
TRANSNET FREIGHT RAIL

Durban North Coast Phase 2

UMGENI TUNNEL

Survey Scope of Works

Prepared by:		18/10/2023
	L. Mabotha Civil Engineer (TFR)	Date
Reviewed by:		18/10/2023
	C Norris Civil Technologist (TFR)	Date
Reviewed by:		18/10/2023
	M Manenzhe Civil Engineer (TFR)	Date
Approved by:		
	N Nxumalo Engineering Manager (TFR)	Date
Approved by:		
	M Mkhize Project Manager (TFR)	Date

PART C3: SCOPE OF SERVICES

Document reference	Title	No of pages
C3.1	The Scope	23
	Total number of pages	23

Contents

Contents.....	3
Glossary	4
1. Purpose of Document	5
2. Project Background	5
3. Description of Services.....	6
4. Drawings	6
5. Specification.....	6
6. Constraints on How the Customer Provides the Service.....	7
6.1. Requirements for Equipment (Refer to SANS 1921-1 clause 4.13).....	7
6.2. Format of information to be provided	7
6.3. Simulation Model	9
6.4. Accurate Measurements of Tolerance	9
6.5. Integrity of Results Deliverables	10
6.6. Integrity of Results Deliverables	10
6.7. Clarification Meeting	11
7. Requirements for the Programme.....	11
8. Services and other things provided by the Employer	11
9. Health and Safety.....	11
10. Procurement	12
10.1 Code of Conduct	12
10.2 The Consultant's Invoices.....	14
11. Pricing.....	15
12. Delay Damage	15

Figures

Figure 1 Umgeni Tunnel - Survey Area	5
--	---

Tables

Table 1: List of abbreviations	4
Table 2: Pricing.....	15

Appendices

Appendix A: Standard Symbols

Glossary

The definitions listed below apply to this document.

Abbreviations	Definition
CAD	Computer Aided Design
DTM	Digital Terrain Model
ECC	Engineering and Construction Contract
MSL	Mean Sea Level
NEC3	New Engineering Contract
OHS	Occupational Health and Safety
SANS	South African National Standards
SES	Standard Environmental Specification
TFR	Transnet Freight Rail
Transnet	Transnet SOC Ltd
ORS	Owner Requirements Specification
URS	User Requirements Specification
WGS	World Geodetic System
DPP	Detailed Procurement Procedure
PSCM	Procurement and Supply Chain Management
PFMA	Public Finance Management Act
BBBEE	Broad Based Black Economic Empowerment Act
TFR	Transnet Freight Rail

Table 1: List of abbreviations

1. Purpose of Document

The purpose of this document is to serve as a formal agreement of the description of survey works to be undertaken by the consultant on behalf the client Transnet Freight Rail (TFR). All specification and deliverables outlined are in conjunction with the client's requirements stipulated in the ORS and URS.

2. Project Background

On the 23rd of August 2023, a team of engineers from EDS (Engineering & Design Service) were received at Durban's infrastructure maintenance depot. The purpose of their visit was to conduct an inspection and condition assessment of eight distinct sites that need remedial repair. These sites are situated at various kilometres points along the Empangeni to Durban railway line. The primary objective of this document is to present the findings and feedback resulting from the comprehensive assessment conducted by the engineers. Moreover, the document aims to offer recommended actions and an approximate list of required materials. This valuable information will greatly aid the depot in procuring the necessary resources essential for the upcoming construction endeavours. Consequently, this will facilitate the initiation of projects by initiating the planning phase.

The site's coordinates are 29°48'28"S and 31°00'36"E (**Figure 1**).



Figure 1 Umgeni Tunnel - Survey Area

3. Description of Services

The Services is to complete a topographical survey for the site as highlighted on the drawings/sketches attached. The Services covers the general survey of the site and any other work arising out of or incidental from the Services or required of the Consultant for proper completion of the work in accordance with the true meaning and intent of the contract document and includes the following:

- a) The survey covers electrical cables and markers, storm water drains, water and sewer network, rock outcrops, culverts, fences and gates within the area along the path of the wall.
- b) Establish permanent and temporary benchmark positions.
- c) Provision of all survey information should be supplied on a magnetic medium in a format accessible by AutoCAD Civil 3D, Civil Designer and MicroStation.
- d) Survey work which could be expected of a **qualified** surveyor that is professionally registered.

