



THE SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE

CONTRACT NO: G494/2023

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR THE SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE (SANBI) AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE

PROCUREMENT DOCUMENT

DECEMBER 2023

Issued by:

South African National Biodiversity Institute
Private Bag X101
Silverton
0184

Prepared by

Ukhukhula Holdings (Pty) Ltd
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Name of tenderer:

Contact Details:

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TENDER INFORMATION

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T1.1: TENDER NOTICE AND INVITATION TO TENDER

SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE INVITES TENDERERS FOR THE PROVISION OF:

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR THE SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	G494/2023

Advertising date:	12 December 2023	Closing date:	5 February 2023
Closing time:	11:00	Validity period:	90 days

THE SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE INVITES TENDERERS FOR THE PROVISION OF: The appointing a contractor for the borehole water supply, water purification, reservoir repairs, potable water storage and automated irrigation system for SANBI at the Karoo Desert National Botanical Garden in Worcester, Western Cape.

It is estimated that tenderers should have a CIDB contractor grading of **4 CE** or higher

- **Tender documents will be available** as from **12 December 2023** and will be available **ONLINE ONLY** on:
- SANBI website www.sanbi.org (click on "Opportunities")
 - CIDB Website
 - National e-Tender Publication Portal

A **compulsory** site briefing session will take place on site on **17 January 2024** at **12:00** in the Education Centre at the Karoo Desert National Botanical Garden, Worcester.

Bidders are encouraged to direct all technical and bidding procedure enquiries to the email address below.

Department: Supply Chain Management
Email: sanbi.tenders@sanbi.org.za
Cc: A.Hendricks@sanbi.org.za
Cut-off date for enquiries: 26 January 2024 at 12:00

Any queries regarding the tender document or any related matter prior to submission of tenders must be directed to:

SANBI Representative (Technical Queries Only)	Mr Johan Kruger Ukhukhula Holdings (Pty) Ltd Tel: 082 335 0535 E-mail: johan@ukhukhula.com
SANBI SCM Representative	sanbi.tenders@sanbi.org.za

The closing time and date for the receipt of tenders is **11:00** on **5 February 2024**.

The tenders will **NOT** be opened in public (please note that the two-envelope system is being followed). Requirements for sealing, addressing, delivery, opening and assessment of tenders are stated in the Tender Data.

T1.2 TENDER DATA

The conditions of tender are the Standard Conditions of Tender as contained in Annex F of the CIDB Standard for Uniformity in Construction Procurement (28 May 2010) as published in Government Gazette No 33239, Board Notice 86 of 2010 of 28 May 2010. (See www.cidb.org.za).

The Standard Conditions of Tender make several references to the Tender Data for details that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender.

Each item of data given below is cross-referenced to the clause in the Standard Conditions of Tender to which it mainly applies.

Clause number	Tender Data
F.1.1	The employer is: The South African National Biodiversity Institute (SANBI) Private Bag X101 Silverton 0184
F.1.2	The Tender Documents issued by the Employer comprise the following documents: THE TENDER Part T1: Tendering procedures T1.1 - Tender notice and invitation to tender T1.2 - Tender data Part T2: Returnable documents T2.1 - List of returnable documents THE CONTRACT Part C1: Agreements and Contract data C1.1 - Form of offer and acceptance C1.2 - Contract data C1.3 - Construction guarantee Part C2: Pricing Data C2.1- Pricing Instructions C2.2 – Bill of Quantities Part C3: Scope of Works C3.1- Description of the works C3.2 – Construction C3.3 - Annexures Part C4: Site Information C4.1 – Geotechnical information C4.2 – Health and Safety Specification

F.1.4	The employer's agent is : Ukhukhula Holdings (Pty) Ltd 117 Strand Street Cape Town, 8000 Tel: 082 335 0535 Fax: 086 552 3309 E-mail: johan@ukhukhula.com
F 2.1.1	Only those tenderers who score the minimum score in respect of the quality criteria stated in F.3.11.9 of this Tender Data shall be considered responsive and have their tenders evaluated further.
F.2.1.2	Only those tenderers who are registered with the CIDB, or are capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered, or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations, for a 4 CE class of construction work, are eligible to have their tenders evaluated. Joint ventures are eligible to submit tenders provided that: - every member of the joint venture is registered with the CIDB; - the lead partner has a contractor grading designation in the 4 CE class of construction work; and - the combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a 4 CE class of construction work or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations.
F.2.7	The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. Tenderers must sign the attendance list in the name of the tendering entity. Addenda will be issued to and tenders will be received only from those tendering entities appearing on the attendance list.
F.2.12	Main tender offers are required to be submitted together with alternative tenders.
F.2.12	If a tenderer wish to submit an alternative tender offer, the only criteria permitted for such alternative tender offer is that it demonstrably satisfies the Employer's standards and requirements, the details of which may be obtained from the Employer's Agent. Calculations, drawings and all other pertinent technical information and characteristics as well as modified or proposed Pricing Data must be submitted with the alternative tender offer to enable the Employer to evaluate the efficacy of the alternative and its principal elements, to take a view on the degree to which the alternative complies with the Employer's standards and requirements and to evaluate the acceptability of the pricing proposals. Calculations must be set out in a clear and logical sequence and must clearly reflect all design assumptions. Pricing Data must reflect all assumptions in the development of the pricing proposal. Acceptance of an alternative tender offer will mean acceptance in principle of the offer. It will be an obligation of the contract for the tenderer, in the event that the alternative is accepted, to accept full responsibility and liability that the alternative offer complies in all respects with the Employer's standards and requirements. The modified Pricing Data must include an amount equal to 5% of the amount tendered for the alternative offer to cover the Employer's costs in confirming the acceptability of the detailed design.

F.2.13.3	Tenderers shall note the specific requirements for packaging of their tender documents and include only the following: - Original: one (1) original document marked "Original" including Form of Offer and Acceptance, Estimated monthly expenditure and Priced Bills of Quantity; and - Memory Stick: one (1) document pack without any pricing on a memory stick Financial or pricing details should ONLY be included in the printed document pack marked 'ORIGINAL', and not in the PDF file(s) of the document(s) on the memory stick. NB: Failure to submit one printed document pack with pricing in the envelope, and a document pack without pricing on a memory stick will lead to your bid being disqualified. (Please put them in one envelope) INCLUSION OF ANY PRICING INFORMATION ANYWHERE ON THE MEMORY STICK WILL LEAD TO THE BID BEING DISQUALIFIED. The original document and the memory stick will be placed in one envelope and on the envelope sealed bearing the following: - The address as stated in C.2.15.1 below - The identification details as stated in C.2.15.1 below - Name of the Tenderer - The words "Not be opened before the Tender opening"
F.2.13.5	The Employer's address for delivery of tender offers and identification details to be shown on each tender offer package are: Location of Tender box: Biodiversity Centre, Pretoria National Botanical Garden, 2 Cussonia Avenue, Brummeria, Pretoria, Gauteng Province
F.2.15.1	Identification details: Tender number: G494/2023 Title of Tender: The appointment of a contractor for the borehole water supply, water purification, reservoir repairs, potable water storage and automated irrigation system for SANBI at the Karoo Desert National Botanical Garden in Worcester, Western Cape
F.2.13.6	A two-envelope procedure will be followed as described in clause F.2.13.3.
F.2.13.9	Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.
F.2.15	The closing time for submission of tender offers is as stated in the Tender Notice and Invitation to Tender.
F.2.16	The tender offer validity period is 90 days.
F.2.18	The tenderer shall, when requested by the Employer to do so, submit the names of all management and supervisory staff that will be employed to supervise the Labour Intensive portion of the works together with satisfactory evidence that such staff members satisfy the eligibility requirements.

F.2.23	The tenderer is required to submit with his tender the following documents. Failure to include the following documents <u>WILL</u> result in the bid being disqualified: 1) A copy of the Central Suppliers Database (CSD) registration report or registration number. 2) A printed copy of the Active Contractor's Listing off the CIDB website (www.cidb.org.za) 3) Letter of Good Standing from the Office of the Compensation Commissioner as required by the Compensation for Occupational Injuries and Diseases Act (COIDA). The letter should be issued by the Department of Labour. 4) In the case of a Joint Venture/Consortium the tax Compliance status Pin or Compliant tax status on CSD report must be submitted for each member of the Joint Venture/Consortium." 5) The signed compulsory Site Briefing Certificate.											
F.3.4	The tenders will be opened in public if required (please note that the two-envelope system is being followed).											
F.3.11.1	The tender evaluation method for the evaluation of all responsive tender offers will be Method 4: Financial offer, quality and preferences in accordance with F.3.11.5.											
F.3.11.7	Scoring financial offers The financial offer will be scored using Formula 1 (Option 1) where the value of W1 is 80 points.											
F.3.11.9	Scoring Quality The functionality (quality) evaluation criteria are listed below. Maximum points for each criterion are in bold while points for each sub-criterion are indicated in brackets. <table><tr><th colspan="3">FUNCTIONALITY CRITERIA</th></tr><tr><th>ID</th><th>CRITERIA</th><th>POINTS</th></tr><tr><td rowspan="2">1</td><td>Implementation method and project plan or programme</td><td>25</td></tr><tr><td> (a) Project methodology • Method to be followed in delivering this project, the methodology and approach must be specific to the project and location of works. • It should include team Organogram of the people who will be working on the project tendered. • Time and quality management of the project • A list of subcontractors (if any) to be utilized for various disciplines and how the work will be dispatched to subcontractors considering the reasonable response times. </td><td>(15)</td></tr></table>	FUNCTIONALITY CRITERIA			ID	CRITERIA	POINTS	1	Implementation method and project plan or programme	25	(a) Project methodology • Method to be followed in delivering this project, the methodology and approach must be specific to the project and location of works. • It should include team Organogram of the people who will be working on the project tendered. • Time and quality management of the project • A list of subcontractors (if any) to be utilized for various disciplines and how the work will be dispatched to subcontractors considering the reasonable response times.	(15)
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	(b) Weekly plan/programme with milestones • The programme should indicate the sequence of work execution. • Milestones and resources linked to the activity. • It should be practical, realistic and include all activities linked to the project. <table><tr><th>Sub-Criteria</th><th>Points</th></tr><tr><td>No Programme</td><td>0</td></tr><tr><td>Poor Programme</td><td>2</td></tr><tr><td>Average Programme</td><td>4</td></tr><tr><td>Above Average Programme</td><td>6</td></tr><tr><td>Good Programme</td><td>8</td></tr><tr><td>Comprehensive (Exceptional) Programme</td><td>10</td></tr></table>	Sub-Criteria	Points	No Programme	0	Poor Programme	2	Average Programme	4	Above Average Programme	6	Good Programme	8	Comprehensive (Exceptional) Programme	10	(10)						
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2	Contractor's Experience • Three relevant reference letters regarding work of similar scope and scale completed in the last ten (10) years <table><tr><th>Sub-Criteria</th><th>Points</th></tr><tr><td>One relevant reference letter</td><td>5</td></tr><tr><td>Two relevant reference letters</td><td>10</td></tr><tr><td>Three relevant reference letters or more</td><td>15</td></tr></table> • List of at least five other similar projects with appointment letters, completion certificates and telephonic references indicating work of similar value completed in the last ten (10) years. <table><tr><th>Sub-Criteria</th><th>Points</th></tr><tr><td>One relevant Project</td><td>5</td></tr><tr><td>Two relevant Projects</td><td>10</td></tr><tr><td>Three relevant Projects</td><td>15</td></tr><tr><td>Four relevant Projects</td><td>20</td></tr><tr><td>Five relevant Projects</td><td>25</td></tr></table>	Sub-Criteria	Points	One relevant reference letter	5	Two relevant reference letters	10	Three relevant reference letters or more	15	Sub-Criteria	Points	One relevant Project	5	Two relevant Projects	10	Three relevant Projects	15	Four relevant Projects	20	Five relevant Projects	25	40 (15) (25)
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Score	Prompt for judgement
0	Failed to address the question / issue
1	Very poor response: - response / answer / solution lacks convincing evidence of skill / experience sought or medium risk that relevant skills will not be available.
2	Poor response – some elements of the response / answer / solution are present but documentary evidence is mostly lacking in respect of the required information
3	Acceptable response / answer / solution to the particular aspect of the requirements and evidence given of skill / experience sought
4	Above acceptable - response / answer / solution demonstrating real understanding of requirements and evidence of ability to meet it.
5	Excellent - response / answer / solution provides confidence that the tenderer will add real value to the project.

