PART 3: SCOPE OF WORK

Document reference	Title	No of pages
	This cover page	1
C3.1	*Employer*'s Scope	
C3.2	*Consultant's* Scope	
	Total number of pages	

C3.1: EMPLOYER'S SCOPE

Contents

When the document is complete, insert a 'Table of Contents'. To do this go to: Insert, → Reference, → Index and tables → Table of Contents. Three levels and the title (but not the subtitle) may be shown if the formats used in this template are retained.

Otherwise insert list of contents manually.

1 Description of the *services*

1.1 Executive overview

Eskom Transmission plans to put together a panel of geotechnical consultants, who will undertake geotechnical / dolomitic analysis investigation or for new 132 to 765Kv substation developments (GIS and AIS) as well as extensions on existing substations and specialised investigations on our high voltage (HV) lines.

The consultants will have to carry out preliminary geotechnical / dolomitic analysis investigations to determine the most suitable site to construct on. They will also be required to carry out detailed geotechnical in order to provide design parameters for the design of the earthworks and foundations as well as identifying of geotechnical problems and mitigation thereof at the proposed substation.

2 Specification and description of the *service*s

2.1 Stage 1 Preparation

The services shall be carried out **strictly in accordance to the** '**geotechnical/ dolomitic stability investigations scope & specification'** issued as part of the tender enquiry. Below is a summary of the scope and specification document.

2.1.1 Site Description

2.1.1.1 Location

The proposed developments will be located throughout South Africa.

2.1.2 Professional services required

Substation engineering department may require the service of a geotechnical Advisor, who has more than 5 years' experience after professional registration as a geotechnical engineer or engineering geologist (based on SANS competence levels for geo-professionals). **The advisor will be required to guide a candidate geotechnical engineer in compiling a geotechnical investigation report for the** proposed development. The advisor will be responsible for ensuring that:

- The document is wholly compiled by the candidate, with the exception of the resistivity studies scope
- The advisor guides the candidate through the compiling of a safety file to be approved by an ESKOM SHE Manager. The candidate has to ensure approval of the file under the guidance of the Advisor
- The advisor plans for the site investigation and ensures all necessary services are procured for the site investigation, including the resistivity studies.
- The advisor allows the candidate to profile the test pits and boreholes under complete supervision of the advisor. The advisor is to review and approve all test pit and/borehole profiles
- The advisor provides all the necessary tools, equipment, and relevant literature for the candidate to be able to make the correct analysis on all project specific available data.
- Guides the candidate to full understanding on sections the candidate has no prior experience or knowledge, taking into consideration the time constraints of the task order.
- The advisor reviews, comments and provides guidance to the candidate for the correct analysis of all the sections of the report.
- The advisor has in their employ all the necessary human resources, i.e. pavement/earthworks designer, transport (road design) engineer, structural engineer to assist the candidate in all the relevant sections of the report.

- The advisor signs off the geotechnical report as the approver of all the content in the document.

2.1.3 Scope of Work

2.1.3.1 Purpose

The primary objective of a preliminary investigation is to assess the soil and rock profile across the sites for site selection purposes.

The following specific items should be dealt with in the investigation:

- Site geology and stratigraphy.
- Soil and rock classification.
- Identification of geotechnical problems.
- Earthworks and terrace construction recommendations
- Excavatability of material on site as per SANS1200 specifications
- establish the sources available to obtain the G6/G7 material for fill
- Comment on cost estimates for each site
- Structural design requirements of the fill
- Recommended foundation solutions
- Seismic assessment and classification of the site needs to be part of the report

The primary objective of a detailed investigation is to assess the soil and rock profiles across the site so as to provide foundation recommendations, foundation and pavement design parameters as well as earthworks/pavement designs.

The following specific items will be dealt with in the investigation:

- Site geology and stratigraphy.
- Soil and rock classification.
- Identification of geotechnical problems.
- Bearing capacity of in-situ soils and import material to be used
- Settlement of in-situ soils
- Heave of in-situ soils
- Earthworks and terrace construction recommendations
- Excavatability of material on site as per SANS1200 specifications
- Establish the sources available to obtain the G6/G7 material for fill
- Comment on cost estimates for construction of final design
- Structural design requirements of the fill
- Recommended foundation solutions
- Corrosivity and aggressiveness of the soils as well as corrosion protection of buried structures
- Ground resistivity
- Seismic assessment and classification of the site

The investigation should present practical recommendations for site preparation (earthworks and terracing) and for the design and construction of foundations, substation platforms and access road.