4. Drawings

Drawing Number	Sheet	Revision	ID	Title
#####	03	OA	MM	UMNGENI TUNNEL SURVEY SCOPE OF WORK

5. Specification

5.1 Applicable Standard Specifications

There are no technical specifications applicable.

5.2 Applicable Generic Specifications

Transnet E7/1 (July 1998): Specification for works on, over, under or adjacent to railway lines and near high voltage equipment.

5.3 The Consultant must make sure that he obtains an access certificate and together with his personnel comply to any safety and environmental requirements imposed by Transnet Freight Rail and as arranged by the Employer's Agent

6. Constraints on How the Customer Provides the Service

6.1. Requirements for Equipment (Refer to SANS 1921-1 clause 4.13)

- The requirements for equipment to be used near high voltage equipment are provided in the Generic specification, E7/1.
- The Consultant shall use a non-conductive (wood or plastic) mechanism, to accurately determine the centre line and level of railway track survey points.
- The design of such a mechanism shall be submitted to the **Employers Agent for approval** before the Consultant first establishes on site.

6.2. Format of information to be provided

- 6.2.1 The survey information shall be supplied in a digital format (assessable on AutoCAD, Civil Designer and Microstation).
- 6.2.2 The DTM data shall be in a Text file, ASCII and TOT format, supplied on a virus free compact disc and readable by the software programme CIVIL DESIGNER.
- 6.2.3 All annotations on the plan shall be in English.
- 6.2.4 The plan shall be orientated with north at the top of the drawing.
- 6.2.5 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 survey shot.
- 6.2.6 Levels shall be indicated with 2 digits before the decimal point and 2 digits after the decimal point, with lettering not less than 2.5mm high, in Arial font. The level shall be one text line.
- 6.2.7 To prevent cluttering of the as-is drawings, when plotting these levels, the Consultant shall ensure that they are spaced not closer than **1mm apart (at a 1:500 scale)**, and that the numerals indicating the levels do not **overlap**.
- 6.2.8 Levels and descriptions of the level shall be on separate CAD layers.
- 6.2.9 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. Where practical 0,5m contours shall be shown, but the space between plotted contours on the plan shall not be less than 5mm.
- 6.2.10 When defining the various points surveyed, the standard symbols to be used on the as-is drawings are indicated on the 6 sheets in Annexure B.

6.2.11 Co-ordinates system and datum level

- All co-ordinates shall be based upon the WGS system.
- The datum for levels shall be MSL.

6.2.12 Information to be recorded

- The Consultant shall record all local topography on a grid of not more than 20m x 20m.
- Spot heights shall indicate the crests of hills and bottom of valleys and depressions. Sufficient spot heights need to be provided to indicate ground variations, which cannot be adequately expressed by contour lines. Storm water trenches, streams and berms need to be located and shown clearly.
- Control points must be recorded on a separate layer on the drawing.
- **Levels of control points** shall be indicated with 4 **digits before the decimal point and 2 digits** after the decimal point, with lettering not less than 2.5mm high, in Arial font. The level shall be one text line.

