Transnet Freight Rail

Sope of Work / Specification

The purpose of this guidance document is to outline the technical specifications required in the intended tender and receive approval for the specifications from all stakeholders prior to the creation of a business case/tender. This document sets out the key areas that should be included in a specification document.

Project Title:

The Design of Rockfall Protection and Rock Slope Stabilisation Systems at km 36 and 38 between Syfergat and Sterkstroom

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1. BACKGROUND

Transnet Freight Rail operates approximately over 30 000 km of railway infrastructure across its network in the Republic of South Africa. This national network comprises approximately 200 tunnels and railway cuttings cover nearly 33% of the total track chainage. Slopes in the vicinity of these assets constantly pose potential risks for rock slope failures – and seasonal slope failures (in the form of rock debris slide-, wedge-, planar-, and toppling failures) are common. Hence, this extent and effect of cuttings amplify the importance of recurrent condition assessment and prioritised routine maintenance – that aims at supporting the objective of providing a safe, reliable and efficient network that permits both freight and passenger railway services.

In April of 2021, the geotechnical department at TFR's technical office, in Johannesburg, developed a quantitative and qualitative *modified rock slope hazard rating system* (RHRS), based on Wyllie (1987) and Pierson et al (1990). The objective of the modified RHRS was to identify significant elements that contributed to the overall hazard associated with typical rock slope failures, particularly in the railway environment. Each site was assigned an *overall hazard rating* that was subsequently incorporated into a prioritised rock slope stabilisation programme. Risk ratings were categorised from "mild*"* to "very severe*"*.

Two sites (shown in Figures 1-1 and 1-2 respectively), classified as "severe*"*, described within this technical demand request (TDR), are relatively small rock cuttings, situated between Syfergat and Sterkstroom, near Queenstown, in the Eastern Cape of South Africa. A summary of the outcome showing the current condition rating of both cuttings per the modified RHRS is shown below in Figure 1-3. These sites are located at rail chainage (km/mast pole no.) 36/06 - 36/12 (**-31.504312 S, 26.48267 E**) and 38/06 – 38/11 (**-31.496204 S, 26.493949 E**), respectively. Aerial locality maps of the two sites are shown below from Figures 1-4 to 1-7.

Figure 1-1: Site 1 - km 36/06, near Sterkstroom, Eastern Cape.

Figure 1-2: Site 2 - km 38/06, near Sterkstroom, Eastern Cape.

								Geological Character 1: Relevant to Structurally-Controlled Failures		Geological Character 2: Differential Erosion or Over-steepening is the dominant condition					Final Rating (RHRS)		
No.	Site	Slope Height (m)	Slope Angle (°)	Ditch Effectiveness	Average Vehicle Risk (% of the time)	Decision Sight Distance (m)	Clearance of Cutting Toe to Ballast (m)	Structural Condition	Rock Friction	Structural Condition	Difference in Erosion Rates	Block Size (m) / Quantity of Rock fall (m3)	Climate and Prescence of Water on Slope	Rock Fall History	Sum	Avg Score	Risk Hazard Description
1	km 36/06 - 36/09 (Sterkstroom - Syfergat)	27	81	81	3	81	81	27	3	0	0	81	9	27	501	45.5	Severe
2	km 38/06 - 38/11 (Sterkstroom - Syfergat)	3	81	81	9	81	81	81	9	0	0	81	9	27	543	49.4	Severe

No.	Category	Rating Criteria & Score			
		Points = 3	Points = 9	Points = 27	Points = 81
1	Slope Height (m)	0 - 7.5 m	7.5 - 15 m	15 - 23 m	> 23 m
2	Slope Angle (°)	< 30 °	30 - 45 °	45 - 70 °	> 70 °
3	Ditch Effectiveness	Good Catchment	Moderate Catchment	Limited Catchment	No Catchment
4	Average Vehicle Risk (% of the time)	< 25 % of the time	25 - 50 % of the time	50 -75 % of the time	75 - 100 % of the time
5	Sight Distance (m)	> 1000 m	500 - 1000 m	250 - 500 m	< 250 m
6	Clearance of Cutting Toe to Ballast (m)	> 5 m	2.5 - 5 m	1 - 2.5 m	< 1 m
7	**Geological Character 1:**				
	Structural Condition	Discontinuous Joints; Favaourable Orientation	Discontinuous Joints; Random Orientation	Discontinuous Joints; Adverse Orientation	Continuous Joints; Adverse Orientation
	Rock Friction	Rough; Irregular	Undulating	Planar	Clay Infilling, or Slickensided
	Geological Character 2:				
	Structural Condition	Few Differential Erosion Features	Occasional Erosion Features	Many Erosion Features	Major Erosion Features
	Difference in Erosion Rates	Small Difference	Moderate Difference	Large Difference	Extreme Difference
8	Block Size (m) / Quantity of Rock fall (m3)	0.3 m / 3 - 6 m3	0.6 m / 6 - 9 m3	1.0 m / 9 - 12 m3	> 1.2 m / > 12 m3
9	Climate and Prescence of Water on Slope	Low to Moderate Precipitation; No freezing Periods; No Water on Slope	Moderate Precipitation; or Short Freezing Periods; or Intermittent Water on Slope	High Precipitation; or Long Freezing Periods; or Continual Water on Slope	High Precipitation & Long Freezing Periods; or Continual Water on Slope & Long Freezing Periods
10	Rock Fall History	Few Falls	Occasional falls	Many /Seasonal Falls	Constant Falls

Average Final Rating		
From	To	Code
0	3	Low
3	15	Mild
15	36	Moderate
36	54	Severe
54	81	Very Severe

Sum of Final Scores		
From	To	Code
0	33	Low
33	165	Mild
165	396	Moderate
396	594	Severe
594	891	Very Severe

Figure 1-3: Outcome showing the current condition rating of both cuttings per the modified RHRS.

Figure 1-4: Locality map 1 of site 1, km 36/06, near Sterkstroom, Eastern Cape.

Figure 1-5: Locality map 2 of site 1, km 36/06, near Sterkstroom, Eastern Cape.

Figure 1-6: Locality map 1 of site 2, km 38/06, near Sterkstroom, Eastern Cape.

Figure 1-7: Locality map 2 of site 2, km 38/06, near Sterkstroom, Eastern Cape.

Approximately 75% of reported rock fall events, since 2010, occurred between September and March, between Queenstown and Stormberg, the section within which these sites of interested are located. Common root causes of rock falls may be attributed to:

- increased precipitation and humidity (between September and March): the seepage of water contributing to the weathering of discontinuities (with failures predominantly initiating on adverse joint sets and fracture planes)
- growth of vegetation along discontinuities causing disturbances to equilibrium conditions within discontinuities
- differential weathering or erosion compromising other initially undisturbed zones within the rock mass or rock-soil matrices.

Between September and February, the mean monthly rainfall increases from approximately 33 mm to 92 mm, with most rock falls reported during February. The regional relative humidity modestly increases from 49% to 58%, within this same period. The surrounding environment of both sites are characterised by dense veld and brush, co-existing with steep natural slopes emanating from rock mountainous hills. Slopes of rock cuttings typically comprise steeply dipping faces varying between 60° and 90°. Bedding planes of sedimentary rock units are generally shallow dipping or sub-horizontal – typically ranging between 2° and 20°.

