Contract specification for core samples at Kraal tunnel

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1 Description of work

1.1 Scope of work

1.1.1 The works that the contractor must perform is in Kraal tunnel which is located in the Heidelberg area. The tunnel is from km 52.552 (Heidelberg side) to km 54.014 (Balfour side), 1.462 kilometres long with access via service roads from both sides.

1.1.2 The work that has to be done over a section includes:

- drilling a hole in the concrete slab/mass concrete/rock to a depth of 2 metres
- the pressure grouting of the hole to make the hole water tight
- taking core samples, 2 metre in depth, adjacent to the pressure grout hole as per specification
- Perform a core logging report
- Perform a water pressure test on each hole

1.1.3 Refer to table 1 for a summary of the work locations and the number of samples to be taken at each site.

Table 1: Summary of work locations and sample quantities

	Site A	Site B	Site C
From (km)	53.450	53.465	53.605
To (km)	53.465	53.605	53.620
Length (m)	15	140	15
Coring	Yes	Yes	Yes
Number of holes	3	8	3

1.2 Transnet objectives

1.2.1 The objectives of the work are:

- To gather information on the tunnel substructure by taking core samples at various locations.
- To assess the condition of the substructure and accurately estimate the volume of material (concrete, grout etc) required to repair the abovementioned areas.

2 Design responsibilities

2.1 Transnet design

2.1.1 Transnet (Delegate from Transnet) will be responsibly for:

- The hole layout (This will be verbally communicated on site during coring process)

2.2 Contractor design

2.2.1 The contractor is responsible for:

- Grout type to use based on the grout specification (Refer to annexure A)

3 Construction Arrangements

3. 1 Access & security

3.1.1 Access is available to either side of the tunnel via the existing service roads.

3.1.2 The Contractor will not be responsible for security associated with the Works as it will be provide by Transnet.

3.1.3 The Contractor is advised that the tunnel is not considered to be located in a high incident zone.

3.2 Hours of work

3.2.1 Hours of work for all works within and outside of the tunnel shall be restricted to 08h00 – 18h00.

3.2.2 Hours of work will further be limited to two periods on 2 consecutive days during a full occupation of the line.

3.3 Site facilities & site services

3.3.1 The area outside each tunnel portal will be made available to the Contractor for the storage of material/equipment/plant and vehicle parking etc. The Contractor shall at all times maintain these sites in a neat and tidy condition.

3.3.2 The available space at the tunnel entrances are limited and must be planned for accordingly.

3.3.3 Housing of the Contractor's staff is permitted on Transnet land however no housing will be permitted on privately owned land adjacent to the Transnet rail reserve.

3.3.4 The provision of all electrical requirements including lights shall be the responsibility of the Contractor.

3.3.5 There must be adequate light for safe working conditions.

3.3.6 For site health & safety refer to Section 5

3.3.7 On completion of the Works, the Contractor shall de-establish his site facilities, removing all property, equipment, plant and materials etc and reinstating the site to a clean and tidy condition.

3.3.8 Diesel generators and air compressors must be outside the tunnel with the necessary infrastructure to the work site.

3.4 Track occupations & construction constraints / requirements

3.4.1 All works shall take place in accordance with the Transnet specification E7/1 for Works on, over, under or adjacent to railway lines & near high voltage equipment.

3.4.2 The overhead track equipment/electrical lines will be switched off during the periods of work.

3.4.3 A total of 2 (two) total occupations will be granted from 08:00-18:00 on the 2 (two) consecutive days.

3.4.4 Total track occupations conditions will rule during the consecutive work periods.

3.4.5 The Contractor shall record the start and end times of all occupations on a daily basis. These occupation recordings shall be certified daily by TFR and the Contractor.

3.4.6 The Contractor shall ensure his work methods do not short-circuit any signals. The use of conductive materials over the track is consequently prohibited.

3.5 Exceeding track occupations & reworks

3.5.1 Occupations shall commence when instructed and shall be cancelled when declared safe for the passage of trains by the TFR representative.

3.5.2 The *Contractor* shall ensure his planned activities do not exceed the approved occupation periods. Should the occupation be exceeded due to the actions of the *Contractor*, he will be charged the VAT exclusive rate of R200, 00 for each minute that the occupation is exceeded. The relative amount will be deducted from the *Contractors* payments.

3.6 Completion and quality assurance

3.6.1 The work will be considered complete once the Supervisor confirms the following:

- All core samples has been taken (14), clearly marked and placed into appropriate core sample boxes.
- Core logging report for each core is compiled
- Water pressure test result report is received
- All equipment/material has been removed from site.
- The site is left in a neat and tidy condition

3.6.2 All he core holes is clean and dry..

3.6.3 No maintenance period will be applicable.

3.6.4 The supervisor will indicate that all cores were taken as required. Cores that do not fulfill the requirements has to be repeated.

