sources mentioned above:

- a) The correct property description and extent of the property,
- b) Title Deed information not already available on ITIS, notarial deeds, caveats, interdicts and rights that are registered or noted against the title deed(s) such as Bonds, Leases, Options, Servitudes, usufructs, expropriations, fidei-commissums, water rights, prospecting rights, and attachments, etc, including their numbers if registered against the relevant title deed in the office of the Registrar of Deeds. Where Title Deeds are not available in the Deeds Office for any reason, the Regulation 68 under the Deeds Act makes provision for their replacement, which may include advertising the application for a replacement in local newspapers,
- c) Where mineral rights in respect of the land are held under separate title, full particulars shall be given of the holder of the mineral rights and the title under which the rights are held, including a description of the mineral details with regard to compensation including, but not limited to the amount, date of purchase and minerals involved. In cases where the mineral rights are not held under separate title, the status of the rights shall be clarified,
- d) SG diagrams of the registered or surveyed unregistered property in respect of property, servitudes, lease areas, prospecting areas, reserved mineral right areas, any encumbrances described as a condition in the title deed(s), such as usufructs, fidei-commissum, access roads, power line and other servitudes, water rights, mineral rights, etc,
- e) Unless the project is a “Green Fields” project, the location of the property by route, section and km distance as marked along national roads by blue km marker boards, spaced every 200 m, or 1 km as the case may be,

- f) If applicable, the relevant Company, Closed Corporation or Trust Registration Certificate (together with all addenda),
- g) Full details of declarations or proclamations in respect of all national, provincial, municipal and/or secondary roads that have been declared over the subject property, including details in respect of all portions of the subject property that were previously acquired/expropriated by any authority for their road reserves or as severed land, as well as details with regard to the compensation (if any) that was paid out in respect of the property. In some cases, this information is still kept by the authorities concerned,
- h) Any other documentation relevant to the property, such as the VAT certificate and bank details of the owner,
- i) Land Acquisition Plan prior to acquisition or expropriation,
- j) Details of compensation, which shall include details from Provincial files where a former provincial road has been declared as a national road,
- k) Current and, if applicable, the approved land use of the property,
- l) Details of approved accesses, or how an existing access will be affected by the acquisition,
- m) Mortgage Bonds registered against the property and bond holder details,
- n) Interdicts and judgements affecting the property, etc
- o) Copies of any correspondence in respect of the relevant property,
- p) Way leave/Lease/sale agreements where applicable to the acquisition,
- q) Valuation details,
- r) Township Development Establishment conditions, if required to clarify any aspect of the acquisition,
- s) If already commenced with by the current owner, any land ennoblement or alienation details,
- t) Any information concerning the existing access to, or over the property to another property or properties, especially so if the access is a registered servitude
- u) Land claims registered against the property.

All of the documents and information must be placed on the property case file (referenced N10/3/1/district no./case No. - see the approved filing system include in Volume 3) for future use and reference.

The Service Provider shall correctly and accurately enter all relevant data into the ITIS system and where necessary, correct or update data.

S1850 SOURCING OF COMPILATION PLANS AND SG DIAGRAMS

If not already available in ITIS, and as covered by the surveying specifications, the Service Provider shall source relevant compilation plans from the Surveyor General in the different provinces to enable it to, thereafter, source the relevant SG Diagrams applicable to the national road reserve or any other properties that might be required by the Employer.

The Compilation plans may be sourced in any available scale. The normal scale used for rural areas is 1:25 000 and in urban areas 1:5 000.

Some Surveyor General Offices will be able to supply electronic plans, but in other instances, a printed copy of the Compilation plans will have to be sufficient. The Service Provider shall ensure that Compilation plans are recorded in the ITIS system of the Employer for quick reference purposes and shall be replaced whenever a new plan becomes available.

Upon the receipt of the Compilation plans, the Service Provider shall be in a position to determine which SG Diagrams are required to compile a Cadastral Key plan (see Surveying Specifications). The relevant SG Diagrams shall then be requested from the Surveyor General's Offices.

The following duties must be performed:

- a) Identify and obtain compilation sheets,
- b) Identify road centre line on compilation sheets,
- c) Identify stands affected by buffer,
- d) Source SG Diagrams from ITIS, SG Office or SG internet site in Hardcopy or digital Format of stands affected by buffer,
- e) Scan SG Diagrams and Rename .pdf file to ITIS requirements,
- f) Convert Digital SG Diagrams to .pdf format,
- g) Separate Digital SG Diagrams into;
 - i) Inside road reserve
 - ii) Outside road reserve
- h) Merge all .pdf files that are outside road reserve to one .pdf file or another readable format as prescribed by the Employer.

S1850(a) ENTRY OF SOURCED SG DIAGRAMS AND ATTRIBUTES OF PROPERTIES INCLUDED IN THE PROCLAIMED ROAD RESERVE INTO THE DOCUMENT MANAGEMENT SYSTEM.

Create a folder and enter once off attributes per road section:

- a) Service Provider name,

- b) Category,
- c) LAC number,
- d) Provincial Office,
- e) Key plan – source,
- f) Author,
- g) Document type,
- h) Category sub-type,
- i) Service Provider job number,
- j) Route,
- k) Section,
- l) Document name.

Enter .pdf files and attributes of each SG diagram into ITIS. The attributes of each SG diagram include:

- a) Diagram type,
- b) SG number,
- c) SG Approved date,
- d) Property Location (“Mother” property),
- e) Property description,
- f) Parcel number,
- g) Actual Portion,
- h) Sub-divisional Portion,
- i) Surveyed area,
- j) Property type,
- k) Major Region,
- l) Minor Region,
- m) S G office name,
- n) Province,
- o) Municipality,

p) Magisterial district.

S1850(b) ENTRY OF SOURCED SG DIAGRAMS AND ATTRIBUTES OF PROPERTIES OUTSIDE THE PROCLAIMED ROAD RESERVE INTO THE DOCUMENT MANAGEMENT SYSTEM

Create a folder and enter once off attributes per road section;

- a) Company,
- b) Category,
- c) LAC number,
- d) Provincial Office,
- e) Key plan – source,
- f) Author,
- g) Document type,
- h) Category sub-type,
- i) Service Provider job number,
- j) Route,
- k) Section,
- l) Document name.

Enter one merged .pdf file of all SG diagrams outside road reserve.

S1860 SOURCING OF TOWNSHIP DEVELOPMENT ESTABLISHMENT CONDITIONS

The conditions of Township Development Establishment are required to establish what the zoning and land use of a specific land parcel is, and in whom the ownership thereof vests.

Where required, the Service Provider shall source the Conditions of Establishment of a Township from the local authority/Municipality who approved the township development. All the conditions pertaining to the approval of the township will be contained in the Township Development Establishment Conditions. This information must be entered into the document management system of the Employer.

S1870 SOURCING OF PROPERTY OWNER DETAILS

If up to date information is not already in ITIS, Property Owners' details will be required when Land Acquisition is performed or when a Donation Agreement needs to be negotiated with a property owner, or for any other purpose of carrying out a duty in terms of these Specifications. Once obtained, data shall always be recorded in ITIS.

If the data is not available in ITIS, or it is out of date, the Service Provider shall source property owner details from entities such as local authorities or municipalities, the Registrar of Companies, Master of the High Court or any other source available. At times, it may be necessary to employ the services of tracing agents as Third-Party Service Providers, which is covered by the General Specifications. The Service Provider shall always first check what information is provided in ITIS before embarking on further property owner information searches as title deed and SG information is received and updated monthly by the Employer.

The sourcing of property owner details may be done using the property description or any other information that is known to the Service Provider. The Service Provider shall develop and implement, as part of its Quality Management, an internal verification system to verify that the correct information has been requested and received in order to safeguard against incorrect information being recorded on the Employer's database.

It shall be necessary to update owner information as properties may have changed hands at any time during the acquisition process. To establish if a property has changed hands, a Deeds Office search, which is usually the first source of information, shall be done to establish the current registered owner details, which must be checked against the information already on the case file and updated as required.

The information and documents listed below must be obtained and placed on the case files of properties and be captured on ITIS:

- a) The full name(s), addresses, date(s) of birth, ID number, marital status, telephone numbers, and if appropriate their representatives, the Executor of Estate (including the letter of Appointment as Executor as contained in the records of the Master of the High Court) if the owner is deceased, the Administrator of Estate (including the letter of Appointment as Curator as contained in the records of the Master of the Supreme Court) if the owner is sequestered, and the relevant Sheriff if property has been attached shall be obtained and recorded. Full particulars of a landowner's marital status shall also be provided; for example, "SUSAN DAPHNE SMITH, born JOHNSTON, widow", or "SUSAN DAPHNE SMITH, born JOHNSTON, married under ante nuptial contract to PETER JOHN SMITH with marital powers included/excluded",
- b) The name(s), marital status, dates of birth/ID number, postal address(es) and telephone numbers of the registered usufructuary(ies), fidei-commisum(s), etc. or their representatives,
- c) In the case of minors, the full names, etc. of the guardians (natural or appointed) shall be recorded. In the case of an appointed guardian, the number and date of the letter of appointment, as well as a copy thereof (if available) shall be placed on file,
- d) In the case of a Company, Closed Corporation or Trust, the relevant registration number must be given,

- e) An indication whether any sequestration or interdicts are registered against either the registered landowner or the affected property and if so, full particulars shall be supplied and filed,
- f) Names, addresses and telephone numbers of all registered bondholders, holders of mineral rights, lessees and owners of servitudes, options (such as offer to purchase), prospecting rights and any other registered right on, under or over the affected property.

At times, authorities may charge a fee for providing information, which shall be reimbursed at cost, plus a mark-up.

S1880 SOURCING OF SPATIAL DEVELOPMENT FRAMEWORK INFORMATION

In terms of the Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013), a certificate allowing the subdivision of land and its subsequent use must be obtained from the relevant local authority before a development (such as a road) can be constructed.

Currently the SPLUMA Act allows municipalities to publish their own bylaws concerning the zoning of property, the requirements for applications for approval to subdivide property, develop it and further use it. Each municipality may also publish its own fee structure. Some municipalities exempt the Employer from having to follow some, or all of their procedures, while others have published bylaws that are restrictive or expensive to comply with. In most cases, the submission of SPLUMA applications results in a longer project delivery period and frustrates landowners who cannot receive their compensation until the property the Employer has acquired has finally been transferred.

It is therefore important that the Employer and Service Provider are fully aware of, and are able to respond to these challenges to avoid project delays.

Where this data is not already on the Employer's system for areas where national roads exist, or are planned, the Service Provider must obtain missing spatial development bylaws and proclamations from all spheres of government and capture them in ITIS / SAP.

Thereafter, the Service Provider must, wherever national roads exist or are planned, ensure that each time a new plan is published, or an existing plan is updated by a sphere of government, the information is obtained and captured on the Employer's computer system.

Where spatial development plans are available in a GIS format, the information must be obtained and submitted to the Employer for loading onto its system.

S1890 PAYMENT

Information Sourcing

Item	Unit
S18.01 Sourcing of all property and owner details from;	
S18.01(a) Deeds Office (if not already in ITIS)	No

S18.01(b)	Courts, Registrar of Companies	No
S18.01(c)	Provincial Authorities	No
S18.01(d)	Local Authorities	No
S18.01(e)	Other sources and third parties not mentioned above	No
S18.02	Direct costs of sourcing of property information	Prov.sum
S18.02(a)	Mark up on direct costs for sourcing property information	%
S18.03	Applications for the replacement of lost or destroyed Title Deeds	No
S18.04	Advertisement costs	PC sum
S18.04(a)	Administration fee for Advertisement costs	%
S18.05	Sourcing township development establishment conditions	No
S18.06	Direct costs for township development establishment conditions	Prov.sum
S18.06(a)	Mark up on direct costs	%
S18.07	Sourcing of Owner Contact Details;	
S18.07(a)	Deeds office	No
S18.07(b)	Surveyor General	No
S18.07(c)	Courts	No
S18.07(d)	Local Authorities	No
S18.07(e)	Any other third party not mentioned above	No
S18.08	Sourcing of compilation plans and SG Diagrams	No
S18.09	Sourcing of new or updated spatial development bylaws	Hr
S18.10	Ongoing monitoring for new or updated bylaws	Month

Generally, the Service Provider shall be paid once only for sourcing all documents and information in the categories S18.01 (a) – (e) above, provided always that whenever the Service Provider is unsuccessful in sourcing the required information, the service rendered shall not be paid for. The Service Provider shall, however, be paid for the sourcing of information again where it is necessary to verify previously sourced information that could reasonably be suspected to have changed. The capturing of the documents and information in ITIS and the placing of the information and documents in the case files, as well as any subsequent correction of any information captured shall deemed to be included in the above rate. Payment shall not distinguish between cases in which all the listed required information has to be sourced, or cases in which certain of the documents and documentation is not required to sourced, or does not exist. It must be noted that the sourcing of information from the Surveyor-General, if not already in ITIS, is covered by the Surveying Specifications. The Service Provider shall note that the entry of the data into ITIS is a requirement, and that payment may, at the discretion of the Employer, be measured by the data that is entered into ITIS.

The actual costs, exclusive of VAT, charged by third parties for providing the documents and information will be reimbursable by the Employer. The Service Provider shall be entitled to a mark up on the actual direct costs incurred, exclusive of VAT, at the tendered percentage rate. Copies of invoices must be attached to claims for payment.

Where the Deeds Office, or any other statutory body requires and advertisement to be placed in a news paper or other publication, the costs will be remunerated at invoice value less VAT, with an administration fee being payable at the tendered percentage.

S1900 LAND IDENTIFICATION

THIS SPECIFICATION NOT TO BE USED FOR THIS TENDER

S2000 CADASTRAL WORK

S2100 LEGAL ASPECTS OF BEACONS

S2110 SCOPE

This section covers important aspects of the Land Survey Act that relate to beacons, and supplements Chapter 5 of the TMH11.

S2120 BEACON REQUIREMENTS

Beacons shall be placed in accordance with the Land Survey Act No 8 of 1997 and the promulgated Regulations.

Additionally, beacons shall conform with and be clearly marked in conformance with Chapter 5 of TMH11.

S2130 BEACONING OF THE ROAD RESERVE

Where the road reserve has been previously staked but is unfenced, the staked positions shall be adopted as being the road reserve, excepting where the positions of the stakes are found to deviate from the road reserve co-ordinates supplied by a Y,X mis-closure that exceeds 0,5 m. In this case, the road reserve co-ordinates shall be used.

Where the road reserve has not been previously staked and is unfenced, beacons are to be placed in accordance with the road reserve co-ordinates supplied.

Where the road reserve has been fenced, the following shall apply:

- a) Refer to the “Formalisation of the Employer’s Jurisdiction over National Roads” “Scenarios potentially encountered in the sub-division of road reserves”,
- b) Corner fence posts, which are in a solid state and of a permanent nature, may be adopted as demarcating the road reserve and must be painted green over the top 300 mm of the post provided that the fence is in the correct position. Where the fence post is not in an acceptable condition, a beacon shall be established in close proximity to the fence post so as to minimise the deviation of the fence line from its original position,
- c) If it was discovered during the investigation prior to the sub-division that a fence line materially deviates from the road reserve position, additional land may have to be acquired to remedy the deviation, or it may occur that land previously acquired and compensated for lies outside of the fence line. The Service Provider shall always notify the Employer of the situation in writing. The Service Provider shall attach an A4 plan to his investigation report clearly defining the deviation and the areas of adjacent land and road reserve involved. The Employer will then advise the Service Provider whether or not to deviate from the normal beaconing protocols described above.

S2140 BEACON CERTIFICATES

The surveyor may be instructed to point out cadastral or road reserve beacons (whether placed, adopted or from existing subdivisions) to the Employer and/or landowner. A duplicate beacon certificate may be required to be signed by both the landowner and the Employer.

These beacon certificates shall be submitted to the Employer.

S2150 PAYMENT

Legal aspects of beacons

Item	Unit
S21.1 Iron standards 450 mm	No.
S21.2 Iron pegs 16 mm diameter, 450 mm with concrete blocks	No.
S21.3 Extra over for standards or pegs installed by drilling	No
S21.4 Whitewashed stone cairns	No.
S21.5 Issuing of beacon certificates	No.

The payment items shall be measured by the number of iron standards, iron pegs with concrete blocks and whitewashed cairns of stones installed.

Where standard or pegs must be installed in rock, an extra-over payment may be claimed for every hole drilled to accommodate the standard or peg.

Beacon certificates shall be measured by the number of certificates issued, regardless of the number of beacons contained in any certificate.

S2200 COMPILATION OF KEY AND ACQUISITION PLANS
THIS SPECIFICATION NOT TO BE USED FOR THIS TENDER

S2300 SUB-DIVISIONAL SURVEYS

S2310 SCOPE

This section covers sub-divisional surveys to enable the transfer of properties that were previously acquired but not transferred to the Employer, as well as new sub-divisional surveys.

Although it is a general principle that applies to the entire contract, the Service Provider is reminded here that items that are measurable and payable under other items apply equally to the work covered by this section including, but not limited to getting permission to enter site, subsistence and travel, printing costs and any other item for which a rate has been tendered.

S2320 LEGISLATION GOVERNING STATUTORY SUBDIVISION CONSENTS

S2320(a) THE SOUTH AFRICAN NATIONAL ROADS AGENCY AND NATIONAL ROADS ACT 1998, (ACT 7 OF 1998)

At present, it is necessary to secure sub-divisional consent for the sub-division of land inside the road reserve within an urban area and where land outside a road reserve is being subdivided.

Further, the Surveyor-General of the province concerned will also insist on sub divisional consent being obtained for transfers of roads within a road reserve. This imply having to obtain consent from the local municipality.

S2320(b) THE SUBDIVISION OF AGRICULTURAL LAND ACT, ACT NO 70 OF 1970

In terms of Section 3, the consent of the Minister of Agriculture or his/her delegate is required for any subdivision, lease or any other right to or over “agricultural land” as defined in the Act unless exempted in terms of other provisions of the Act or any other law. “Agricultural land” is defined as any area of land not divided into erven and may exclude public spaces and roads indicated as such on a general plan. In terms of Proclamation R 100 of 1995, all land situated in the area of jurisdiction of a transitional council, which immediately prior to the first election of the members of the transitional council, was classified as agricultural ground, shall remain classified as such.

The following list represents some of the cases and /or bodies that are exempt from the provisions of the Act:

- a) Agricultural Holdings and townships (specifically excluded from the definition of “agricultural land “,
- b) The subdivision of land owned by or intended for transfer to the State,

- c) The subdivision of land intended for transfer to statutory bodies such as the Employer.