Throughout the greater area surrounding and including Queenstown, the younger rock formations originate from the Mesozoic era (250 to 65 Ma) and these include the Molteno-, Elliot-, Clarens-, Ntabeni- and Nyoka formations. More specifically, within the study area, the Molteno formation comprise approximately 450 m thick grey to olive-grey mudstone and subordinate medium-grained sandstone (Johnson, 1984). In addition, according to Johnson (1984), dark grey shale, coal seams and minor conglomerate are also present throughout the greater Queenstown area.

The sedimentary units are underlain by the Burgersdorp formation (comprising 600 m to 900 m of brownish red and grey mudstone and subordinate fine-grained sandstone) and Katberg formation. The Katberg formation is the oldest sedimentary rock formation in the study area, consisting of fine-grained sandstone and subordinate brownish red and grey mudstone. The sedimentary rock units co-exist with intrusions of Dolerite (dykes and sills). Alluvium soils in the area include both alluvial slope and alluvial valley (channel-transported) deposits.

The Burgersdorp and Katberg formations constitute the Tarkastad subgroup. The Tarkastad and Adelaide subgroups form part of the Beaufort group. The Molteno, Elliot, Clarens, Ntabeni and Nyoka formations and Beaufort group – along with the lavas of the Drakensberg formation

- are constituents of the Karoo Supergroup. The local geology between Syfergat and Sterkstroom is illustrated below in Figure 1-8.

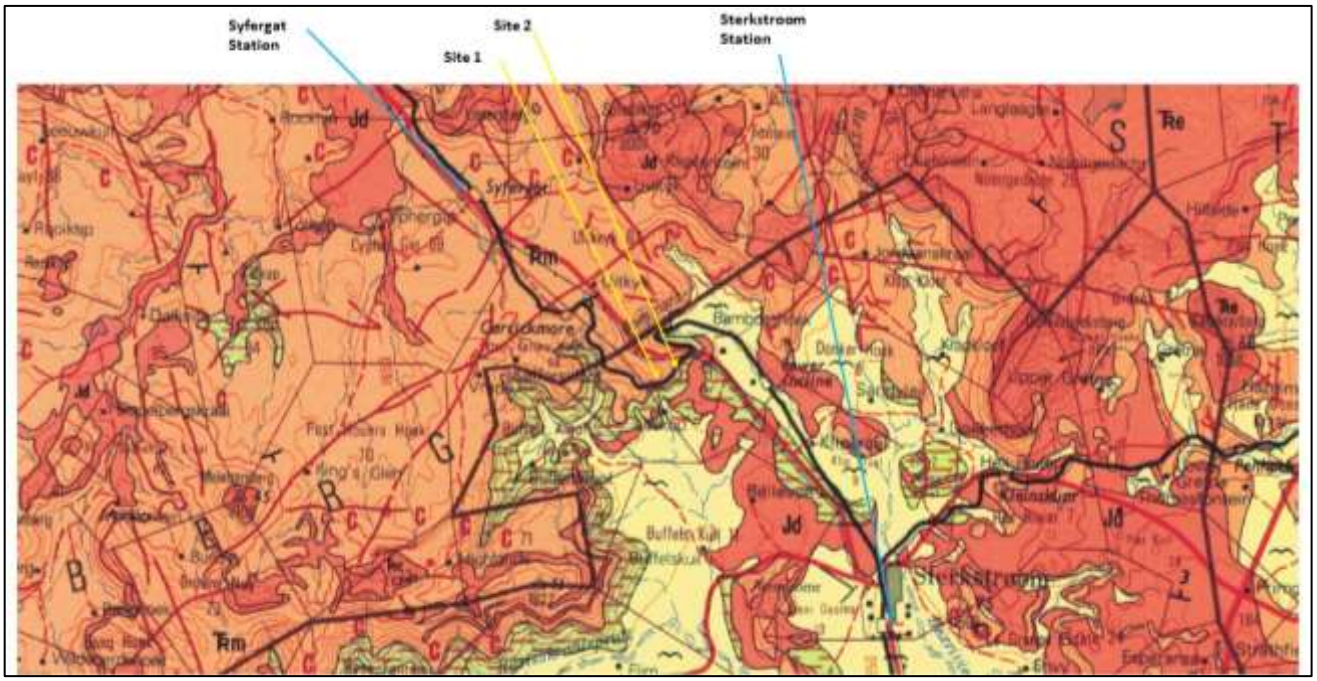

Figure 1-8: Local geology between Queenstown and Syfergat, from 1:250 000 geological series, (from the Council for Geoscience).

2. PURPOSE/ OBJECTIVE

The purpose of this Technical Demand Request (TDR) is to enable and secure the provision of the detailed engineering design of long-term, cost-effective, robust, industry-proven rockfall protection and rock slope stabilisation systems at two rock cuttings, situated at railway chainage km 36/06 – 36/12 (site no. 1) and km 38/06 – 38/11 (site no. 2), between Syfergat and Sterkstroom, near the town of Queenstown, in the Eastern Cape of the Republic of South Africa.

These detailed designs shall be checked and approved by a professionally registered geotechnical or rock engineer.

The long-term objective is to implement robust engineering systems that will effectively mitigate the risk of rock slope instability at the affected sites– particularly eliminating the risk of rock falls occurring on the railway track at both sites.

3. CONFIDENTIALITY

A fundamental requirement of the procurement process is that tender information is always kept confidential. No team members or stakeholders (i.e., TFR, Suppliers or a representative of TFR or the Supplier) are to communicate any specifications or information to anyone outside this process.

4. LEGISLATION, STANDARDS AND CODES OF PRACTICE

All work shall be performed in strict accordance with the following described specifications, drawings, and other documents, which by this reference are made a part hereof. The lists provided below are not exhaustive, and the appointed service provider must adhere and/or refer to all the applicable legislation and specifications. Any documents not in the possession of the Professional Services Provider must be requested from The Employer in writing.

4.1 Applicable Legislation and Standards

Table 4-1 shows different standards/legislation that must be used in this investigation, where applicable.

Table 4-1: Standards/legislation that may be applicable to this investigation.

Standard	Title
OHS Act No. 85 of 1993	Occupational Health and Safety Act No. 85 of 1993 as amended
COIDA, Act 130 of 1994	Compensation for Occupational Injuries and Diseases Act
Act No. 46 of 2000	Engineering Professions Act, No. 46 of 2000.
SABS ISO 9001: 2008	Quality Management Systems.

4.2 Applicable Codes of Practice and Engineering Standards

Table 4-2 lists codes that must be used in the study, where applicable. The Employer's codes will be provided on request.

Table 4-2: Standards/legislation that may be applicable in this investigation.

Code No.	Rev Date	Title
SANS 1200C	1980	Site Clearance
SANS 1200ME	1981	Sub-base
SANS 1200MF	1981	Base
SANS 1200G	1982	Concrete (Structural)
SANS 1200GA	1982	Concrete (Small Works)
SANS 1200LE	1982	Storm water Drainage
Bridge Code	1983	Transnet Bridge Code
SANS 1200LB	1983	Bedding
SANS 1200MK	1983	Kerb and Channelling
SANS 1200GE	1984	Structural Precast Concrete
SANS 1200A	1986	General
Bridge Handbook	1988	Transnet Bridge Handbook
SANS 1200DB	1989	Earthworks (Pipe Trenches)
Transnet E7/1	1998	Specification for works on, over, under or adjacent to railway lines and near high voltage equipment
SANS 1090	2002	Aggregates from natural sources – Fine aggregates for plaster and mortar
Guidelines for Soil and Rock Logging	2002	Guidelines for Soil and Rock Logging in South Africa (2nd Impression) (Brink & Bruin, 2002)
Specification for earthworks S410	2006	Transnet Specification for Railway Earthworks
BBC4038	2007	Geosynthetics Specification for Railway Earthworks Construction
COTO	2010	Standard Specifications for Subsurface Investigations
The Geotechnical Division of SAICE	2010	Site Investigation Code of Practice
Track Manual BBB0481 Ver 2	2012	Transnet Infrastructure Engineering, Manual for Track Maintenance
Drainage Manual	2013	The South African National Roads Limited Drainage Manual

5. TECHNICAL SPECIFICATIONS

5.1. Introduction

The following section outlines technical specifications relevant to the detailed design of rockfall protection and rock slope stabilisation systems earmarked for railway chainage **km 36/06 - 36/12 (site no. 1)** and **km 38/06 – 38/11 (site no. 2)**, between Syfergat and Sterkstroom, near the town of Queenstown, in the Eastern Cape of the Republic of South Africa.