The actual design of foundations, roads, and other geotechnical structures are not part of the scope of work of this investigation.

2.1.4 Investigation Methodology

2.1.4.1 Desk Study

Review of existing regional, site and surface information. Sources of information should include:

- Topographical maps, geological maps, aerial photo interpretation - to be able to identify topographical, drainage channels and erosion features of the site.
- Geological data, such as lithology of nearby rock outcrops landforms, erosion patterns that surrounds the proposed site.
- Existing geotechnical information available of the area in the surrounds of the site.
- Data on the performance of existing engineered structures in the area.
- Data on the bodies of groundwater levels in the surrounds of the proposed site.
- Data on seismic aspects, such as ground motion, liquefaction potential.

2.1.4.2 Scanning for underground services

Underground scanning shall be undertaken to ensure that no underground services traverse the site prior to undertaking the investigation.

2.1.4.3 SOIL RESISTIVITY TESTS

Soil resistivity tests are to be carried out as per the 240-96393507: Soil Resistivity testing for Substation applications (See Appendix E).

2.1.4.4 Excavation of Test Pits

In order to profile the sub-soil stratigraphy and to obtain disturbed samples, undisturbed samples and bulk samples for laboratory testing, test pits (max depth 5m) should be excavated across the site using an excavator or TLB (where shallow bedrock is anticipated). The test pits should be excavated in a minimum grid of 50m x 50m /as shown in a test pit layout/with increased density as required during field work.

All test pits should be profiled by a registered Geotechnical Engineer or a registered Engineering Geologist in accordance with the latest standard of South African practice (after Jennings et. al.1973).The positions all test pits should be coordinated with a valid calibrated hand-held GPS and in accordance with the WGS84 coordinate system.

All excavation test pits should be carried out in accordance to SAICE – “Code of Practice 2007: The Safety of Persons Working in Small Diameter Shafts

2.1.4.5 DPSH Testing

DPSH testing should be carried out between the trial holes or next to the hole where there is no certainty of depth of bedrock and the material 3m below NGL or where the soils are predominantly of a loose-medium dense or soft-firm consistency.

2.1.4.6 DRILLING OF BOREHOLES

Rotary cored boreholes (max depth 25m or 3m into the bedrock) with SPT “N” tests, undisturbed Shelby Samples to determine collapse potential/expansiveness and/or heave of the material must be undertaken.

The drilling contractor should allow for a concrete plug to fill up the boreholes after drilling.

2.1.4.7 Laboratory Testing

Undisturbed, samples, Disturbed samples and bulk samples will be taken for laboratory testing and tests carried out as per SANS 3001 method. The following tests should be conducted on representative samples from site:

- Classification tests: grading & indicator (Atterberg Limits and Hydrometer).
- Compaction tests (Bulk density, MDD and OMC)
- Mod AASHTO moisture/density relationship and CBR Tests.
- Laboratory Conductivity tests (ms/cm) as per TMH-1.
- Chemical analysis of soil water extracts assessing corrosiveness (Basson index) as per TMH-1.
- Dynamic probe super heavy tests
- Swelling pressure tests
- Free swell test
- Specific gravity tests
- Heave test
- UCS tests on rocks (if necessary)
- Consolidated undrained triaxial tests on fully saturated samples and samples at natural moisture content. The test should be carried out on both undisturbed and remoulded samples (where necessary)
- Specialized testing should be conducted, such as slaking properties of rock where necessary
- Collapse potential tests (where necessary)
- Potential alkali reactivity of aggregates in areas where geology may give rise to the ASR attack on concrete
- ACV on yard stone aggregates
- 10% FACT on yard stone aggregates
- Durability Mill Index on yard stone aggregates
- Glycol test on yard stone aggregates
- XRD analysis on yard stone aggregates

Loose to medium dense soils below founding depth should be stabilized with 1-3% cement. Prior to stabilising the materials, test should be done to determine if the soil contain sulfate and the concentration/quantity of the sulfate in the soil. The following test should be carried out on the specimens after stabilisation:

- ICL test as per SANS 3001
- Compaction tests (MDD and OMC)
- Mod AASHTO moisture/density relationship and CBR Tests (soaked and unsoaked).
- Unconfined compression strength test
- Indirect tensile strength test
- Atterberg limits
- Laboratory Conductivity tests (ms/cm) as per TMH-1.
- 1D oedometer heave test
- Consolidated undrained triaxial tests

***All materials encountered on site should be tested.**

It is the responsibility of the Consultant to evaluate the attached schedule of "Required Laboratory. Testing and Quantities", and motivate any tests or quantities required by him, in addition to this schedule.