The minimum number of evaluation points for functionality proposal is **70 points** in order to progress to stage 3 of the evaluation

3 Stage 3: Tender Price and Preference

The tenderers who complied with the functionality criteria in stage 2 are considered for further evaluation in terms of their Tender Price and Preference points.

3.1 Correction of arithmetical errors

Pursuant to clause C.3.9 of the standard conditions of tender as amended in the Tender Data, correction of arithmetical errors shall be undertaken.

3.2 Calculation of score for Tender Price

The score for Tender Price shall be calculated using the following formula:

$$N_F = W_f \times \left[1 - \left(\frac{P_t - P_{min}}{P_{min}} \right) \right]$$

Where:

N_F = the score for Tender Price awarded for the tender under consideration

W_f = the weighting given to financial offer, determined as follows:

- 90 where the Tender Price, inclusive of VAT, of all responsive tender offers received has a value in excess of R50 000 000,00; or
- 80 where the Tender Price, inclusive of VAT, of one or more responsive tender offers has a value that equals or is less than R50 000 000,00.

P_t = Tender Price of the tender under consideration

P_{min} = Tender Price of the lowest responsive tender

In the event that the calculated value of N_F is negative, the allocated score shall be 0

	3.3 Financial and Preference After calculation of the scores for Tender Price and for Preference, a combined score will be calculated as follows: $NT = NF + NP$ Where: NT = Total score for tender under consideration NF = Score for Tender Price NP = Score for Preference The tender with the highest score should be recommended for appointment
F.3.13	In addition to the requirements of the Condition of Tender, offers will only be accepted if: - the tenderer submits a copy of the CSD registration report or registration number (refer to T2.1.13); - the tenderer is registered with the Construction Industry Development Board in an appropriate contractor grading designation (refer to T2.1.12); - the tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector; - the tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract (refer to T2.1.16); the tenderer has completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the employer or potentially compromise the tender process and persons in the employ of the state are permitted to submit tenders or participate in the contract (refer to T2.1.16); - the tenderer is registered and in good standing with the compensation fund or with a licensed compensation insurer (Letter of good standing with COIDA); - the employer is reasonably satisfied that the tenderer has in terms of the Construction Regulations, 2014, issued in terms of the Occupational Health and Safety Act, 1993, the necessary competencies and resources to carry out the work safely; - A copy of Tax Compliance Status Pin or CSD report.

Annex F

(normative)

Standard Conditions of Tender

F.1 General

F.1.1 Actions

F.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in F.2 and F.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

F.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict, and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note: (1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.

(2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

F.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

F.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

F.1.3 Interpretation

F.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

F.1.3.2 These conditions of tender, the tender data and tender schedules which are only required for tender evaluation purposes, shall not form part of any contract arising from the invitation to tender.

F.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

- (a) **conflict of interest** means any situation in which:
 - (i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfil his or her duties impartially;
 - (ii) an individual or organisation is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
 - (iii) incompatibility or contradictory interests exist between an employee and the organisation which employs that employee.
- (b) **comparative offer** means the tenderer's financial offer after all tendered parameters that will affect the value of the financial offer have been taken into consideration in order to enable comparisons to be made between offers on a comparative basis
- (b) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process; and
- (c) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the

award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels

- (e) **organization** means a company, firm, enterprise, association or other legal entity, whether incorporated or not, or a public body
- (f) **quality (functionality)** means the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs

F.1.4 Communication and employer's agent

Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

F.1.5 The employer's right to accept or reject any tender offer

F.1.5.1 The employer may accept or reject any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The employer shall not accept or incur any liability to a tenderer for such cancellation and rejection, but will give written reasons for such action upon written request to do so.

F.1.5.2 The employer may not subsequent to the cancellation or abandonment of a tender process or the rejection of all responsive tender offers re-issue a tender covering substantially the same scope of work within a period of six months unless only one tender was received and such tender was returned unopened to the tenderer.

F.1.6 Procurement procedures

F.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to F.3.13, be concluded with the tenderer who in terms of F.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

F.1.6.2 Competitive negotiation procedure

F.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of F.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of F.3.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

F.1.6.2.2 All responsive tenderers, or not less than three responsive tenderers that are highest ranked in terms of the evaluation method and evaluation criteria stated in the tender data, shall be invited in each round to enter into competitive negotiations, based on the principle of equal treatment and keeping confidential the proposed solutions and associated information. Notwithstanding the provisions of F.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

F.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to make a fresh tender offer, based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

F.1.6.2.4 The contract shall be awarded in accordance with the provisions of F.3.11 and F.3.13 after tenderers have been requested to submit their best and final offer.

F.1.6.3 Proposal procedure using the two stage-system

F.1.6.3.1 Option 1

Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

F.1.6.3.2 Option 2

F.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

F.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data, and award the contract in terms of these conditions of tender.

F.2 Tenderer's obligations

F.2.1 Eligibility

F.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

F.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

F.2.2 Cost of tendering

Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

F.2.3 Check documents

Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

F.2.4 Confidentiality and copyright of documents

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

F.2.5 Reference documents

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

F.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

F.2.7 Clarification meeting

Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

F.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five working days before the closing time stated in the tender data.

F.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

F.2.10 Pricing the tender offer

F.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the tender data.

F.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

F.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

F.2.10.3 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

F.2.11 Alterations to documents

Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited.

F.2.11 Alternative tender offers

F.2.11.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

F.2.11.2 Accept that an alternative tender offer may be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

F.2.12 Submitting a tender offer

F.2.12.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works, services or supply identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

F.2.12.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

F.2.12.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

F.2.12.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

F.2.12.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.12.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked "financial proposal" and place the remaining returnable documents in an

envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

F.2.12.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

F.2.12.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

F.2.12.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

F.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.

F.2.14 Closing time

F.2.14.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

F.2.14.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

F.2.15 Tender offer validity

F.2.15.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

F.2.15.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

F.2.15.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted.

F.2.15.4 Where a tender submission is to be substituted, submit a substitute tender in accordance with the requirements of F.2.13 with the packages clearly marked as "SUBSTITUTE".

F.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: Sub-clause F.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.

F.2.17 Provide other material

F.2.17.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

F.2.17.2 Dispose of samples of materials provided for evaluation by the employer, where required.

F.2.18 Inspections, tests and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

F.2.19 Submit securities, bonds, policies, etc.

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

F.2.20 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

F.2.21 Return of other tender documents

If so instructed by the employer, return all retained tender documents within 28 days after the expiry of the validity period stated in the tender data.

F.2.22 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

F.3 The employer's undertakings

F.3.1 Respond to requests from the tenderer

F.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five working days before the tender closing time stated in the Tender Data and notify all tenderers who drew procurement documents.

F.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

- (a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
- (a) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
- (b) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

F.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who drew documents.

F.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

F.3.4 Opening of tender submissions

F.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

F.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, specific goals and time for completion for the main tender offer only.

F.3.4.3 Make available the record outlined in F.3.4.2 to all interested persons upon request.

F.3.5 Two-envelope system

F.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

F.3.5.2 Evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the quality evaluation more than the minimum number of points for quality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on Specific Goals. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for quality.

F.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

F.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

F.3.8 Test for responsiveness

F.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

- (a) complies with the requirements of these Conditions of Tender,
- (a) has been properly and fully completed and signed, and
- (b) is responsive to the other requirements of the tender documents.

F.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- (a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- (a) significantly change the Employer's or the tenderer's risks and responsibilities under the contract, or
- (b) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

F.3.9 Arithmetical errors, omissions and discrepancies

F.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

F.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with F.3.11 for:

- (a) the gross misplacement of the decimal point in any unit rate;

- (a) omissions made in completing the pricing schedule or bills of quantities; or
- (b) arithmetic errors in:
 - (i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
 - (ii) the summation of the prices.

F.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

F.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

- (a) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
- (a) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

F.3.10 Clarification of a tender offer

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

F.3.10 Evaluation of tender offers

F.3.10.1 General

Appoint an evaluation panel of not less than three persons. Reduce each responsive tender offer to a comparative offer and evaluate them using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

F.3.10.2 Method 1: Financial Offer

In the case of a financial offer:

- (a) Rank tender offers from the most favourable to the least favourable comparative offer.
- (a) Recommend the highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- (b) Re-rank all tenderers should there be compelling and justifiable reasons not to recommend the highest ranked tenderer and recommend the highest ranked tenderer, unless there are compelling and justifiable reasons not to do so and the process set out in this subclause is repeated.

F.3.10.3 Method 2: Financial offer and preference

In the case of a financial offer and preferences:

- (a) Score each tender in respect of the financial offer made and preferences claimed, if any, in accordance with the provisions of F.3.11.7 and F.3.11.8.
- (a) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_{EV} = N_{FO} + N_P$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;

N_P is the number of tender evaluation points awarded for specific goals in accordance with F.3.11.8.

- (b) Rank tender offers from the highest number of tender evaluation points to the lowest.
- (c) Recommend the tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.

- (d) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points, and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this sub-clause is repeated.

F.3.10.4 Method 3: Financial offer and quality

In the case of a financial offer and quality:

- (a) Score each tender in respect of the financial offer made and the quality offered in accordance with the provisions of F.3.11.7 and F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- (a) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula:

$$T_{EV} = N_{FO} + N_Q$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;

N_Q is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- (b) Rank tender offers from the highest number of tender evaluation points to the lowest.
- (c) Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- (d) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this sub-clause is repeated.

F.3.10.5 Method 4: Financial offer, quality and preferences

In the case of a financial offer, quality and preferences:

- (a) Score each tender in respect of the financial offer made, specific goals claimed, if any, and the quality offered in accordance with the provisions of F.3.11.7 to F.3.11.9, rejecting all tender offers that fail to score the minimum number of points for quality stated in the tender data, if any.
- (a) Calculate the total number of tender evaluation points (T_{EV}) in accordance with the following formula, unless otherwise stated in the Tender Data:

$$T_{EV} = N_{FO} + N_P + N_Q$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer made in accordance with F.3.11.7;

N_P is the number of tender evaluation points awarded for specific goals claimed in accordance with F.3.11.8.

N_Q is the number of tender evaluation points awarded for quality offered in accordance with F.3.11.9.

- (b) Rank tender offers from the highest number of tender evaluation points to the lowest.
- (c) Recommend the tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
- (d) Rescore and re-rank all tenderers should there be compelling and justifiable reasons not to recommend the tenderer with the highest number of tender evaluation points and recommend the tenderer with the highest number of tender evaluation points, unless there are compelling and justifiable reasons not to do so and the process set out in this sub-clause is repeated.

F.3.10.6 Decimal places

Score financial offers, preferences and quality, as relevant, to two decimal places.

F.3.10.7 Scoring Financial Offers

Score the financial offers of remaining responsive tender offers using the following formula:

$$NFO = W_1 \times A$$

where: N_{FO} is the number of tender evaluation points awarded for the financial offer.

W_1 is the maximum possible number of tender evaluation points awarded for the financial offer as stated in the Tender Data.

A is a number calculated using the formula and option described in Table F.1 as stated in the Tender Data.

Table F.1: Formulae for calculating the value of A

(c) Formula	(d) Comparison aimed at achieving	(e) Option 1 ^a	(f) Option 2 ^a
(g) 1	(h) Highest price or discount	(i) $A = (1 + (\frac{P-P_m}{P_m}))$ (j) P_m	(k) $A = P / P_m$
(l) 2	(m) Lowest price or percentage (n) commission / fee	(o) $A = (1 - (\frac{P-P_m}{P_m}))$ (p) P_m	(q) $A = P_m / P$
(r) a (s)	P_m is the comparative offer of the most favourable comparative offer. P is the comparative offer of the tender offer under consideration.		

F.3.10.8 Scoring preferences

Confirm that tenderers are eligible for the preferences claimed in accordance with the provisions of the tender data and reject all claims for preferences where tenderers are not eligible for such preferences. Calculate the total number of tender evaluation points for preferences claimed in accordance with the provisions of the tender data.

F.3.10.9 Scoring quality

Score each of the criteria and sub-criteria for quality in accordance with the provisions of the Tender Data.