The Employer seeks to acquire the services and expertise of the following professionals from the Professional Services Provider to which this tender will be awarded:

1. ***Professional Lead 1:*** Professional Geotechnical Engineer or Rock Engineer
2. ***Professional Lead 2:*** Professional Land or Engineering Surveyor
3. ***Professional Lead 3:*** Professional Geologist or Engineering Geologist

5.2. Scope and Overview

Detailed designs of rockfall protection and rock slope stabilisation systems, for both site no. 1 (km 36/06) and no. 2 (km 38/06) shall comply with the enclosed technical specifications, codes of practice, legislation and technical standards.

Subcontractors appointed by the Professional Services Provider shall also comply with the specifications defined in this document.

The Employer will issue any relevant information, including standard project control documents, section diagrams, small-scale longitudinal sections of the track, existing topographical survey data and relevant reports to the Professional Services Provider on request. However, the Professional Services Provider will carry the responsibility, at their own cost, for the control, maintenance and handling of all relevant project documents and reports. The Professional Services Provider will also demonstrate to the Employer that the management of project information emanates from an adequate information management control system.

5.3. Technical Requirements, Qualifications and Experience

The following technical requirements shall be met by the Professional Services Provider:

5.3.1 ***Professional Lead 1*** shall be a civil geotechnical or rock engineer satisfying the following requirements and criteria:

a) To be able to perform a detailed review of any conceptual or preliminary designs pertaining to rock slope protection and stabilisation systems proposed by the Employer.

b) Must provide evidence pertaining to the completion of at **least 10 (ten)** detailed designs (in the form of brief [historic] case studies) of rockfall protection and/or rock slope stabilisation works successfully completed over the past **15 (fifteen) years** ending on the last day of month previous to the one in which this TDR was issued.

c) ***Professional Lead 1*** shall provide evidence to the Employer that they have obtained a Bachelor of Engineering (BEng) or Bachelor of Science in Engineering (BSc) in civil engineering at an accredited academic tertiary institution.

d) If applicable, the professional rock engineer shall also show evidence of attaining the ***Chamber of Mines Rock Mechanics Certificate***.

e) ***Professional Lead 1*** shall be a civil geotechnical engineer or rock engineer, professionally registered with ECSA (Pr. Eng.) or a registered Chartered Engineer (CEng), with a minimum working experience of **15 (fifteen) years** in the fields of soil and rock mechanics. These experiences shall include:

    i. Slope stability analyses and slope stabilisation
    ii. Soil and rock characterisation
    iii. Rock fall kinematics – note: *if necessary, any rockfall analysis shall be carried out based on 3-dimensional (3D) models, as two-dimensional (2-D) analysis is too simplistic and ignores out-of-plane rockfall trajectories. 3-D rockfall analysis shall be carried out using either i) Rigid Body Dynamics or ii) Discrete Element Methods (DEM). Lumped mass models will not be accepted. Rockfall analysis incorporating Rigid Body Dynamics is preferred by The Employer.*
    iv. Rock mass classification
    v. Mechanical properties of rocks and rock masses
    vi. Laboratory testing of soil and rock (core) samples

f) Help prepare, review and submit project information and control documents such as project files, project quality control plans/procedures, environmental management plans (where applicable) etc. (especially in the case of intrusive geotechnical investigations)

g) Prepare and submit a method statement for the proposed investigative methods - specifically outlining the equipment and procedures associated with the proposed investigative methods.

h) Complete detailed interpretative and factual geotechnical investigation and design reports at each site.
i) Complete detailed engineering designs including technical specifications and a detailed bill of quantities.
j) Provide a quality control/quality assurance framework for construction of all detailed designs.
k) Perform quality control, quality assurance during the construction phase of each design at both sites described in this TDR.

5.3.2 ***Professional Lead 2*** shall adhere to the following protocols, requirements and criteria:

a) The Employer shall provide the existing topographical survey information of both sites to ***Professional Leads 1 and 2***. The Employer must first issue written approval (for any additional topographical survey work) to the Professional Services Provider if:
    i. ***Professional Lead 1*** requires that the topographical survey area be increased.
    ii. ***Professional Leads 1 and 2*** require an increased point density within the existing topographical survey area.
    iii. ***Professional Leads 1 and 2*** need to verify existing points (e.g. benchmarks, control points, etc.) in the current surveyed area.
b) ***Professional Lead 2*** shall be a professional land or engineering surveyor, registered with SAGI and/or PLATO, having a minimum working experience of **10 (ten) years** in their field.
c) Perform supervision, including quality control/quality assurance on the completion of site drawings by a qualified draughtsman with a minimum working experience of **8 (eight) years** in their field.
d) Any additional topographical surveying and draughting work shall comply to the following specifications:
    i. The submission of a quality control plan (QCP) is mandatory. Site access will not be permitted if a QCP is not produced to the satisfaction of the Employer.
    ii. All coordinate systems shall be based on the WGS system.
    iii. The datum for all levels shall be MSL.
    iv. The survey information shall be supplied in digital format compatible with AutoCAD Civil 3D and Micro Station.
    v. All annotations on drawings shall be in English.
    vi. Plan drawings shall be orientated with North at the top of the drawing.

vii. Levels shall be displayed with a point as the decimal point and this point shall be placed at the centre of the level and must correspond with the surveyed shot.

viii. Levels shall be indicated with 2 digits after the decimal point.

ix. To prevent cluttering of the as-is drawings, when plotting these levels, ***Professional Lead 2*** shall ensure that they are spaced not closer than 1 mm apart (at a 1:500 scale), and that the numerals indicating the levels do not overlap.

x. Levels and descriptions of the level shall be on separate CAD layers.

xi. Contours generated from the survey must accurately reflect the ground levels. The height intervals shall depend on site conditions and on the scale of the drawing.

xii. Control points shall be recorded on a separate layer on the drawing.

xiii. Any new control points shall be 600mm long Y-standard driven into the ground leaving at least 20mm protruding, which must be encased in concrete of at least 200mm diameter and 100mm deep, or any other method which will protect these points permanently, as agreed between the Professional Services Provider and the Employer.

xiv. Any new control point shall have its own photograph accompanied with the topographical survey.

5.3.3 ***Professional Lead 3*** shall satisfy the following requirements and criteria:

a) Professional geologist registered with the Geological Society of South Africa (GSSA), having a minimum working experience of **10 (ten) years** in the field of geology – whose core experiences shall include geological mapping, soil and rock logging, soil and rock characterisation and rock mass classification).

b) The professional geologist shall demonstrate evidence of obtaining a Bachelor of Science in Geology: BSc (Geology) at an accredited academic tertiary institution.

c) Conduct an on-site geological survey (of geological exposures) and complete a geological survey report

d) If intrusive rock core drilling is performed, ***Professional Lead 3*** shall aid ***Professional lead 1*** in conducting on-site supervision (to the drilling, handling, transportation and storage of core samples) and quality control of soil and rock core samples, in addition to soil and rock core logging.