Statutory approval in terms of Section 3 must be obtained for the subdivision of any land that is not to be used for national road purposes. Where the subdivided portion may not be used for agricultural purposes, a condition will be imposed stating that the portion concerned must be rezoned prior to the consent to subdivide is issued.

S2320(c) SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 16 OF 2013

This Act was recently promulgated and it seeks to provide a framework for spatial planning and land use management in South Africa. All planning legislation in the country must be in conformity with this Act. If it is necessary to obtain consent for the subdivision or consolidation of land, it may be necessary to obtain such approval in terms of this Act if other legislation does not exist in the province concerned.

S2320(d) THE ADVERTISING ON ROADS AND RIBBON DEVELOPMENT ACT, ACT NO 21 OF 1940

The Surveyor-General, in terms of section 11, may not approve a diagram of a subdivision, without the consent of the Premier of the Province, if the division would defeat any object of the Act.

All subdivisions or remainders (created as a result of subdivisions) that are less than 25 ha in extent and are situated outside an urban area, but lie within 95 m of a main or building restriction road, require consent in terms of Sections 11 (3) and 11 (6) of the Act (main roads do not include National Roads).

The provisions of the Act are binding on the State and Organs of State.

The provisions of this Act are not regarded to be applicable to the subdivision of an agricultural holding or a leasehold area.

S2320(e) REQUIREMENTS IN TERMS OF KWAZULU NATAL PLANNING AND DEVELOPMENT ACT, ACT NO 6 OF 2008

Application shall be lodged with municipalities in terms of chapter 3 of the said act. A municipality may approve the sub-division or consolidation of land in accordance with this act.

S2320(f) AGRICULTURAL HOLDINGS (TRANSVAAL) REGISTRATION ACT, ACT NO 22 OF 1919

Although the Act was repealed in terms of section 36(1) of the Division of Land Ordinance, 20/1957, its provisions are still applicable to agricultural holdings that existed at the time that the above-mentioned ordinance came into operation.

Consent for subdivision of a holding is granted in terms of Section 18 of the Division of Land Ordinance 20/1986.

In terms of Section 5 of the Act an agricultural holding may, however, not be subdivided into portions (including the remainder) smaller than 8565 m² in extent.

It is necessary to excise an agricultural holding from the relevant General Plan before it can be subdivided into portions smaller than 8565 m².

It is possible to close a portion of a street shown on the General Plan of agricultural holdings that are smaller than 8565 m². The ownership, however, vests with the Local Authority and in order for the street portion to be transferred to the Employer; this newly created holding must be excised.

S2320(g) TOWN-PLANNING AND TOWNSHIPS ORDINANCE NO 15 OF 1986

Consents for the subdivision of erven in an approved township are granted in terms of Section 92.

Consents in terms of Section 92 cannot be granted for subdivision of erven in townships established in terms of Proclamations R1897/1986 (former Black Urban areas) and R293/1962 (former Trust Land) unless these laws have been repealed.

Land of which a Local Authority is the owner is not exempt from the provisions of Section 92 since only the subdivision of State-owned land, by the presumption of law, are exempt from the provisions thereof. This presumption, however, does not apply to a portion of a piece of land intended for transfer to the State.

S2320(h) DIVISION OF LAND ORDINANCE NO 20 OF 1986

This Ordinance effectively applies to the subdivision of all land with farm descriptions, including agricultural holdings, but excluding “agricultural land” as defined in terms of Act 70 of 1970.

Land of which the State or a Local Authority is the owner is exempt from the provisions of this Ordinance in terms of section 2(1)(a).

In terms of Section 2(1)(i) the provisions of this Ordinance do not apply to the division of land where the land is held, required or alienated by the Employer, provided that each subdivision line shall coincide with a boundary of a National Road.

In terms of Proclamation No 114 of 17 June 1994, the administration of this Ordinance has been assigned to the Province of Gauteng and in terms of Proclamation No 110 of 17 June 1994, to the Provinces of Mpumalanga, North-West, Western Cape and Limpopo. It is clear, therefore, that the Provinces of the Eastern Cape, Northern Cape, Free State and Kwazulu-Natal do not enjoy the above-mentioned exemptions.

S2320(i) TOWNSHIP ESTABLISHMENT AND LAND USE REGULATIONS PROCLAMATION NO R1897 OF 1986

These regulations were promulgated in terms of the Black Communities Development Act 4 of 1984 and are still in operation in townships established in terms of this Act.

The areas not affected by these regulations, are the North West Province, the previously self-governing areas of Kwa-Ndebele, Gazankulu, Lebowa and KaNgwane and the independent states of Venda and Bophuthatswana.

Consents to the subdivision of erven and the closing of streets are issued by the department charged with local government in terms of regulations 19(5) and 19(7) respectively.

S2320(j) ADMINISTRATION AND CONTROL OF TOWNSHIPS REGULATIONS PROCLAMATION NO R293 OF 1962

These regulations were promulgated in terms of the Development Trust and Land Act 18 of 1936, and are still in operation in areas governed by this Act.

The areas affected are Mpumalanga (except the area previously comprising the self-governing State of Kwa-Ndebele), Gauteng and Limpopo (except for the area that previously comprised the independent State of Venda).

The regulations are not in force in the Northwest Province.
Consents to subdivide and the closing of streets are issued by the Department charged with local government.

S2320(k) VENDA LAND AFFAIRS PROCLAMATION NO 45 OF 1990

The provisions of this proclamation are still in force in the area that was previously the independent State of Venda.

Consent to a subdivision of an erf in an approved township is issued by a Local Authority in terms of Section 18(1).

S2320(l) LAND USE PLANNING ORDINANCE NO 15 OF 1985 (CAPE)

This Ordinance is in effect in the Eastern, Northern and Western Cape Provinces.
Consent to subdivide is issued in terms of Section 25, unless exempted in terms of Section 23(1).
In terms of Section 23(1) the following subdivisions are, *inter alia*, exempt from the provisions of the Ordinance;

- a) subdivision of land for the purposes of construction or the alteration of roads or any matter related thereto,
- b) subdivision of land for transfer to a local authority, semi-state institution or other statutory body,
- c) subdivision of land for transfer from a local authority, semi-state institution or other statutory body, excluding land units which are alienated for development.

S2320(m) TOWNSHIPS ORDINANCE NO 33 OF 1934 (CAPE)

Consent for subdivision is issued by the Director of Local Government or local authority, if so authorised.

The Surveyor-General may approve a diagram if the local authority has certified on the diagram that the subdivision is necessary for the purposes of constructing, widening or

improving any road or street, or for the purposes of any other matter ancillary to or connected with a road or street.

The closure of a street must be published in the provincial gazette and a copy of this notice must accompany the ordinary road closure certificate and instruction in terms of section 37(2) of the Land Survey Act, 1997.

S2320(n) OTHER LEGISLATION AFFECTING ROADS THROUGH TOWNS

Public places may be closed in terms of Section 67(10) of the Local Government Ordinance, 17/1939, Development Facilitation Act, 67/1995 and the Township Establishment and Land Use Regulations, Proclamation No R1897/1986.

The closure of a public place cannot be reversed.

An erf number (or holding number, in the case of a smallholding) for the closed street/road will be allocated.

The new holding thus created, if smaller than 8565 m², must be excised from the General Plan prior to transfer.

S2330 SCENARIOS POTENTIALLY ENCOUNTERED IN THE SUBDIVISION OF ROAD RESERVES

S2330(a) FENCES LINES, PROCLAMATIONS AND ACQUISITION AREA

Road proclaimed or declared on co-ordinates

If the declared bending point falls more than 0,5 m outside the road reserve fence, the declared co-ordinate must be surveyed as a subdivision beacon. For a deviation of less than 0,5 m, the fence line may be accepted as the subdivision boundary.

If the fence falls outside the proclamation / declaration boundary, the fenced position must be accepted as the subdivision boundary. The declaration must be amended if the fenced position and the proclamation differ by more than 0,5 m.

If the extent of the acquisition diagram differs by more than 10% from the fenced area or the declared area, an investigation must be undertaken in order to determine the following:

- a) Was the fence line erected in the same position as shown on the acquisition diagram? (This may be difficult to determine as the acquisition co-ordinates were not displayed on the acquisition diagrams prior to 1998).
- b) Was all the acquisition information considered?
- c) Does the subdivision boundary differ from the declared boundary?
- d) Does the fence have to move into the current road reserve area or into the adjacent property?

- e) If it is established that the fence has been erected in a different position to that anticipated, the Employer shall advise;
 - i) Whether the fence has to be moved to the correct position,
 - ii) Whether additional land will be acquired,
 - iii) Whether the fence is to be accepted and the declaration changed,
 - iv) Whether the status quo is to be maintained with the fence in the wrong position and the subdivision based on the acquisition or the declaration boundary.

The decision of the Employer will determine the boundaries of the subdivision survey.

If no acquisition data is available, or if the road was not declared using co-ordinates, the subdivision boundary will be determined by one of the following methods;

- a) The width of the road as stated in the declaration / proclamation description,
- b) Evidence of the width of the existing road reserve,
- c) Inputs from other role players (100 cape feet width for provincial roads, etc.)

If no fence exists, and the surveyor has to determine a boundary for subdivision purposes derived from the available information, care must be taken not to take any action which might put a financial burden on the Employer.

The surveyor must avoid establishing chords around bends which change the width of the road reserve by more than 0,5 m.

The most common action to take, if no other evidence is available to prove the contrary, is to subdivide the road reserve as if it were fenced. The fence is generally and historically accepted as the road reserve boundary.

As a general rule, if the surveyed area does not differ by more than 10% with the area contained in the declaration or the land acquisition records, and if the shape of the area does not differ significantly from the subdivision diagram, the subdivision diagram will be acceptable to the Surveyor-General and the Registrar of Deeds.

S2330(b) EXISTING ROAD RESERVE CLOSE TO, BUT NOT COINCIDING WITH AN EXISTING CADASTRAL BOUNDARY

In many instances, subdivision surveys of properties adjacent to a National Road have been undertaken with the National Road fence-line being accepted as the subdivision boundary.

If the road was declared using co-ordinates, theoretically the fence and the cadastral boundaries should coincide, but in practice they might be different due to coordinate system adjustments and subdivision surveys that have been adjusted to coincide with other adjacent subdivisions.

Trigonometrical beacons have been re-fixed and adjusted through the years, which means that published declaration points may differ with surveyed points (adjustments to

the WGS system have caused the same problem.)

The above can result in small differences between boundaries when the road reserve is subdivided. In these cases, the existing cadastral boundary will be accepted, provided that the difference is less than 0.5 m. otherwise, the Employer must be consulted for advice.

The same scenario may occur if the Design Engineer designs a road reserve using a boundary obtained from a topographical survey which differs from the official cadastral boundary.

Design Engineers do not always take cadastral boundaries into consideration when designing a road reserve, which can result in little slivers of severed land being required to be acquired and subdivided. These cases have to be clarified through consulting with the Design Engineer during the compilation of land acquisition plans.

In cases of historic acquisitions affecting new subdivisions, the new subdivision boundary may be adjusted to coincide with a cadastral boundary, if so approved by the Employer.

S2330(c) BELL MOUTHS AT LEVEL CROSSINGS AND INTERSECTIONS

Bell mouths must be included in National Road reserves at major intersections (such as intersections with provincial Roads), or where access is provided to towns.

Previously, bell mouths were regarded as access roads and the diagrams had the Prefix “DP”. They should in future form part of the road reserve and the diagram numbers must have the prefix “O”.

S2330(d) DETERMINATION OF ROAD RESERVE BOUNDARIES THROUGH TOWNS

In order for the Employer to declare a national road through certain towns, the following is required;

- a) The existing road reserve must be determined up to the point where the urban area, indicated by cadastral general plan information, starts. The urban area normally starts where services inside the road reserve start to appear.
- b) As no two towns will be dealt with in the same way, the Employer shall indicate its specific instructions and requirements for determining the road reserve through towns to the Service Provider.

Usually, the road reserve through towns is declared by description only. However, in cases where the road reserve through a town is to be described by coordinates, a drawing shall be submitted to the Employer showing the draft extent of the road reserve for its consideration and approval/comments, after which the final road reserve co-ordinates (L & R points) shall be determined by the Service Provider for declaration purposes.

S2340 DATA TO BE SOURCED PRIOR TO SUBDIVISION SURVEYS

The sourcing of this information is covered by the Property Specifications, but for the sake of clarity it is mentioned here that the following will be required by the land surveyor prior to performing subdivisions,

- a) Proclamation or Declaration information,
- b) Expropriation and/or acquisition data,
- c) Acquisition and/or expropriation diagrams,
- d) The area (as endorsed on Title Deeds) encompassed by each diagram,
- e) Ownership data in order to distinguish between private, state and the Employer properties.
- f) Owner contact details in order to obtain subdivision consent.

S2350 CAPTURING OF SUB-DIVISION DIAGRAMS AND THEIR ATTRIBUTES

S2350(a) ENTRY OF DOCUMENTS INTO THE EMPLOYER'S DOCUMENT MANAGEMENT SYSTEM

The Service Provider shall be responsible for capturing new subdivision parcels and all their attributes in ITIS (some attributes will only be able to be captured when an approved diagram is received back from the SG office).

The attributes of the subdivided parcel will change as workflow progress is made, e.g. the date submitted attribute and all other relevant attributes must be updated once the subdivision diagram is submitted to the SG office. The date approved attribute is updated once the approved subdivision diagram is received from the SG office. Once approved, the subdivision data must be cleanly merged by the Service Provider into the existing cadastral data that is in ITIS.

Scanning and Entry into ITIS of Provisional Sub-Division Diagrams in .pdf Format

- a) Assign a unique number to any new SG diagram and ensure this number is written on the diagram. Manage the register of unique SG diagram numbers,
- b) Scan the SG diagram to create a .pdf file,
- c) Name the .pdf file to comply with ITIS requirements,
- d) As explained in Volume 4, enter attributes per road section as follows;
 - i) Service Provider name,
 - ii) Category,
 - iii) LAC number,
 - iv) Provincial Office,
 - v) Source of key plan,

- vi) Author,
- vii) Document type,
- viii) Category sub-type,
- ix) Service Provider job number,
- x) Route,
- xi) Section,
- xii) Document name/number.

e) Enter .pdf file and attributes into ITIS as follows;

- xiii) Diagram type,
- xiv) S G number,
- xv) S G Approved date,
- xvi) Property Location (Mother property),
- xvii) Property description,
- xviii) Parcel number,
- xix) Actual Portion,
- xx) Sub-divisional Portion,
- xxi) Surveyed area,
- xxii) Property type,
- xxiii) Major Region,
- xxiv) Minor Region,
- xxv) SG office name,
- xxvi) Province,
- xxvii) Municipality.

f) Enter .pdf file into ITIS.

Updating Attribute Data, and Scanning and Entry into ITIS of Approved SG Diagrams in .pdf

- a) Write the unique number assigned to the provisional diagram on the approved diagram,
- b) Manage the register of unique SG diagram numbers,
- c) Scan the SG diagram to create a .pdf file,
- d) Name the .pdf file to meet ITIS requirements,
- e) Open the provisional diagram document in the document management system of the Employer, and import the approved SG diagram as a new version of the document, making the remark “Approved SG diagram” in the space provided,
- f) Update the “SG number” and “date approved” attributes of the approved SG diagram in ITIS.

Updating Attribute Data and Scanning and entry of withdrawn SG Diagrams in .pdf

- a) Scan SG diagram to create a .pdf file for each SG diagram,
- b) Rename .pdf files to ITIS requirements,
- c) Check out .pdf files of withdrawn diagram from IT IS,
- d) Rename checked out document to the same file name as sub-divided SG diagram, replace checked out document with the sub-divided SG diagram .pdf file and check in
- e) Update attribute of each SG diagram.

S2350(b) ENTRY OF SUB-DIVIDED PARCEL SPATIAL DATA INTO ITIS

- a) Capture and Entry into ITIS of Spatial and attribute Data in respect of Provisional SG Diagrams,
- b) Build polygons of sub-divided parcels and enter into ITIS,
- c) Replace temporarily sub-divided parcels with provisional sub-divided parcels,
- d) Append SG code to polygon attribute table.

Updating of Spatial Data for Approved SG Diagrams in cases of revisions, amendments and withdrawn Diagrams

- a) Build polygon of revised or amended parcel,
- b) Delete provisional parcel and replace with approved parcel,
- c) Delete parcels of withdrawn diagrams.

The subdivision polygons shall be stored in ITIS

- a) Capture New Sub-divisions (These procedures need to be repeated for each new sub-division),
- b) Capture the new sub-division by entering the co-ordinates on a temporary layer.
- c) Sub-divide the existing parent property in the ITIS spatial data with this temporary layer by splitting the existing polygon with the outline of the temporary layer,
- d) Edit the original cadastral data to fit exactly onto the new sub-divisions in order to create consistency,
- e) Change the status of the new sub-divisions to “New Sub-division Original” in the attribute list,
- f) Enter the SG number of the new sub-division in the attribute list,
- g) Change the cadastral text layer of the new sub-division as well as the original sub-

divided property by adding new text and changing the existing text as required.

Quality Control

- a) Switch on the layer that will identify if the spatial data links to the attribute data,
- b) Scrutinise the spatial data in the route/section and identify where properties do not link. If they do not link, investigate and fix the problem by checking in ITIS and comparing with the spatial data,
- c) If necessary, source the data and enter it into the Employer's document management system,
- d) On completion, compare all the spatial data in the route section with the declaration to ensure that the whole route is sub-divided.

S2360 SUBDIVISION FOR THE CLEARING OF TITLE DEEDS

The Employer intends to take transfer of all acquired land. This also includes land previously expropriated by the Provinces on behalf of the Employer, and land acquired by its predecessors.

This task requires extensive investigation in respect of historical expropriations, declarations, title deed endorsements, etc. Countrywide interaction with the Surveyor-Generals' offices, the Deeds Registrars' offices, Provincial Road Departments and other relevant organs of State will be required. Refer to the Specifications for Road Reserve Determination in S4600.

The undertaking of subdivision surveys also originates from requests by property owners for the clearance of their title deeds.

It is important to note that programming for subdivision surveys for the clearance of Title Deeds is governed by a programme according to the Employer's priorities and shall therefore be executed strictly in accordance with this programme. The programme dictates the variety of issues that might have an influence on the subdivision activities and should therefore always be taken into consideration.

It shall be required by the Employer, from time to time, to expedite the completion of draft SG diagrams and obtaining their sub-divisional consent for the purposes of concluding purchases or donation agreements with landowners.