Calculate the total number of tender evaluation points for quality using the following formula:

$$N_Q = W_2 \times S_O / M_S$$

where: S_O is the score for quality allocated to the submission under consideration;

M_S is the maximum possible score for quality in respect of a submission; and

W_2 is the maximum possible number of tender evaluation points awarded for the quality as stated in the tender data

F.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and/or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

F.3.12 Acceptance of tender offer

Accept the tender offer, if in the opinion of the employer, it does not present any unacceptable commercial risk and only if the tenderer:

- (a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement,
- (a) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
- (b) has the legal capacity to enter into the contract,
- (c) is not insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,
- (d) complies with the legal requirements, if any, stated in the tender data, and
- (e) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

F.3.13 Prepare contract documents

F.3.13.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

- (a) addenda issued during the tender period,
- (b) inclusion of some of the returnable documents, and
- (c) other revisions agreed between the employer and the successful tenderer.

F.3.13.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

F.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

F.3.15 Notice to unsuccessful tenderers

F.3.15.1 Notify the successful tenderer of the employer's acceptance of his tender offer by completing and returning one copy of the form of offer and acceptance before the expiry of the validity period stated in the tender data, or agreed additional period.

F.3.15.2 After the successful tenderer has been notified of the employer's acceptance of the tender, notify other tenderers that their tender offers have not been accepted.

F.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

F.3.17 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender, but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

T2.1: LIST OF RETURNABLE DOCUMENTS

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	G494/2023

1. RETURNABLE SCHEDULES REQUIRED FOR TENDER EVALUATION PURPOSES

Tender document name	Number of pages issued	Returnable document
Resolution of Board of Directors (T2.1.01)	1 Page	☒ Yes ☐ No
Resolution of Board of Directors to enter into consortia or JV's (T2.1.02) (If Applicable)	2 Pages	☒ Yes ☐ No
Special Resolution of Consortia or JV's (T2.1.03) (If Applicable)	3 Pages	☒ Yes ☐ No
Schedule of proposed sub-contractors (T2.1.04)	1 Page	☒ Yes ☐ No
Capacity of Tenderer (T2.1.05)	3 Pages	☒ Yes ☐ No
Preference points claim form in terms of the Preferential Procurement Regulations 2022 (T2.1.06)	6 Pages	☒ Yes ☐ No
Resources to be employed in terms of organization and staffing (T2.1.07)	2 Pages	☒ Yes ☐ No
Estimated Monthly Expenditure (T2.1.08)	1 Page	☒ Yes ☐ No
Unemployment Insurance Fund (UIF) (Clause F2.23)		☒ Yes ☐ No
Compensation of Occupational Injuries and Disease Act (COIDA) (Clause F.2.23)		☒ Yes ☐ No

2. OTHER DOCUMENTS REQUIRED FOR TENDER EVALUATION PURPOSES

Tender document name	Number of pages issued	Returnable document
Bidders Disclosure (T2.1.10)	1 Page	☐ Yes ☒ No
Medical Certificate for the confirmation of permanent disabled status (T2.1.11)	1 Page	☒ Yes ☐ No
Proof of registration with Construction Industry Development Board (T2.1.12)	1 Page	☒ Yes ☐ No
A copy of the Central Suppliers Database Registration Report or registration number (T2.1.13)	3 Pages	☒ Yes ☐ No
Financial reference (T2.1.14)	1 Page	☒ Yes ☐ No
Proof of Liability Insurance (T2.1.22)	1 Page	☒ Yes ☐ No
Equipment Datasheets (T2.1.20)	1 Page	☒ Yes ☐ No

3. RETURNABLE SCHEDULES THAT WILL BE INCORPORATED INTO THE CONTRACT

Tender document name	Number of pages issued	Returnable document
Record of Addenda to tender documents (T2.1.15)	1 Page	☒ Yes ☐ No
Compulsory Enterprise Questionnaire (T2.1.16)	3 Pages	☒ Yes ☐ No

4. OTHER DOCUMENTS THAT WILL BE INCORPORATED INTO THE CONTRACT

Tender document name	Number of pages issued	Returnable document
Applicable Form of Guarantee	3 Pages	☒ Yes ☐ No
Priced Bill of Quantities	Pages	☒ Yes ☐ No

C1.1 Offer portion of Form of Offer and Acceptance
C1.2 Contract Data (Part 2)
C1.3 Form of Guarantee

RETURNABLE DOCUMENT CHECKLIST

This form has been created as an aid to ensure a tenderer's compliance with the completion of the returnable schedules and subsequent placement in the correct **Technical** and **Financial** envelopes.

A TECHNICAL ENVELOPE (1 COPY)

Reference No	Document Description	Tick if completed
T2.1.01	Resolution of Board of Directors	
T2.1.02	Resolution of Board of Directors to enter into consortia or JV's (If Applicable)	
T2.1.03	Special Resolution of Consortia or JV's (If Applicable)	
T2.1.04	Schedule of proposed sub-contractors	
T2.1.05	Capacity of Tenderer	
T2.1.06	Preference points claim form in terms of the Preferential Procurement Regulations 2022	
T2.1.07	Resources to be employed in terms of organization and staffing	
T2.1.09	Site Inspection Certificate	
T2.1.10	Bidders Disclosure	
T2.1.11	Medical Certificate for the confirmation of permanent disabled status	
T2.1.12	Proof of registration with Construction Industry Development Board (T2.1.12)	
T2.1.13	Original Valid Tax Clearance Certificate	
T2.1.14	CSD Registration Certificate	
T2.1.15	Financial Reference	
T2.1.16	Record of Addenda to Tender Documents	
T2.1.17	Compulsory Enterprise Questionnaire	
T2.1.18	Compensation of Occupational Injuries and Disease Act (COIDA)	
T2.1.22	Proof of Liability Insurance	
SBD 9	Certificate of Independent Quotation Determination	

B FINANCIAL ENVELOPE (ORIGINAL DOCUMENT)

The entire original tender document must be submitted in this envelope including the forms as listed below:

Reference No	Document Description	Tick if completed
Form C1.1	Form of Offer and Acceptance	
Form C1.2	Contract Data – Part 1	
Form C2.2	Priced Bill of Quantities	
Form T2.1.08	Estimated Monthly Expenditure	

PART T: THE TENDER

Part T2: Returnable Documents

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	G494/2023

T2.2 Returnable documents/Schedules

T2.1.01: RESOLUTION OF BOARD OF DIRECTORS

RESOLUTION of a meeting of the Board of *Directors / Members / Partners of:

.....
.....
(Legally correct full name and registration number, if applicable, of the Enterprise)

Held at (place)

On (date)

RESOLVED that:

1. The Enterprise submits a Bid / Tender to the South African National Biodiversity Institute in respect of the following project:

.....
.....
(Project description as per Bid / Tender Document)

Bid / Tender Number: (Bid / Tender Number as per Bid / Tender Document)

2. *Mr/Mrs/Ms:

in *his/her Capacity as: (Position in the Enterprise)

and who will sign as follows:

be, and is hereby, authorised to sign the Bid / Tender, and any and all other documents and/or correspondence in connection with and relating to the Bid / Tender, as well as to sign any Contract, and any and all documentation, resulting from the award of the Bid / Tender to the Enterprise mentioned above.

	Name	Capacity	Signature
1			
2			
3			
4			

Note:

1. * Delete which is not applicable
2. **NB.** This resolution must be signed by all the Directors / Members / Partners of the Bidding Enterprise.
3. Should the number of Directors / Members/Partners exceed the space available above, additional names and signatures must be supplied on a separate page.

ENTERPRISE STAMP

T2.1.02: RESOLUTION OF BOARD OF DIRECTORS TO ENTER INTO CONSORTIA OR JOINT VENTURES

RESOLUTION of a meeting of the Board of *Directors / Members / Partners of:

.....
.....
(Legally correct full name and registration number, if applicable, of the Enterprise)

Held at (place)

On (date)

RESOLVED that:

1. The Enterprise submits a Bid /Tender, in consortium/Joint Venture with the following Enterprises:

.....
.....
(List all the legally correct full names and registration numbers, if applicable, of the Enterprises forming the Consortium/Joint Venture)

to the South African National Biodiversity Institute in respect of the following project:

.....
.....
(Project description as per Bid /Tender Document)

Bid / Tender Number: (Bid / Tender Number as per Bid / Tender Document)

2. *Mr/Mrs/Ms:

in *his/her Capacity as: (Position in the Enterprise)

and who will sign as follows:

be, and is hereby, authorised to sign a consortium/joint venture agreement with the parties listed under item 1 above, and any and all Other documents and/or correspondence in connection with and relating to the consortium/joint venture, in respect of the project described under item 1 above.

3. The Joint Venture formation/arrangement will be in the following proportions:

Name of Contractor	Proportion (%)

4. The Enterprise accepts joint and several liability with the parties listed under item 1 above for the due fulfilment of the obligations of the joint venture deriving from, and in any way connected with, the Contract to be entered into with the Employer in respect of the project described under item 1 above.
5. The Enterprise chooses as its *domicilium citandi et executandi* for all purposes arising from this joint venture agreement and the Contract with the Employer in respect of the project under item 1 above:

Physical address:.....

.....

.....(code)

Postal address:.....

.....

.....(code)

Telephone number:(code)

Fax number:(code)

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Note:

1. * Delete which is not applicable.
2. **NB.** This resolution must be signed by all the Directors / Members / Partners of the Bidding Enterprise.
3. Should the number of Directors / Members / Partners exceed the space available above, additional names and signatures must be supplied on a separate page.

ENTERPRISE STAMP

T2.1.03: SPECIAL RESOLUTION OF CONSORTIA OR JOINT VENTURES

RESOLUTION of a meeting of the duly authorised representatives of the following legal entities who have entered into a consortium/joint venture to jointly bid for the project mentioned below: *(legally correct full names and registration numbers, if applicable, of the Enterprises forming a Consortium/Joint Venture)*

1.
.....
2.
.....
3.
.....
4.
.....
5.
.....
6.
.....
7.
.....
8.
.....

Held at (place)

On (date)

RESOLVED that:

- A. The above-mentioned Enterprises submit a Bid in Consortium/Joint Venture to the South African National Biodiversity Institute in respect of the following project:

.....
.....
(Project description as per Bid /Tender Document)

Bid / Tender Number: *(Bid / Tender Number as per Bid / Tender Document)*

*Mr/Mrs/Ms:

in *his/her Capacity as: (*Position in the Enterprise*)

and who will sign as follows:

be, and is hereby, authorised to sign the Bid, and any and all other documents and/or correspondence in connection with and relating to the Bid, as well as to sign any Contract, and any and all documentation, resulting from the award of the Bid to the Enterprises in Consortium/Joint Venture mentioned above.

- B. The Enterprises constituting the Consortium/Joint Venture, notwithstanding its composition, shall conduct all business under the name and style of:
- C. The Enterprises to the Consortium/Joint Venture accept joint and several liabilities for the due fulfilment of the obligations of the Consortium/Joint Venture deriving from, and in any way connected with, the Contract entered into with the Employer in respect of the project described under item A above.
- D. Any of the Enterprises to the Consortium/Joint Venture intending to terminate the consortium/joint venture agreement, for whatever reason, shall give the Employer 30 day's written notice of such intention. Notwithstanding such decision to terminate, the Enterprises shall remain jointly and severally liable to the Employer for the due fulfilment of the obligations of the Consortium/Joint Venture as mentioned under item D above.
- E. No Enterprise to the Consortium/Joint Venture shall, without the prior written consent of the other Enterprises to the Consortium/Joint Venture and of the Employer, cede any of its rights or assign any of its obligations under the consortium/joint venture agreement in relation to the Contract with the Employer referred to herein.
- F. The Enterprises choose as the *domicilium citandi et executandi* of the Consortium/Joint Venture for all purposes arising from the consortium/joint venture agreement and the Contract with the Employer in respect of the project under item A above:

Physical address:

.....

..... (code)

Postal address:

.....