Additional information and considerations:

The Employer also requires the following from the Professional Services Provider:

- Written technical specifications (including material datasheets) of all materials included in the final detailed design of all proposed rockfall protection and rock slope stabilisation systems.
- The technical specifications of all proposed in-situ and laboratory testing of soil and rock samples, if and where applicable.
- The technical specifications associated with all quality control plans/procedures associated with the design and construction phase of the project. For example, the proof-load testing of rock anchors during the construction phase of the project.
- Gross estimates associated with the construction of the final detailed design of all rockfall protection and rock slope stabilisation systems – mainly for budgeting purposes.
- In preparation for the construction phase of the project and lifecycle management of the designs: The Professional Services Provider shall provide advice and/or written guidelines on the minimum level of competency (i.e., skill, experience and certification) required for i) the installation of all rockfall protection and stabilisation systems and ii) the predicted long-term maintenance requirements of all rockfall protection and stabilisation systems.

5.4. Current suppliers

Currently, TFR-Infrastructure, has no approved accredited Professional Services Providers specialising in the design and installation of rockfall protection and rock slope stabilisation systems.

5.5. Duration of the contract

The duration of the contract will comprise the following key **3 phases** (which are not to be construed as the project lifecycle phases):

- **1 month** for preparing project charter – including project key performance indicators (KPIs) - all regulatory administration work, planning and compiling project management documentation such as the project constraints report, risk assessment(s), resource plan, QA/QC plan, environmental management plan (EMP), safety plan and safety file(s), (dynamic) Gannt charts (also reflecting the project's critical path), dynamic project cost trackers and material (monitoring/tracking) reports.

- **5 months** for performing any relevant desktop studies, topographical surveys, geological surveys and in-situ or laboratory testing, engineering analysis, scoping studies and completing the final detailed design drawings including: technical specifications, bill(s) of quantities, and technical reports – all of which shall be produced to the satisfaction of the Employer.

- ***6 months*: Provision for site supervision, including quality control/quality assurance for the detailed design, only performed by Professional Lead 1 during the construction phase of this project. (NB: This contractual provision only applies to Professional Lead 1***

5.6. Timeline/ Timeframe for Procurement

The evaluation of all bids and award of the contract shall be dependent on TFR's internal processes and guidelines outlined in Transnet's Procurement Manual (2023).

5.7. Functional Requirements

The detailed design of all rockfall protection and rock slope stabilisation systems shall comply with the existing geometric standards and clearances outlined in Transnet's Manual for Track Maintenance (2012).

The detailed design of all rockfall protection and rock slope stabilisation systems shall aim to satisfy the functional requirements shown below in Tables 5-1 to 5-3.

Table 5-1: Functional requirements for km 36/06 – 36/12.

Item No.	**Description**: Design of a rock fall protection and rock slope stabilisation system comprising 1) Concrete Canvas, BIDIM A5, 2) rock bolts, 3) surface drainage structures and 4) a gabion reserve	SI Unit	Provisional Area or Length
1	Secured Rockfall Drapery Mesh – galvanised, high (tensile) resistance woven steel mesh such as **STEEL GRID HR 50**, with a minimum class A galvanisation (Zn95% AL5%) coating quantity of 245 g/m^2, comprising 8x10 mesh with 80 mm opening size, and 2.7 mm diameter wire mesh. Steel wire ropes installed with this system shall satisfy the following requirements: • Class A galvanisation (Zn95% AL5%) coating • Min. outer diameter of 8 mm • Rope construction adhering "6x7WC – WSC" in accordance with EN 12385-2 and EN 12385-4. • Nominal grade of rope satisfying 1770 N/mm^2 • Minimum breaking load (MBL) of 40.3 kN As part of the preparation of the rock slope surface [surface should be free of loose and broken rock, soil and vegetation], the following methods may be required: • Scaling & rock removal • Trimming of rock slope surface The secured drapery mesh shall have a minimum runout length of 3 m from the **slope crest** and anchored (i.e. fully cement-grouted over entire bar embedded length) into the **slope crest** using Y20 (min dia.) ribbed, galvanised rebar with a min. characteristic tensile strength of 450 MPa. These anchors may be installed to a min. depth of 1.5 m (into competent rock) and in a drilled hole with a min. diameter of 30 mm. All anchors shall be adequately grouted to ensure permanent fixity.	m^2	1500
2	Installation of rock bolts/anchors with min. diameter (d_a) of 25 mm (with min. drill hole diameter (d_h) of 1.5*d = 38 mm or satisfying the guideline 0.4 ≤ $\frac{d_a}{d_h}$ ≤ 0.6. Rock bolts/anchors shall have a min. length of 3 m, sloping at approximately 10 to 15° degrees below the	m^2	1500

	horizontal, manufactured from class A galvanisation coating, placed at a grid spacing of at least 1.5 m (horizontal) x 1.5 m (vertical). Cement grout used for rock bolts shall have a minimum *characteristic* compressive strength of 40 MPa, with 30 MPa achieved after 72 hours. Cement grout shall comprise non-shrink cement and have enough viscosity and exhibit minimal bleed of water from the mix. All steel ancillaries (such as anchor plates, hexnuts, anchor nuts etc) shall be manufactured with a class A galvanisation coating. All anchor plates must be either circular or square shaped with radiused corners to prevent stress concentrations.		
3	Open/surface channel (400 mm wide x 400 mm high) - lined using **either** pre-cast, > 30 MPa, reinforced concrete panels or Concrete Canvas, CC 5 - installed along the toe of the cutting, parallel to the railway line at a min. longitudinal slope of 0.25%. A trapezoidal-shaped (with 1:1 side slopes) surface drainage channel (preferably lined with grouted stone pitching, 30 MPa concrete/19 mm nominal stone size) installed parallel to the crest of the rock slope (and at least 3 m away from the slope crest to intercept surface run-off) and traversing at a min. longitudinal slope of 0.25%. **Open channels shall satisfy a 1:5-year storm return period.**	m	500
4	Installation of a gabion reserve structure (parallel to the railway line or toe of the cutting) with a min. width of 2.5 m and min. height of 2 m (above natural ground level), either embedded at a min. depth of 1 m below natural ground level (that entails one [1 m] high course of gabion baskets embedded into a compacted soil substrate with a minimum CBR of 45%) or anchored into competent rock substrate that is at least *moderately strong* (ISRM, 1979) using galvanised, ribbed/deformed Y25 (min. dia.) bars with a min. bonded length (fully cement grouted in the competent rock) of 1 m. Cement grout used to secure the Y25 (min. dia.) bars shall have a minimum 14-day *characteristic* compressive strength of 40 MPa, with 30 MPa achieved after 72 hours. Cement grout shall comprise non-shrink cement and have enough viscosity and exhibit minimal bleed of water from the mix.	m	800

	The proposed gabion reserve structure shall adhere to the track clearance (horizontal and vertical) requirements in accordance with Transnet's Manual for Track Maintenance (2018).		

Table 5-2: Functional requirements for km 38/06 – 38/11: Upstream Western Cutting.