S2360(a) DUTIES TO BE PERFORMED

Duties include the following;

- a) Formulation of survey requirements in terms of all relevant legislation and specifications,
- b) Undertaking survey work in accordance with the LAC programme, Land Survey Act

and relevant planning legislation and the guidelines to formalise SANRAL's jurisdiction,

- c) Distribution of the end product to the relevant stakeholders,
- d) Preparation of Cadastral Key-plans and Subdivision Key-plans,
- e) Obtaining all necessary consents and approvals for subdivision surveys,
- f) Identification of clearance of title deed needs within the Employer's Provincial Offices and to advise the Employer in order to programme the surveys in the LAC programme,
- g) The creation of land rights,
- h) Reconnaissance for the survey,
- i) Establishment of WGS 84 Control,
- j) Relocation of beacons in the field,
- k) Setting out of new beacons,
- l) Administration of cadastral rights,
- m) Beacon relocation audits,
- n) Calculations for new beacons,
- o) Supervision of technical personal and field assistants,
- p) Drafting of working plans, diagrams and general plans,
- q) Consistency checks on plans,
- r) Submission of survey records to the Surveyor General in terms of the Regulations of Act 8 of 1997 and the promulgated Regulations, and liaison,
- s) Supply field materials required,
- t) Enter attributes and sub-divisional parcels spatially into ITIS.

In cases where the fenced boundary of any land differs from the official boundary as determined during the investigation stated in the second paragraph above, a fully detailed report, accompanied by plans and/or diagrams clearly depicting these differences, shall be submitted to the Employer for consideration and the issuing of further instructions.

S2370 SUBDIVISION SURVEYS FOR THE ACQUISITION OF NEW LAND

This work includes subdivision surveys of road reserves that are, as yet, un-surveyed but fall within a road project. It is imperative to note that compensation payable for any land acquired for the purposes of road construction is subject to the subdivision of the land and the transferring of it in title to the Employer. These subdivision surveys will

therefore be allocated a higher priority than subdivisions emanating from the Land Identification Process.

Duties

Duties include the following;

- a) Accept requests for subdivision surveys from the Employer and Design Engineers,
- b) Advise the Employer on the viability of proposed subdivisions of land parcels, the subdivision of severed land and the consolidation of land,
- c) Formulate survey requirement in terms of all relevant legislation and specifications,
- d) Undertake survey work in accordance with the approved LAC Programme, Land Survey Act and relevant planning legislation,
- e) Prepare Cadastral Key-plans and Subdivision Key-plans,
- f) Attend regular LAC meetings for the planning and programming of surveys held in the clients Provincial Offices,
- g) Obtaining of all necessary consents and approval for the subdivision surveys,
- h) Identify subdivision needs within the Employer's Provincial Offices and advise the Employer in order to programme surveys,
- i) Enter attributes and sub-divisional parcels spatially into ITIS,
- j) Distribute end products to relevant stakeholders,
- k) Update and maintain subdivision key-plans.

S2380 SUBDIVISION IN THE FORMER HOMELANDS AND TRIBAL AREAS

The work to be done includes consultation with the respective Surveyor- General's offices and Registrars of Deeds, Tribal Authorities and relevant State Departments in order to obtain instructions with respect to the subdivision of unalienated State land.

Surveys undertaken that are unlikely to, or never will be approved by the Surveyor- General

This will include the undertaking of subdivision surveys for the purpose of framing compensation diagrams. Compensation diagrams, as the name suggests, are for compensation purposes only.

These diagrams will be framed in the same way as any other diagram but will not be submitted to the Surveyor General for approval.

Land tenure in South Africa in general is very diverse. There are roughly four forms of

tenure, namely un-surveyed communal tenure, surveyed quitrent, freehold tenure and Trust tenure. The four types of tenure are discussed below;

- a) Freehold Tenure: Under freehold tenure system the owner is accorded full ownership and freedom to alienate and use the land at will, subject to statutory restrictions. A subdivision over freehold land is the normal one. Freehold properties have defined boundaries and subdivisions are a deduction from the parent diagram,
- b) Quitrent Tenure: A grantee of a quitrent title is allocated a surveyed residential site, surveyed arable plot and rights to commonage. An annual rent used to be paid,
- c) Communal tenure: This is also referred to as ‘traditional land tenure system’. Under communal tenure, members of a settlement share certain rights in the land attached to their settlement. They hold the land under conditions of usufruct, as opposed private ownership. Access to residential plot is through a ‘certificate of ownership’ commonly known as PTO (Permission to Occupy) permits,
- d) Trust Tenure: The land under the trust tenure system was allocated on leasehold tenure system.

In the Eastern Cape, General Plans exist of the rural areas which comprise building lots, garden lots and trading posts. The trading posts are held under full title deeds and will therefore be subdivided and diagrams framed for approval by the Surveyor General. However, the Service Provider is referred to the “SG Circular No 3 Of_ 2009 - Cape-Garden and Building Lots Etc”.

The Garden and Building lots are held mostly under PTO (Permission to Occupy) permits or Quitrent titles, or there is simply a user with some rights over the land. The Surveyor General and Deeds Registrar regard this land as State Land. Thus, the subdivisions disregard the existence of such GPs. However, the Employer requires diagrams of the affected portions of garden lots and building lots for compensation purposes.

S2390 AD-HOC SUBDIVISIONS

This function entails sub-divisional surveys for individual areas normally falling outside the road reserve or for areas of which the land acquisition diagrams have been framed prior to the commencement of this contract. Whenever so required by the Employer, ad-hoc subdivisions not provided for in these Specifications will need to be performed. Wherever applicable, tendered rates shall be used, but situations may arise under which special rates will be negotiated and will form part of Works Authorisation or Contract Instructions. All normal requirements for sub-divisional surveys, consent applications and entering of diagrams into ITIS shall also apply to this type of surveys.

S23100 OBTAINING OF SUB DIVISIONAL CONSENTS

Sub-divisional consent must be obtained from the Surveyor-General by the Service Provider to enable the Registrar of Deeds to transfer properties to the Employer.

S23110 ENTRY OF DATA OF SUB-DIVISION KEY PLANS INTO ITIS

- a) Enter sub-divisional "lollipops" and text into ITIS database,
- b) Temporarily sub-divide land parcels according to Acquisition Plan road reserve on existing cadastre in ITIS database, these parcels shall also be linked to the attribute data in the Land Register,
- c) Append Acquisition Diagram Number text to temporarily sub-divided land parcels attribute table. Refer also to cadastral key plan specifications.

S23120 PAYMENT

Subdivision Surveys

Item	Unit
S23.1 Subdivision surveys for the clearing of title deeds,	
S23.1(a) Title Deed clearance sub-divisions smaller than or equal to 1 ha	No.
S231(a)(i) 10% Extra over for 6 to 15 sides Prov. Sum	
S231(a)(ii) 5% Extra over for more than 15 sides Prov. Sum	
S231(a)(iii) 10% Extra over for difficult access to site Prov. Sum	
S231(a)(iv) 10 % Extra over for difficult topography Prov. Sum	
S231(a)(v) 10% Extra over for obstructions in the line of survey Prov. Sum	
S23.2 Title Deed clearance sub-divisions between 1 and 10 ha	No.
S23.2(a) 10% Extra over for 6 to 15 sides Prov. Sum	
S232(a)(i) 5% Extra over for more than 15 sides Prov. Sum	
S232(a)(ii) 10% Extra over for difficult access to site Prov. Sum	
S232(a)(iii) 10 % Extra over for difficult topography Prov. Sum	
S232(a)(iv) 10% Extra over for obstructions in the line of survey Prov. Sum	

S23.2(b)	Title Deed clearance sub-divisions between 10 and 50 ha	No.
S232(b)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S232(b)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S232(b)(iii)	10% Extra over for difficult access to site Prov. Sum	
S232(b)(iv)	10 % Extra over for difficult topography Prov. Sum	
S232(b)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.2(c)	Title Deed clearance sub-divisions between 50 and 200 ha	No.
S232(c)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S232(c)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S232(c)(iii)	10% Extra over for difficult access to site Prov. Sum	
S232(c)(iv)	10 % Extra over for difficult topography Prov. Sum	
S232(c)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.2(d)	Title Deed clearance sub-divisions between 200 and 500 ha.	No.
S232(d)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S232(d)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S232(d)(iii)	10% Extra over for difficult access to site Prov. Sum	
S232(d)(iv)	10 % Extra over for difficult topography Prov. Sum	
S232(d)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.2(e)	Title Deed clearance sub-divisions between 500 and 1500 ha	No.
S232(e)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S232(e)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S232(e)(iii)	10% Extra over for difficult access to site Prov. Sum	
S232(e)(iv)	10 % Extra over for difficult topography Prov. Sum	
S232(e)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.3	Sub-division surveys for acquiring land;	

S23.3(a)	Sub-division surveys smaller than or equal to 1 ha.	No.
S233(a)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(a)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(a)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(a)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(a)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.3(b)	Sub-division surveys between 1 and 10 ha.	No.
S233(b)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(b)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(b)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(b)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(b)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.3(c)	Sub-division surveys between 10 and 50 ha.	No.
S233(c)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(c)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(c)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(c)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(c)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.3(d)	Sub-division surveys between 50 and 200 ha.	No.
S233(d)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(d)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(d)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(d)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(d)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	

S23.3(e)	Sub-division surveys between 200 and 500 ha.	No.
S233(e)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(e)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(e)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(e)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(e)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S233(e)(vi)	Hourly rate for servitude endorsements on plans	hr
S23.3(f)	Sub-division surveys between 500 and 1500 ha.	No.
S233(f)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S233(f)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S233(f)(iii)	10% Extra over for difficult access to site Prov. Sum	
S233(f)(iv)	10 % Extra over for difficult topography Prov. Sum	
S233(f)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.4	Sub-division surveys of Unalienated State and Tribal Land,	
S23.4(a)	Sub-divisional surveys smaller or equal to 1 ha	No.
S234(a)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(a)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(a)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(a)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(a)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.4(b)	Sub-divisional surveys between 1 ha and 10 ha	No.
S234(b)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(b)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(b)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(b)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(b)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	

S23.4(c)	Sub-divisional surveys between 10 and 50 ha	No.
S234(c)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(c)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(c)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(c)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(c)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.4(d)	Sub-divisional surveys between 50 and 200 ha	No.
S234(d)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(d)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(d)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(d)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(d)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.4(e)	Sub-divisional surveys between 200 and 500 ha	No.
S234(e)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(e)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(e)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(e)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(e)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.4(f)	Sub-divisional surveys between 500 and 1500 ha	No.
S234(f)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S234(f)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S234(f)(iii)	10% Extra over for difficult access to site Prov. Sum	
S234(f)(iv)	10 % Extra over for difficult topography Prov. Sum	
S234(f)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.5	Ad-hoc subdivisions,	

S23.5(a)	Ad-hoc sub-divisions smaller than or equal to 1 ha	No.
S235(a)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(a)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(a)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(a)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(a)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.5(b)	Ad-hoc sub-divisions between 1 and 10 ha	No.
S235(b)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(b)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(b)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(b)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(b)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.5(c)	Ad-hoc sub-divisions between 10 and 50 ha	No.
S235(c)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(c)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(c)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(c)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(c)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.5(d)	Ad-hoc sub-divisions between 50 and 200 ha	No.
S235(d)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(d)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(d)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(d)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(d)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	

S23.5(e)	Ad-hoc sub-divisions between 200 and 500 ha	No.
S235(e)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(e)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(e)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(e)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(e)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	
S23.5(f)	Ad-hoc sub-divisions between 500 and 1500 ha	No.
S235(f)(i)	10% Extra over for 6 to 15 sides Prov. Sum	
S235(f)(ii)	5% Extra over for more than 15 sides Prov. Sum	
S235(f)(iii)	10% Extra over for difficult access to site Prov. Sum	
S235(f)(iv)	10 % Extra over for difficult topography Prov. Sum	
S235(f)(v)	10% Extra over for obstructions in the line of survey Prov. Sum	

S23.6 Hourly rate for servitude endorsements on plans hr

The rate payable for each of the surveyed properties for the clearing of title deeds, surveys for acquiring land, surveys for acquiring former homeland and tribal area land and ad-hoc subdivisions shall be the number of sub-divisional surveys carried out and the data entered into ITIS, based on a maximum of five sides per property surveyed. An extra over amount shall be payable per side if any property has between 6 and 15 sides, or more than 15 sides. An extra over payment shall be made for difficult access to site, working in difficult topography, and when there are obstructions in the line of survey at the additional percentages of the tendered amount for each size of property surveyed. Payment for each of the extra over amounts shall be subject to the prior approval of the Employer in terms of a Contract Instruction for the use of the Provisional Sums provided. If beacons are not available, they must first be established.

It must be noted that payment is NOT cumulative for the above surveys. To avoid doubt, the sub-divisional survey of a piece of land measuring 201 Ha in extent, will only be paid for using S23.05(e) and its sub items, and NOT also any surveys of property smaller than that extent.

Payment of the full tendered rates shall only be made when proof is submitted that the applications, correct in all respects, have been submitted to the Surveyor General and the diagrams have been entered into the ITIS system of the Employer. The correction of errors in the diagrams, made by the Service Provider, will not be paid for.

The Service Provider shall not be expected to undertake the changing of land rights applications, rezoning, removing of restrictive conditions on the property, any Environmental impact studies, feasibility studies or to obtain any certificates of identity during these processes.

In the case of subdivisions of Un-alienated State and Tribal land, the tendered rate shall include all negotiations with the Surveyors General and the Registrars of Deeds in order to obtain their directives on specific subdivision issues which might have an impact on the execution of the survey project.

Where a servitude lies within a subdivision being created, the additional beacons necessary to define the servitude are measured separately and paid for as a cost in addition to the cost of the subdivision.

The adjustments to the tendered rates will be as shown under each item and will be paid upon application and motivation to the Employer. The final price shall be charged as follows;

- A = Tendered subdivision rate determined from the size of the subdivisions as tendered
- B = Additional amount for sides
- C = Additional hourly rate of a professional surveyor for servitudes and curvilinear boundary
- D = The sum of the abnormal circumstance adjustments

$$\text{Amount Claimed} = (A + B + C) + (A + B)(D/100)$$

NB: D may not exceed 40%.

Very important;

- a) The adjustment of tariffs as provided for above shall not take place before a survey is done, but upon completion of each subdivision survey and the submission of the Survey Report as required in TMH11, Chapter 1 to the Employer's project manager, or designated person,
- b) The provided diagrams shall be used to determine the number of sides of the subdivided property,
- c) The difficulty of access to site, the difficulty of the topography and obstructions in the lines of sight must be supported by georeferenced and dated photographs, or by Google Earth images no longer than two years old, or the images of any aerial surveys or drone photography not older than two years.
- d) The Service Provider shall, before claiming remuneration present the required documentation to the Employer's project manager, or designated person for signing off on the adjustments before the compensation is claimed.

Wherever servitudes have to be overlaid on sub-divisions, payment shall be made at the tendered hourly rate for a professional land surveyor, subject always to only half an hour being payable for straight line servitude endorsements and one-and-half hours being payable when the servitude abuts a curvilinear boundary.

Obtaining Sub-divisional consents

Item	Unit
S23.7 Obtaining subdivision consents in terms of Act 70 of 1970;	
S23.7(a) basic fee (per application batch).	No.
S23.7(b) individual applications	No.
S23.7(c) Diverse fees and costs	
Prov. Sum	
S23.8 Making Ordinance applications;	
S23.8(a) Basic fee (per application batch)	No.
S23.8(b) Individual applications	No.
S23.8(c) Diverse fees and costs	
Prov. Sum.	
S23.9 Excision of agricultural holdings;	
S23.9(a) Basic fee (per application batch)	No.
S23.9(b) Individual applications	No.
S23.9(c) Diverse fees and costs	
Prov. Sum	
S23.10 National Roads;	
S23.10(a) Basic fee (per application batch)	No.
S23.10(b) Individual applications	No.
S23.10(c) Diverse fees and costs	
Prov. Sum	
S23.11 Closure of public places;	
S23.11(a) Basic fee (per application batch)	No.
S23.11(b) Individual applications.	No.
S23.12 Diverse fees and costs	
Prov. Sum	
S23.13 Advertising on Roads and Ribbon Development Act;	
S23.13(a) Basic fee (per application batch)	No.
S23.13(b) Individual applications.	No.
S23.13(c) Diverse fees and costs	
Prov. Sum	
S23.14 KwaZulu Natal Planning and Development Act 6 of 2008;	
S23.14(a) Basic fee (per application batch)	No.
S23.14(b) Individual applications	No.
S23.14(c) Diverse fees and costs	
Prov. Sum	

Applications

Item	Unit
S23.15 Proclamation Applications;	
S23.15(a) Basic fee (per application batch)	No.
S23.15(b) Individual applications	No
S23.15(c) Diverse fees and costs	
Prov. Sum	
S23.15(d) Mark up on diverse fees and costs	
Percent	
S23.16 Application in term of the Spatial Planning and Land Use Management Act 16 of 2013;	
S23.16(a) Basic fee (per application batch)	No.
S23.16(b) Individual applications.	No.
S23.17 Diverse fees and costs	
Prov. Sum	
S23.17(a) Mark up on diverse fees and costs	
Percent	

The basic fee is payable to the Service Provider irrespective of the number of subdivisions submitted in the application batch. In addition, the Service Provider shall be paid for every individual application included in the batch. Payment shall include the completion of application forms, the obtaining of all relevant information and the preparation of layout and key plans to accommodate the application.

The individual application fee covers all the required work including but not limited to the managing of the individual subdivision consent applications, the following up thereof with the statutory bodies and all correspondence, liaison and co-ordination that may be required to obtain the consents applied for.

The cost of the publication of notices in the Provincial or Government Gazettes as well as the application charges payable to the respective statutory bodies shall be paid for from the Provisional Sum provided without the need for a Contract Instruction to be completed.

Payment of all items under this section is subject to the entry of all the relevant data into ITIS.

S2400 STAKING OF ROAD RESERVE BEACONS

S2410 SCOPE

This section covers the staking of road reserve beacons for cadastral purposes.

Under this section, it is not required of the Service Provider to fix and establish permanent survey control beacons, nor to cast beacons in concrete, nor to determine the position of the road reserve, all of which are covered elsewhere. Wherever applicable, these items must be used (for example photographing road reserve beacons from the air to have proof that they were installed - see S3500).

S2420 DESCRIPTION

The staking of all road reserve bending points and all points where Cadastral boundaries cross a road reserve must be undertaken in accordance with the following requirements;

- a) All points are to be marked with an 800 mm iron standard, or a 25 mm steel peg.
- b) All bending points are to be marked with an aluminium tag indicating the L or R number,
- c) All points are to be covered with a cairn of clearly white-washed stones,
- d) Accurate calculation of Cadastral and road reserve intersection point co-ordinates, checking observations of all points, and calculating of stake co-ordinates,
- e) Compiling a list of calculated and staked co-ordinates, indicating the differences between them.