..... (code)

Telephone number: (code)

Fax number: (code)

South African National Biodiversity Institute

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

	Name	Capacity	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Note:

1. * Delete which is not applicable.
2. **NB.** This resolution must be signed by all the Duly Authorised Representatives of the Legal Entities to the Consortium Joint Venture submitting this Bid.
3. Should the number of Duly Authorised Representatives of the Legal Entities joining forces in this Bid exceed the space available above, additional names and signatures must be supplied on a separate page.
4. Resolutions, duly completed and signed, from the separate Enterprises who participate in this Consortium/Joint Venture must be attached to the Special Resolution.

T2.1.04: SCHEDULE OF PROPOSED SUBCONTRACTORS

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	G494/2023

We notify you that it is our intention to employ the following Subcontractors for work in this contract.

If we are awarded a contract we agree that this notification does not change the requirement for us to submit the names of proposed Subcontractors in accordance with requirements in the contract for such appointments. If there are no such requirements in the contract, then your written acceptance of this list shall be binding between us.

	Name and address of proposed Subcontractor	Nature and extent of work	Previous experience with Subcontractor
1			
2			
3			
4			

Name of representative	Signature	Capacity	Date

Name of organisation:	
------------------------------	--

T2.1.05: CAPACITY OF TENDERER

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	G494/2023

1. WORK CAPACITY: *(The Tenderer is requested to furnish the following particulars, attach additional pages if more space is required. Failure to furnish the particulars may result in the Tender being disregarded.)*

Skilled artisans employed		Unskilled employees employed	
Categories of artisans	Number	Categories of employees	Number

1.1. Provide full particulars of:

Machinery	Plant	Workshops

2. PARTICULARS OF COMMITMENTS WHICH THE TENDERER HAS PREVIOUSLY COMPLETED AND PRESENTLY ENGAGED WITH:

2.1. Current projects:

Project		Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencem ent	Scheduled date of completion
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

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2.2. Previous projects:

Project	Place (town)	Reference / Contact person	Contact Tel. No.	Contract amount	Contract period	Date of commencement	Scheduled date of completion	Actual date of completion
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
Name of Tenderer		Signature			Date			

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words "Tender" or "Tenderer".

T2.1.06: PREFERENCE POINT SYSTEM

SBD 6.1

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to invitations to tender:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 To be completed by the organ of state

(delete whichever is not applicable for this tender).

- a) The applicable preference point system for this tender is the **90/10** preference point system.
- b) The applicable preference point system for this tender is the **80/20** preference point system.
- c) Either the **90/10 or 80/20 preference point system** will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

1.3 Points for this tender (even in the case of a tender for income-generating contracts) shall be awarded for:

- (a) Price; and
- (b) Specific Goals.

1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS	20
Total points for Price and SPECIFIC GOALS	100

- 1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.
- 1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

- (a) **“tender”** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;
- (b) **“price”** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;
- (c) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;
- (d) **“tender for income-generating contracts”** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and
- (e) **“The Act”** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.1.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:

80/20	or	90/10
$Ps = 80 \left(1 - \frac{Pt - P_{min}}{P_{min}} \right)$	or	$Ps = 90 \left(1 - \frac{Pt - P_{min}}{P_{min}} \right)$
Where		
Ps	=	Points scored for price of tender under consideration
Pt	=	Price of tender under consideration
Pmin	=	Price of lowest acceptable tender

4. POINTS AWARDED FOR SPECIFIC GOALS

- 4.1. In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:
- 4.2. In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—
- (a) An invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or
 - (b) Any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,
- Then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.

Note to tenderers: The tenderer must indicate how they claim points for each preference point system.)

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of points claimed (80/20 system) (To be completed by the tenderer)
Categories of persons historically disadvantaged by unfair discrimination on the basis of race. Information will be verified on the CSD report. Points will be allocated based on the percentage of ownership per goal Black Ownership = 10 Points		(10)		

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Categories of persons historically disadvantaged by unfair discrimination on the basis of gender. Information will be verified on the CSD report. Points will be allocated based on the percentage of ownership per goal Female Ownership = 10 Points		(10)		
Total		20		

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm.....

4.4. Company registration number:

4.5. TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
- ☐ One-person business/sole propriety
- ☐ Close corporation
- ☐ Public Company
- ☐ Personal Liability Company
- ☐ (Pty) Limited
- ☐ Non-Profit Company
- ☐ State Owned Company

[TICK APPLICABLE BOX]

4.6. I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/ firm for the preference(s) shown and I acknowledge that:

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;
- iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –
 - (a) disqualify the person from the tendering process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

- (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
- (d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and
- (e) forward the matter for criminal prosecution, if deemed necessary.

.....
SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME:

.....

DATE:

.....

ADDRESS:

.....

.....

.....

.....

The Tenderer shall list below the key personnel (including first nominee and the second choice alternate), whom he proposes to employ on the Contract should his tender be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities.

[illegible]

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[illegible]

Any reference to words "Bid" or Bidder herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

T2.1.08: ESTIMATED MONTHLY EXPENDITURE

The Tenderer shall state below the estimated value of work to be completed every month, based on his preliminary programme and his tendered unit rates.

The amounts for contingencies and Contract Price Adjustment must not be included ***OR** The amount for contingencies must not be included.

MONTH	VALUE
1	R
2	R
3	R
4	R
5	R
6	R
7	R
8	R
9	R
	COMPLETION OF CONTRACT
TOTAL	R

T2.1.10: Bidders Disclosure

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
CONTRACT NO:	SANBI G494/2023

1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

2. Bidder's declaration

- 2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest¹ in the enterprise, employed by the state? **YES/NO**

- 2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

- 2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

¹ the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

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2.2.1 If so, furnish particulars:

.....
.....

2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract?

YES/NO

2.3.1 If so, furnish particulars:

.....
.....

3 DECLARATION

I, the undersigned, (name)..... in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium² will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 3.6 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

² Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

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THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS

OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING

AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD

THIS DECLARATION PROVE TO BE FALSE.

.....

Signature

.....

Date

.....

Position

.....

Name of bidder

T2.1.11: MEDICAL CERTIFICATE FOR THE CONFIRMATION OF PERMANENT DISABLED STATUS

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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I, _____ (*surname and name*), Identity number, _____ do hereby declare that I am a registered medical practitioner, with my practice number being _____, practicing at _____
_____(Physical and postal addresses) declare that I have examined

Mr/Mrs _____, identity number of _____ and have found the said person to be permanently disabled or having a recurring disability.

“Disability” means, in respect of a person, a permanent impairment of a physical, intellectual, or sensory function, which results in restricted, or lack of, ability to perform an activity in the manner, or within the range, considered normal for a human being.” – As per Preferential Procurement Policy Framework Act: No 5 of 2000 (PPPFA)

The nature of the disability is as follows:

Thus signed at _____ on this day of _____ of _____.

Signature Date

OFFICIAL STAMP OF
MEDICAL PRACTITIONER

T2.1.12: PROOF OF REGISTRATION WITH CONSTRUCTION INDUSTRY DEVELOPMENT BOARD

The Tenderer shall provide a printed copy of the Active Contractor's Listing off the CIDB website. (www.cidb.org.za). In the case of a joint venture, a printed copy of the Active Contractor's listing must be provided **for each member of the joint venture**.

Name of Contractor:

Contractor Grading Designation:

CIDB Contractor Registration Number:

T2.1.13: COPY OF CENTRAL SUPPLIERS DATABASE (CSD) REGISTRATION REPORT OR REGISTRATION NUMBER

A copy of CSD registration report or registration number must be included for evaluation purposes.

T2.1.14: FINANCIAL REFERENCES

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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Notes to tenderer:

1. The tenderer shall attach to this form a letter from the bank in which it is declared how he conducts his account. The contents of the bank's letter must state the credit rating that the bank, in addition to the information required below, accords to the tenderer for the business envisaged by this tender. Failure to provide the required letter with the tender submission may render the tenderer's offer unresponsive in terms of tender condition F3.8.
2. The tenderer's banking details as they appear below shall be completed.
3. In the event that the tenderer is a joint venture enterprise, details of all the members of the joint venture shall be similarly provided and attached to this form.

Details of Company's Bank

DESCRIPTION OF BANK DETAIL	BANK DETAILS APPLICABLE TO TENDERER'S HEAD OFFICE
Name of bank	
Branch name	
Branch code	
Street address	
Postal address	
Name of manager	
Telephone number	
Fax number	
Account number	

South African National Biodiversity Institute

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T2.1.15: RECORD OF ADDENDA TO TENDER DOCUMENTS

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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I / We confirm that the following communications received from the South African National Biodiversity Institute before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer: *(Attach additional pages if more space is required)*

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Name of Tenderer	Signature	Date

I / We confirm that no communications were received from the South African National Biodiversity Institute before the submission of this tender offer, amending the tender documents.

Name of Tenderer	Signature	Date

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

T2.1.16: COMPULSORY ENTERPRISE QUESTIONNAIRE

The following particulars must be furnished. In the case of a joint venture, separate enterprise questionnaires in respect of each partner must be completed and submitted.

Section 1: **Name of enterprise:**

Section 2: **VAT registration number, if any:**

Section 3: **CIDB registration number, if any:**

Section 4: **Particulars of sole proprietors and partners in partnerships**

Name*	Identity number*	Personal income tax number*

*Complete only if sole proprietor or partnership and attach separate page if more than 3 partners.

Section 5: **Particulars of companies and close corporations**

Company registration number:

Close corporation number:

Tax reference number:

Section 6: **Record in the service of the state**

Indicate by marking the relevant boxes with a cross, if any sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently, or has been within the last 12 months, in the service of any of the following:

☐ a member of any municipal council	☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No 1 of 1999)
☐ a member of any provincial legislature	☐ a member of an accounting authority of any national or provincial public entity
☐ a member of the National Assembly or the National Council of Province	☐ an employee of Parliament or a provincial legislature
☐ a member of the board of directors of any municipal entity	
☐ an official of any municipality or municipal entity	

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If any of the above boxes are marked, disclose the following:

Name of sole proprietor, partner, director, manager, principal shareholder or stakeholder	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*Insert separate page if necessary.

Section 7: Record of spouses, children and parents in the service of the state

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent or a sole proprietor, partner in a partnership or director, manager, principal shareholder or stakeholder in a company or close corporation is currently, or has been within the last 12 months, in the service of any of the following:

☐ a member of any municipal council ☐ a member of any provincial legislature ☐ a member of the National Assembly or the National Council of Province ☐ a member of the board of directors of any municipal entity ☐ an official of any municipality or municipal entity	☐ an employee of any provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No 1 of 1999) ☐ a member of an accounting authority of any national or provincial public entity ☐ an employee of Parliament or a provincial legislature
--	--

Name of spouse, child or parent	Name of institution, public office, board or organ of state and position held	Status of service (tick appropriate column)	
		Current	Within last 12 months

*Insert separate page if necessary.

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The undersigned, who warrants that he/she is duly authorised to do so on behalf of the enterprise:

- (i) authorises the Employer to obtain a tax clearance certificate from the South African Revenue Services that my/our tax matters are in order;
- (ii) confirms that neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act, 2004;
- (iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise, has within the last five years been convicted of fraud or corruption;
- (iv) confirms that I/we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the Tenderers or those responsible for compiling the Scope of Work that could cause or be interpreted as a conflict of interest; and
- (v) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

Signed: Date:

Name: Position:

Enterprise name:

T2.1.18: COMPENSATION OF OCCUPATIONAL INJURIES AND DISEASE ACT (COIDA)

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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Letter of Good Standing from the office of the Compensation Commissioner as required by the Compensation for Occupational Injuries and Diseases Act (COIDA) must be included for evaluation purposes. The letter should be issued by the Department of Labour.

South African National Biodiversity Institute

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

T2.1.22: PROOF OF LIABILITY INSURANCE

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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The tender shall append their Proof of Liability Insurance behind this page.

SBD 9

CERTIFICATE OF INDEPENDENT QUOTATION DETERMINATION

1. This Standard Bidding Document (SBD) must form part of all quotations¹ invited.
2. Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive Bidding (or Bid rigging) ² Collusive Bidding is a *per se* prohibition meaning that it cannot be justified under any grounds.
3. Treasury Regulation 16A9 prescribes that accounting officers and accounting authorities must take all reasonable steps to prevent abuse of the supply chain management system and authorizes accounting officers and accounting authorities to:
 - a. Disregard the Bid of any Bidder if that Bidder, or any of its directors have abused the institution's supply chain management system and or committed fraud or any other improper conduct in relation to such system.
 - b. Cancel a contract awarded to a supplier of goods and services if the supplier committed any corrupt or fraudulent act during the Bidding process or the execution of that contract.
4. This SBD serves as a certificate of declaration that would be used by institutions to ensure that, when Bids are considered, reasonable steps are taken to prevent any form of Bid-rigging.
5. In order to give effect to the above, the attached Certificate of Bid Determination (SBD 9) must be completed and submitted with the Bid:

¹ Includes price quotations, advertised competitive Bids, limited Bids and proposals.