6.2.13 In addition to the above, the following features shall also be surveyed, if encountered:

- Civil and other features
 - Water network
 - Stormwater network
 - Sewer Network
 - Top and bottom of banks
 - Change in topography
- Telephones, power lines and electrification
 - Telephone poles and routes
 - Power poles and routes
 - Transmission lines
 - Surface cables and cable markers, also recording the markings / numbering on it
 - Yard Area lighting
 - Transformers and sub-stations
- Structures and buildings
 - Edge of platforms – where applicable
 - Culverts, also recording the size of opening, length, and invert levels
 - Bridge structures, bridge decks, parapets, piers, abutments and retaining walls.
 - Buildings derelict buildings and quarters– where applicable
 - Manholes – both cover and invert levels and recording the type of manhole. Invert levels shall clearly be marked as either pipe invert levels or manhole invert level
 - Fire hydrants and water taps
 - Miscellaneous features
 - Subway and subway invert levels shall clearly be marked
 - Markers for pipes / cables also recording the markings / numbering on it
 - Landside abutment foundation corners as per solid circles in image above
 - All bridge abutment and pier corners under bridge
 - Rail and road fill toe's
 - Rail and road fill crests
 - Proposed in and outlet area for new culvert as per image above
 - Existing culvert section under bridge - in, and outlet as well as diameter.
 - Surrounds

-
- Toe of embankment
 - Centre line of Prasa rail line
 - Mast pole position/ other structures next to the Prasa line
 - Embankment profile
- Roads, fences and other features
 - Footpaths and roads, showing kerbs, gutters, catch pits, type of road surface, width of premix and concrete surfaces with the relevant invert levels clearly marked as for Structures and buildings above
 - Fencing, stating the type of fence
 - Eroded areas, gullies and streams
 - Trees

6.3. Simulation Model

- 6.3.1. The Consultant shall make use of new **control points** and pick up all **existing** control points if any.
- 6.3.2. The Consultant shall provide a list showing the co-ordinates and elevation of each control point and survey station
- 6.3.3. The new control points shall be inter-visible and not more than 50m apart.
- 6.3.4. As a general rule, control points shall be placed in the periphery of the area to be surveyed and so spaced that a network of further control points can be established if required.
- 6.3.5. Control points shall be located in such a position as to minimise the likelihood of disturbance or damage and outside of the new proposed construction
- 6.3.6. The Consultant and the Employees Agent shall agree on the minimum envisaged number of control points required for the survey.
- 6.3.7. The control points shall be 600 mm long Y-standard driven into the ground leaving at least 20mm protruding, which must be encased in concrete of at least $\Phi 200\text{mm}$ and 100mm deep, or any other method which will protect these points permanently, as agreed between the Consultant and the Employers Agent.
- 6.3.8. Each control point shall be provided with a rust proof metal tag set into the concrete indicating its number.
- 6.3.9. Each control point shall have its own **photograph accompanied** with the survey.

6.4. Accurate Measurements of Tolerance

-
- 6.4.1 The accuracy of the contours generated from engineering programmes must be such that upon comparison with the results of a selective check survey, the surveyed elevations of at least 90% of the points checked do not differ from their elevation as interpolated from the contours by more than half of the contour interval, and not more than 1% differ by more than the contour interval. The check shots shall be placed at random and shall be sufficient in number for the size of the area being surveyed.
 - 6.4.2 Spot heights shall be accurate to $\pm 20\text{mm}$.
 - 6.4.3 Invert levels of culverts and manholes shall be accurate to $\pm 10\text{mm}$. Cross sectional dimensions of all structures such as culverts, pipes and any structure deemed necessary shall be given.

6.5. Integrity of Results Deliverables

- 6.5.1 Testing
- 6.5.2 The Consultant shall ensure, by means of field checks or other independent confirmations, that the task complies with the specified standards and shall furnish proof, if required by the Employers Agent, that drawings depict details correctly.
- 6.5.3 The Employers Agent will scrutinise and check the fieldwork, calculations, drawings, and records to such an extent as he may deem necessary in order to satisfy himself that the terms of the contract and specification are met and complied with.

6.6. Integrity of Results Deliverables

6.6.1 DTM Survey: Civil Designer format

Survey data shall be submitted on a CD as a "Civil Designer format" or equivalent file that can be used in "Civil Designer" and must include, all break lines, survey points, triangles and contours.

Triangulation of break lines must create the actual representation of the topography of the land when longitudinal sections and cross sections are extracted.

The DTM must be in a LandXML format that is triangulated. The triangulations must be in 3D and in a DWG/ DGN format or equivalent.