Item No.	**Description**: Design of a rock fall protection and rock slope stabilisation system comprising 1) Concrete Canvas, BIDIM, 2) rock bolts, 3) subsurface and surface drainage structures and, 4) a bund wall.	**SI Unit**	**Provisional Area or Length**
1	Installation of Concrete Canvas, CC8, underlain by BIDIM A5/A6 as a slope protection measure [to prevent ravelling of the slope face]. As part of the preparation of the rock slope surface [surface should be free of loose and broken rock, soil and vegetation], the following methods may be required: • Scaling & rock removal • Trimming of rock slope surface CC8 shall have a minimum runout length of 2 m from the slope crest and anchored into the **slope crest** using Y20 (min. dia.) ribbed, galvanised rebar with a min. characteristic tensile strength of 450 MPa. These anchors shall be installed to a min. depth of 0.75 m (into competent rock) at a horizontal spacing of no less than 1 m, and in a drilled hole with a min. diameter of 30 mm. CC8 layers shall be installed at 100 mm overlaps, with overlaps joined with stainless steel screws secured at 200 mm vertical spacing and installed 30 to 50 mm from the machine edge of each roll. Joints shall also be sealed with a CC approved adhesive, applied with a min. bead diameter of 8 mm. Because CC8 is an impermeable slope protection system, the design requires the installation of weepholes, at a typical slope between 2.5% and 5%, with a minimum outer hole diameter of 54 mm, lined with a perforated polymer casing – with perforation sized to minimize infiltration of fines (that may be washed out from joint infilling in the rock mass). Drilled holes for weepholes	m^2	1000

	shall extend to a min. depth (into the slope) equal to the lesser of 1.5 m and 1/3 of the maximum slope height. Weepholes to be installed in a min. grid spacing of at 2 m x 2 m.		
2	Installation of rock bolts [*only applicable to areas where joints and other discontinuities have adverse orientations, that is, discontinuities dipping out of the slope face potentially resulting in planar, wedge or toppling failures*], with min. diameter (d_a) of 25 mm (with min. drill hole diameter (d_h) of 1.5*d = 38 mm or satisfying the guideline $0.4 \leq \frac{d_a}{d_h} \leq 0.6$. Rock bolts shall have a min. length of 2 m, sloping at 10-15° degrees (or at an optimum angle determined by the design engineer) below the horizontal, manufactured from class A galvanisation coating, placed at a grid spacing of at least 1.5 m (horizontal) x 1.5 m (vertical). Cement grout used for rock bolts shall have a minimum *characteristic* compressive strength of 40 MPa, with 30 MPa achieved after 72 hours. Cement grout shall comprise non-shrink cement and have enough viscosity and exhibit minimal bleed of water from the mix. All steel ancillaries (such as anchor plates, hexnuts, anchor nuts etc) shall be manufactured with class A galvanisation coating. All anchor plates must be either circular or square shaped with radiused corners to prevent stress concentrations.	m^2	1000
3	Open/surface channel (300 mm wide x 300 mm high) - lined using **<u>either</u>** pre-cast, > 30 MPa, reinforced concrete panels or Concrete Canvas, CC 5 - installed parallel to the toe of the western cutting at a min. longitudinal slope of 0.25%. Trapezoidal shaped (1:1 side slopes) surface drainage channel installed along the top of the western cutting at a min. longitudinal slope of 0.25%. **Open channels shall satisfy a 1:5-year storm return period.**	m	500
4	A 1.25 m high bund wall (also lined with CC8) structure installed at the top of the western cutting at least 3 m from the slope crest, traversing parallel to the crest of the western cutting.	m	500

Table 5-3: Functional requirements for km 38/06 – 38/11: Downstream Eastern Cutting.

Schedule of Quantities			
Item No.	**Description**	**SI Unit**	**Min. Quantity**
1	Installation of Concrete Canvas, CC8, underlain by BIDIM A6 as a slope protection measure [to prevent ravelling of the slope face]. As part of the preparation of the rock slope surface [surface should be free of loose and broken rock, soil and vegetation], the following methods may be required: • Scaling & rock removal • Trimming of rock slope surface • Re-sloping (where necessary) CC8 shall have a minimum runout length of 1.5 m from the slope crest and be anchored into the **slope crest** using Y20 (min. dia.) ribbed, galvanised rebar with a min. characteristic tensile strength of 450 MPa. These anchors shall be installed to a min. depth of 0.75 m (into competent rock) at a horizontal spacing of no less than 1 m, and in a drilled hole with a min. diameter of 30 mm. CC8 layers shall be installed at 100 mm overlaps, with overlaps joined with stainless steel screws secured at 200 mm vertical spacing and installed 30 to 50 mm from the machine edge of each roll. Joints shall also be sealed with a CC approved adhesive, applied with a min. bead diameter of 8 mm. The design engineer will determine whether weepholes are required.	m^2	750
2	Open/surface channel (300 mm wide x 300 mm high) - lined using **either** pre-cast, > 30 MPa, reinforced concrete panels or Concrete Canvas, CC 5 - installed along the toe of the eastern (downstream) cutting at a min. longitudinal slope of 0.25 %. **Open channels shall satisfy a 1:5-year storm return period.**	m	500

NOTE: VARIATION IN CONTRACT QUANTITIES

The proposed scope of work for the provisional areal (m^2) and linear (m) distributions are guidelines for the pricing of this tender.

Geometric aspects of the engineering design may be altered **only** to achieve and ensure optimal engineering performance of the proposed rockfall protection and rock slope stabilisation systems - whilst maintaining the required minimum predicted service life of all systems. These aspects may pertain to alterations in the:

- Vertical and horizontal spacing of anchors or rockbolts
- Length of anchors or rockbolts
- Inclination of anchors or rockbolts (to the horizontal)
- Open channel cross-sections
- Longitudinal slopes of hydraulic open channels (which shall not be less than 0.25 %)

5.8. Performance Requirements

- The minimum cover and durability of any concrete works (such as surface protection, lining or anchorage works) shall withstand the degree of corrosiveness of the local environment in which the site is located, within the Republic of South Africa.
- The design of all proposed rockfall protection and rock slope stabilisation systems shall guarantee engineering performance at acceptable levels of stress/deformation, at both the serviceability and ultimate limit states.
- These systems shall be relatively easy to install and maintain over their predicted service lives.
- Assuming regular and ad-hoc maintenance are performed over the service lives of all proposed rockfall protection and rock slope stabilisation systems:
    - The design life of the proposed rockfall **protection** systems shall exceed **50 years**.
    - The design life of the proposed rock slope **stabilisation** systems shall exceed **50 years**.
- The design of all rockfall protection and rock slope stabilisation systems shall consider the suitability of subsurface and surface drainage (conveyance) structures. Where deemed necessary, the Professional Services Provider shall be responsible for the design of all hydraulic structures. Furthermore, we recommend

that the design engineer considers the following storm return periods for various hydraulic structures, where applicable:

- Track Internal Drainage - *1:1 year (min)* to 1:2 year (*max)*
- Surface Ditch/Channels - *1:5 year (min)* to 1:10 year (*max)*
- Culverts - *1:50 year (min)* to 1:100 year (*max)*

5.9. Other Requirements – particularly pertaining to site investigation work

- For investigations that require the temporary closure of the railway line, the Professional Services Provider must notify the Employer **at least calendar 21 days** prior to the first day of the temporary closure.

- ***Water***: Water used in any proposed intrusive investigation shall be of appropriate quality and shall be supplied by the Professional Services Provider. Irrespective of its source (i.e. municipal, borehole, river, dam, lake etc), water quality shall be monitored and tested on a regular basis, particularly prior to and during the intrusive investigation.