2.1.4.8 Source of Construction Material and yard stone aggregates

In addition the consultant needs to comment on the sources available to source G6/G7 material. They should comment on whether according to the geotechnical investigation there is sufficient material for earthworks/pavement construction, if not what are the available suppliers in the area of G6/G7 material. The name of the supplier, the distance from the site as well as the contact details of the supplier should be included in the report.

The consultant also needs to identify a minimum of three (3) quarries which have yard stone material that conforms to 240-108982466: Standard for HV Yard Stones in ESKOM Substation. They should comment on whether the quarry can provide enough volumes to cover the substation yards (100mm x area of substation yards). Samples should be taken from each quarry and subjected to ACV, 10% FACT, glycol test, Durability Mill Index and the XRD test.

2.1.5 Dolomitic stability investigations

On sites that are underlain by dolomitic geology, the following additional work will have to be undertaken:

2.1.5.1 Gravity survey

A gravity survey should be undertaken and a gravity map produced to determine borehole positions. The survey shall be carried out as detailed in SANS 1936:2. The gravimetric survey should cover an area 100m wider than the footprint of the development to allow for detection of geo-features at the edge of the property.

2.1.5.2 Percussion Drilling

Minimum of four boreholes per hectare (or as directed by ESKOM scope and spec) percussion boreholes should be drilled to:

- A depth of 60m.
- Where shallow bedrock is encountered, the borehole should be drilled a minimum of 6m into the rock.

On gravity high anomalies, the borehole should be drilled into bedrock to determine depth of the shallowest bedrock

- Where area has been de-watered, a sample of boreholes shall be drilled a minimum depth of a 100m or 6m where bedrock depth is shallow
- Where competent non-dolomitic bedrock overlies the dolomite, the borehole shall be drilled such that
- If depth of rock is more than 15m, then it should be drilled a minimum of 15m into the rock
- If depth more than 15m, then I should be drilled a minimum of 6m into the dolomite bedrock.

The drilling contractor should allow for a concrete plug to fill up the boreholes after drilling.

2.1.5.3 Geohydrological data

Gathering of geo-hydrological data shall be undertaken for the proposed development and shall be reported as per SANS:1936:2 section 4.2.5.

2.2 Stage 2 : Factual reporting

A factual report should be compiled within two weeks upon completion of the field work. The report should contain:

- A revision section, which shows all the revisions done to the documents and reasons why the document was revised
- Names of all authors
- Professional registration body of all authors listed
- Professional registration number of all authors listed
- Signatures of all authors listed,
- and dates on which they signed the document

The above sections should also be included in the interpretive reports.

The factual report should be structured in the following manner:

a. Physical Site Data

Physical site data based on information required in the desktop study such as location, current land use (incl. known services), accessibility, trafficability, regional geology and local geology, topography, drainage aspects and vegetation, climate conditions and seismic zoning.

b. Field Work

Details of field work carried out on site with Coordinates of all test pits (clear pictures of each test pit), boreholes and other in-situ tests done, number of tests done, date of execution, laboratory testing procedures followed, type of equipment used during execution, any limitations and relevant observations noted during the site investigation.

c. Site Map Layout Drawing With Cross-Sections

Coordinated site maps indicating test pits and other in-situ testing of the subsurface conditions shall be prepared together with representative cross sections and longitudinal sections showing positioning all test pits and variation in geology down the profile at each position.

d. Geological Plan Layout

A coordinated plan showing geological contacts, faults etc. for each site.

e. Excavation Test Pits

Complete test pits profiles showing all samples taken and in-situ tests done. All test pits should be accompanied with clear colour pictures of the test pits.

Test pits should be excavated to the maximum reach or refusal of the excavator. The in-situ test profiles should be recorded as per the latest standard of South African practice (after Jennings et. al.1973).