² Bid rigging (or collusive Bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a Bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying Bid:

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE – CONTRACT G494/2023

In response to the invitation for the quote made by:

SOUTH AFRICAN NATIONAL BIODIVERSITY CONSERVATION CENTRE (SANBI)

Do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of: _____ that:

(Name of Bidder)

1. I have read and I understand the contents of this Certificate.
 2. I understand that the accompanying Bid will be disqualified if this Certificate is found not to be true and complete in every respect.
 3. I am authorized by the Bidder to sign this Certificate, and to submit the accompanying Bid, on behalf of the Bidder.
 4. Each person whose signature appears on the accompanying Bid has been authorized by the Bidder to determine the terms of, and to sign the Bid, on behalf of the Bidder.
 5. For the purposes of this Certificate and the accompanying Bid, I understand that the word “competitor” shall include any individual or organization, other than the Bidder, whether or not affiliated with the Bidder, who:
 - (a) Has been requested to submit a Bid in response to this Bid invitation.
 - (b) Could potentially submit a Bid in response to this Bid invitation, based on their qualifications, abilities or experience; and
 - (c) Provides the same goods and services as the Bidder and/or is in the same line of business as the Bidder
 6. The Bidder has arrived at the accompanying Bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium³ will not be construed as collusive Bidding.
 7. In particular, without limiting the generality of paragraphs 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
 - (a) Prices.
 - (b) Geographical area where product or service will be rendered (market allocation).
 - (c) Methods, factors or formulas used to calculate prices.
 - (d) The intention or decision to submit or not to submit, a Bid.
 - (e) The submission of a Bid which does not meet the specifications and conditions of the Bid; or
 - (f) Bidding with the intention not to win the Bid.
 8. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this Bid invitation relates.
- ³ **Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.**
9. The terms of the accompanying Bid have not been, and will not be, disclosed by the Bidder, directly or indirectly, to any competitor, prior to the date and time of the official Bid opening or of the awarding of the contract.
 10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to Bids and contracts, Bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No. 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

.....
Signature

.....
Date

.....
Position

.....
Name of Bidder

Any reference to words “Bid” or Bidder” herein and/or in any other documentation shall be construed to have the same meaning as the words: “Tender” or “Tenderer”.

C1.1: FORM OF OFFER AND ACCEPTANCE

PROJECT TITLE:	THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE
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The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract for THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE

The tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto as listed in the Returnable Schedules, and by submitting this Offer has accepted the Conditions of Tender.

The tenderer, identified in the Offer signature block, has examined the draft contract as listed in the Acceptance section and agreed to provide this Offer.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the **Contractor** under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the Contract Data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VAT IS:

(in words)

.....Rand;

R..... (in figures)

THE OFFERED PRICES ARE AS STATED IN THE PRICING SCHEDULE

This Offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the **Contractor** in the conditions of contract identified in the Contract Data.

Signature(s)

Name(s)

Capacity

For the tenderer:

.....
(Insert name and address of organisation)

Name & signature of

Witness

Date

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

Acceptance

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the conditions of contract identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the Employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the Contract are contained in

Part C1	Agreements and Contract Data <i>[which includes this Agreement]</i>
Part C2	Pricing Data
Part C3	Scope of Work
Part C4	Site Information

and drawings and documents or parts thereof, which may be incorporated by reference into Parts C1 to C4 above.

Deviations from and amendments to the documents listed in the Tender Data and any Addenda thereto listed in the Tender Schedules, as well as any changes to the terms of the Offer agreed by the Tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Agreement. No amendments to or deviations from the said documents are valid unless contained in this Schedule, which must be duly signed by the authorised representative(s) of both parties.

The Tenderer shall within the time required to submit documentation in accordance with clause 5.3.2 of the Contract Data (C1.2) after receiving a completed copy of this Agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the Conditions of Contract identified in the Contract Data at, or just after, the date this Agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this Agreement.

Notwithstanding anything contained herein, this Agreement comes into effect on the date when the Tenderer receives one fully completed original copy of this document, including the Schedule of Deviations (if any). Unless the Tenderer (now Contractor) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this Agreement, this Agreement shall constitute a binding Contract between the parties.

Signature(s)

Name(s)

Capacity

**For the
Employer:**

.....

.....
(Insert name and address of organisation)

Name &
signature of
witness

Date

.....

Schedule of Deviations

1 Subject

Details

.....

.....

.....

2 Subject

Details

.....

.....

.....

3 Subject

Details

.....

.....

.....

4 Subject

Details

.....

.....

.....

5 Subject

Details

.....

.....

.....

By the duly authorised representatives signing this Schedule of Deviations, the Employer and the Tenderer agree to and accept the foregoing Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and Addenda thereto as listed in the Tender Schedules, as well as any confirmation, clarification or change to the terms of the offer agreed by the Tenderer and the Employer during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the Tender Documents and the receipt by the Tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the Contract between the parties arising from this Agreement.

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

FOR THE TENDERER:

Signature(s) _____
Name(s) _____
Capacity _____

[Name and address of organisation]

Name and
signature of
witness _____ Date _____

FOR THE EMPLOYER:

Signature(s) _____
Name(s) _____
Capacity _____

[Name and address of organisation]

Name and
signature of
witness _____ Date _____

CONFIRMATION OF RECEIPT

The Tenderer (now Contractor), identified in the Offer part of this Agreement, hereby confirms receipt from the Employer, identified in the Acceptance part of this Agreement, of one fully completed original copy of this Agreement, including the Schedule of Deviations (if any) today:

The *[day]*

of *[month]*

20 *[year]*

at *[place]*

For the Contractor:
Signature
.....
Name
.....
Capacity

Signature and name of witness:
Signature
.....
Name

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

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C.1.2 Contract Data

The Conditions of Contract are the *General Conditions of Contract for Construction Works (Second Edition, 2010)* published by the South African Institution of Civil Engineering. Copies of these conditions of contract may be obtained from the South African Institution of Civil Engineering (Tel: 011-805 5947).

Each item of data given below is cross-referenced to the clause in the Conditions of Contract to which it mainly applies.

Part 1: Data provided by the Employer

Clause	Data
1.1.1.13	Clause 1.1.1.13: Defects Liability Period The Defects Liability Period is 12 months , measured from the date of the Certificate of Completion
1.1.1.14	Clause 1.1.1.14: Due Completion Date The time for achieving Practical Completion is nine (9) months after the Commencement Date
1.1.1.15	The name of the Employer is The South African National Biodiversity Institute , represented by Mr C. Willis and/or such persons or person duly authorised thereto be the Employer in writing.
1.2.1.2	The Employer's address for receipt of communications is: Delivery Address: Attention: Deputy Director: Supply Chain Management Biodiversity Centre Pretoria National Botanical Garden 2 Cussonia Avenue, Brummeria, Pretoria Postal Address: Attention: Deputy Director: Supply Chain Management The South African National Biodiversity Institute Private Bag X101 Silverton, 0184
1.1.1.16	The name of the Engineer is Ukhukhula Holdings (Pty) Ltd
1.2.1.2	The address of the Engineer is: Ukhukhula Holdings (Pty) Ltd 117 Strand Street Cape Town, 8000 Tel: 082 335 0535 Email: joan@ukhukhula.com

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

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1.1.1.26	Clause 1.3.: Pricing Strategy The Pricing Strategy is a re-measurement contract
3.1.3	Clause 3.1.3: Specific Approval of the Employer Required The Engineer is required to obtain the specific approval of the Employer before executing any of the following functions or duties: 1 Clause 6.3: Variations 2 Clause 5.11.1: Suspension of the Works 3 Clause 5.12: Extension of Time for Practical Completion
5.3.1	Clause 5.3.1: Commencement of the Works The documentation required before commencement with Works execution are: Health and Safety Plan (Refer to Clause 4.3) Initial programme (Refer to Clause 5.6) Security (Refer to Clause 6.2) Insurance (Refer to Clause 8.6) Cash flow projection
5.3.2	Clause 5.3.2: Timeframe to deliver documentation The time to submit the documentation required before commencement with Works execution is twenty-eight (28) days.
5.4.2	The access and possession of Site shall not be exclusive to the Contractor but as set out in the Site Information.
5.8.1	Clause 5.8.1: Non-Working Times The non-working days are Saturdays and Sundays. The special non-working days are: 1. All gazetted public holidays falling outside the year end break. 1. The year-end break commencing on 14 December 2023 and ending on 14 January 2024 (Provisional).
5.12.2.	Clause 5.12.2.: Some reasons for extension of time Clause 5.12.2.2: Abnormal climatic conditions. <i>Add the following:</i> Regardless of the cause of any delay an extension of time will only be considered if it can be shown that the activity delayed is on the critical path indicated on the Programme of Works (Clause 5.6.1). No extension of time will be granted in respect of any delays attributed to normal climatic conditions. Normal Climatic Conditions shall be deemed to include normal rainfall and associated wet conditions and materials, strong winds and extremes of temperature. However, in the event that delays to critical activities exceed the number of working days listed below for each month, then abnormal climatic conditions shall be deemed to exist, and an extension of time shall be granted in accordance with the provisions of that Clause.

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THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

VARCO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CALE - Contract: 0454/2020

	The number of days quoted below shall be regarded as a fair estimate of the delays to be anticipated and allowed for under normal climatic conditions where inclement weather prevents or disrupts work on the critical path. <table><tr><td>January</td><td>2 days</td><td>May</td><td>2 days</td><td>September</td><td>4 days</td></tr><tr><td>February</td><td>2 days</td><td>June</td><td>4 days</td><td>October</td><td>2 days</td></tr><tr><td>March</td><td>2 days</td><td>July</td><td>4 days</td><td>November</td><td>2 days</td></tr><tr><td>April</td><td>2 days</td><td>August</td><td>4 days</td><td>December</td><td>2 days</td></tr></table> Claims for delays for abnormal climatic conditions shall be accompanied by substantiating facts and evidence, which shall be submitted timeously as each day or half-day delay is experienced. Should an extension of time be granted by the Engineer such extension of time will be added to the Time for Completion. It shall be further noted that where the critical path is not affected, no extension of time for <u>abnormal</u> climatic conditions or for any other reason will be entertained. Rainfall of 10mm or less per day shall be deemed to be normal climatic conditions.	January	2 days	May	2 days	September	4 days	February	2 days	June	4 days	October	2 days	March	2 days	July	4 days	November	2 days	April	2 days	August	4 days	December	2 days
January	2 days	May	2 days	September	4 days																				
February	2 days	June	4 days	October	2 days																				
March	2 days	July	4 days	November	2 days																				
April	2 days	August	4 days	December	2 days																				
5.13.1	Clause 5.13.1: Penalty for Delay The penalty for failing to complete the Works is R 1,500.00 per day.																								
5.16.3	Clause 5.16.3: Latent defect liability The latent defect period is ten (10) years for civil engineering works.																								
6.2	Clause 6.2: Security The Form of Guarantee is to contain the wording of the pro-forma document as per the contract document. The liability of the guarantee shall be for 10% of the Approved Contract Sum.																								
6.8.2	Clause 6.8.2: Contract Price Adjustment Contract Price Adjustment: Is not applicable																								
6.8.3	Clause 6.8.3: Variation in Cost of Special Materials Price adjustments for variations in the costs of special materials are not allowed																								
6.10.1.5	Clause 6.10.1.5: Interim Payments - Materials on Site No percentage advance on materials on site but not yet built into the Permanent Works is allowed for, or will be paid.																								
6.10.3	Clause 6.10.3: Retention Money The percentage retention on the amounts due to the Contractor is 10% (ten percent). The limit of retention is 5% of the Contract Sum, including allowances for contingencies. This reduces to 2.5% upon the issue of the Certificate of Completion. The remaining 2.5% retention will be released upon the issue of the Final -Approval Certificate upon lapse of the defects liability period. Security plus Retention amount will not exceed 15% of the Contract Sum																								
6.10.4	Clause 6.10.4: Delivery, dissatisfaction with and payment of payment certificate <i>Replace “28 days” in the second last sentence with “30 days”</i>																								