Although it is a general principle that applies to the entire contract, the Service Provider is reminded here that items that are measurable and payable under other items apply equally to the work covered by this section including, but not limited to subsistence and travel, printing costs and any other item for which a rate has been tendered, wherever such payment may be justified in terms of the Specifications and necessarily incurred.

Chapter 3 of the TMH11 Standard Survey Methods applies.

S2430 RATE ADJUSTMENTS

The following adjustments of the tendered rates will be considered by the Employer,

Feature	Adjustment
Bushy terrain	0-40%
Terrain and detail	0-40%

These adjustments shall be added together and claimed for under the Provisional Sum provided.

A signed Contract Instruction shall be required for expenditure of the Provisional Sum provided for rate adjustments.

Where survey control is missing, beacons must first be established as provided for in the relevant Section.

S2430(a) REQUIREMENTS FOR RATE ADJUSTMENTS

- a) The adjustment of the tariff as provided for above shall not take place before a survey is done, but upon completion of the survey and the submission of the Survey Report as required in TMH11, Chapter 1 to the Employer's project manager, or designated person,
- b) The difficulty of the terrain must be supported by georeferenced and dated photographs taken at each bending point or other cadastral beacon,
- c) The Service Provider shall, before claiming remuneration present the required documentation to the Employer's project manager, or designated person for signing off on the adjustments before the compensation is claimed.

S2440 PAYMENT

Staking of Road Reserve Beacons

Item	Unit
S24.1 Staking of road reserve beacons and cadastral boundaries	No.
S24.2 Adjustment of rates;	
S24.2(a) Rate adjustment for bushy terrain	Prov Sum
S24.2(b) terrain and detail	Rate adjustment for Prov Sum

The staking of beacons at all bending points shall be measured by the number of bending points and points where cadastral boundaries cross the road reserve.

S2500 LINKING OF SG DIAGRAMS AND SPATIAL DATA

S2510 SCOPE

In order to use the Land Register spatial data as a basis for exploring the attribute data it must first be linked from the cadastral parcel and acquisition data.

S2520 GENERAL

Attribute data for all land parcels identified during the land identification process, parcels obtained through the acquisition of land for road building purposes, severed land and all other land over which SANRAL has jurisdiction, are entered into the land register and ITIS.

Attribute data contained in the land register can have a restriction on the complete management of the property portfolio if this has not been spatially linked to the land parcels.

The purpose of a spatially enabled database is, amongst others;

- a) All data is to be easily and immediately accessible to all users
- b) Location of properties can be viewed on a plan
- c) Google view can be overlaid on the plan
- d) Give the user a wider perspective of the property portfolio that is being managed
- e) Irregularities on the properties can be identified
- f) Errors in data can be identified and rectified
- g) Identifying GAPS in the SANRAL property portfolio
- h) Identify Investment Properties
- i) Location of all borrow pits that have been used over the years
- j) Record of properties that have been alienated

S2530 DESCRIPTION

The work involves the following;

- a) Cadastral data of every property on the key plan and acquisition plan must be linked to the corresponding entry in the land register,
- b) Extent of land parcel and GIS calculated area must be verified as falling within the

acceptable deviation levels,

- c) Any irregularities in the data on the plans and survey diagrams to be identified and referred for correction.

S2540 PAYMENT

Linking of SG diagrammes and spatial data

Item	Unit
S25.1 Obtain SG diagram of identified gap from ITIS or CSG	No.
S25.2 Verify property shape and extent of IT IS and SG parcels	No.
S25.3 Source information on adjacent properties	No.
S25.4 Search for entry in ITIS	No.
S25.5 Rectify polygons on key plans	No.
S25.6 Link property in spatial data to SG diagram	No.
S25.7 Update ITIS database	No.

If all tasks are required to be undertaken in order to successfully complete the linking of an SG diagram to a land parcel in ITIS, all items S25.01 to S25.07 are applicable.

If tasks S25.03 and S25.05 are not required to be undertaken, payment may not be claimed.

The unit of measurement for all items S25.01 to S25.07 shall be the number of times that each item of work is performed.

S3000 NON-CADASTRAL SURVEYS

S3100 ROAD RESERVE FENCE BENDING POINT SURVEYS

S3110 SCOPE

This section covers road bending point surveys to determine road reserves by coordinates but does not cover cadastral work (covered in S2000).

This section supplements Clause 8.4 of the TMH11 Standard Survey Methods and must be read with Chapter 3 of the Guidelines to Formalise SANRAL's Jurisdiction.

S3120 QUALITY MANAGEMENT

The requirements of Chapter 13 and Annexure 24 of the TMH11 Standard Survey Methods apply.

S3130 DESCRIPTION

S3130(a) DUTIES

- a) Locate and fix fence bending points of the existing road reserve fences,
- b) A position on the fence shall be surveyed at least every 100 m on straights between fence bending points,
- c) The identification and fixing of ideal road reserve positions in those cases where fences do not exist, or where development adjacent to the road might have an impact on the road reserve position,
- d) The moving and fixing of points to ideal declaration positions if the fence is not erected to comply with the Employer's requirements with respect to maintenance vehicle accommodation, safety and reserve boundaries at slopes and drainage structures (Refer to the Guideline to Formalise SANRAL's Jurisdiction, Chapter 3),
- e) Supplying of a digital Key-plan where all the fence bending points and the 100 m points on the straights are numbered and joined. All surveyed feature codes shall be shown on the plan. The ideal position shall also be indicated on this plan and the points joined with a dotted line. The points shall bear a prefix "LL" or "RR",
- f) Supplying a digital geo-referenced photo image showing all the surveyed points, feature codes, the recommended road reserve boundary line and cadastral data,
- g) Supplying of two separate ASCII files one of which will contain all the left boundary points in sequential order bearing the prefix "L" and the second file with all the right-hand boundary points with the prefix "R",
- h) The fixing or determination of road surface edges where no fences exist,

- i) The entry of all data into ITIS,
- j) Capture and enter temporary sub-divisions from bend point survey in ITIS;
 - i) Build polygons from bend points surveys,
 - ii) Subdivide existing polygons with bend point survey,
 - iii) Spatially link temporary sub-divisions to the attribute data in the land register
 - iv) Update attributes in Land Register.

This activity excludes the establishment and fixing of permanent survey control, which is covered elsewhere.

S3140 RATE ADJUSTMENTS

- a) The adjustments of the tariffs as provided for above shall not take place before a survey is done, but upon completion of the survey and the submission of the Survey Report as required in TMH11, Chapter 1 to the Employer's project manager, or designated person,
- b) The claim for the nature of the terrain must be supported by georeferenced and dated photographs taken at each bending point or other cadastral beacon. These photographs may be taken by drone,
- c) The Service Provider shall, before claiming remuneration present the required documentation to the Employer's project manager, or designated person for signing off on the adjustments before the compensation is claimed.

The following adjustments to tendered rates will be considered, based on the approval of the Employer in terms of a Contract Instruction;

Feature (see definitions below)	Adjustment
Bushy terrain (defined below)	0 – 40%
Cases where no, or very few fences exist and where the points have to be identified in the field	+20%
Terrain features (defined below)	up to 40%

The following definitions affect the adjustment of survey tariffs;

Bushy Terrain

Average bushy terrain	Average bushy terrain is where the bush/tree cover to land area in the road reserve is less than 30%, and where no additional survey stations have to be established to survey the area and it is not necessary to clear vegetation for the survey; No tariff adjustment
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Category 1	Bushy terrain is where the bush/tree cover to land area is between 30% and 50% and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area, and moderate clearing of vegetation; Up to 20% tariff adjustment
Category 2	Bushy terrain is where the bush / tree cover to land area is between 50% and 70%, and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area, and substantial clearing of vegetation without having to employ additional labour; Up to 30% tariff adjustment
Category 3	Bushy terrain is where the bush / tree cover to land area is between 70% and 100%, and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area and extensive clearing of vegetation to open lines in the bush / trees for which additional labour must be employed; Up to 40% tariff adjustment

Terrain Features

Flat and open terrain	Flat and open terrain is where 80% of the area under survey is flatter than 1:2 and where less than 5% of the area is covered by detail or obstructions: No tariff adjustment
Hilly terrain	Hilly terrain is where the steepness of the terrain makes access difficult and time consuming but to a lesser extent than mountainous terrain: Between + 5% to and +10% tariff adjustment
Impeding traffic volumes	Impeding traffic volumes is where road reserve beacons have to be staked and the volume of traffic makes crossing the road time-consuming, and instrument readings are interrupted by traffic breaking electromagnetic rays: Up to +15% tariff adjustments
Heavy details	Heavy detail is where the area to be surveyed has buildings in close proximity and / or where there is an abundance of services or any other detail to be surveyed, not catered for in any of the other adjustments; tariff adjustment negotiable up to +40%.

These adjustments shall be added together and claimed for under the provisional sum provided. A Contract Instruction is required for rate adjustments. The tendered rates shall include the entry of the data into ITIS.

S3150 PAYMENT

Road reserve fence bending point surveys

Item	Unit
S31.1 Road reserve bending point surveying	km
S31.1(a) Adjustment of rates	
Prov. Sum	

The rate payable for road reserve bending point surveying covers average terrain with medium vegetation on an existing fence, where 90% of the bending points are easy to identify.

The unit of measurement shall be the kilometre road reserve bending point survey as specified and shall include the entry of the data into ITIS and the Employer's document management system.

S3200 TOPOGRAPHICAL AND ENGINEERING SURVEYS

S3210 SCOPE

This section covers topographic and engineering surveys.

All surveys shall be undertaken in terms of the latest TMH11 requirements. Survey work shall be undertaken by a registered surveyor or under the direct supervision of a registered surveyor.

Chapter 3 of the TMH11 Standard Survey Methods applies.

S3220 GENERAL

General duties include the following;

- a) Accepting notices of survey requirements from the Employer, and registering these requests in a job register,
- b) Accepting survey records from engineers, contract surveyors and from in-house surveyors and entering the records in ITIS,
- c) Liaison with all relevant stakeholders,
- d) Quality control performed on all engineering, topographical and photogrammetric survey work,
- e) Recommendations for standardisation, and advice provided to the Employer.

Although it is a general principle that applies to the entire contract, the Service Provider is reminded here that items that are measurable and payable under other items apply equally to the work covered by this section including, but not limited to getting permission to enter site, subsistence and travel, printing costs and any other item for which a rate has been tendered.

S3230 TARIFF ADJUSTMENT AND REIMBURSABLE EXPENSES

In all cases provided for below, the payable rate for non-cadastral surveys is for average terrain with medium vegetation / development, with existing fences and where 90% of the bending points are easy to identify. Where traffic is involved, average traffic volumes are assumed. Where terrain features adversely affect the work being done, provision is made for tariff adjustments. Traffic accommodation and other reimbursable costs are covered elsewhere.

Further detail is provided under the Payment items.

S3240 DTM AND DETAIL CONTOUR SURVEYS (GROUND METHODS)

These surveys fall into two categories;

- a) DTM and detail survey for average terrain and medium detail for 1:1000 scale survey and 1,0 m contour interval mapping, 10 m interval shots on the road prism, including the centre line,
- b) DTM and detail survey for dual carriageway, 80 m wide, at 1:1000 scale and 1 m contour interval mapping, 10 m interval shots on the road prism, excluding the centre line.

S3240(a) DUTIES

- a) DTM and detail field measurements,
- b) Processing of data and creation of digital data,
- c) Plotting of plans, contours and detail at a scale of 1:1000,
- d) Superimpose the cadastral key plan onto the survey (The cadastral key plan must be brought to specification before it can be superimposed),
- e) Supplying information in hardcopy and digital format in terms of TMH11 and entry of the data into ITIS,
- f) The establishment and fixing of permanent survey control on site, the conversion of data into other formats and all reimbursable items are paid for under other items, wherever applicable, failing which, they are to be included in other rates.

S3250 CROSS SECTIONS

S3250(a) DUTIES

- a) Taking Cross Sections for average terrain within a 40 m wide reserve at 20 m intervals (i.e. 50 cross-sections per km),
- b) Included in the work is the survey of field cross-sections or DTM measurements to generate cross-sections at maximum 20 metres intervals (50 cross-sections per km), the generation of cross-section data, including the cross-section detail descriptions and the plotting of cross-sections.

The following is not covered under this section, as they are measured and paid for elsewhere in these Specifications;

- a) The establishment and fixing of permanent survey control or reference beacons.
- b) Staking of centre lines,
- c) Calculation of road alignment,

- d) All reimbursable items as are contained in the General Specifications.

S3260 STAKING OF ROAD CENTRE LINES

S3260(a) DUTIES;

- a) Staking of the Road Centre Line (centre line or off-set staking) at a rate of 50 stake positions per km,
- b) The rate shall be adjusted in relation to the 50 stake positions per km if longer/shorter stake intervals are required,
- c) The work includes;
 - i) Centre line staking every 20 m (pegs not in concrete),
 - ii) Every 200 m peg in concrete,
 - iii) All key points in concrete,
 - iv) Marking all key points with an iron standard.

The following items are not covered by the staking of road centre lines;

- d) All reference points,
- e) Establishment and fixing of permanent control,
- f) Taking of long- and cross-sections,
- g) All reimbursable items as per General Specifications.

S3270 ROAD PRISM SURVEYS

Road alignment surveys include the surveying of a road prism to generate a representative alignment, and the calculation of a horizontal alignment. Subject to tariff adjustments, an average traffic volume is presumed, with a moderate alignment, and using a GPS mounted on a vehicle to generate accuracies of between 15 cm and 40 cm.

It will not be expected of the Service Provider, under this Section, to establish and fix permanent survey controls. All reimbursable items are covered by the General Specifications.

Tariffs are adjustable as provided for under the Payment Items.

S3280 STAKING OF KILOMETRE MARKER BOARDS

The staking of kilometre marker boards includes the placing of a roof nail on the edge of the road surface perpendicular to the road centre line, clearly marked with white paint as well as an indication of the relevant kilometre distance. It also includes the calculation

of staking data if the road alignment is available. Staking of kilometre marker boards is done at 200 m intervals.

The payment item assumes an average terrain with adequate survey control points, the staking information being available and low traffic volumes being encountered.

The establishing and fixing of permanent survey control, the surveying of the road centre line to calculate staking data, the determination of the horizontal alignment and reimbursable items are not included in this section and are covered, where applicable, by other Specifications.

Tariffs are adjustable as provided for under the Payment Items.

S3290 SURVEY OF THE LOCATION OF BILLBOARDS NEXT TO NATIONAL ROADS

S3290(a) DUTIES

The work involves the following;

- a) Identify the required billboard position,
- b) Obtain cadastral information from the Surveyor General and compile a cadastral key plan,
- c) Obtain the national road declaration and plot on the key plan,
- d) Survey the position of the foot pieces of the billboard as well as the size of the billboard,
- e) Plot billboard position on the cadastral key plan,
- f) Obtain the owner information of the property on which the billboard is situated,
- g) Compile a document indicating:
 - i) Cadastral data showing the billboard position relative to the national road reserve and declaration, and adjoining properties,
 - ii) Property description on which the billboard is situated,
 - iii) The distance from the closed edge of the billboard to the road declaration,
 - iv) SG diagrams of property on which billboard is situated,
 - v) Provide a photo of the billboard,
 - vi) Provide co-ordinate values and kilometre distance of billboard,
 - vii) Owner information and contact details of the owner of the property on which the billboard is situated.
- h) Certify the correctness of the data,
- i) Submit data to SANRAL.

S32100 SURVEYING OF WEIGHBRIDGE APPROACHES AND DECKS

Weighbridge decks and approaches need to conform to strict requirements in respect of level for prosecutions to be effective. As a result, it may be necessary for the Service Provider, upon the instruction of the Employer, to visit the weighbridge facilities from time to time to measure the levels of the approaches 10 metres either side of the weighing decks, and to also measure the deck(s) to determine its/their conformance with tolerances.

S32110 RIVERBED SURVEYS

River surveys are conducted for the purposes of determining the characteristics of the water flowing under bridges and through culverts for design purposes and involves measuring cross sections of the riverbed and measuring the depth of the water at various distances from structures. The slope of the riverbed must be able to be calculated from the data captured.

Where dry riverbeds and small streams are encountered which can easily be crossed on foot, the Service Provider shall determine the watercourse cross section using ordinary topographic surveying methods.

In the case of rivers where the water is deeper than 600 mm at any point and flowing fast enough to cause a person to feel unbalanced, all persons entering the water for the purposes of taking readings, must wear life jackets suitable for their weights.

Where water is flowing too strongly for personal safety, the survey must either be rescheduled and carried out when the flow is less powerful, or another method must be devised to measure the profile of the riverbed, such as using a motorised watercraft to keep the surveyors in a stable position.

Surveys may be carried out using suitable drone-boats equipped with bathymetric surveying equipment, which may be echo-sounding based. The drone-boat must be able to link the measured depth data to a survey-grade differential GPS system. This data must tie into the local survey control system.

Generally, the equipment best suited to undertaking these surveys is a total station linked to a data logger, with the data recorded in an unreduced (raw) format (i.e. horizontal and vertical angles, and distance). The survey data may then readily be reduced using trigonometric principles to produce cross sectional profiles, plan orientation of sections, stage levels and longitudinal profiles.

Where necessary, the surveyor must use either a motorboat, drone, or a rowing boat as is most economical and sensible to measure the cross section of the riverbed. The safety of the surveyors and other staff must not be compromised by any survey.

Cross sections shall be measured every 20 metres, from the culvert or bridge extremity to a distance 100 metres further away on either side of the structure, using a conventional total station linked to a data logger. If there is a change from subcritical to supercritical flow, or the presence of any disruption in the water level, a cross section must be taken

about 5 metres before, and 5 metres after the phenomenon, and at least one more at the normal spacing thereafter.

At each cross section, the wetted perimeter of the river must be surveyed, as well as up to the top of the river embankment, or roughly 20 metres either side of the centre of the river, whichever is the widest.

At survey site, at least two photographs of each cross-section must be taken, each from a subsequently identifiable and repeatable fixed point upstream and downstream of the cross section.

S32120 UNDERTAKING SPECIAL SURVEYS UPON THE EMPLOYER'S REQUEST

It may be required of the Service Provider to conduct special surveys not included elsewhere in this section. These may be triggered by any situations such as accidents, floods, encroachment surveys and any other survey that is not defined in the document. These surveys are often, but not always urgently required to be done.

The work may also include surveying for locating or identifying specific features such as graves, boreholes, encroachments, boundary walls, changes in borrow pits, border post features, kerbs, parking areas, pedestrian pathways, road level surveys for the calibration of survey vehicles, mapping local road markings, flagging or marking of certain features, etc.

The nature and magnitude of these surveys must be otherwise undefined in this document. Wherever possible, the work must be carried out using existing specifications and tariffs.