The surface features and contours must be in 3d polylines in DWG/DGN format.

6.6.2 Survey Mapping

Survey mapping shall be provided in the form of hard copies to a scale of 1:500 as well as a magnetic medium in a format assessable by Microstation and AutoCAD (.dwg and/or .dxf format) on a CD.

6.6.3 Tabulation of survey data in Excel and ASCII format

-
- 6.6.4 A list of the permanent / temporary survey beacons (benchmarks) used for undertaking the services. This list must also be indicated on the Drawing.
 - 6.6.5 List of Codes:
A list showing all descriptions of survey codes used.
 - 6.6.6 Photographs of the site in general must be provided in a digital format.
 - 6.6.7 A walk through digital video recording of the site in general must be provided.

6.7. Clarification Meeting

- 6.7.1 The appointed consultant must be available for a clarification meeting either at the office or on site after the contract is awarded. The surveyor and the draft person must be available for this meeting.

7. Requirements for the Programme

Services Start Date: To be confirmed

Services End Date: To be confirmed

8. Services and other things provided by the Employer

The Employer will not provide any plant, equipment or material.

There will be no other activities on site that will interfere with the execution of the requirements of this task other than train operational activities. In this regard the Consultant shall acquaint himself of and abide by the requirements of specification: Transnet E7/1 (July 1998) Specification for works on, over, under or adjacent to railway lines and near high voltage equipment.

9. Health and Safety

Prepare and submit for approval a Health and Safety file in terms of Transnet's Health and Safety requirements for Consultants working on Transnet property. In terms of this file, the successful Tenderer will be responsible for the implementation of the obligations contained in Health and Safety file.

The successful Tenderer must prepare and submit for approval a Health and Safety file in terms of Transnet's Health and Safety requirements for Consultants working on Transnet property. In terms of this file, the successful Tenderer will be responsible for the implementation of the obligations contained in Health and Safety file. A copy of the file will be kept by TFR and be available on site. There are requirements of the Consultant in terms of Health and Safety. These are described below:

- Legal Appointments and proof of competencies for the Delegated Authority 16(2), Construction supervisor 6(1), Construction safety officer 6(6) or SHE Rep 17(1) and First Aider (Trained).
- First Aid Box with all the required contents.
- Valid letter of good standing for the Consultant, a copy of WCL2 form and ID copies for all on site.
- Safety Daily task Instruction (Safety Talk) to be done daily before work commences.
- Health & Safety Plan for the Consultant correlating with TFP Health & Safety Specification.
- Organogram of supporting structure (this document must provide all persons appointed in terms of the OHS Act 85 of 1993).
- Baseline Risk Assessment with all the activities that will be performed on site.
- Method statement for the tasks.
- Safe work procedure for the tasks.
- Proof that issue register system in place for P.P.E.
- Valid medical certificates of fitness done by an Occupational Health Practitioner for all on site.
- Proof of induction training received.
- Section 37(2) mandatory agreement between Client – Consultant and Consultant – Sub contractor.
- Proof of alcohol testing register of all on site daily done by the trained person.
- Risk Assessment covering all the tasks and hazards on site including Overhead Wires and Moving Trains
- Appointment of certified track flagmen.

The above-mentioned points are the minimum safety requirements.

The PRE-SITE AUDIT provides an indication what will be required in terms of Health and Safety prior to the Consultant commencing with the work. Please note that this is standard audit and some of requirements may not be applicable for this investigation.

10. Procurement

10.1 Code of Conduct

Transnet aims to achieve the best value for money when buying or selling goods and obtaining services. This however must be done in an open and fair manner that supports and drives a competitive economy. Underpinning our process are several acts and policies that any supplier dealing with Transnet must understand and support. These are:

- The Transnet Detailed Procurement Procedure (DPP);
- Section 217 of the Constitution - the five pillars of Public PSCM (Procurement and Supply Chain Management): fair, equitable, transparent, competitive and cost effective;
- The Public Finance Management Act (PFMA);
- The Broad Based Black Economic Empowerment Act (BBBEE); and
- The Anti-Corruption Act.