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THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

6.10.6	Clause 6.10.6: Set-Off and Delayed Payments A guarantee <i>in lieu</i> of retention is not permitted.
6.10.6.2	Clause 6.10.6.2: Set-Off and Delayed Payments <i>Replace the words “prime overdraft rate certified by the Contractor’s banker” with the words “interest rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999), will apply”</i>
6.10.8	Clause 6.10.8: Contractor’s completion statement <i>Replace “28 days” in the last sentence with “30 days”</i>
6.10.9	Clause 6.10.9: Final payment certificate <i>Replace “28 days” in the last sentence with “30 days”</i>
6.12	Clause 6.12: Additional <i>Add Clause 6.12 as follows:</i> In respect of any amount owed by the Contractor to the Employer, the Contractor shall pay the Employer interest at the rate as determined by the Minister of Finance, from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No. 1 of 1999), will apply
8.6.1	Clause 8.6.1: Insurance <i>Add the following:</i> Damage to the Works (a) Without in any way limiting the Contractor’s obligations in terms of the Contract, the Contractor shall bear the full risk of damage to and/or destruction of the Works by whatever cause during construction of the Works and hereby indemnifies and holds harmless the Employer against any such damage. The Contractor shall take such precautions and security measures and other steps for the protection and security of the Works, as he may deem necessary. (a) The Contractor shall at all times proceed immediately to remove or dispose of any debris arising from damage to or destruction of the Works and to rebuild, restore, replace and/or repair the Works. (b) The Employer shall carry the risk of damage to or destruction of the Works and material paid for by the Employer that is the result, whether direct or indirect or proximate or remote, of the excepted risks as set out in Clause 8.6.2. (d) Where the Employer bears the risk in terms of this Contract, the Contractor shall, if requested to do so, reinstate any damage or destroyed portions of the Works and the costs of such reinstatement shall be measured and valued in terms of Clause 6.7 hereof. .
8.6.1.1.2	Clause 8.6.1.1.2: Insurance The value of the materials supplied by the Employer to be included in the insurance sum is -Nil.
8.6.1.1.3	Clause 8.6.1.1.3: Insurance The amount to cover professional fees for repairing damage and loss to be included in the insurance sum is -Nil.

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8.6.1.3	Clause 8.6.1.3: Insurance The limit of indemnity for liability insurance is R5 000 000.00 for any single claim – the number of claims to be unlimited during the construction.
8.6.1.5	Clause 8.6.1.5: Additional Insurance Additional Insurance is required for the following: a) Where the contract involves manufacturing and/or fabrication of the works or part thereof at premises other than the Site, the Contractor shall satisfy the Employer that all materials and equipment for incorporation in the works are adequately insured during manufacture and/or fabrication. In the event of the Employer having an insurable interest in such works during manufacture or fabrication then such interest shall be noted by endorsement to the Contractor's Policies of Insurance. a) The insurance policy held by the Contractor shall cover "wet risks" because a portion of the works will be in the confines of an existing river.
10.5, 10.6, 10.7	Clause 10.5, 10.6, 10.7: Dispute Resolution Dispute resolution shall be by Arbitration .
11	Clause 12: Confidentiality The Contractor shall treat the details of the Works comprised in this Contract as private and confidential (save in so far as may be necessary for the purposes hereof) and shall not publish or disclose the same or any particulars thereof in any trade or technical paper elsewhere without prior written consent of the Engineer.
12	Clause 13: Amendments in writing No amendments of this Contract or of any provisions or terms hereof and no waiver or relaxation or suspension of any of the provisions or terms of this Contract shall be of any force or effect unless reduced to writing and signed by both the parties hereto.

PART 2: DATA PROVIDED BY THE CONTRACTOR

Clause

1.1.1.9 The Contractor is

1.2.1.2 The Contractor's address for receipt of communications is:

Physical address:	Postal address:
.....	
.....	
.....	
.....	
Telephone:	
Fax:	
Email:.....	

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C1.3 FORM OF GUARANTEE

GUARANTOR DETAILS AND DEFINITIONS

"Guarantor" means:

Physical address:

"Employer" means:

"Contractor" means:

"Engineer" means:

"Works" means:

"Site" means:

"Contract" means: The Agreement made in terms of the Form of Offer and Acceptance and such amendments or additions to the Contract as may be agreed in writing between the parties.

"Contract Sum" means: The accepted amount inclusive of tax of R

Amount in words:

"Guaranteed Sum" means: The maximum aggregate amount of R.....

Amount in words:

"Expire Date" means:

CONTRACT DETAILS

Engineer issues: Interim Payment Certificates, Final Payment Certificate and the Certificate Completion of the Works as defined in the Contract.

PERFORMANCE GUARANTEE

- 1 The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.
- 2 The Guarantor's period of liability shall be from and including the date of issue of this Performance Guarantee and up to and including the Expiry Date or the date of issue by the Engineer of the Certificate of Completion of the Works or the date of payment in full of the Guaranteed Sum, whichever occurs first. The Engineer and/or the Employer shall advise the Guarantor in writing of the date on which the Certificate of Completion of the Works has been issued.
- 3 The Guarantor hereby acknowledge that:
 - 3.1 any reference in this Performance Guarantee to the Contract is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship;
 - 3.2 its obligation under this Performance Guarantee is restricted to the payment of money.

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- 4 Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in 4.1 to 4.3:
 - 4.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Engineer in an Interim or Final Payment Certificate has not been made in terms of the Contract and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of 4.2;
 - 4.2 A first written demand issued by the Employer to the guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum certified has still not been paid;
 - 4.3 A copy of the aforesaid payment certificate which entitles the Employer to receive payment in terms of the Contract of the sum certified in 4.
- 5 Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Performance Guarantee, such demand stating that:
 - 5.1 the Contract has been terminated due to the Contractor's default and that this Performance Guarantee is called up in terms of 5; or
 - 5.2 a provisional or final sequestration or liquidation court order has been granted against the Contractor and that the Performance Guarantee is called up in terms of 5; and
 - 5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.
- 6 It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.
- 7 Where the Guarantor has made payment in terms of 5, the Employer shall upon the date of issue of the Final Payment Certificate submit an expense account to the Guarantor showing how all monies received in terms of this Performance Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Performance Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.
- 8 Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.
- 9 Payment by the Guarantor in terms of 5 will only be made against the return of the original Performance Guarantee by the Employer.
- 10 The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which the Employer may deem fit and the Guarantor shall not have the right to claim his release from this Performance Guarantee on account of any conduct alleged to be prejudicial to the Guarantor.
- 11 The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.

- 12 This Performance Guarantee is neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired.

- 13 This Performance Guarantee, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.

- 14 Where this Performance Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at

Date.....

Guarantor's signatory: (1)

Capacity

Guarantor's signatory: (2)

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Part C2: Pricing Data and Bill of Quantities

	<u>Page</u>
C2.1 Pricing Instructions	75
C2.2 Bill Of Quantities	77

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

C2.1 Pricing Instructions

1. Measurement and payment clauses of the COTO (2020)/SABS 1200 Standardised Specifications, as well as the Particular Specifications, shall be deemed to form part of and included in the pricing instructions.

1. The units of measurement described in the Bill of Quantities are metric units. Abbreviations used in the Bill of Quantities are as follows:

%	=	percent	m ² .pass	=	square metre-pass
h	=	hour	m ³	=	cubic metre
ha	=	hectare	m ³ .km	=	cubic metre-kilometre
kg	=	kilogram	MN	=	meganewton
kl	=	kilolitre	MN.m	=	meganewton-metre
km	=	kilometre	MPa	=	megapascal
km-pass	=	kilometre-pass	No.	=	number
kPa	=	kilopascal	Prov sum	=	Provisional sum
kW	=	kilowatt	P C sum	=	Prime Cost sum
l	=	litre	sum	=	lump sum
m	=	metre	t	=	ton (1 000 kg)
mm	=	millimetre	W/day	=	Work day
m ²	=	square metre			

2. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.
3. The prices and rates to be inserted in the Bill of Quantities are to be the full inclusive prices for the work described under the items. Such prices and rates shall cover all costs and expenses that may be required in accordance with the provisions of the Scope of Work, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the Contract Data, as well as overhead charges and profit. These prices shall be used as a basis for assessment of payment for additional work that may have to be carried out.
4. It will be assumed that prices included in the Bill of Quantities are based on Acts, Ordinances, Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders. (Refer to www.sabs.co.za or www.iso.org for information on standards).
5. Where the Scope of Work requires detailed drawings and designs or other information to be provided, all costs associated therewith are deemed to have been provided for and included in the unit rates and sum amount tendered for such items.
6. An item against which no price is entered will be considered to be covered by the other price s or rates in the Bill of Quantities. A single lump sum will apply should a number of items be grouped together for pricing purposes.
7. The quantities set out in the Bill of Quantities are approximate and do not necessarily represent the actual amount of work to be done. The quantities of work accepted and certified for payment will be used for determining payments due and not the quantities given in the Bills of Quantities.
8. Reasonable compensation will be received where no pay item appears in respect of work required in the Bills of Quantities in terms of the Contract and which is not covered in any other pay item.
9. The short descriptions of the items of payment given in the Bill of Quantities are only for the purposes of identifying the items. More details regarding the extent of the work entailed under each item appear in the Scope of Work.
10. The Bill of Quantities has been drawn up in accordance with the latest issue of the COLTO (1998)/SABS1200 Standardised Specifications. Descriptions in the Bill of Quantities are abbreviated and must be read in conjunction with the measurement and payment clauses of the applicable specifications.

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C2.2 Bill of Quantities

General Conditions of Contract for Works of Civil Engineering Construction (GCC 2015: 3rd Edition)

NB TENDERERS MUST COMPLETE THE SCHEDULE OF QUANTITIES IN BLACK INK

SCHEDULE NO 1: GENERAL

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
SANS 1200 A PSA 8.3.1	1.00	<u>GENERAL</u>				
	1.01	Scheduled fixed-charge items:				
		.01 Fixed preliminary and general charges	-	-	sum	
PSA 8.4.1	1.02	Scheduled time-related items:				
		.01 Borehole	month	2		
		.02 Irrigation	month	6		
		.03 Reservoir	month	3		
PSA 8.9	1.03	Special testing				
		.01 Special testing as required by the Engineer	-	PC	sum	24,000.00
		.02 Charge required by Contractor on sub item .01 above	%	24,000	%	
	1.04	Prime Cost Sum:				
		.01 Housing for Engineer's representative	-	PC	sum	36,000.00
		.02 Charge required by Contractor on sub item .01 above	%	36,000	%	
		.03 Housing for Engineer during inspections	-	PC	sum	36,000.00
		.04 Charge required by Contractor on subitem .03 above	%	36,000	%	
	1.05	<u>CONTINGENCY INFRASTRUCTURE</u>				
		.01 Provide the sum of R 90 000.00 (Ninety Thousand Rand) for contingencies, to be used as instructed for by the Engineer.	-	PC	Sum	90,000.00
		.02 Charge required by Contractor on sub item .01 above	%	90,000	%	
	Carried forward					

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SCHEDULE NO 1: GENERAL

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		Brought forward				
PSA 8.13	1.06	Occupational Health and Safety				
		.01 Compliance with the Occupational Health and Safety Act and Regulations	month	9		
	1.07	Supply complete key plan for irrigation system, pipe sizes, pipe routes, zones, sprinklers, valves, controllers, etc. including borehole and reservoir feed and supply lines.				
		.01 Irrigation System	-	-	sum	
PSA 8.8.4.2	1.08	Supply complete key plan for existing potable water network at Karoo Desert National Botanical Garden indication total pipe network, pipe sizes, valves, etc.				
		.01 Water Network	-	-	sum	
	1.09	Hand excavation necessary for locating and exposing existing services in all material:				
		.01 In roadways	m ³	24		
		.02 In all other areas	m ³	16		
	1.10	<u>Repair of rainwater tank pressure pumps at New Training Centre</u>				
		.01 Provide the sum of R 9 000.00 (Nine Thousand Rand) for the repair or installation of new pressure pumps, to be used as instructed for by the Engineer.	-	PC	Sum	9,000.00
		.02 Charge required by Contractor on sub item .01 above	%	9,000	%	
		TOTAL SCHEDULE NO 1: GENERAL CARRIED TO SUMMARY: GENERAL				