  Therefore, the Professional Services Provider shall make provision for the supply, transportation and storage of water (required during the project) in his pricing. Moreover, water used on the Employer's property and the surrounding geographical environment shall comply to the following requirements:

  - $6 < pH < 8$
  - Organic solids < 200 mg/litre
  - Inorganic solids < 3000 mg/litre
  - Chlorides < 500 mg/litre (for reinforced concrete)
  - Chlorides < 1000 mg/litre (for plain/unreinforced concrete)
  - SO_4 < 400 mg/litre
  - Suspended matter < 2000 mg/litre
  - Total dissolved salts < 1600 mg/litre

- ***Electricity***: If applicable, the Professional Services Provider and his subcontractors shall be responsible for the provision of electricity on site and, therefore shall include electricity and its associated costs in his pricing.

- ***Service Roads, Access Ways and Unpaved/Gravel Roads***: Where approval is granted by The Employer and/or the Local Authorities to the Professional Services Provider, the Professional Services Provider shall be responsible for the clearance of access ways to the site and other working areas.
  Where new access ways are cleared, the Professional Services Provider shall be responsible for adequate remediation of those access ways. That is, the condition of all access ways (created by the Professional Services Provider and his subcontractors) shall be restored to their natural condition (prior to their disturbance).
  The Professional Services Provider shall be responsible for any damages caused by him or his subcontractors to the Employer's service roads and shall make good on all damages incurred.
  Similarly, the Professional Services Provider shall be responsible for any damages caused by him or his subcontractors to the Local Authority's unpaved/gravel roads and shall make good on all damages incurred on these roads.

- ***Plant, Tool and Construction Materials***: The Employer shall not supply any equipment, tools & machineries for any proposed intrusive investigations.

- ***Security***: If needed, the Professional Services Provider shall be responsible for the provision of security on site – therefore shall include these costs in his pricing.

- ***Lighting & Nightwork***: Site nightwork that is proposed or planned by the Professional Services Provider shall reflect in the project program during the planning phase of the project and shall be subject to approval by The Employer (during the planning phase of the project).

  Herein, nightwork shall be defined as any planned and approved activities (especially those leading to the satisfactory completion of project KPI's) carried out by the Professional Services Provider or his subcontractors, on site, between 18h00 and 06h00.

  If nightwork is granted to the Professional Services Provider by The Employer:
  - Supervision of the Professional Services Provider and his subcontractors will be provided by The Employer. That is, once granted, nightwork can only occur with the Employer's supervision present on-site.

5.10. Special Technical Requirements (where applicable)

- All slope stabilisation measures shall ensure a minimum factor of safety of 1.3 - satisfying both drained and undrained (slope stability) conditions.
- Rockbolts or anchors shall be designed with adequate corrosion protection systems that will ensure:
    - Long-term reliability of the anchor
    - The service life of the anchor is not reduced
    - The materials used in the corrosion protection system are inert and therefore do not cause any degradation to the anchor, its ancillaries and the surrounding environment.

- Reinforced concrete, with i) a minimum characteristic strength of **30 MPa**, ii) a minimum cover of **25 mm**, and iii) and nominal stone size of **19 mm** is preferred for the design and construction of any proposed surface drainage (conveyance) structures such as open channels designed to traverse along (or parallel to) the toe (bottom) and/or the top of a rock slope cutting.
- Moreover, concrete associated with reinforced concrete slabs or beam elements shall adhere to the following:
    - *Concrete surfaces above the natural ground level and fully sheltered against precipitation or concrete surfaces permanently subjected to non-aggressive water (towards the concrete)* shall have a maximum design crack width of **0.25 mm**.
    - *Concrete surfaces exposed to precipitation and/or intermittent and seasonal cycles of wetting and drying* shall have a maximum design crack width of **0.20 mm**.
- Any erosion control blankets (ECB)/turf reinforcement mats (TRM) should have a minimum anti UV warranty period of **3 years** (under exposed conditions for erosion control on a slope's surface). Biodegradable ECB or TRM's shall have a minimum service period of **1.5 years**.

Biodegradable ECB's or TRM's (where applicable):

Any biodegradable ECB/TRM shall have a minimum thickness of **5.6 mm** and mass of **350 g/m²**. The coir blanket shall be covered on the top and bottom sides with polymer net having minimum tensile strength of **5.0 kN/m** and **2.5 kN/m** in machine and transverse directions, respectively.

Non-biodegradable ECB's or TRM's (where applicable):

Non-biodegradable ECB's or TRM's shall be three-dimensional woven and/or stitch bonded polypropylene geotextiles that deliver long-term erosion protection on cut slopes that consist of a dense web of crimped, interlocking with multibed, polypropylene fibres positioned between two biaxial oriented nets and mechanically bound together by parallel stitching with polypropylene net. All turf reinforcement mats shall have **minimum long-term design tensile strength of 25 kN/m** in machine direction and **20 kN/m** in transverse direction. TRM's shall also have minimum mass per unit area of **350 g/m^2** and have a minimum thickness of **12.7 mm**.

5.11. Constraints

- The Professional Services Provider shall compile and present a project constraints report. These constraints shall be pertinent to:
    - **Financial/Cost** constraints
    - **Quality** constraints
    - **Time** constraints
    - **Scope** constraints
    - **Resource** constraints
    - **Risk** constraints (which shall also include evidence of a risk assessment identifying all potential risks associated with all phases of this project, especially the construction phase)

5.12. Health and Safety

a) Transnet's Supply Chain Services (SCS) shall obtain written confirmation and signoff from TFR's Corporate Safety Department on this procurement event as well as the evaluation criteria if applicable.
b) The Professional Services Provider shall comply with the following Acts,
    a. The Compensation for Occupational Injuries and Diseases Act, no. 130 of 1993.
    b. Occupational Health & Safety Act, no. 85 of 1993.
c) Employees and subcontractors representing the Professional Services Provider shall have adequate PPE and valid safety induction cards/certificates prior to

accessing or working on each site. Copies of safety induction cards/certificates shall be submitted to the Employer.

d) The Professional Services Provider shall make cost provisions for all health and safety requirements in his pricing (including PPE, cleaning supplies and other health and safety costs associated with the proposed scope of work).
e) All personnel working on site must have attended a Health & Safety Induction course (offered by a responsible, competent and qualified person).
f) Particularly for intrusive site investigations: risk assessments and health & safety management plans shall be reviewed, from time to time, to identify new risk, evaluate the effectiveness of existing controls and implement new controls to mitigate new and existing risks.

5.13. Environmental

a) The Professional Services Provider shall ensure the provision of an environmental management plan (EMP) and environmental constraints plan addressing all impact and potential impact of his activities – particularly pertaining to activities carried out during any intrusive investigations.
b) In the event of environmental damage, pollution or any deterioration that is caused by the Professional Services Provider or any party subcontracted by him, the Professional Services Provider shall make good all damages to the environment, which shall be to the satisfaction of the Employer.
c) Hence, the Professional Services Provider may appoint a competent and responsible person (such as an environmental or safety specialist) to ensure that no incident shall occur on site that could cause pollution and long-term deterioration of the natural environment – particularly pertaining to activities carried out during any intrusive investigations.
d) Should the Employer determine that the Professional Services Provider was negligent and caused any form of pollution, the damages to the environment shall be rectified at the Professional Services Provider's cost and to the satisfaction of the Employer.
e) The Professional Services Provider and all parties subcontracted by him shall always comply with the statues that prohibit pollution of any kind. These statues are enacted in the following legislation:
    a. The National Environmental Management Act, 107/1998
    b. The Environmental Conservation Act, 73/1989; and
    c. The National Water Act, 36/1998

5.14. Project Deliverables

The Professional Services Provider shall ensure that the following project deliverables are satisfied and timeously met at each phase of this project:

Table 5-4: Project deliverables for both sites.