This code of conduct has been included in this contract to formally apprise Transnet Suppliers of Transnet's expectations regarding behaviour and conduct of its Suppliers.

Prohibition of Bribes, Kickbacks, Unlawful Payments, and Other Corrupt Practices

Transnet is in the process of transforming itself into a self-sustaining State Owned Enterprise, actively competing in the logistics industry. Our aim is to become a world class, profitable, logistics organisation. As such, our transformation is focused on adopting a performance culture and to adopt behaviours that will enable this transformation.

- 1 Transnet will not participate in corrupt practices and therefore expects its suppliers to act in a similar manner.
 - Transnet and its employees will follow the laws of this country and keep accurate business records that reflect actual transactions with and payments to our suppliers.
 - Employees must not accept or request money or anything of value, directly or indirectly, to:
 - Illegally influence their judgement or conduct or to ensure the desired outcome of a sourcing activity;
 - Win or retain business or to influence any act or decision of any decision stakeholders involved in sourcing decisions; or
 - Gain an improper advantage.
 - There may be times when a supplier is confronted with fraudulent or corrupt behaviour of Transnet employees. We expect our Suppliers to use our “Tip-offs Anonymous” Hot line to report these acts. (0800 003 056).
2. Transnet is firmly committed to the ideas of free and competitive enterprise.
 - Suppliers are expected to comply with all applicable laws and regulations regarding fair competition and antitrust.
 - Transnet does not engage with non-value adding agents or representatives solely for the purpose of increasing BBBEE spend (fronting)
3. Transnet’s relationship with suppliers requires us to clearly define requirements, exchange information and share mutual benefits.
 - Generally, Suppliers have their own business standards and regulations. Although Transnet cannot control the actions of our suppliers, we will not tolerate any illegal activities. These include, but are not limited to:
 - Misrepresentation of their product (origin of manufacture, specifications, intellectual property rights, etc);
 - Collusion;
 - Failure to disclose accurate information required during the sourcing activity (ownership, financial situation, BBBEE status, etc.);
 - Corrupt activities listed above; and
 - Harassment, intimidation or other aggressive actions towards Transnet employees.
 - Suppliers must be evaluated and approved before any materials, components, products or services are purchased from them. Rigorous due diligence is conducted and the supplier is expected to participate in an honest and straight forward manner.
 - Suppliers must record and report facts accurately, honestly and objectively. Financial records must be accurate in all material respects.

Conflicts of Interest

-
1. A conflict of interest arises when personal interests or activities influence (or appear to influence) the ability to act in the best interests of Transnet.
 - Doing business with family members
 - Having a financial interest in another company in our industry

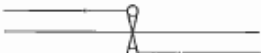
10.2 The Consultant's Invoices

- 10.2.1 When the Project Manager certifies payment (see ECSC Clause 50) following an assessment date, the Consultant complies with the Employer's procedure for invoice submission.
- 10.2.2 The invoice must correspond to the Project Manager's assessment of the amount due to the Consultant as stated in the payment certificate.
- 10.2.3 The invoice states the following:
 - Invoice addressed to Transnet Limited;
 - Transnet Limited's VAT No: 4720103177;
 - Invoice number;
 - The Consultant's VAT Number; and
 - The Contract number: R323
- 10.2.4 The invoice shall contain the supporting documentation details.
- 10.2.5 The invoice is presented either by post or by hand delivery.
- 10.2.6 Invoices submitted by email addressed to Project Manager: Mandisa Mkhize, Transnet Freight Rail.
- 10.2.7 Invoices submitted by hand are presented to:

Transnet Freight Rail
 15 Girton Road
 Parktown
 Johannesburg, 2001
 For the attention of the Contract Administrator, Transnet Freight Rail
- 10.2.8 The invoice is presented as an original.