2.3 Stage 3: Interpretive reporting

An interpretive report which contains the following information shall be submitted:

- Factual information contained in factual report
- Laboratory test results analysis

2.4 Stage 4: Design of platform & platform construction costs

Design of Platforms with Typical Design Sections

The substation terrace will consist of the following main civil structures:

- Access roads (outside and within station both category D)
- Column foundations (loading up to 150kPa, incl. self-weight of foundation)
- Medium sized foundation (maximum loading up to 100kPa, incl. self-weight of foundation)

- Transformer plinth drawing and transformer outline drawing (max load is usually 150 kPa. Drawings have been provided to enable the author to make accurate calculations of the load exerted by the transformer and the plinth), and a
- Control and GIS building (bearing loads will be between 200-300kPa).

The substation will carry, in high density both the column foundations as well as the medium sized foundation, to depths as shown in drawing provided.

Specific earthworks recommendations should be made for the access road, transformer, control and GIS buildings.

Design of the platform with reference to the suitability of materials from cut for the construction of the fill – design options should be evaluated with respect to typical construction of the fill, incorporating rock fill if required, with cost estimates.

The following specific items will also be dealt with in the report:

- Site geology and stratigraphy.
- Soil and rock classification.
- Identification of geotechnical problems.
- Earthworks and terrace construction recommendations
- Excavatability of material on site as per SANS1200 specifications
- Establish the sources available to obtain the G6/G7 material for fill
- Comment on cost estimates for the site
- Structural design requirements of the fill
- Recommended alternative foundation solutions (where necessary, should ESKOM designed foundations be deemed not fit for intended purpose)
- Foundation design parameters with allowable bearing capacities and
- expected settlement and prediction of heave
- Slope stability of cut and fill faces
- Corrosion protection recommendations for foundations and buried services
- Ground resistivity
- Seismic assessment and classification of the site needs to be part of the report
- Shear strength parameters of the in situ soils
- Bearing capacity of profiled layers on site

Construction Cost Evaluation

The consultant is required to prepare cost estimates for construction of the terrace final designs, scheduled in table format, indicating activities, quantities, rates and totals.

For the preliminary investigation, the Consultant is required to prepare a comparative cost estimate of the three sites for construction of the final design, scheduled in table format, indicating activities, quantities, rates and totals.

For detailed geotechnical/dolomitic analysis investigation the table should contain two cost comparison tables for a design which includes importing of competent materials to replace poor in situ materials (if necessary) and another table for stabilising of the in-situ materials (if necessary), scheduled in table format, indicating activities, quantities, rates and totals.

2.5 Stage 5: Review of interpretive report

The interpretive report including the platform design and cost estimate to construct the platform, shall be submitted to ESKOM as per the agreed upon schedule. The ESKOM designer will review the report and submit comments within 2 weeks of receiving the draft document.

The consultant will address the comments within 1 (one) week and send back the updated report.

2.6 Final report submission

Three full interpretive reports shall be compiled within three weeks after receiving of laboratory results and delivered in the following manner:

- Three (3) x Hard copies of a full interpretive report together with all the associated drawings, laboratory tests and all other in-situ tests done (report should also include **ALL** information and drawings contained in the factual report)
- Two (2) x USB's (soft copies) of the report in a pdf format and drawings in dwf, dwg and pdf format.

On sites underlain by dolomitic bedrock the t investigation and compiling of the report shall be in accordance to SANS 1936 and SANS 633. The report should include a dolomite risk management plan (consultant to work together with geo-professional from ESKOM), dolomite risk management strategy and a CGS (Council of Geoscience) review

3 Constraints on how the *Consultant* Provides the Services.

3.1 Management meetings

Upon appointment the supplier will be requested to attend a further clarification meeting with the employer / clients' representative. Over and above this meeting the client will request meetings on or upon completion of a project phase and as and when required by the clients' representative. Meetings to manage the overall contract and performance will be scheduled as shown on the below table.

Regular meetings of a general nature may be convened and chaired by the *Employer's Agent* as follows:

Technical Project Meeting	Twice a year	Employer's office(s) or MS Teams	All keys personal of the supplier
Risk register and compensation event(s)	As and when required	**[To be advised]**	*Employer's Agent* , *Consultant*
Overall contract progress and feedback	Quarterly	**[To be advised]**	*Employer's Agent* , *Consultant*

Meetings of a specialist nature may be convened as specified elsewhere in this Scope or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the *services*. Records of these meetings shall be submitted to the *Employer's Agent* by the person convening the meeting within five days of the meeting.