Professional Lead	Project Deliverable(s)	Project Phase(s)
Professional Geotechnical Engineer or Rock Engineer	a) Project safety file, including Health & Safety management plan b) Project quality control plan c) Project resource plan d) Project schedule: bar or Gannt chart (that is regularly updated) e) Project Constraint Plan f) Quality Control Plan g) Method Statement (*covering the investigation, analysis and design phases of the project*) h) *Environmental management plan (particularly pertaining to any intrusive site investigation*)	*Initiation, Planning*
	a) Engineering geotechnical investigation report b) Engineering design report c) Signed-off detailed design drawings in the following formats: a. PDF b. DWG c. DGN d) Specifications of the detailed design e) Bill of Quantities of the detailed design	*Investigation, Detailed Design*
	a) Aid site supervision and perform quality control of the design during construction phase of this project	*Execution, Closure (Hand-over)*
Professional Land or Engineering Surveyor	a) Quality control plan b) Method statement c) Comprehensive topographical surveying file in a native format – **DWG** (AutoCAD Civil 3D), **DGN** (Micro Station) and **PDF**	*Investigation*
Professional Geologist or Engineering Geologist	a) Quality control plan b) Method statement c) Geological survey report d) Soil and rock core logging (if applicable)	*Investigation*

5.15. Pricing (Site 1 – km 36 & Site 2 – km 38)

Any additional items, which the Professional Services Provider deems necessary for the successful completion of this project, should be defined and substantiated in a separate letter to The Employer. All additional items are to be priced and submitted with the tender, for consideration.

All Bidders shall complete their pricing per tables 5-5 and 5-6 below.

Table 5-5: Pricing Schedule: Site 1 – km 36/06 – 36/12.

Item	Description	Unit	Qty	Rate	Cost in Rands
1	**P&G's**: Sum of **fixed** and **time-related** charges – including, but not limited to, health and safety obligations such as SHE requirements, environmental management, site supervision provided during any intrusive geotechnical investigation,	Sum	1		
2	**Investigation Engineering Analysis and Reporting**: Including possible costs associated with any intrusive investigation, (including professional fees associated with conducting desktop studies, geological and hydrology studies, geotechnical laboratory testing etc.)	Sum	1		
3	**Topographical surveying and draughting**	Sum	1		
4	**Detailed Design**	Sum	1		
5	**Subsistence**: Travel costs, including transportation and accommodation costs	Sum	1		
6	**Site Supervision and Quality Assurance/Quality Control of all Detailed Designs**: To be provided by ***Professional Lead 1*** **during the construction phase** of this project	Sum	1		
				Total (excluding VAT)	

Table 5-6: Pricing Schedule: Site 2 – km 38/06 – 38/11.

Item	Description	Unit	Qty	Rate	Cost in Rands
1	**P&G's**: Sum of **fixed** and **time-related** charges – including, but not limited to, health and safety obligations such as SHE requirements, environmental management, site supervision provided during any intrusive geotechnical investigation,	Sum	1		
2	**Investigation Engineering Analysis and Reporting**: Including possible costs associated with any intrusive investigation, (including professional fees associated with conducting desktop studies, geological and hydrology studies, geotechnical laboratory testing etc.)	Sum	1		
3	**Topographical surveying and draughting**	Sum	1		
4	**Detailed Design**	Sum	1		
5	**Subsistence**: Travel costs, including transportation and accommodation costs	Sum	1		
6	**Site Supervision and Quality Assurance/Quality Control of all Detailed Designs**: To be provided by ***Professional Lead 1*** **during the construction phase** of this project	Sum	1		
				Total (excluding VAT)	

6. TECHNICAL CRITERIA

Technical Evaluation Criteria	Requirement(s)	Weighting	Sub Weighting	Scoring guideline (0 to 5)
CV's of key persons who will be involved in the project including verifiable references on CV's. **Technical Ability:** **Professional** **Lead 1** Experience in - Geotechnical engineering (Particularly Rock and Soil Slope Stability Assessments) - Design of Hydraulic Structures **Professional Lead 2** - Experience in Topographical Surveying and Draughting on Engineering projects **Professional Lead 3** - Experience in geological mapping and interpretation, soil and rock logging, soil and rock characterisation and rock mass classification.	Submit proof of CV's, including verifiable references. Submission of CV's must include certified ID copies not older than 3 months.	70	30	**None** of the Professional Leads have the minimum working experience required in their respective fields. **(0 points =0%)** Professional Lead 1 has at least 6 years' experience in geotechnical engineering. **Either** Professional Lead 2 **or** 3 has a minimum of 10 years' experience in their respective field/discipline - with the lead other having at least 6 years' working experience in their field. **(1 point =6%)** Professional Lead 1 has at least 8 years' experience in geotechnical engineering. **Either** Professional Lead 2 **or** 3 has 10 years' experience in their respective field/discipline - with the other lead having at least 8 years' working experience in their field. **(2 points =12%)** Professional Lead 1 has at least 10 years' experience in geotechnical engineering. **Either** Professional Lead 2 **or** 3 has 10 years' experience in their respective field/discipline - with the other lead having at least 8 years' working experience in their field. **(3 points =18%)** Professional Lead 1 has at least 12 years' experience in geotechnical engineering. **Both** Professional Lead 2 and 3 have 10 years' working experience in their respective field/ discipline. **(4 points =24%)** Professional Lead 1 has at least 15 years' experience in geotechnical engineering. **Both** Professional Lead 2 and 3 have at least 10 years' working experience in their respective field/ discipline. **(5 points =30%)**

Technical Evaluation Criteria	Requirement(s)	Weighting	Sub Weighting	Scoring guideline (0 to 5)
Technical Ability: **Professional Lead 1** - Demonstrate design and construction experience in projects of a similar nature - Geotechnical engineering (Particularly rock and soil slope protection and stability analysis, design and construction works)	List of completed projects of similar nature in the form of case studies, with photos of the project (in pdf format). Each completed project will have its own case study that highlights the following factors: - Problem statement - Solutions considered - Final solution developed and project scope - Project duration - Estimated total cost of project - Key role players - Project risks and benefits These case studies must contain verifiable information – which shall include contactable information such as full names, cell phone numbers and e-mail addresses.		10	Professional Lead 1 submitted no proof of completed projects of a similar nature and with no verifiable references. **(0 points =0%)** Professional Lead 1 submitted proof of less than **3** completed projects of a similar nature with verifiable references. **(1 point =2%)** Professional Lead 1 submitted proof of at least **3** completed projects of a similar nature with verifiable references. **(2 points =4%)** Professional Lead 1 submitted proof of at least **6** completed projects of a similar nature with verifiable references. **(3 points =6%)** Professional Lead 1 submitted proof of at least **8** completed projects of a similar nature with verifiable references. **(4 points =8%)** Professional Lead 1 submitted proof of at least **10** completed projects of a similar nature with verifiable references. **(5 points =10%)**