ANNEXURE B
Sh 1

PLOT SIZE: 350 x 200

STANDARD			SYMBOLS
LAND SURVEY	TRIGONOMETRICAL BEACON		 485
	SURVEY STATION		P KB 7 1 517  54
	BENCH MARK		1 314,176 
BOUNDARIES, FENCES, ETC	TRANSNET BOUNDARY	FENCED	
		UNFENCED	
	SECURITY FENCE	ON BOUNDARY	
		NOT ON BOUNDARY	
	FENCE		
	GATE	IN FENCE	
		ACROSS TRACK	
	CATTLE GUARD		
WIRES CABLES AND PIPES	TELEPHONE OR TELEGRAPH ROUTE (SPECIFY NUMBER OF WIRES)		
	POWER ROUTE (SPECIFY eg. ESKOM, 88 kV, 2 WIRES)		
	CABLE OR PIPE (SPECIFY)	SURFACE	
		UNDER- GROUND	

ANNEXURE B Sh 3

PLOT SIZE: 350 x 250

STANDARD		SYMBOLS
WIRES, CABLES AND PIPES	SPLICE JOINT	
	RAIL AND FLANGE LUBRICATOR	
	AXLE COUNTER	
	CLEARANCE MAKER	
	AASH PIT	
	MASS BRIDGE	
	OFF - TRACK PLATFORM	
TURN - OUTS AND CROSSINGS	TURNOUT SPECIFY ANGLE & HAND eg 1:9 L.H.	
	SINGLE SLIP	
	DOUBLE SLIP	
	DIAMOND CROSSING	
SIGNALS	SEMAPHORE SIGNAL	
	COLOUR LIGHT SIGNAL	
NOTICE BOARDS	TELEPHONE	
	NAME BOARD	

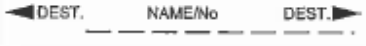
ANNEXURE B Sh 4

PLOT SIZE: 350 x 250

STANDARD			SYMBOLS	
NOTICE BOARDS	WHISTLE BOARD			
	NOTICE BOARD		OR	
	WARNING BOARD		OR	
	SPEED RESTRICTION			
	SPEED DERESTRICTION			
SIGN POSTS	LEVEL CROSSING SIGNS	DISTANT		
		CLOSE - UP		
		WITH FLASHING LIGHTS		
	GRADE POSTS	V.C. OF 120m OR SHORTER		
		V.C. LONGER THAN 120m	SUMMIT	
			SAG	
	KILOMETRE POST 1. FULL KILOMETRE 2. HALF KILOMETRE		1. 2.	

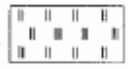
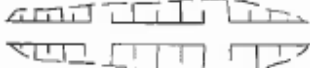
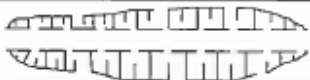
ANNEXURE B
Sh 5

PLOT SIZE: 350 x 250

STANDARD		SYMBOLS
TRACTION MASTS	CANTILEVER MAST	
	PUSH PULL - OFF MAST	
	PULL - OFF MAST	
	DOUBLE BOOM	
	DOUBLE BOOM WITH RAKING LEG	
	TENSION BRIDGE	
	BRIDGE MAST	
	SWITCH STRUCTURE	
	ANCHOR MAST	
ROADS AND PATHS	TARRED	
	GRAVEL	
	TRACKS	
	FOOTPATH	

ANNEXURE B Sh 6

PLOT SIZE: 350 x 250

STANDARD		SYMBOLS
LAND FEATURES	PLANTATION / TREES / ORCHARD	 PINES PEARS
	BUSH	
	1. DRY LAND 2. IRRIGATED LAND	1.  2. 
	LOOSE BOULDERS	
	ROCK 1. SCATTERED OUTCROP 2. CONTINUOUS	1.  2. 
	CLIFF	
	MARSH	
	1. DAM 2. LAKE / PAN	1.  2. 
	QUARRY OR BORROW PIT	
	DUMP OR EARTH MOUND	
	FILL	
	CUTTING	
	1. SURFACE EROSION 2. DONGA	1.  2. 
	CEMETERY	