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SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		<u>WATER DISTRIBUTION NETWORKS</u>				
		Servicing and Cleaning				
CE.04	2.01	Servicing of valves (bulk water)	number	3		
CE.03	2.02	Cleaning of manholes, chambers and other structures	number	12		
	2.03	Water storage tank:				
	.01	Manufacture, supply and erection of a 14,6 kilolitre storage tank complete with 10m high galvanized steel stand "Press tank" or similar approved including engineer's certificate	-	-	sum	
	.02	Cast in-situ concrete - Class 25	m ³	8		
	.03	Steel reinforcement				
	.01	Mild steel bars	t	0.2		
	.02	High-tensile steel bars	t	0.3		
	2.04	Connect to Municipality Line				
	.01	UPVC Class 9 pressure pipes for municipal connection				
	.01	90 x 75mm Reducer	number	6		
	.02	75 mm dia	m	900		
CE.07	2.05	Cleaning and sterilization of reservoir:				
	.01	Sterilization of storage tank	number	1		
	.02	Clean area around storage tanks (10m x 10m) of vegetation and growth	number	1		
EA.02	2.06	Boreholes, piping and pumps				
EA.02	.01	Clean area around borehole (5m x 5m) of vegetation and growth	number	1		
	2.07	Testing of Borehole				
EA.01	.01	Test Pumping of Boreholes Complete inclusive of Establishment, Plant setup, and de-establishment. Installation of test pump up	number	1		
	Carried forward					

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SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Brought forward					
EA.02.01		.02 Removal of existing equipment	number	1		
EA.02.02		.03 Recovery of lost equipment	number	1		
EA.02.03		.04 Installation of temporary pumps	number	1		
EA.02.04		.05 Ground water sampling and analysis for risk assessment i.t.o. SANS 241-2: 2015	number	1		
EA.02.05		.06 Compilation of Borehole report	number	1		
EA.02.06		.07 Reinstallation of pumping equipment including 6mm dia stainless steel cable with cable tie shackles for pump and fixing to mounting flange above ground	number	1		
EA.04.02	2.08	Servicing of submersible borehole pumps				
		.01 Borehole submersible pump	number	1		
EA.04.03	2.09	Reconditioning of submersible pumping equipment, installation and recommission				
		.01 Borehole submersible pump	number	1		
	2.10	Pump Control Panel				
		Installation, testing and commissioning of new pump control panel with surge arrestor, isolator switch, on/off switch, indicator lights, 24 hours timer, hold in and hold out relays, pressure switch for tank control, and Motor trio protection to protect the pump from overload/under load, phase failure protection. All mounted in powder coated steel enclosure.	number	1		
EA.04.04	2.11	Commissioning				
		.01 Borehole commissioning	number	1		
	2.12	Borehole siting and drilling				
		.01 Drilling of Borehole (including site establishment)	m	140		
		.02 Borehole casing				
		.01 Mild Steel Casing (165mm)	m	30		
		.02 Casing Shoe	number	2		
	Carried forward					

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SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		Brought forward				
		.03 Appointment of Hydrogeological Consultant	-	PC	sum	65,000.00
		.04 Charge required by Contractor on item .03 above	%	65,000	%	
		.05 Submersible borehole pump	-	PC	sum	32,000.00
		.06 Charge required by Contractor on item .05 above	%	32,000	%	
		.07 22mm Ball-o-stop valves for pressure gauges	number	1		
		.08 50mm dia flanged CI diaphragm "SAUNDERS" valve	number	1		
		ELECTRICAL				
PFN 10.04	2.13	.01 Motor Control Centre for borehole pumps as specified in PFN 08 with controls as specified in PFN 08.01.01.02. The MCC shall be of the free standing weather and water proofed kiosk type mounted on a 100mm dia steel pole 1.5m high	number	1		
PFN 10.05		.02 Compile complete wiring diagrams for borehole MCC boards	number	1		
PAB 03.21	2.14	.03 Submit Certificate of Compliance (COC) for all electrical work and infrastructure for borehole MCC	number	1		
		PRESSURE SWITCH				
	2.15	.01 Pressure switch for borehole start/stop operation. With time delay for restarting borehole	number	1		
		.02 '0-1000 kPa Pressure gauge	number	1		
		Carried forward				

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SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		Brought forward				
	2.16	IRRIGATION WATER SUPPLY SYSTEM				
		.01 uPVC Class 9 pressure water supply pipe jointed with 'Lyng' mechanical rubber ring joints including short lengths and cutting and laid in pipe trenches as SANS 1200 LB and SANS 1200 DB for borehole to reservoir				
		.01 75mm Pipes laid in trenches not exceeding 1m deep	m	270		
		.02 Extra over Class 9 uPVC pressure pipes with 'Lyng' mechanical joints for uPVC pressure fittings with 'Lyng' couplers:				
		.01 75mm 90 Degree bends.	number	9		
		.02 75mm Adaptor coupling (uPVC to GMS)	number	4		
		.03 75mm Tee	number	16		
		.04 75mm Diameter end cap	number	8		
		.05 75mm Brass flange	number	4		
		.03 uPVC Class 9 pressure water supply pipe jointed with 'Lyng' mechanical rubber ring joints including short lengths and cutting and laid in pipe trenches for irrigation ring main				
		.01 75mm Pipes laid in trenches not exceeding 1m deep	m	1,550		
		.02 90mm Pipes laid in trenches not exceeding 1m deep	m	90		
		.04 Extra over Class 9 uPVC pressure pipes with 'Lyng' mechanical joints for uPVC pressure fittings with 'Lyng' couplers:				
		.01 90 x 75mm Reducer	number	6		
		.02 75 x 50mm Reducer	number	24		
		.03 90mm 90 Degree bends.	number	4		
		.04 75mm 90 Degree bends.	number	16		
		Carried forward				

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South African National Biodiversity Institute

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		Brought forward				
SANS1200	2.17	.05 90mm Tee	number	4		
		.06 90mm Diameter end cap	number	4		
		Pressure reducing and Gate valves (double socketed) [C# 8.2.3]				
		.01 75mm Diameter SS gate valve	number	16		
		.02 90mm Diameter SS gate valve	number	2		
		.03 75mm Diameter CI valve	number	16		
		.04 90mm Diameter CI valve	number	2		
		.05 75mm Diameter non-slam air valve	number	6		
	2.18	Water Meters				
		.01 75mm 'SENSUS' (or similar approved by Engineer) combination water meter with flanges.	number	4		
	2.19	Water Mains Connection				
		.01 UPVC Class 9 pressure pipes for municipal connection				
		.01 90 x 75mm Reducer	number	6		
		.02 90 mm dia	m	100		
		Valves or meters chambers:				
	2.20	Excavate for and build valve chamber size 1500 x 800 x 1500mm deep overall valve and water meter chamber, including 500mm diameter Type 4A cast iron manhole cover and frame and 'Saint Gobain' Type LD 16099 GI stopcock assess box type 7 installed complete as Valve and Water Meter Chamber.	number	4		
	2.21	Precast concrete valve chamber for 75mm valve with and including precast concrete cover including excavations, backfilling, carting away surplus material, etc., as Gate Valve.	number	4		
		Carried forward				

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THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Brought forward					
	2.22	Excavation:				
		.01 Excavation of all material types within the following depth ranges below the surface level:				
		.01 0 m up to and including 1,5 m	m³	1,146		
		.02 Extra over excavation in earth for pipe trenches, chambers, etc for excavation in soft rock.	m³	172		
		.03 Extra over excavation in earth for pipe trenches, chambers, etc for excavation in hard rock.	m³	229		
		.04 Extra over excavation for pipe trenches, chambers, etc for carting away surplus material to a dumping site to be located by the Contractor.	m³	241		
		.05 Unreinforced concrete in thrust blocks at bends, tees, etc including necessary extra excavations, formwork , etc.	m³	8		
		.06 Locate, cut into and temporarily stop off 90mm diameter water pipe, insert reducing tee and joint to new 75mm uPVC pipe.	number	2		
	2.23	Bedding from commercial sources [SANS 1200 LB]				
		.01 Extra over for bedding (150mm thick) and backfilling to pipe trenches (200mm above pipe), chambers, etc. for backfilling with sand material supplied by the Contractor to bedding and cradle in accordance with SANS 1200M compacted to 98% Mod AASHTO density.	m³	516		
	2.24	Reinstate road surfaces complete with all courses				
		.01 Gravel on shoulders	m²	98		
		.02 Reinstate concrete slab surfaces complete with all courses [C# 8.3.6.1 (d)]	m²	56		
	Carried forward					

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THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
		Brought forward				
CE.05.04	2.25	.03 Saw cutting of concrete slab and asphalt surfaces up to 150mm thickness MARKERS	m	50		
CE.06	2.26	.01 Concrete-route marker including aluminium plate (150mm x 150mm x 200mm high) TESTING	No	60		
		.01 Rinsing the entire water system before testing	-	-	sum	
		.02 Testing water supply system	-	-	sum	
	2.27	AUTOMATED IRRIGATION SYSTEM (+/- 4 HECTARES)				
		.01 Allowance of R510,000 for Irrigation system of approximately 4 ha	-	PC	sum	510,000.00
		.02 Charge required by Contractor on item .01 above	%	510,000	%	
EN.01	2.28	Registration of Water Use				
		.01 Registration of water use as per the National Water Act (Act 36 of 1998). Application for water use as per Department of Water Affairs regulations.	number	1		
		RESERVOIR (Concrete reservoir of dia 12m x 2.2m deep)				
	2.29	Remove damaged roof (area 12m diameter)				
		.01 Roof removal	-	-	sum	
	2.30	Remove rafters				
		.01 Rafters removal	-	-	sum	
	2.31	Breakdown concrete columns				
		.01 Concrete column removal	-	-	sum	
	2.32	Reservoir repairs (Walls, roof and Lining)				
		.01 Waterproof walls	m ²	84		
		Carried forward				

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South African National Biodiversity Institute

THE APPOINTMENT OF A CONTRACTOR FOR THE BOREHOLE WATER SUPPLY, WATER PURIFICATION, RESERVOIR REPAIRS, POTABLE WATER STORAGE AND AUTOMATED IRRIGATION SYSTEM FOR SANBI AT THE KAROO DESERT NATIONAL BOTANICAL GARDEN IN WORCESTER, WESTERN CAPE - Contract: G494/2023

SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
	Brought forward					
		.02 HDPe internal lining	-	-	sum	
		.03 Allowance of R125,000 for reservoir roof structure and sheeting	-	PC	sum	125,000.00
		.04 Charge required by Contractor on item .03 above	%	125,000	%	
		.05 Screed floor	m ²	114		
	2.33	<u>WATER TREATMENT</u>				
		.01 Allow the sum of R 600 000.00 (Six-hundred Thousand Rand) for water treatment process	-	PC	Sum	600,000.00
		.02 Charge required by Contractor on sub item .01 above	%	600,000	%	
	2.34	Compile and supply a complete set of Operating and Maintenance Manuals for the water treatment works.	-	-	sum	
TOTAL - SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR						

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CALCULATION OF TENDER SUM

TENDER SUM

TOTAL - SCHEDULE NO 1: GENERAL R

TOTAL - SCHEDULE NO 2: BOREHOLE, IRRIGATION AND RESERVOIR R

SUBTOTAL R

VALUE-ADDED TAX (VAT)
The tenderer shall add 15% of the subtotal for value-added tax R

TENDER SUM CARRIED TO FORM OF TENDER R

Any reference to words "Bid" or Bidder" herein and/or in any other documentation shall be construed to have the same meaning as the words: "Tender" or "Tenderer".