Technical Evaluation Criteria	Requirement(s)	Weighting	Sub Weighting	Scoring guideline (0 to 5)
Management Arrangements of key persons who will be involved in the project including an organogram with certified copies of all qualifications and certifications	Organogram showing all key personnel and their sub-ordinates. Information submitted with organogram includes descriptions of the roles and responsibilities of key personnel involved in the project. Professional Lead 1 must submit proof of professional registration with ECSA or a similar international professional registration body (e.g. CEng) Professional Leads 1, 2 and 3 shall provide proof of their academic qualifications from accredited tertiary institutions: <u>Professional Lead 1:</u> - Proof of qualification shall be a Bachelor's Degree in Civil Engineering or Rock Engineering (Note: If professional lead 1 is a qualified professional rock engineer, proof of Chamber of Mines Rock Mechanics Certificate must be provided) <u>Professional Lead 2:</u> - Proof of qualification shall be a degree in Surveying / Engineering Surveying - Proof of registration with SAGI and/or PLATO <u>Professional Lead 3:</u> - Proof of qualification shall be a Bachelor of Science degree in Geology - Proof of registration with the Geological Society of South Africa (GSSA)		30	Poor organogram submitted. - No certified qualifications and certificates submitted - Qualifications submitted are not relevant to the project. **(0 points =0%)** Poor organogram submitted [*Poor = not all professional leads are shown in the organogram*]. Only Professional Lead 1 has provided proof of certified qualifications and certification. **(1 point =6%)** Adequate organogram submitted [*Adequate = the designations of all 3 professional leads and assistants are included in the organogram*]. Only Professional Lead 1 has provided proof of certified qualifications and certification. **(2 points =12%)** Adequate organogram submitted [*Adequate = the designations of all 3 professional leads and assistants are included in the organogram*]. Only Professional Leads 1 and 3 have provided proof of certified qualifications and certification. **(3 points =18%)** Adequate organogram submitted [*Adequate = the designations of all 3 professional leads and assistants are included in the organogram*]. Professional Leads 1, 2 and 3 have provided proof of certified qualifications and certification. **(4 points =24%)** A comprehensive organogram submitted [*Comprehensive = titles and designations of the entire reporting line and structure of personnel involved in the project is shown. Brief descriptions of job functions for all personnel in the organogram are included*]. Professional Leads 1, 2 and 3 have provided proof of certified qualifications and certification. **(5 points =30%)**

Method Statement Does the method statement cover all aspects of the project? Including: - Intrusive and/or non-intrusive geotechnical and geological investigation - Flood hydrology and hydraulic study - Concept and Detailed Design drawings - Sizes for stormwater management systems -Proposals have a design life exceeding 50 years	All outputs must be covered with detailed information as to how each output will be achieved. The method statement must cover how each of the following project aspects will be satisfactorily completed during the investigation, analysis and design phases of this project: - Intrusive and/or non-intrusive geotechnical and geological investigation - Flood hydrology and hydraulic study - Concept and Detailed Design drawings - Sizes for stormwater management systems (that is, where applicable, surface and subsurface hydraulic structures) The method statement must also include how different design proposals will be assessed for technical feasibility. These design proposals shall have a design life exceeding 50 years.	10	10	No method statement **(0 points =0%)** Vague method statement submitted. That is, the method statement does not adequately address any of the key project aspects. The design life of the proposals is not indicated. **(1 point =2%)** Method statement substantiates how the work will be completed to the required quality. At least **one (1)** on the following are clearly outlined: - Intrusive and/or non-intrusive geotechnical and geological investigation - Flood hydrology and hydraulic study - Concept and Detailed Design drawings - Sizes for stormwater management systems Proposals have a design life exceeding 50 years. **(2 points =4%)** Method statement substantiates how the work will be completed to the required quality At least **two (2)** of the following are clearly outlined: - Intrusive and/or Non-intrusive geotechnical and geological investigation - Flood hydrology and hydraulic study - Concept and Detailed Design drawings - Sizes for stormwater management systems Proposals have a design life exceeding 50 years. **(3 points =6%)** Method statement substantiates how the work will be completed to the required quality At least **three (3)** of the following are clearly outlined: - Intrusive and/or Non-intrusive geotechnical and geological investigation - Flood hydrology and hydraulic study - Concept and Detailed Design drawings - Sizes for stormwater management systems Proposals have a design life exceeding 50 years. **(4 points =8%)** Method statement comprehensively substantiates how the work will be completed to the required quality. The method statement clearly defines all key aspects of the project. Proposals have a design life exceeding 50 years. **(5 points =10%)**

Technical Evaluation Criteria	Requirement(s)	Weighting	Sub Weighting	Scoring guideline (0 to 5)
Quality Control /Quality Assurance Plan/Procedure Is there a realistic and executable quality control/ quality assurance plan?	Equipment used must comply to ISO9001 The Quality Control/Quality Assurance Plan must include details outlining the following: - Acceptance of outputs must pass more than 1 (one) level of approval - The arrangement of equipment used must ensure output data corroboration - QA/QC plan for the entire geotechnical investigation, including data collection for rock mass characterisation and rock mass classification. - QA/QC plan for data collection during topographical surveying - Furthermore, the QA/QC plan must also include the details of the following: i) quality management policy and quality standards to be maintained for this project ii) audit checklist, audit frequency, audit approval process,	10	10	No QA/QC plan submitted. **(0 points =0%)** No details provided in QC/QA plan Or QC/QA plan is inadequate. **(1 point =2%)** Quality management policy submitted but no plan for how to implement QC. No quality standards. **(2 points =4%)** Quality plan adequate. That is, it includes standards to be maintained. Requires further detail on some aspects i.e. frequency of audits**. (3 points =6%)** Detailed quality assurance plan. Showing how quality standards will be maintained. Contains some detail on external interfaces, frequency of audits/ checks. **(4 points =8%)** Detailed quality control/quality assurance plan. Showing how quality standards will be maintained. Contains details on external interfaces, frequency of audits/ checks. Details of how the QA plan will be executed. **(5 points =10%)**

Technical Evaluation Criteria	Requirement(s)	Weighting	Sub Weighting	Scoring guideline (0 to 5)
Health & Safety Management Plan and Environmental Management Plan	Are there realistic and executable health & safety management and environmental management plans? The Environmental Management Plan and policy must outline standards to be maintained (during the project) and reference and comply to: - The National Environmental Management Act, 107/1998 - The Environmental Conservation Act, 73/1989; and - The National Water Act, 36/1998 The Safety Management plan and policy must outline safety standards to be maintained during the project, including a safety checklist, audit, and comply to: - The Compensation for Occupational Injuries and Diseases Act, no. 130 of 1993. - Occupational Health & Safety Act, no. 85 of 1993. Together, Safety and Environmental management plans must contain details on how compliance to these plans and policies will be maintained, for example, through conducting audits and risk assessments.	10	10	No H&S and environmental management plan submitted. **(0 points =0%)** Very few details provided about health & safety management and environmental management plans or policy. **(1 point =2%)** Health & safety management and environmental management policy submitted but no clearly defined action plan for how to implement health & safety and environmental management plans. **(2 points =4%)** Health & safety and environmental management plans are adequate. That is, H&S and EM policies submitted but action plan covers only one (1) of the following: - H&S action plan - EM action plan **(3 points =6%)** Detailed health & safety and environmental management plans plan showing how safety standards will be maintained **throughout the duration of the project**. Containing some detail on external interfaces, frequency of safety checks on site **(4 points =8%)** Very detailed health & safety and environmental management plans indicating how safety standards will be maintained throughout the duration of the project. Action plans cover both H&S and environmental management. Contains comprehensive details on external interfaces, frequency of audits/ safety checks on-site/ frequency of conducting risk assessments/ monitoring risks and effectiveness of risk mitigation actions. **(5 points =10%)**
	Total Weighting:	**100**		
	Minimum qualifying score required:	**70**		