Where using existing tariffs is not possible, the Employer and Service Provider shall agree upon the scope and a method of doing the work. Payment shall be made for every day, or part thereof that a survey team conducts a special survey. The processing of data, production of reports and drawings shall be paid for by the hour. The Service Provider must produce survey reports as required by TMH11 and submit copies thereof to the Employer.

Travel and subsistence as well as any other item covered by the Specifications shall be measured and paid for under those items.

S32130 BUILDING PERMANENT SURVEY BEACONS FOR TOPOGRAPHICAL SURVEYS

It may be required of the Service Provider to establish permanent survey beacons in isolated areas for topographical surveys like isolated borrow pits, access roads, drainage problems, bridge sites, small road surveys, weigh bridge or other problematic areas. The specifications for the establishment and fixing of permanent control are covered by TMH11 Standard Survey Methods and section S3300 of these specifications.

S32140 PROJECT MANAGEMENT

From time to time, the Service Provider shall be required to perform project management over the work done by other appointees of the Employer. The scope of these appointments shall be agreed to between the Service Provider and Employer. In view of the undefined nature of this work, every instruction shall be fully defined in a Contract Instruction issued to the Service Provider for expenditure of the Provisional Sum provided.

S32150 STRUCTURAL SURVEYS – BRIDGES, CULVERTS AND GANTRIES

S32150(a) SURVEY CONTROL

Refer to TMH11 Standard Survey Methods Sections 5.3 and 8.7.3(c). Control beacons shall be established, if required.

S32150(b) BRIDGES AND CULVERTS

The provisions of TMH11 Standard Survey Methods Section 8.7 applies.

Structural surveys shall only be undertaken upon the specific instructions issued by the Employer.

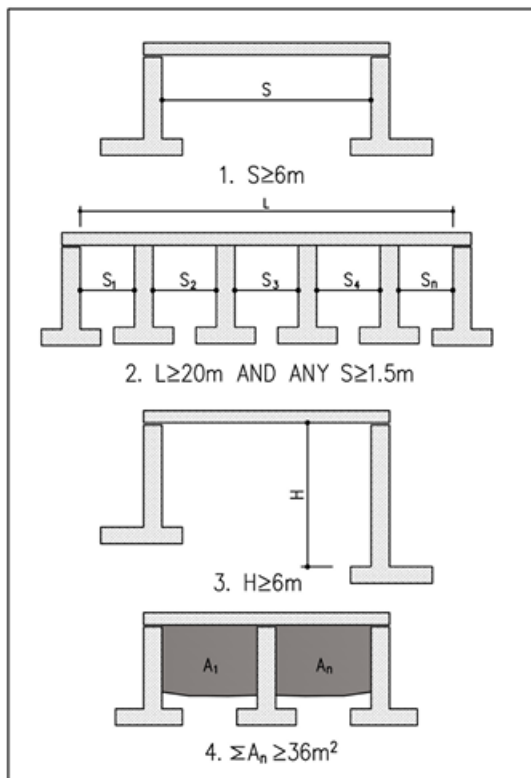
S32150(b)(i) DEFINITIONS

Bridge

A structure shall be classified as a bridge, if any one or more of the following criteria apply:

- b) Any single span (as measured horizontally at the soffit along the road or rail centre line between the faces of its supports) is equal to or greater than 6 m; or
- c) The individual clear spans (as measured horizontally at the soffit along the road or rail centre line between the faces of its supports) exceed 1.5 m and the overall length measured between abutment faces exceeds 20 m; or
- d) The opening height, which is the maximum vertical distance measured from the streambed or structure floor at the inlet or from the top of any base, to the soffit of the superstructure, is equal to or greater than 6 m; or
- e) The total cross-sectional opening is equal to or larger than 36 m²; or
- f) The structure is a road-over-rail, or rail-over-road structure, even if the span is less than 6 m.

Refer to Figure 1 for a visual representation of the classification criteria for a bridge.



Major Culvert

A Major Culvert is a cellular structure with dimensions less than those defining a bridge, but with any clear span length (as measured horizontally at the soffit perpendicular to the faces of its supports) equal to or larger than 2.1 m, or diameter equal to or larger than 2.1 m, or a culvert with a total cross-sectional opening equal to or larger than 5 m².

A visual representation of the classification criteria for a Major Culvert is presented in Figure 2.

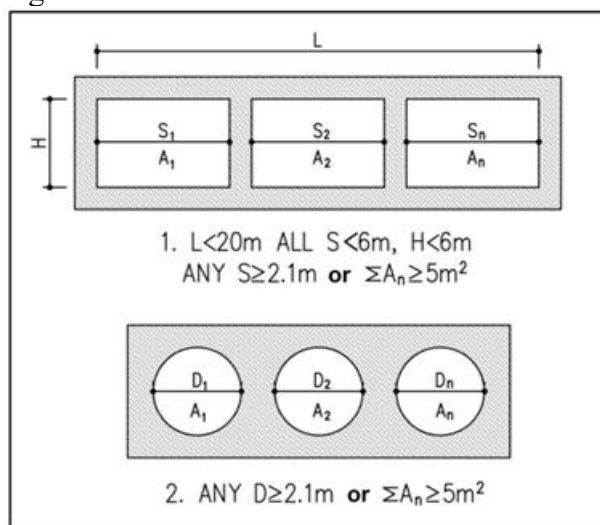


Figure 2 Major Culvert Classification Criteria

Lesser Culvert

All culverts smaller than that defined as a Major Culvert are classified as Lesser Culverts.

S32150(c) GANTRIES

Refer to section 8.7.6 of TMH11 Standard Survey Methods.

S32150(d) DELIVERABLES

The deliverables for bridge, culvert and gantry surveys is described in section 12.18 of TMH11 Standard Survey Methods.

S32160 QUALITY MANAGEMENT AND CHECKS

All quality control work shall be undertaken by a registered surveyor or professional surveyor.

This work includes checking the execution of instructions issued for all survey and measuring the surveyors work against requirements for accuracy, timeliness, quality of data, etc. and liaison with in-house surveyors and Sub-Service Providers and involves, inter alia;

- a) Quality control – office checks of all surveys done by sub-Service Providers and in-house surveyors and advising Design Engineers and the Employer on the quality and accuracy of the surveys undertaken,
- b) Carrying out field checks of surveys done by in-house surveyors and sub-Service Providers and advising Design Engineers and the Employer on the quality and accuracy of data provided.
- c) Where quality management is performed on surveys done by the Service Provider's own staff, personnel entirely uninvolved in the survey must be used to perform the quality checks.

S32160(a) OFFICE BASED QUALITY CONTROL

All survey work shall be checked and certified for adherence to the completion and quality of the following items:

S32160(a)(i) Check and certify the completeness of the data

This work includes checking;

- a) That the survey project file is compiled in terms of TMH11 and these Specifications,
- b) That all the information and data in the survey project file conforms to TMH11 and the project requirements and Specifications,
- c) That all work required to have been done has been submitted,
- d) All digital data has been submitted, documented, and labelled in terms of the project requirements and the TMH11 Standard Survey Methods,
- e) That the digital format of all data conforms to the project requirements.

The following must be verified before submitting survey work;

- a) That all the work as specified in the project requirements has been undertaken,
- b) That the required area has been covered by the survey,
- c) That the survey system and datum conform to the normal standards and special requirements as stated in these Specifications and the project Specifications,
- d) That all required schedules conform to the requirements.

S32160(a)(ii) Check and certify conformance with procedures

Check and certify that the following conforms to the project requirements, TMH11 specifications and standard survey principals:

- a) Horizontal fixing,
- b) Vertical fixing,
- c) Survey control verification,
- d) Tying in and calibration on existing control,
- e) DTM and detail observations,
- f) Point numbering,
- g) Structural survey,
- h) Photogrammetric and Lidar photo ground control configuration,
- i) Photogrammetric mapping and ortho-photos,
- j) Mobile scanning procedure,
- k) Static terrestrial scanning procedure,
- l) Processing of mobile and static terrestrial scanning,
- m) Method employed for aerial triangulation and calculations,
- n) Long sections and Cross sections,
- o) That any other work undertaken adheres to the requirements.

S32160(a)(iii) Check and certify calculations and reduction procedures

In respect of the following, check and certify that calculations and reduction procedures conform to standard survey practice and the requirements of the project:

- a) Horizontal fixing,
- b) Vertical fixing,
- c) Verification of survey control,
- d) DTM and detail positions,
- e) Permanent survey control values,
- f) Structural dimensions,
- g) Photogrammetric and Lidar photo ground control values,
- h) Aerial triangulation values,
- i) Geo- referencing of the photo images for orthophoto,
- j) Scanned imaged and pixel size,
- k) Long- and Cross sections,
- l) Processing of mobile and static terrestrial scanning,
- m) Any other work undertaken adheres to the requirements.

S32160(a)(iv) Check and certify that specified accuracies have been met

Check and certify that the specified accuracies for the following phases of the work have been met;

- a) Horizontal fixing,
- b) Vertical fixing,
- c) Verification of survey control and verification report,
- d) DTM and detail,
- e) Permanent survey control,
- f) Structural dimensions,
- g) Photogrammetric and Lidar photo ground control,
- h) Aerial triangulation,
- i) Long- and Cross sections,
- j) DTM checks undertaken by the contactor,
- k) Any other work undertaken adheres to the required accuracy.

S32160(a)(v) Check and certify CAD drawings

Check and certify that the following items on the CAD (continuous model and individual sheets) drawing adhere to the requirements as stipulated in TMH11 Standard Survey Methods;

- a) Title block completion,
- b) Description of the project,
- c) Route and section numbers,
- d) Survey job number,
- e) Plan numbers,
- f) Sheet numbers,
- g) Co-ordinate list,
- h) Survey system,
- i) Grid spacing,
- j) Grid values,
- k) Drainage structures and invert levels,
- l) Cad symbols,
- m) Contours,
- n) Contour values,
- o) Spot heights,
- p) Detail completion and the transfer of field checked data onto the final drawings,
- q) Embankments,
- r) Under- and over passes,
- s) Cadastral boundaries,
- t) Ortho-photo image quality and sharpness,
- u) The completion and neatness of all other features as specified in TMH11,
- v) DTM intervals and observation positions,
- w) DTM and triangle formation,
- x) Break lines and the utilization of break lines,
- y) DTM digital data,

z) CAD layers,

aa) Check if the CAD data co-inside with plotted sheets supplied.

S32160(a)(vi) Reporting

The office checks shall be reported on a check list consisting of all the different elements of the office check.

A complete report on the quality accuracy, completeness including specific instructions to the contractor shall be submitted.

On completion of the final checks the survey shall be certified by the Service Provider for completeness and accuracy by a registered surveyor or professional surveyor.

S32160(a)(vii) Other work

This includes;

- a) Certification of all survey work done, duplication of data, delivery to the Employer and entry of data into ITIS,
- b) Provision of historical topographical survey information, existing permanent survey control data, declarations, cadastral key plans and any other relevant information in the possession of the Employer to subcontracted survey firms or any other 3rd party as approved by the Employer.

S32160(b) FIELD CHECKS

All survey work shall be checked and certified for adherence to the completion and quality of the following Items;

S32160(b)(i) Permanent survey control

Duties;

- a) Check and certify that the permanent survey beacon positioning, construction and stability conform to TMH11 and the survey requirements,
- b) Check-survey all permanent survey control beacons (Normally 300 m apart) spread over the entire length of the project. This survey can be undertaken by making use of GPS equipment in order to check the relative accuracy of co-ordinate values and to check the accuracy of co-ordinate values in relation to the trigonometric beacons in the area. The heights shall be checked by one-way spirit levelling in order to compare the height differences between the contractors' heights and the check survey heights. Horizontal calibration shall be done by including at least 3 trig beacons within the survey area. (This calibration might change depending on the survey datum prescribed in the project requirements),

- c) The rate for one-way spirit levelling shall not be included in the tendered kilometre unit rate for field check surveys. Separate provision is made in the Bill of Quantities for this Item.
- d) All horizontal discrepancies have to be confirmed by a separate measurement and height discrepancies by an addition levelling run between suspicious points,
- e) A detailed report showing the quality of the beacons, the efficiency of the beacon positions, the distances from the road reserve fence or declaration line, the stability of the beacons and the differences in position and height between the submitted and the checked data.

S32160(b)(ii) Check cross sections

Check and certify the DTM heights accuracy in terms of TMH11 specifications and the survey requirements.

Cross-sections, covering the width of the survey, shall be taken at 500 m intervals on all changes of slope and all elements of the road prism. All observations shall be made from the existing established permanent survey beacons. GPS observations for check cross sections shall not be allowed. Total station observation distances shall be limited to 150 meters.

S32160(b)(iii) DTM height comparison

Co-ordinates and heights for all cross-section points shall be calculated.

Heights for these positions shall be interpolated from the contractors DTM and a comparison shall be made between the observed checked heights and the interpolated heights.

S32160(b)(iv) Detail accuracy

The following shall be carried out;

- a) Well identified detail shall be observed and the position co-ordinates calculated,
- b) These coordinates shall be compared with the co-ordinates derived from the digital CAD drawing,
- c) These checks shall be spread over the project,
- d) The number of check points will be left to the discretion of the surveyor but has to be sufficient to evaluate the detail accuracy,
- e) The result of this test shall be reflected in the final quality control report.

S32160(b)(v) Drainage Structures

Spot checks on dimensions and invert levels of at least 20% of all structures shall be done. The results of this test shall be reflected in the final quality control report.

S32160(b)(vi) Field check of the final drawings

The final drawings are normally only available after all the other field checks have been done. Provision shall be made for the re-establishment onto site after submission of the final drawings in order to undertake a physical field checks for the completeness of the drawings.

S32160(c) FINAL QUALITY CONTROL REPORT

The field checks results shall be submitted as separate tables for each activity as, permanent survey control, Cross sections (DTM), detail, culverts etc. reflecting the contractor's values, the quality control values and the residuals for each checked point shall be provided.

Accuracy statistics on the cross-section tests shall be supplied as part of the quality control report with regards to the accuracy in height on the entire survey, the road prism and the black top.

Test results shall be expressed as a percentage of the total number of test points which fall within 30 mm error intervals, starting at 0 mm to 30 mm, up to 0 mm to 0.5 meter. All errors larger than 0.5 meters shall be listed separately.

The test results for photogrammetric surveys can be extended up to errors between 0 and 1.0 meter using 50 mm intervals.

S32160(d) CERTIFICATION BY REGISTERED SURVEYOR

The registered surveyor who undertook the quality control survey shall certify his findings in writing, and shall specifically express his views on completeness, quality and accuracy.

Recommendations regarding sections or phases to be re-surveyed shall also be made by the quality controller.

On completion of the final checks and acceptance of the data the survey shall be certified as being complete and accurate by a registered surveyor or professional surveyor and be entered into ITIS.

S32170 PAYMENT

Topographic and engineering surveys

Item	Unit
S32.1 Liaison, meetings, advice	hr
S32.2 Detail and Digital Terrain Model (DTM) Surveys (Ground methods)	Ha
S32.3 Cross Sections	km
S32.4 Staking of road centre line	km
S32.5 Road prism surveys	km
S32.6 Staking of kilometre marker boards	km
S32.7 Survey of billboard positions	No.
S32.8 Surveying of weighbridge decks and approaches	No.
S32.9 Riverbed cross section surveys;	
S32.9(a) survey in water less than 600 mm	Riverbed cross section No.
S32.9(b) surveying using a drone boat	Riverbed cross section No.
S32.9(c) surveying from a motorboat	Riverbed cross section No.
S32.9(d) surveying from a rowing boat	Riverbed cross section No.
S32.10 Special surveys upon the Employer's request	
S32.10(a) reports, drawings for special surveys	Processing of data, Hr
S32.11 Project management of the Employer's service providers	Hr

Payment shall be made for discussing instructions, reports, surveys, attending survey project meetings under the tendered hourly rate under S3201.

Under item S3202, DTMs will be paid for at the tendered rate per Ha of survey carried out, measured to four decimal places.

The rate for cross-sections shall be adjusted in relation to the 50 cross-sections per km if longer/shorter cross-section intervals are required.

With the exception of item S3210 and S3210(a), payment for all items under S3203 to S3211 shall be made in accordance with the units of measurement shown.

In respect of item S3210 the Employer and the Service Provider shall assess the work to be done and shall agree upon the scope of work to be done. Payment shall be made for

every day, or part thereof that a survey team undertakes special surveys. The processing of data and producing drawings and reports shall be paid for per hour.

It is a general principle that applies to the entire contract, but the Service Provider is reminded that items that are measurable and payable under other items apply equally to the work covered by this section including, but not limited to getting permission to enter site, subsistence and travel, printing costs and any other item for which a rate has been tendered.

Tariff adjustments are dealt with later under the payment items.

Project Management

Item		Unit
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S32.12	Project Management of other's work Prov. Sum	
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Payment for project management shall be paid from the provisional sum provided and shall be based on the requirements and provisions contained in a Contract Instruction.

Structural surveys

Item		Unit
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S32.13	Structural Surveys;	
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S32.13(a)	structure and supply 3D as built model No	Survey major culvert
S32.13(b)	structures and supply 3D as built model No	Survey major bridge
S32.13(c)	drawings and sections from the major culvert 3D model No.	Extract 2D as built
S32.13(d)	drawings and sections from the bridge 3D model No	Extract 2D as built
S32.13(e)	lessor culverts and the supply of the drawings	Structural survey of No

Payment for all items shall be made in accordance with the units of measurement shown.

Tariff adjustments are dealt with later under the payment items.

Tariff Adjustments

Item

Unit

S32.14 Tariff Adjustments
Prov. Sum

Tariff adjustments for the surveying work described in this Section will be considered, based on the prior approval of the Employer, and confirmed in terms of a Contract Instruction. The General Tariff adjustments apply to all surveying work under this section, unless over-ruled or supplemented by the Specific Adjustments. Each tariff adjustment shall be calculated as additional compensation based on the tendered rate.