3.7 Labour, plant, equipment and material arrangement

3.7.1 The contractor will be responsible for all labour, plant, components, equipment and material to take core samples.

3.7.2 Transnet will provide the following labour:

- Occupation staff (flagmen, track master, etc.)
- Electricians responsible for switching off OHTE
- Personnel responsible for safety induction
- Technicians responsible for camera inspections

3.7.3 Transnet will provide the following equipment:

- Camera inspection equipment.

3.7.4 The contractor must use the appropriate technical information and specification supplied when manufacturing or purchasing material and components.

3.7.5 The equipment used must be able to work inside the tunnel with the existing track and centenary in place.

4 Plant and Material Standards and Workmanship

4.1 Core samples

4.1.1 Core samples must be taken using the method of double or triple tube coring.

4.1.2 The minimum diameter of coring holes is 63mm. The contractor needs to specify during the tender stage what size he intend using

4.1.3 After coring samples must be marked and put into coring boxes for safe storage.

4.1.4 Pilot hole must be drilled to a depth of 2 metres and grouted before core sample may be taken. The pilot hole must be in close proximity of the core sample and does not specifically have to be on the exact location of the core sample. The reasoning for this is to fill all voids, cracks and fissures and keep them in tack when cores are removed.

4.1.5 Water must be used during coring.

4.1.6 After coring the hole must be washed and air dried for further camera inspections.

4.1.7 Core samples must be taken to a depth of 2 metres.

4.1.8 A total of 14 core samples must be taken at the locations indicated by the supervisor/project manager.

4.1.9 A core logging report must be compiled for each core sample. The report must include the following minimum information:

- Depth, sample number, location, graphic log, material classification, location, angle and size of fissures, comments, water table, date, core size

4.2 Water pressure test

4.2.1 Water pressure tests to determine the permeability of the existing formation shall be undertaken at locations indicated by the site agent.

4.2.2 Water pressures indicating a permeability > 2Lu shall require further grouting.

4.2.3 One Lugeon (Lu) = one litre of fluid injected into 1 m length of borehole within one minute at an injection pressure of 10 bars.

5 General safety

5.1 All the personnel of the contractor must undergo safety induction training

5.2 The contractor must appoint a Safety officer and comply with the Transnet safety requirements.

5.3 PPE must be worn at all times while inside the tunnel an outside up to a distance of 3 metres from the railway track.

6 Scheduling

6.1 Time scheduling

6.1.1 All applications must include an estimated time required (days, hours) for completion of all work.

6.1.2 Once the contract has been awarded the successful party must submit a detailed time schedule within 2 weeks. The time schedule will be used to measure daily performance and monitor overall performance of the work.

Annexure A Low viscosity resin based grouting specification and application of grout

A1.1 The low viscosity resin based grout must comply with the requirements as set out in the table below.

Table B1 Low viscosity resin based grouting specification and application.

Grouting minimum specification	
Grouting must comply with the following minimum requirement	
	Must penetrate cracks > 0.15 mm
	Minimum compressive strength of 25 MPa after 30 minutes
	Viscosity < 8 cps
	Must have good adhesion to wet substrates
	Must set and bond to the mass concrete and rock under a static water head < 4 Bar
	0% grout swell and water absorption
	Must have a bond strength > 2 MPa
Grouting application	
Grouting must be done as per contractor's method for repair.	
Grouting must be repeated if the deflections under the base plate exceed 0.2 mm and/or if the water pressure test fails.	
Care must be taken to prevent the slabs from being lifted by using laser technology to check for movement. If movement is observed then the slab must first be anchors as described above.	
Maximum allowable injection pressure must be 4 Bar.	
Grout till refusal at 4 Bar with no flow.	

Annexure B Pricing schedule

ITEM	DESCRIPTION Kraal tunnel cores	Type of cost	UNIT	QTY	RATE	AMOUNT
A	**Fixed project costs**					
A1	Establish all facilities & equipment on site excluding chemical toilets	fixed	sum	1		
A2	Provide testing equipment - breathalyser	fixed	each	1		
A3	Establish site storage facility	fixed	each	1		
A4	Insurance & other contractual obligations	fixed	sum	1		
A5	Remove site storage facility	fixed	each	1		
A6	Remove all facilities & equipment on site	fixed	each	1		
					SUB TOTAL	
B	**Accommodation, transport and supervision**					
B1	Management and superintendence of contract during execution	fixed	each	1		
B2	Accommodation & subsistence during execution	fixed	each	1		
B3	Transport to & from site during execution	fixed	each	1		
B4	Provide fulltime train safety co-ordinator / certified safety officer	fixed	each	1		
					SUB TOTAL	
C	**Core samples**					
C1	Take core samples inclusive of (but not limited to): • Drilling pilot holes • Grouting of pilot holes • Double tube coring • Cleaning and drying • Core box • Core logging report	fixed	each	14		
					SUB TOTAL	
D	**Water pressure test**					
D1	Water pressure test	fixed	each	14		
					SUB TOTAL	
H	**Other costs**					
	(Any work that has not been mentioned in sections above)					
					SUB TOTAL	
	TOTAL excluding VAT					