All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the *conditions of contract* to carry out such actions or instructions.

3.2 *Consultant*'s *key persons*

As per the data provided by the supplier.

3.3 Provision of bonds and guarantees

None applicable

3.4 Documentation control and retention

3.4.1 Identification and communication

All communication shall be channelled through the purchasers' representative and the supplier's key person.

3.4.2 Retention of documents

All documentation shall be retained by the supplier for a minimum period of 3 years and maximum of 5 years after the contract completion date.

3.5 Records and forecasting of *expenses*

Records shall be kept of all billable items. To be further advised on a task order basis.

3.6 Records and forecasting of the Time Charge

Records shall be kept of all billable items. To be further advised on a task order basis.

3.7 Invoicing and payment

The following details shall be shown on or attached to each Invoice to show how the amount due has been assessed:

The *Consultant* shall address the tax invoice **ESKOM HOLDINGS SOC LIMITED (Reg No. 2002/015527/06)** and include on it the following information:

- Name and address of the *Consultant* and the *Employer's Agent;*
- The contract number and title;
- *Consultant's* VAT registration number;
- The *Employer*'s VAT registration number **4740101508;**
- Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
- (add other as required)

[Add procedures for invoice submission and payment (e. g. electronic payment instructions)]

3.8 Contract change management

Refer to NEC3 professional services contract.

3.9 Inclusions in the programme

Further requirements to be specified on task order basis.

3.10 Quality management

3.10.1 System requirements

240-12248652 Category 4- List of Tender Returnables Documents Rev 5.

3.10.2 Information in the quality plan

240-105658000- Supplier Quality Management Specification.

3.11 The Parties use of material provided by the *Consultant*

3.11.1 *Employer*'s purpose for the material

The information shall be used in determination of existing ground conditions of study site(s) involved which would be used to provide for intended use of those site(s).

3.11.2 Restrictions on the *Consultant*'s use of the material for other work

The supplier may only use the information provided and gathered during investigations for Eskom purpose and or projects.

3.11.3 Transfer of rights if Option X 9 applies

All material and intellectual property generated through this contract shall be transferred to Eskom.

3.12 Management of work done by Task Order

To be specified on each task order.

3.13 Health and safety

All work shall be carried out in accordance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) and the regulations accompanying this act will be adhered to where applicable and comply with Eskom's SHE specification. All employees shall be provided with adequate training for the tasks that they are required to perform including an awareness of the risks involved in the execution of their duties and the methods available for the mitigation of these risks. Safety induction and security clearance will have to be done prior to establishment of site (min 2 hours). A safety file shall be prepared for the project and medicals might have to be carried out and therefore costs thereof should be included in the quote.

The *Consultant* shall at all times comply with the health and safety requirements prescribed by law as they may apply to the *service*s.

3.14 Procurement

3.14.1 BBBEE and preferencing scheme

3.14.2 Other constraints

Limitation of site access.

3.14.3 Preferred subconsultants

Any work sub-contracted by the supplier must comply with the Employers technical criteria.

3.14.4 Subcontract documentation, and assessment of subcontract tenders

Not applicable

3.14.5 Limitations on subcontracting

Not applicable

3.14.6 Attendance on Subconsultants

Not applicable

3.15 Working on the *Employer*'s property

All work shall be done in accordance to the project scope and specification.

3.15.1 *Employer*'s entry and security control, permits, and site regulations

Requirements will be specified on each task order based on the specific site conditions.

3.15.2 People restrictions, hours of work, conduct and records

Requirements will be specified on each task order based on the specific site conditions.

3.16 Cooperating with and obtaining acceptance of others

Requirements will be specified on each task order based on the specific site conditions.

3.17 Things provided by the *Employer*

The following document are available and are attached to the scope and specification document:
- Bill of quantities and estimated quantities, this will be indicated in the task order.
- 240-96393507: Soil Resistivity testing for Substation applications.

ESKOM shall provide all, organise all permits and access to the site

3.18 Cataloguing requirements by the *Consultant*

None will be required

4 List of drawings

4.1 Drawings issued by the *Employer*

This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this contract. Site specific drawings will be issued upon individual task order award.

Drawing number	Revision	Title
	-	
	-	

	-	
	-	