GENERAL ADJUSTMENTS OF TARIFFS FOR TERRAIN FEATURES	
Feature (see definitions below)	Adjustment
Bushy terrain (defined below)	0 – 40%
Cases where no, or very few fences exist and where the points have to be identified in the field (for fence bending point surveys)	+20%
Terrain features (defined below)	up to 40%
No survey control inside the road reserve - This must be corrected using the relevant Specifications.	No adjustment
Topography (defined below)	Up to 40%
High Traffic Volumes (defined below)	Up to 40%

SPECIFIC ADJUSTMENTS OF TARIFFS FOR TERRAIN FEATURES (Over-rules General Adjustments where applicable)		
Situation encountered	Survey type	Adjustment
Existing single carriageway - "fence to fence", up to 40 m.	DTM Surveys, Cross Section Surveys	0
Heavy detail	DTM Surveys	up to 40%
High Traffic Volumes (defined below)	DTM Surveys, Cross Sections, staking of road centrelines (provided that work is done on the road surface or shoulder)	Up to 40%
Less than 2 Ha	DTM Surveys	+40%
Topography (defined below)	DTM Surveys, Cross Sections	Up to 40%
Widening or narrowing from the normal road reserve of 40 m	Cross Sections	+ or - 10% for every 10 m change in road reserve width
Survey less than 5 km	Cross Sections, Road alignment surveys, staking of kilometre marker boards	+40%

SPECIFIC ADJUSTMENTS OF TARIFFS FOR TERRAIN FEATURES (Over-rules General Adjustments where applicable)		
Situation encountered	Survey type	Adjustment
Marking cross section on surface	Cross Sections	One mark per cross section +20% Additional marks +10% per additional mark per cross section-km
Existing double carriageway	Cross Sections	0%
Hilly terrain	Staking of road centrelines	+5%
On existing road	Staking of road centrelines	+20%
River cross sections	Under water cross sections (provision is made for using various boats if water is deeper than 600 mm) Widening or narrowing from a normal river cross section of 100 m	0% + or – 5% for every 50 m or part thereof in change of width

TARIFF ADJUSTMENT FOR STRUCTURAL SURVEYS

Item		
Additional spans	Per Span	25%
Height	0m – 12 m Higher than 12 m	0% + 30%
Carriageways	Single Double	0% 30%
Bushy Terrain		0% - 40%
High Traffic		0% - 40%
Beam Construction	Per Beam	2.5%
Over river/stream/with water deeper than 0.5m		30%
Over/Under Rail		30%
Survey and Supply point cloud for the bridge structure		50%

These adjustments shall be added together and claimed for under the provisional sum provided. A Contract Instruction is required for rate adjustments.

Definitions of Adjustments

BUSHY TERRAIN / VEGETATION	
Category	Description and adjustment value
Average	Average bushy terrain is where the bush/tree cover to land area in the road reserve is less than 30%, and where no additional survey stations have to be established to survey the area and it is not necessary to clear vegetation for the survey; No tariff adjustment
Category 1: Medium	Medium bushy terrain is where the bush/tree cover to land area is between 30% and 50% and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area, and moderate clearing of vegetation; Up to 20% tariff adjustment
Category 2: High	Highly bushy terrain is where the bush / tree cover to land area is between 50% and 70%, and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area, and substantial clearing of vegetation without having to employ additional labour; Up to 30% tariff adjustment
Category 3: Extremely high	Extremely bushy terrain is where the bush / tree cover to land area is between 70% and 100%, and where the bush/ trees are higher than 1,5 m in flat terrain, necessitating additional survey stations to cover the area and extensive clearing of vegetation to open lines in the bush / trees for which additional labour must be employed; Up to 40% tariff adjustment

TERRAIN FEATURES	
Category	Description and adjustment value
Flat and open terrain	Flat and open terrain is where 80% of the area under survey is flatter than 1:2 and where less than 5% of the area is covered by detail or obstructions: No tariff adjustment
Hilly terrain	Hilly terrain is where the steepness of the terrain makes access difficult and time consuming but to a lesser extent than mountainous terrain: Between + 5% and +10% tariff adjustment
Impeding traffic volumes	Impeding traffic volumes is where small non-cadastral surveys have to be done and the volume of traffic makes crossing the road time-consuming, and instrument readings are interrupted by traffic breaking electromagnetic rays: Up to +15% tariff adjustments
Heavy details	Heavy detail is where the area to be surveyed has buildings in close proximity and / or where there is an abundance of services or any other

TERRAIN FEATURES	
Category	Description and adjustment value
	detail to be surveyed, not catered for in any of the other adjustments; tariff adjustment negotiable up to +40%.

TOPOGRAPHY	
Category	Description and adjustment value
Average Topography	Average topography is where the slope of 50% to 65% of the terrain to be surveyed is less than 1:6 and which can be surveyed without it being necessary to fix additional survey control stations to perform the survey; No tariff adjustment
Category 1: Medium	Medium mountainous topography is where the slope of 50% to 65% of the terrain to be surveyed is steeper than 1:6 and which areas require more control points to cover the area, a great number of spot heights and break lines to be surveyed to portray the topography accurately, more spot heights to plot and denser contours to interpolate. Steeper terrain also leads to more difficult access and movement of surveyors and assistants and impeded inter-visibility between survey instrument and roving assistants. Up to 20% tariff adjustment
Category 2: High	Highly mountainous topography is where the slope of 65% to 80% of the terrain to be surveyed is steeper than 1:6 and which areas require even more control points to cover the area, a greater number of spot heights and break lines to be surveyed than category 1 to portray the topography accurately, even more spot heights to plot and denser contours to interpolate. Steeper terrain also leads to more difficult access and movement of surveyors and assistants and impeded inter-visibility between survey instrument and roving assistants. Up to 30% tariff adjustment
Category 3: Extreme	Extremely mountainous topography is where the slope of 80% to 100% of the terrain to be surveyed is steeper than 1:6 and which areas require the most control points to cover the area, a greatest number of spot heights and break lines to be surveyed of all to portray the topography accurately and the most spot heights to plot and densest contours to interpolate. Steeper terrain also leads to more difficult access and movement of surveyors and assistants and impeded inter-visibility between survey instrument and roving assistants. Up to 40% tariff adjustment

HIGH TRAFFIC VOLUMES	
Category	Description and adjustment value
Average traffic	Average traffic volume is less than 200 vehicles per hour and no

HIGH TRAFFIC VOLUMES	
Category	Description and adjustment value
volumes	regulation of traffic is required to perform the survey; No tariff adjustment
Category 1: High	High traffic volumes are between 200 and 500 vehicles per hour which relates to a vehicle every 7 to 18 seconds. A spot shot takes a minimum of 3 seconds to be recorded using a total station survey instrument and traffic control is necessary to perform the survey with this volume of traffic; Up to 20% of tariff adjustment
Category 2: Very high	Very high traffic volumes are between 500 and 800 vehicles per hour which relates to a vehicle every 4.5 to 7 seconds and it is impossible to carry out survey without channelling the traffic flow for which additional labour must be employed; Up to 30% of tariff adjustment
Category 3: Extreme	Extremely high traffic volumes are more than 800 vehicles per hour which relates to a vehicle every 4.5 seconds and the survey is not possible without the assistance of traffic control by the Employer's road maintenance teams; Up to 40% of tariff adjustment

Requirements for rate adjustments

- a) The adjustment of the tariff as provided for above shall not take place before a survey is done, but upon completion of the survey and the submission of the Survey Report as required in TMH11, Chapter 1 to the Employer's project manager, or designated person,
- b) Adjustments for vegetation, terrain features and topography must be supported by georeferenced and dated photographs,
- c) Adjustments for traffic volumes will be determined by the Employer, who shall draw the traffic volume off its ITIS system. If agreed to by the Employer, a location-enabled, time stamped video clip of no less than 1 minute may be presented as evidence of the traffic volume. Adjustments as provided for in TMH11.
- d) The Service Provider shall, before claiming remuneration present the required documentation to the Employer's project manager, or designated person for signing off on the adjustments before the compensation is claimed.

All adjustments are cumulative.

Quality Management

Item	Unit
S32.15 Quality control in the office; S32.15(a) Check and certify completeness per survey request	

	No.	
S32.15(b)	Check and certify conformance with procedures per survey request	No.
S32.15(c)	Check and certify calculations and reductions per survey request	No.
S32.15(d)	Check and certify accuracies have been adhered to per survey request	No.
S32.15(e)	Check and certify CAD drawings per survey request	No.
S32.15(f)	Reporting, submission per survey request	No.
S32.16	Field checks of surveys;	
S32.16(a)	Permanent survey control	km
S32.16(b)	Check cross sections	km
S32.16(c)	Check DTM height comparison	km
S32.16(d)	Check detail accuracy	No
S32.16(e)	Spot checks on 20% of structures	No.
S32.16(f)	Field check of final drawings	km
S32.17	One-way spirit levelling during field checks	No.
S32.18	Preparation of final quality control report	No.

S3300 PERMANENT AND OTHER SURVEY CONTROL POINTS

S3310 SCOPE

This section supplements Chapter 5 of the TMH11 Standard Survey Methods and provides for the establishment of permanent survey control beacons to be used as reference beacons for current and future surveys which might be required. It also provides for the verification of existing beacons and the maintenance of existing beacons. It further requires the ground control for mobile LIDAR surveys and its ancillary requirements which is not in the current TMH11

S3320 DESCRIPTION

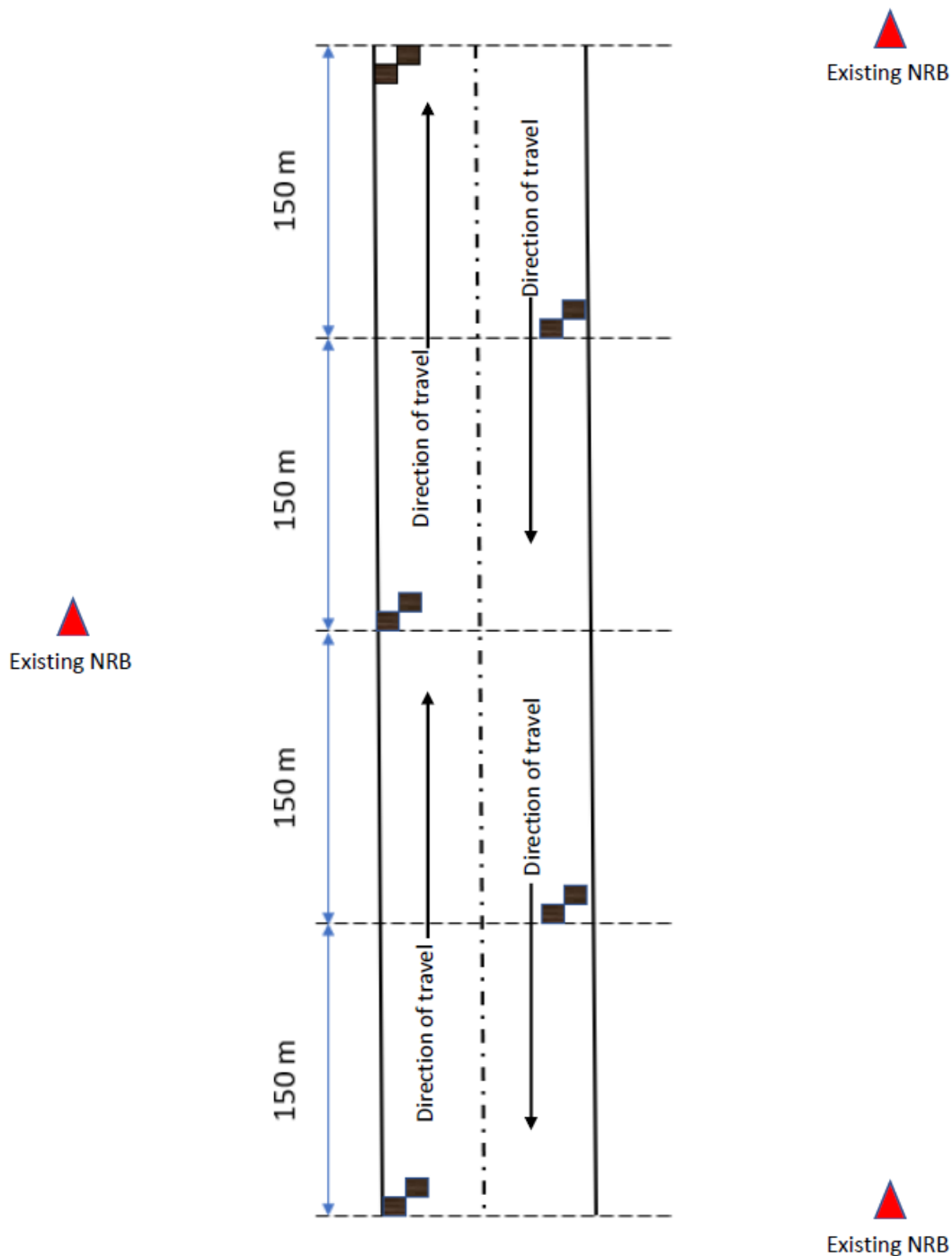
Permanent survey control shall be based on the existing and/or the National Trigonometric Network as specified. Calibration results shall be submitted with the survey data. Permanent survey beacons shall be established at safe positions, at the spacing required in TMH11, along the alignment or in the surveyed area in terms of TMH11 requirements, 1m from the road reserve or as otherwise specified. Traffic accommodation and other reimbursable costs are covered elsewhere.

Chapter 3 of the TMH11 Standard Survey Methods applies.

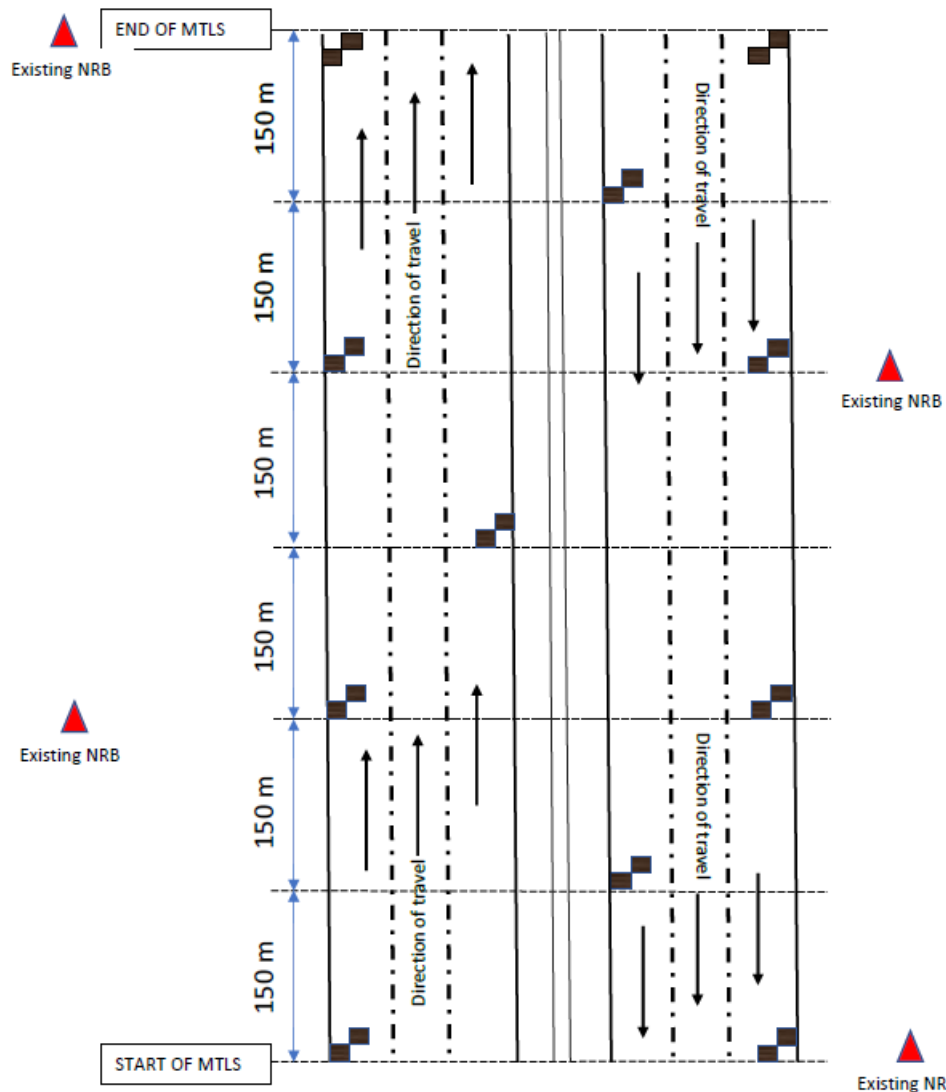
S3330 GROUND CONTROL FOR MOBILE TERRESTRIAL LASER SCANNING (MTLS)

a) Control Configurations and Markings

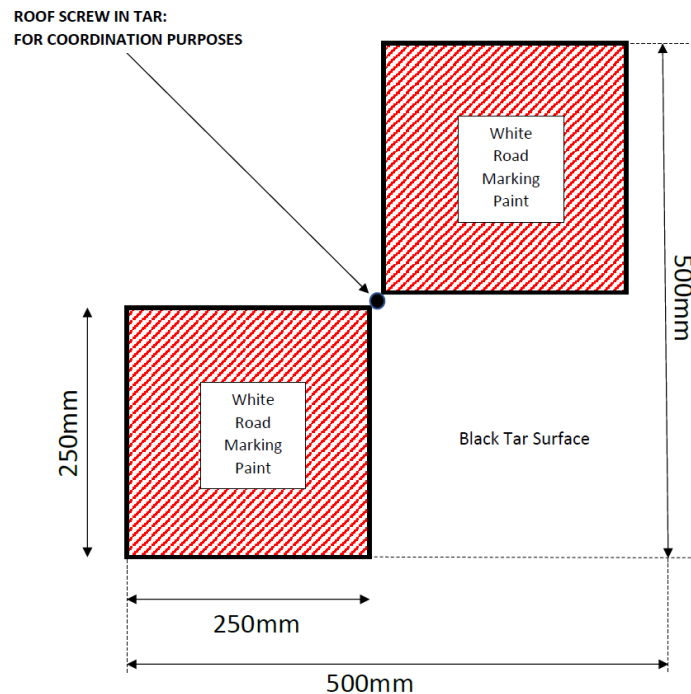
In a Single Carriageway road strip survey, a minimum of one ground control point must be established every 150 metres on the outer edge of the road, staggered on both sides of the strip that must be surveyed.



For a dual Carriageway road survey, control points shall be established as shown in the figure below. The configurations shown shall be adhered to from the start to the end of the project and is for each Carriageway almost the same as for a Single Carriageway road. At the start of the survey each Carriageway shall have a butterfly point on the shoulder of each slow lane. At the end of the project a butterfly point shall also be established in the slow lanes of each Carriageway opposite each other.



- b) In order for the premark to be clearly visible in the mobile data software and to adhere to all the specific observational requirements for lidar surveys, the premark must adhere to the following requirements:
- The minimum size of a MTLS premark should be in the form of a butterfly (checkered pattern), 250mm square blocks;
 - The premark should be on flat road surface and where the surveyed peg is placed in the centre of the butterfly point;
 - A butterfly - Premark should be painted with durable white paint; and
 - Permanent Survey Control can be premarked as per



- c) Butterfly control points shall be based on the existing permanent control points that have been established for the project.
- d) The position of a vertical ground control point should comply with the following requirements:
 - g) The height difference between any two lidar points within a theoretical 250mm square block around the control point should not exceed 10mm in height;
 - h) The surface area must be free of any sand and should be situated on a hard surface such as concrete or a paved road surface;
 - i) The surface area within the above-named theoretical square block must be of a homogeneous colour and should display good reflective capabilities; and
 - j) It is to be noted that, where the height of such a point, which is determined by laser methods, exceeds the height of the control point by more than 10mm, then such point may not be adopted as ground control.
- e) The identification and placement of horizontal ground control should comply with the following requirements:
 - k) The exact position, where a point is to be established in Y and X, must be clearly identifiable.
 - l) The position must be in contrast to its surroundings so as to ensure that the variations in the reflection can be identified by the laser;
 - m) An ideal point would be to the road edge of the existing yellow line on a (black) road surface or the like;

It be noted that butterfly control points, which comply with both above criteria, may then be utilized as individual ground control points provided that the co-ordinates (Y, X and Z) have been determined in accordance with the required specifications.

- f) The newly established control points shall be used as follows:
- n) As the basic network of control from which all the MTLs data will be registered from
 - o) As a test point to determine the MTLs survey accuracy after all surveys have been completed, total station test shots shall be surveyed from the existing route control to verify butterfly control accuracies.
 - p) MTLs data quality must be verified independently through quality control checks.

DTM height comparisons:

For Mobile Terrestrial Laser Scanning (MTLS) surveys, total station check spot heights shall be surveyed on the road surface at 50m intervals staggered along the yellow lines, in absence of such lines, not less than 100mm from the edge of a Single Carriageway road, for the entire length of the survey.

For dual Carriageways, total station check spot heights shall be surveyed at 50m intervals on the shoulder of each Carriageway, for the entire length of the road. If the Carriageways are separated by an island median, the 50m spot shots should be staggered along the left- and right-hand side of each Carriageway.

S3340 GENERAL REQUIREMENTS

Section 5.1 of TMH11 refers.

The Service Provider shall co-ordinate, check and certify the establishment, fixing procedures and accuracy tolerances of all control points it establishes. The survey work shall only be finalised after the control beacon values have been approved by a registered surveyor employed by the Service Provider.

Beacons shall be marked and numbered according to the standard numbering convention used by the Employer.

Two digital photographs shall be supplied of each established permanent survey beacon. The one shall be a vertical photo over the beacon so that the beacon tag is visible. The other photo shall be taken so that the beacon is seen in relation to the road (facing increasing kilometre distance of the road.) The photo file size must be smaller than 5 Mb and must be able to be e-mailed and opened and viewed by generally available software. These photos shall be submitted with the Technical Report, for approval.

It must be noted that the Employer employs a data base containing all details of its survey control beacons, and that each work item under this section will trigger the entry of data into the database of the Employer.

S3350 DATA TO BE SUPPLIED DIGITALLY AND IN HARD COPY

Data must be submitted in terms of Clause 12.20 of TMH11.

Following the fixing of permanent reference beacons, the following shall be provided;

- a) Survey Technical Report,
- b) Co-ordinate list of permanent survey control points used and established in terms of TMH11. The final co-ordinates of the newly established permanent survey control points shall be certified by a registered surveyor on the hard copy in the job file,
- c) Level comparison between level and check levels as well as actual and allowable closing errors,
- d) Calibration results concerning existing control and trigonometric beacons.

S3360 COORDINATION OF THE ESTABLISHMENT AND CERTIFICATION OF THE PROCESSING OF ALL PERMANENT SURVEY CONTROL

The Service Provider shall co-ordinate the establishment of all permanent survey control. Surveys can only proceed once all phases of the control have been certified by a registered professional surveyor.

The Service Provider shall;

- a) Program the submission of the control data for checking,
- b) Check the fixing methodology, the tie-in to other control and quality control checks done by the surveyor,
- c) Undertake check reductions to determine independent residuals,
- d) Verify the horizontal and vertical fixing results and residuals,
- e) Instruct the surveyor to undertake corrections if necessary,
- f) Check corrections and new results in terms of point b) to d) above,
- g) Certify the accuracy and acceptance of the processing results.

S3370 VERIFICATION OF EXISTING PERMANENT SURVEY CONTROL

These supplementary specifications shall be read with Clause 5.6 of TMH11.

The Service Provider shall;

- a) Obtain a co-ordinate list of the NRB Beacons or any other permanent control beacons from the Employer, including all liaisons with the Employer and/or its appointed Agent to obtain beacon data,

- b) Locate the NRB Beacons in the field and compile a status report on the quality and functionality of the beacons for submission to the Employer (with and/or without the use of survey instruments, as may be required),
- c) Perform a verification survey on all the beacons within the limits of the survey. This survey can be undertaken by making use of GPS equipment to verify the co-ordinate accuracy in relation to itself and in relation to the Trigonometric beacons in the area. The heights shall be verified by one-way spirit levelling to compare height differences between the co-ordinated heights and levelled heights. A comparison/verification report shall be submitted to the Employer for further instructions prior to final acceptance of the co-ordinates. This report shall also be submitted with the final data submission,
- d) Upon the written instruction of the Employer, re-survey the existing beacons in position and/or height, or accept the existing co-ordinates. This instruction will be issued after receipt of the comparison report stated in paragraph (c) above.

The cost to undertake the re-fixing of the beacons when so instructed by the Employer shall not form part of the unit rate for the verification of existing permanent survey control and shall be paid for separately. Separate provision is made in the Bill of Quantities for levelling, horizontal fixing and beacon building.

The establishment and fixing of the beacons shall adhere to the requirements stated in TMH11 and section S3403.

Verification of Existing Survey Control Beacons shall be followed by the maintenance of beacons, and encompasses the following actions;

- a) Clearance of all vegetation within a 1 metre radius around the beacon,
- b) Painting of existing iron standard fence post at the beacons,
- c) Re-establishment of damaged/missing iron standards at the beacon if so required,
- d) Indicating the position of the beacons on the edge of the road with a white arrow,
- e) Also compile and submit verification and condition report to the Employer in digital and hardcopy format on completion.

Following the verification and maintenance process, the following data shall be supplied in hard copy and digital format;

- a) Survey report,
- b) Verification/comparison report,
- c) Condition report,
- d) Co-ordinate list,

- e) One final and verified co-ordinate list shall be submitted containing the following co-ordinates:
 - i) All new beacons that have been established and fixed
 - ii) All co-ordinates of beacons which have been verified and accepted
 - iii) All co-ordinates of beacons which have been re-fixed in position and/or height on instruction by the client
 - iv) This co-ordinate list shall be certified for adherence to the accuracy and other requirements by a registered surveyor.
- f) Level comparison between level and check levels as well as actual and allowable closing errors when new beacons have been established or existing beacons re-fixed,
- g) Calibration results on existing control and trigonometric beacons.

S3380 PAYMENT

Permanent and other survey control points

Item	Unit
S33.1 Marking of permanent survey control beacons;	
S33.1(a) Marking fence posts and painting arrows on roads	No.
S33.1(b) Cairns of white-washed stones	No.
S33.1(c) Iron standards 1,8m in length, painted white	No.
S33.1(d) Numbering of beacons	No.
S33.2 Installation of terminal permanent survey control beacons	No.
S33.3 Installation of terminal permanent survey control beacons where Datum Point is more than 5 km away	No.
S33.4 Construction of conical beacons;	
S33.4(a) For bridges	No.
S33.4(b) For bridges where a Datum point is more than 5 km away	No.
S33.4(c) For borrow pits and quarries	No.
S33.4(d) All other cases	No.
S33.5 Construction of pillar beacons;	
S33.5(a) For bridges	No.
S33.5(b) For bridges where a Datum point is more than 5 km away	No.
S33.5(c) For borrow pits and quarries	No.
S33.5(d) All other cases	No.
S33.6 Studs in pavements and on structures	No.
S33.7 Vertical fixing of permanent survey control beacons by;	
S33.7(a) Levelling	No.
S33.7(b) Trigonometrical height traversing	No.

S33.8	Horizontal fixing of permanent survey control;	
S33.8(a)	Traversing with Total Station	No.
S33.8(b)	GPS method	No.
S33.9	Establishment of Photo control for LIDAR and conventional surveys;	
S33.9(a)	Pre-marked Photo Control (PC) points for;	
S33.9(a)(i)	Conventional surveys	No.
S33.9(a)(ii)	Pre-marked Photo Control (PC) points for LIDAR surveys	No.
S33.9(b)	Submission of Flight Plan	No.
S33.10	Verification of Existing permanent survey control;	
S33.10(a)	Locating of beacons and producing status report	No.
S33.10(b)	Position and height verification	No.
S33.10(c)	Clearance of all vegetation within a 1meter radius	No.
S33.10(d)	Re-painting of existing iron standard fence post	No.
S33.10(e)	Re-establishment of damaged/missing iron standards	No.
S33.10(f)	Re-painting of white arrows on the road edge	No.
S33.10(g)	Submit verification and condition report	No.
S33.11	Ground Control for Mobile terrestrial Laser Scanning (MTLS);	
S33.11(a)	Establishment of ground control (butterfly) points for single carriageway road	No
S33.11(b)	Establishment of ground control (butterfly) points for dual carriageway road	No.
S33.11(c)	Premark for (MTLS) butterfly points	No.

All items under S33.01 shall be measured and paid for according to the number of permanent survey control beacons marked and numbered as prescribed in TMH11 Standard Survey Methods.

The installation of terminal permanent survey control beacons shall be measured and paid for by the number of beacons installed as provided for in S33.02.

The installation of terminal permanent survey control beacons where the Datum Point is more than 5km away from nearest beacon shall be measured and paid for by the number of beacons installed as provided for in S33.03.

Payment for items S33.04 and S33.05 shall be measured and paid for by the number of beacons installed in each of the different circumstances listed in a) to d).

Payment will be made for every stud installed, under item S33.06

Under items S33.07 (vertical fixing) and item S33.08 (horizontal fixing) of survey control beacons, payment shall be made for each beacon fixed using the option a) or b).

Under item S33.09, payment shall be made for all work necessary to establish each photo-control point. Payment shall be made for each Flight Plan submitted.

Under item S33.10, payment shall be made for;

a) Each beacon located, for which a status report has also been submitted,

- b) Each beacon's height and position verified,
- c) Each beacon for which a minimum of 1m radius of vegetation has been cleared,
- d) Each iron standard re-painted,
- e) Each missing or damaged iron standard replaced,
- f) Each white arrow re-painted on the road surface,
- g) For the entire project, the verification and condition report, with the Employer's ITIS database updated with all fresh data.

S3400 MONITORING SURVEYS

S3410 SCOPE

This section supplements Chapter 9 of the TMH11 Standard Survey Methods.

Chapter 3 of the TMH11 Standard Survey Methods applies.

Reference beacons for monitoring surveys shall comply with section S3300.

S3420 DESCRIPTION

The Service Provider and Employer shall jointly define the parameters to be monitored and plan the monitoring project, including such matters as beaconing and the installation of targets.

The establishment of reference beacons are specified in TMH11 Standard Survey Methods in section 5.2 while all subsistence and travel costs shall be paid for as provided for elsewhere in the Specifications.

The type of target selected and cost of the installation of targets shall be proposed by the Service Provider and submitted to the Employer for consideration and approval.

The deliverables shall include those specified in Clause 12.19 of the TMH11.

S3430 PAYMENT

Monitoring Surveys

Item	Unit
S34.1 Planning and project parameters Hour	
S34.2 Provision of surveying monitoring targets item	PC
S34.2(a) Mark up on survey monitoring targets Percent	
S34.3 Installation of survey monitoring targets Person-day	
S34.4 Observations;	
S34.4(a) Three- dimensional (dy, dx, dz)	No.
S34.4(b) Uni dimensional (usually dz)	No.
S34.5 Reduction, processing and analysis	No.
S34.6 Quality control and preparation of results report	No.

The Service Provider shall be reimbursed at the tendered hourly rate under S3401 for the attendance of discussions, site visits, meetings, and the preparing of proposals and plans, and project parameters.

Survey monitoring targets shall be paid for at cost, plus a mark-up at the tendered percentage.

The installation of survey monitoring targets shall be paid for by the number of person days required to install the targets. A person-day shall be 4 hours or more that any person spends away from any other work specifically engaged in doing this work, in a day. No time less than 4 hours in any one day shall be claimable.

Observations will be paid for at the tendered rates for three dimensional, or uni-dimensional measuring, for each observation of a target performed.

The Service Provider shall be paid for the reduction, processing and analysis of the observation data, following each day of measuring the targets.

Quality control and the preparation of the results report at the end of the monitoring period shall be paid for at the tendered rate.

S3500 AERIAL AND DRONE SURVEYS

S3510 SCOPE

These specifications supplement Chapter 4 of the TMH11 Standard Survey Methods.

Chapter 3 of the TMH11 Standard Survey Methods applies.

S3520 PROJECT DEFINITION

Add the following to TMH11 paragraph 4.1.1;

Unless the Service Provider has such capacity in-house, aerial and drone surveys shall be performed by sub-contracted parties.

The Employer shall furnish the Service Provider with its requirements for aerial or drone surveys. The Service Provider shall discuss the matter with the Employer, and thereafter prepare a specification and procurement documentation for the survey and submit it to the Employer for approval. The requirements of Clause 12.11 of the TMH11 apply.

The Service Provider shall prepare a summary of its understanding of the instructions and submit this in writing to the survey representative of the Employer for signing off. This communication may in the form of formal minutes, a letter, an e-mail, etc and shall be included in the Technical Report required in terms of clause 1.12 of TMH11 Standard Survey Methods.

The Service Provider shall then advertise the sub-contract, evaluate tenders, appoint the aerial or drone surveyor, manage the contract through to its completion and then consider the aerial or drone survey report before entering the data into ITIS with the appropriate attributes, and informing the Employer of its availability.

S3530 PAYMENT

Item	Unit
S35.1 Advice provided to Employer concerning survey method	No.
S35.2 Preparation of specifications and procurement documents for an aerial or drone survey	No.
S35.3 Flight path design and programme	Hr.
S35.4 Obtaining of pre-flight authorisation	Hr.
S35.5 Processing of captured data	Hr.
S35.6 Management of aerial or drone survey and submission of data into ITIS	No.

S35.7	Cost of subcontracted aerial or drone survey	PC
	Sum	
S35.7(a)	Administration of subcontracted aerial or drone survey	
	Percent	
S35.8	Aerial survey using own drone	day

The Service Provider shall be paid under item S3501 for discussing aerial or drone survey instructions with the Employer and for advising the Employer regarding the appropriate specifications and requirements for the survey.

Under payment item S3502, payment shall be made for preparing the specifications and procurement documents required to procure an aerial or drone survey, regardless of whether the survey is ultimately carried out, or not.

Under items S3503 to S3505, the work will be paid for every hour, or part thereof that is spent designing a flight path and programme, obtaining pre-flight authorisation and processing the captured data. Any fees and charges levied shall be remunerated as provided for in the General Specifications.

The Service Provider shall be paid under S3506 for procuring an aerial survey and managing it through to completion, including performing all actions necessary to advertise the sub-contract, conduct (if necessary) a tender briefing, opening and evaluation tenders, appointing the subcontractor, monitoring the work in respect of its quality and the time taken to complete it, preparing the data for submission into ITIS, and ensuring that a complete Technical Report is prepared, checking the accounts of the sub-contractor and any other duty or action required to be fulfilled to complete the survey.

The actual cost of the aerial survey will be paid to the Service Provider under S3507, plus an administration fee at the tendered percentage.

Any other costs will be remunerated under the items specified in other specifications.

If the Service Provider uses its own drone, remuneration may be claimed for each day that the drone is actually used to perform aerial surveys, regardless of the number of survey flights undertaken during any single day. The tendered rate shall include all costs of using the drone, including the operators of the drone. Other remuneration may be claimed under the relevant items.

The Service Provider is reminded that further costs are remunerable under the General specifications.

S4000 ADDITIONAL SERVICES

S4100 AUDIT SURVEYS AND MENTORSHIP

S4110 SCOPE

This section deals with auditing of surveys and providing mentorship to ensure that construction site surveying is undertaken to a high standard in accordance with Chapter 10 of the TMH11 Standard Survey Methods, and that candidates aspiring to registration or professional status receive mentorship and experiential training.

Chapter 10 of TMH11 describes the requirements for Supervision and Construction Surveys for the Constructions of Roads and Bridges. Besides Chapter 10's more obvious purpose, the work provides opportunities for providing young surveyors with experiential training. However, the work cannot be performed without professional mentorship, and checks being made on the accuracy and quality of their work.

The Service Provider shall note that the supervision of construction works is the responsibility of the Resident Engineer and Site Supervisory Surveyor, and that the work of the Service Provider is not to replace, or to take over the responsibilities of the Resident Engineer and Site Supervisory Surveyor, but rather to assist the Resident Engineer and Site Supervisory Surveyor to ensure that surveying work is being properly conducted, and that surveyors in their employment, have the necessary mentorship to achieve professional registration.

S4120 DESCRIPTION

S4120(a) AUDIT OF SURVEY ON CONSTRUCTION SITES

The Employer shall instruct the Service Provider which construction sites must be provided with survey auditing services.

These services shall include;

- a) Ensuring that all required functions have been attended to,
- b) Suitable equipment is used by the site surveying team,
- c) That the equipment claimed for is on site and is good condition,
- d) Check survey procedures and methodologies used on site,
- e) Check the processing of the data,
- f) Check the frequencies of surveys undertaken and the results obtained,
- g) Check if the data is efficient in exercising control over the works,
- h) Evaluate the recommendations and reports to the resident engineer,
- i) Check the record keeping and backing-up of data,

- j) Check that records are signed off, and point out non-conformances,
- k) Evaluate whether the resident engineer is making proper use of the surveyor and that the Employer gets value for money.

Within 30 days of the commencement of the contract, the Service Provider must prepare a standard audit checklist based on the requirements of Chapter 10 of the TMH11, covering all types of construction and rehabilitation from which the items to be audited may be selected for each project.

The Service Provider must familiarise itself with the work to be done on each site for which it has received an instruction and prepare an audit plan, based on the checklist, for discussion with the Resident Engineer, Site Supervisory Surveyor, and the Employer's representatives in respect of property acquisition and construction project management. The important decisions of the discussions must be recorded in writing, and the audit plan agreed between the parties as early as possible after commencement of the works contract.

The audit plan and items selected from the checklist to be audited must take into account the complexity of the works and the checks that are required to be carried out to satisfy the Employer's construction project manager that the quality of the works will meet all the requirements of the COTO Specifications for Road and Bridge Works. It must include the aspects of the works to be checked, from the preparations of the site surveyor through to the submission by the Resident Engineers as-built plans. The requirements of TMH11 Standard Survey Methods, Chapter 10 for the Supervision and Construction Surveys must guide the content of the audit plan. As no two works projects and hence, audit plans will be the same, each audit plan must contain enough detail and costing to allow the Employer to make decisions about the content and cost of the audit. The Employer shall indicate the required frequency of audits to be carried out.

Auditing of site surveying shall then be carried out in accordance with the audit plan, and Clause 12.22 of the TMH11 document by a senior professional with extensive experience in construction supervision surveys.

The Service Provider shall, after each site audit has been performed, submit an audit report to the Employer's project manager, who at his/her discretion, may refer it to the resident engineer.

Whilst it is the responsibility of the Resident Engineer to submit survey records into the ITIS database, including the as-built records of the construction works as it proceeds, the Service Provider shall ensure that this data is submitted on time, in the format required, to the accuracy required and as required in TMH11. The Service Provider shall also ensure that where the contractor has not complied with the design, the surveyor has identified the matter and that the resident engineer has taken steps to resolve it.

Once construction has been completed, the Service Provider shall audit the as-built drawings to ensure their accuracy from a surveying point of view. A report on the findings of the report shall be provided to the Employer's construction project manager and property manager.

S4120(b) MENTORING OF CANDIDATE SURVEYORS

If unregistered surveyors, or surveyors seeking a higher qualification require experiential training that is satisfactory to the South African Geomatics Council (SAGC) are to be employed on the works site, an assessment must be conducted by the Site Supervisory Surveyor and Service Provider of the candidate's experience to date, and then, with the input of the supervisory surveyor, goals must be set for further training with a view to satisfying the requirements of SAGC for registration. Reporting forms, designed by the Service Provider, and compliant with the requirements of SAGC (where applicable) must be used for conducting regular assessments of the work of the candidate surveyor, and providing feedback and guidance to the person and the supervisory surveyor.

Each candidate surveyor must be assisted by the Service Provider to establish and maintain a training and experience log, which must be periodically signed off by a person in the Service Provider's employment, that has the professional status to do so.

The Service Provider shall, as part of his duties, continually advise the supervisory surveyor, resident engineer and Employer of the success or failure of the mentoring system, and identify what solutions or approaches should be adopted to increase the number of professional surveyors, able to enter the profession as fully independent surveyors.

S4130 PAYMENT

Item	Unit
S41.1 Study of design and designing the audit	No.
S41.2 Auditing of the site surveyor's preparations	Days
S41.3 Auditing of the construction phase	Days
S41.4 Auditing of as-built plans	Days
S41.5 Mentorship and advice	P/month

A payment shall be made once at the tendered rate for the Service Provider familiarising itself with the design and preparing an audit plan for submission to the Employer's construction and project managers and obtaining their comments and suggestions for its finalisation.

Payment shall be made for the number of days involved in auditing site surveyor's preparations as defined in the various audit plans, and if necessary, assisting the surveyors and resident engineers to approach the works contracts in a manner that ensures the best quality of construction. As the person(s) doing the auditing will have to spend time travelling and preparing reports, or in meetings besides doing the actual auditing, measurement shall be made for every day that an auditing surveyor spends more than 4 hours away from other work, regardless of the number of hours spent exceeding 4 hours and regardless of what those auditors may be doing as long as it is in

pursuance of performing the audits. For the avoidance of doubt, no payment will be claimable if any auditor spends less than 4 hours working on an audit during any specific day.

Payment shall be made for the number of days involved in auditing works contracts' surveying work as defined in the various audit plans, and if necessary, assisting the surveyors and resident engineers to ensure the best quality of construction. As the person(s) doing the auditing will have to spend time travelling and preparing reports, or in meetings besides doing the actual auditing, measurement shall be made for every day that an auditing surveyor spends more than 4 hours away from other work, regardless of the number of hours spent exceeding 4 hours and regardless of what those auditors may be doing as long as it is in pursuance of performing the audits. For the avoidance of doubt, no payment will be claimable if any auditor spends less than 4 hours working on an audit during any specific day.

Payment shall be made for the number of days involved in auditing the as-built data submitted by the works supervising engineers. As the person(s) doing the auditing may have to spend time travelling and preparing reports, or in meetings besides doing the actual auditing, measurement shall be made for every day that an auditing surveyor spends more than 4 hours away from other work, regardless of the number of hours spent exceeding 4 hours and regardless of what those auditors may be doing as long as it is in pursuance of performing the audits. For the avoidance of doubt, no payment will be claimable if any auditor spends less than 4 hours working on an audit during any specific day. It must be noted that this item may include field work, in which case other payment items may also be applicable.

Payment shall be made monthly for each candidate surveyor that is mentored, guided and whose experience is signed off, all to meet the requirements of the South African Geomatics Council.

Payment shall not distinguish between parts of months or the number of days in a month.

S4200 EXTRACTING SITE SURVEYS FROM SPLICED DATA SETS

S4210 SCOPE

This section describes the extracting of site surveys from spliced data sets.

S4220 DESCRIPTION

The following process must be followed;

- a) Check that the integrity of both the LIDAR and the Topographical ground survey data sets have not been disturbed during the splicing process,
- b) Determine the correct area that is needed for the site survey, keeping in mind the TMH11 specifications,
- c) Extract the spliced CAD work from the continuous model and ensure that all TMH11 specifications are adhered to,
- d) Extract the spliced triangulated data from the data sets and ensure that all TMH11 specifications are adhered to,
- e) Extract the image area. Keep in mind that the image must be resampled to cover only the site survey area,
- f) Ensure that the exported data conforms to the specifications required for site surveys as stipulated in TMH11,
- g) Export the CAD, triangle and images to all formats specified in the TMH11.

S4230 PAYMENT

Extracting site surveys from spliced data sets

Item	Unit
S42.1 Extracting site surveys from spliced data sets	Ha

Payment shall be made for extracting site surveys from spliced data sets by measuring the number of Ha (calculated to 4 decimals) extracted.

S4300 SPLICING GROUND SURVEYS INTO LIDAR DATA

S4310 SCOPE

This section deals with the splicing of topographical ground surveys into LIDAR triangle data sets, and is to be read with Clause 6.8.1 of TMH11 Standard Survey Methods.

S4320 DESCRIPTION

S4320(a) SPLICING OF TRIANGULATED DTM DATA

- a) Adequate software and hardware will be needed for this process because the computing of this procedure, and the use of the data after splicing can result in large data files,
- b) The triangulated topographical, and the LIDAR data sets must be approved by the Employer and confirm to TMH11 specifications before attempting the splicing procedure,
- c) Regarding the topographical triangle data set;
 - i) Ensure that the triangulated model has no duplicates,
 - ii) Generate a precise boundary shape of the Topographical triangle data set.
- d) In the LIDAR triangle data set, ensure that the triangulated model has no duplicates,
- e) Generate a new working file by using the TMH11 seed file,
- f) Import all LIDAR triangle data sets into the new TMH11 specified file,
- g) Precisely and accurately remove all LIDAR triangle data that covers the same geographical positions as the Topographical ground survey,
- h) Insert the topographical ground survey data onto the position where the LIDAR data has been removed,
- i) Regenerate the two-triangle data sets as one new spliced triangle data set,
- j) The integrity of both data sets must be exactly as it was before the regeneration process into a splices data set,
- k) When the separated data sets are referenced to the back of the spliced data set only the joining data may differ from the original two data sets,
- l) When undertaking the triangulated data regeneration, one must ensure that the splicing of the two data sets into one is without gaps in the triangulated network,
- m) The regenerated triangles are solid and not broken lines,

- n) That there are no duplicates,
- o) These will all create complications when checking the data to TMH11 specifications and will create gaps in you Contour regenerations,
- p) Check the Spliced data to TMH11 specifications,
- q) Change the Colour the topographical triangle data and the LIDAR triangle data in the spliced file as specified in the TMH11 specifications,
- r) Split the newly spliced data set to the exact number and blocks as what was specified for the LIDAR survey project,
- s) Export the Spliced data sets to all formats as specified in the TMH11.

S4320(b) SPLICING OF CAD DATA

- a) Check that the both the topographical CAD data and the LIDAR CAD data conforms to and was accepted as approved TMH11 data sets,
- b) Generate a new working file by using the TMH11 seed file,
- c) Precisely and accurately remove all LIDAR CAD data that covers the same geographical positions as the Topographical ground survey,
- d) Insert the topographical ground CAD data onto the position where the LIDAR CAD data has been removed as per TMH11 specifications,
- e) Were Linear features on the LIDAR CAD has been broken and the same features exists on the Topographical ground survey CAD the linear features will be reconnected between the LIDAR and the topographical CAD data sets,
- f) There should not be any difference to the position of the node were the linear features join up,
- g) New contours should be regenerated from the new spliced triangle data set,
- h) The new contour data set must conform to all the TMH11 specifications,
- i) The new contour data set must be super imposed onto the new spliced CAD drawing,
- j) The newly spliced CAD drawing must be exported to all formats as per TMH11 specifications.

S4330 PAYMENT

Splicing ground surveys into LIDAR data

Item

Unit

S43.01 Splicing of ground surveys in LIDAR data

Payment shall be made for the number of KM (measured to 2 decimals) of topographical ground survey data spliced into LIDAR triangle data sets.

S4400 JURISDICTION LINE FEATURE

THIS SPECIFICATION WILL NOT BE USED IN THIS TENDER
S44.1

S4500 SERVICE AUDIT SURVEYS

S4510 SCOPE

The purpose of these surveys is to identify, locate and record the services running parallel to, or crossing national roads.

S4520 DESCRIPTION

S4520(a) SERVICES TO BE IDENTIFIED

The following shall be surveyed;

- a) Overhead electrical power lines crossing the road and lines parallel to the road, within the road reserve, the voltage of the power lines, and the number of conductors, and the height of the lowest conductor above the road surface shall be recorded,
- b) Overhead telephone lines crossing the road, and lines parallel to the road within the road reserve. The heights of the lowest telephone line above the road surface shall be recorded,
- c) Any underground services where there is visible evidence of the service inside the road reserve and crossing the road reserve,
- d) Manholes and the descriptions of the types of service therein,
- e) All service markers within the road reserve (labeling appearing on the marker must also be recorded),
- f) Optic fibre installations evident from trenching and manholes parallel to the road,
- g) Any safety / security cameras that are visible,
- h) Overhead pipelines, conveyor belts,
- i) Optic fibre installations crossing the road,
- j) Services attached to bridges,
- k) Services running through ducts at bridges, if visible,
- l) Lighting installations, power cable positions, transformers etc.,
- q) Roads or tracks within the road reserve,
- r) Traffic Counting Stations. Only the equipment housing shall be surveyed,
- m) Kilometre marker boards and their km distances as displayed on the board,
- n) All culverts to be checked for services running through the culverts. These services shall be recorded,

- o) Signs/noticeboards not forming part of the road signage,
- p) All accesses but excluding intersections with provincial and districts roads,
- q) All visible services and/or servitudes, up to 60 m outside the road reserve that run parallel to the National Road and that can influence the design of a possible road reserve widening during land acquisition. This is only applicable to areas outside towns as far as the building restriction area reaches,
- r) All visible encroachments into the road reserve. This shall include sections where there are no road reserve fences or walls,
- s) Survey observation for linear services shall be done at least every 100 m and at all bending points,
- t) Information on some of the existing services may be obtained from the Employer. who will extract the information from the Statutory Control Management System (SCOMS). These services shall be identified in the field. It is to be noted that the information that will be supplied might not be complete or accurate. It is important for the survey team to walk the route in order to identify all services that are recorded in SCOMS or in the road logs as well as other services not recorded anywhere else,
- u) Road logs shall be obtained from the Routine Road Manager (RRM). Contact information of the RRM shall be supplied to the surveyor. This information might also not be complete and accurate, and the same principal shall apply as for t) above.

S4520(b) SUBMISSION OF CAD DRAWINGS

TMH11 standards shall be used to produce these CAD drawings.

A continuous CAD drawing in .dgn or .dwg format shall be submitted showing the following information:

- a) Cadastral information calculated from SG Diagram,
- b) Servitude information calculated from SG Diagram,
- c) The declared road reserves. If there is no declaration by co-ordinates available, then the road reserve fence shall be adapted as the actual road reserve. Where there is no fence demarcating the road reserve, the width of the road reserve in these areas shall be determined from the average road reserve width,
- d) All features surveyed and recorded as stipulated above,
- e) All features on the drawings shall be clearly shown and annotated,
- f) All permanent survey control shall be shown on the drawing.

S4520(c) SURVEY DATA TO BE SUBMITTED

- a) Co-ordinates and feature codes of all surveyed positions,

- b) Test on survey observation accuracies (Check on trig beacons or existing permanent survey control),
- c) Survey report.

S4520(d) SURVEY ACCURACY

- a) All features shall be surveyed to an accuracy of 0.20 metres. Only equipment that can guarantee this accuracy shall be used,
- b) No hand-held GPS's shall be used.

S4530 PAYMENT

Service audit surveys

Item	Unit
S45.1 Service audit surveying	Person-Day
S45.2 Preparing data for submission into the Employer's system	Person-Day
S45.3 Service CAD drawings on A0 film	No

Auditing of services and preparing data for submission into the Employer's ITIS system in CAD format shall be paid for by the number of person-days spent carrying out the surveys and doing CAD work. A person-day shall be counted as any time spent by one person away from all other work, that exceeds four hours. For the avoidance of doubt, if less than four hours is spent away from the office by any single person, no payment may be claimed for the surveying or CAD work done by that individual person.

Because heavy detail will involve more person-days to survey and carry out the CAD work, there shall be no adjustment of this rate for heavy detail, or less detail.

Each CAD drawing produced on film and submitted into the Employer's database in the required format shall be paid for at the tendered rate.

**S4600 ROAD RESERVE BOUNDARY
DETERMINATION**

THIS SPECIFICATION WILL NOT BE USED IN THIS TENDER

S4700 GROUND PENETRATING RADAR SURVEYS

S4710 SCOPE

This section covers the location and geo-referencing of underground services, or covered infrastructure.

S4720 DESCRIPTION

The Service Provider shall use Ground Penetration Radar Systems (GPRS) that detect underground services buried no less than 2 meters underground.

The GPRS must be able to log the measured data in a geo-referenced data set by linking the GPRS to a survey-grade differential GPS system. This data must tie into the local survey control system.

The logged GPRS data must be able to be viewed, post capture, in appropriate software. The post capture software must enable the user to slice through the captured depth data and export the data to other formats.

Other suitable detection techniques and equipment for detecting underground pipes may be deployed alongside GPRS to enhance detection accuracy and form part of the survey. This includes precision cable detection equipment with the ability to track induced currents in the service, such as Transnet traction cable or signalling cable induced signals. The detection equipment must use a multi- array of antennas for improved accuracy.

The Service Provider shall locate, survey and map all underground services in intervals of;

- a) Less than 20 meters in straight lines,
- b) Less than 10 meters on gentle bends (about $135^{\circ} \pm 10^{\circ}$)
- c) Less than 5 meters or less on sharp bends (about $90^{\circ} \pm 10^{\circ}$), and all junctions.

The detected service must be modelled in 3D (Y, X and Z position) and incorporated into CAD models in the correct service layer.

Where other GPR surveys are required, such as on bridge decks, the density of readings and detail required shall be discussed with the Employer, who shall instruct the Service Provider according to its needs.

S4730 PAYMENT

Ground penetration radar surveys

Item	Unit
S47.1	GPRS equipment, operator and support
	day
S47.2	Post processing of GPRS data
	hr

A day performing GPRS surveys shall be counted as any time spent by a team using GPRS equipment for a day, or any period less than a day.

Post processing shall be measured by the number of hours spent post processing the GPRS survey data, capturing it in the Employer's database, writing reports or performing any other duty to conclude the survey.

Any other costs are remunerable under the relevant items.

S4800 SPECIAL REPORT AND MAP PRODUCTION

S4810 SCOPE

This section deals with the production of maps, diagrams and special reports for the Employer on an ad-hoc basis following an instruction from the Employer.

S4820 DESCRIPTION

On occasion, the Employer may require any of the following for producing reports, preparing tender documents, creating presentations, providing information in a visual form, etc. The list is not exhaustive and may include other work of a similar nature;

- a) Special investigations, mainly for planning and management purposes,
- b) Locality plans,
- c) Layout plans,
- d) Property/route investigations and producing of reports,
- e) Reports including the acquisition key plan for a project, together with other data,
- f) Wall maps, which may require to be laminated with clear film,
- g) Booklets containing information required by project managers, or the executives, by Board members, the potential lenders,
- h) Etc.

S4830 PAYMENT

Map and special report production

Item

Unit

S48.1	Persons engaged in map and special report production;	
S48.1(a)	Non-professional persons with specialist skills	hr
S48.1(b)	Registered persons	hr
S48.1(c)	Professional persons	hr

Payment for producing maps, reports, drawings, presentations, locality plans, booklets or any other property/route investigations, the compiling of documents, reports or visual aids shall be paid for at the tendered rates for every hour, or part thereof spent producing the required deliverable.

The Service Provider must keep a register for every map or report produced containing the following information, at least;

- a) Unique number,
- b) Date of receipt of instruction,
- c) Name of the person issuing the instruction,
- d) Name of the instruction / Essential details of the instruction,
- e) Names of the people working on the deliverables,
- f) The status (non-professional, etc as required for payment) of each of the people engaged in the deliverables,
- g) The hours spent by each person per day worked on the deliverable,
- h) The printing, copying costs claimed as provided for in the General Specifications,
- i) Any other costs claimed as provided for in the General Specifications.

S4900 SPLUMA APPLICATIONS FOR MATERIAL OR OTHER SITES REQUIRE BY LEGISLATION AND/OR BY-LAWS

S4910 Scope

It is required from time to time that full SPLUMA applications be done for material sources or other sites for temporary or other type of rezoning as required by Municipalities

S4920 Description

It will be required of the Service Provider to embark on the following:

- a) Diagrams as needed
- b) Applications to be lodged
- c) All required paperwork, addenda, restrictive conditions or other consents required be sourced
- d) Public participation
- e) Site Plans
- f) Following up on applications
- g) Consultation with the Municipality
- h) Receive certificates

S4930 Payment

Item

Unit

S49.01	Diagram	No
S49.02	Application prepared and submit	No
S49.03	Certificates received	No

The service provider will be paid on the above deliverables. All other required actions, i.e. for example meetings, public participation, follow ups and additional information required must be taken into account into the pricing for the deliverables.

Any other costs as per the General Specifications will be priced under such payment item.

A Register must be kept of all applications that includes:

- s) Date of diagram
- t) Date of submission of application
- u) Date of receiving the certificate
- v) Full comments of information provided as well as consents received