Part C3: Scope of Work

		<u>Page</u>
C3.1	DESCRIPTION OF THE WORKS	88
C3.2	CONSTRUCTION	89
C3.3	ANNEXURES	170

Status

Should any requirement or provision in the parts of the Scope of Work conflict with any requirement of any Standardised Specification, Particular Specification or any drawings, the order of precedence, unless otherwise specified, is:

Drawings
Scope of Work
Standardised Specifications

C3.1 Description of the Works

C3.1.1 Employer's Objectives

The Employer's objective is the borehole water supply, water purification, reservoir repairs, potable water storage and automated irrigation system for SANBI at the Karoo Desert National Botanical Garden in Worcester, Western Cape.

C3.1.2 Overview of the Works

This project entails the testing of an existing borehole, drilling and equipping a new borehole, water treatment, installation of a new irrigation ring main, potable water storage, reservoir repairs and installation of several new automated irrigation zones in the Karoo Desert National Botanical Garden, Worcester, Western Cape.

C3.1.3 Extent of the Works

The scope of works includes but not limited to the following:

- Testing of an existing borehole (not in use)
- Drilling and equipping a new borehole
- Water quality testing and analysis
- Water treatment of irrigation water
- Repair of irrigation reservoir
- New irrigation water main
- New automated irrigation system (zoned)
- New potable water storage reservoir

The Contractor will be required to construct the works in conformity with design criteria specified in the Project Specification and/or shown on the drawings.

C3.1.4 Location of the Works

The works is located at the following site:

The Karoo Desert National Botanical Garden (NBG) is located in Worcester in the Western Cape. GPS Co-ordinates: 33°37'00.2"S; 19°27'01.7"E.

C3.1.5 Description of Site and Access

The garden is easily accessible via public roads.

C3.1.6 Temporary Works

All design and the construction of any temporary works must be approved by the Engineer.

C 3.2 Construction

G : VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS FOR THIS CONTRACT, AS WELL AS TECHNICAL SPECIFICATIONS

The following variations and additions to the SANS 1200 Standardised Specifications referred to in the last clause of Portion 1 apply to this Contract. The prefix PS indicates an amendment to SANS 1200. The letters and numbers following these prefixes respectively indicate the relevant Standardised Specification and clause numbers in SANS 1200.

G GENERAL

G 1 SCOPE

REPLACE SUBCLAUSE 1.1 WITH THE FOLLOWING:

"1.1 This specification covers requirements, principles and responsibilities of a general nature that are normally applicable to all Civil Engineering Contracts, as well as the requirements for the Contractor's establishment on the Site."

G 2 INTERPRETATIONS

G 2.3 DEFINITIONS

(a) General

ADD THE FOLLOWING DEFINITIONS:

"General conditions: The General Conditions of Contract specified for use with this Contract, and the Special Conditions of Contract.

Specified: As specified in the standardised specifications, the Drawings or the Project Specifications.

Permanent Works: as defined in Subclause 1(1)(p) of the General Conditions of Contract shall for the purpose of this Contract, be regarded as the repair work.

(c) Measurement and payment

REPLACE THE DEFINITIONS FOR "fixed charge", WITH THE FOLLOWING:

"Fixed charge: A charge that is not subject to adjustment on account of variation in the value of the Contract amount or the Contract Time of Completion.

G 2.4 ABBREVIATIONS

- (a) Abbreviations relating to standard documents

ADD THE FOLLOWING ABBREVIATION:

"CKS: SABS Co-ordinating Specification."

G 3 MATERIALS

G 3.1 QUALITY

ADD THE FOLLOWING:

"All manufactured materials supplied shall be new materials unless the contrary is specified. All materials specified in accordance with SABS Specifications shall bear the SABS mark, whether so specified or not."

ADD THE FOLLOWING SUBCLAUSE:

G 3.3 ORDERING OF MATERIALS

The quantities set out in the Schedule of Quantities have been carefully determined from calculations based on data available at the time and should therefore be *considered to be approximate quantities only*. Before ordering materials of any kind the Contractor shall check with the Engineer whether or not the scope of the work for which the materials are required is likely to change substantially. No liability or responsibility whatsoever shall be attached to the Employer for materials ordered by the Contractor except when ordered in accordance with written confirmation issued by the Engineer."

G 4 PLANT

G 4.2 CONTRACTOR'S OFFICES, STORES AND SERVICES

ADD THE FOLLOWING PARAGRAPH BEFORE THE FIRST PARAGRAPH:

"The Contractor's construction camp shall be fenced off and shall contain all offices, stores, workshops, testing laboratories, toilet facilities, etc. The camp shall always be kept in a neat and orderly condition.

No personnel may reside on the Site. Only one night-watchman may be on the Site after hours."

ADD THE FOLLOWING TO THE SECOND PARAGRAPH:

"One chemical toilet per 10 workmen shall be provided and must be screened from public view and its use shall be enforced.

The Contractor shall, where applicable, make the necessary arrangements for the removal of night soil."

G 5 CONSTRUCTION

G 5.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES

REPLACE THE HEADING AND THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"G 5.4 LOCATION AND PROTECTION OF EXISTING SERVICES

G 5.4.1 Location of existing services

Before underground or excavation work is carried out, the Contractor shall ascertain the presence and position of all services likely to be damaged or interfered with by his activities. He shall obtain up-to-date plans from the Engineer for this purpose, showing the position of services in the area where he intends to work. As services can often not be reliably located from such plans, the Contractor shall determine the exact position of such services by means of suitable detecting equipment and afterwards by careful hand excavation where necessary in order to expose the services at the positions of possible interference by his activities. This procedure shall also be followed in respect of services not shown on the plans but believed to be present.

All such services, the positions of which have been located at the critical points, shall be designated as 'known' services and their positions shall be indicated on a separate set of Drawings, a copy of which shall be furnished to the Engineer.

While he is occupying the Site, the Contractor shall be liable for all damage caused by him to known services as well as for consequential damage, whether caused directly by his operations or by the lack of proper protection.

G 5.4.2 **Protection during repair work**

The Contractor shall exercise all the necessary care to prevent damage to known services during repair work. Where applicable, major excavating equipment and other Plant shall not be operated dangerously close to these services. Where necessary, excavation in close proximity to these services shall be carefully carried out with suitable hand tools, excluding picks wherever their use could damage the services. No additional payment will apply to such more difficult work.

Services left exposed shall be suitably protected from damage.

G 5.4.3 **Alterations and repairs to existing services**

Unless the contrary is clearly specified or ordered, the Contractor shall not carry out alterations to existing services. When this is necessary, the Contractor shall inform the Engineer, who will either make arrangements for such work to be executed by the owner of the service, or instruct the Contractor to make such arrangements himself.

When existing services are damaged by the Contractor, he shall immediately inform the Engineer, or when this is not possible, the relevant authority, and obtain instructions as to who should carry out repairs. In urgent cases the Contractor shall take the necessary steps to minimise damage to and interruption of the service. No repairs of telecommunication cables or electric power lines and cables shall be attempted.

The Employer will accept no liability for damages due to a delay in having such alterations or repairs effected. The Contractor shall provide all reasonable opportunity, access and assistance to persons carrying out alterations or repairs of existing services."

ADD THE FOLLOWING SUBCLAUSE:

"G 5.9 **SITE MEETINGS**

The Contractor will be required to attend regular site meetings, normally held once a month to discuss general progress, quality of work, problems, claims, payments, etc, but not matters concerning the day-to-day running of the Contract."

G 6 TOLERANCES

ADD THE FOLLOWING SUBCLAUSE:

"G 6.4 GENERAL

No guarantee is given that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more of the tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work.

Except where the contrary is specified or when clearly not applicable, all quantities for measurement and payment shall be determined from the 'authorised' dimensions. These are specified dimensions or those shown on the Drawings or, if changed, as finally prescribed by the Engineer, without any allowance for the specified tolerances. Except if otherwise specified, all measurements for determining quantities for payment will be based on the 'authorised' dimensions.

If the work is therefore constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, quantities will be based on the 'authorised' dimensions regardless of the actual dimensions to which the work has been constructed.

When the work is not constructed in accordance with the 'authorised' dimensions plus or minus the tolerances allowed, the Engineer may nevertheless, at his sole discretion, accept the work for payment. In such cases no payment shall be made for quantities of work or material in excess of those calculated for the 'authorised' dimensions, and where the actual dimensions are less than the 'authorised' dimensions minus the tolerance allowed, quantities for payment shall be based on the actual dimensions as constructed."

G 8 MEASUREMENT AND PAYMENT

G 8.1 MEASUREMENT

G 8.1.2 Preliminary and general items or section

G 8.1.2.2 Tendered sums

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"The Contractor's tendered sums under item G 8.3 shall cover all charges for

- risks, costs and obligations in terms of the General Conditions of Contract and of this standardised specification, except where provision is made in these Project Specifications to cover compensation for any of these items;
- head-office and site overheads and supervision;
- profit and financing costs;
- expenses of a general nature not specifically related to any item or items of permanent or temporary work;
- providing facilities on site for the contractor's personnel

G 8.2 PAYMENT

G 8.2.1 Fixed-charge and value-related items

REPLACE THE CONTENTS OF THIS SUBCLAUSE WITH THE FOLLOWING:

"Payment of fixed charges in respect of item 8.3.1 will be made as follows:

Eighty per cent (80%) of the sum tendered will be paid when the facilities have been provided and approved. The remaining 20% will be paid when the works have been completed, the facilities have been removed and the camp site has been cleared and cleaned.

8.3 SCHEDULED FIXED-CHARGE ITEMS

REPLACE THE ITEMS WITH THE FOLLOWING:

"G 8.3.1 Fixed preliminary and general charges Unit : Sum

8.8 TEMPORARY WORKS

REPLACE ITEM 8.8.4 WITH THE FOLLOWING:

"G 8.8.4 Location and protection of existing services:

G 8.8.4.1 Provision of detecting devices for:

(a) Water and sewer pipes..... Unit : Sum

(b) Electrical and other cables Unit : Sum

The tendered sums shall cover the cost of providing and operating suitable equipment for as long as it is needed to locate all the existing services likely to be affected by the construction activities. Alternatively, an approved specialist firm may be employed to carry out the work.

G 8.8.4.2 Hand excavation necessary for locating and exposing existing services in all material:

(a) In roadways Unit: m³

(b) In all other areas Unit: m³

The rates shall cover the cost of excavating by means of hand tools within authorised dimensions, for all precautionary measures to protect the services from damage during excavation and backfilling, and for subsequent backfilling and compacting. Compaction of material in all areas except in roadways shall be to 90% of the modified AASHTO density.

The rate for hand excavation in roadways shall include compensation for compacting excavated or selected backfill material to 93% of modified AASHTO density.

The tendered rates shall also include for keeping excavations safe, for dealing with surface and subsurface water, for removing surplus excavated material from the Site, for transporting all material, and for supplying adequate supervision during both excavation and backfilling operations."

ADD THE FOLLOWING ITEMS:

"G 8.9 ADDITIONAL TESTS:

(a) Additional tests required by the Engineer..... Unit : PC Sum

(b) Attendance and profit Unit : %

An amount has been allowed in the Schedule of Quantities under subitem (a) to cover the cost of additional tests required by the Engineer. The Engineer will have the sole authority to spend the amount or part thereof.

The tendered percentage under subitem (b) will be paid to the Contractor on the value of each payment made to the testing authority.
Note in connection with subitem (a):

The Contractor is responsible for both the cost of normal testing and for the cost of any additional test that indicates that the Specifications have not been complied with.

G 8.13 COMPLIANCE WITH OHS ACT AND CONSTRUCTION REGULATIONS..... Unit: sum

The tendered sum shall include full compensation to the Contractor for compliance with all the requirements of the OHS Act and the Construction Regulations 2003 at all times during construction, as described in the Project Specifications. The successful tenderer shall provide the Engineer with a complete breakdown of this tendered sum.

This sum will be paid to the Contractor in equal monthly amounts for the entire duration of the contract period.

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TECHNICAL SPECIFICATION

CE WATER DISTRIBUTION NETWORKS

CONTENTS

CE 01	SCOPE
CE 02	STANDARD SPECIFICATIONS
CE 03	OPERATING AND MAINTENANCE MANUALS
CE 04	EXECUTION OF REPAIR WORK
CE 05	TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK
CE 06	QUALITY ASSURANCE SYSTEM
CE 07	MAINTENANCE TO INSTALLATION SYSTEMS AND REPAIR WORK
CE 08	MEASUREMENT AND PAYMENT

CE 01 SCOPE

This specification covers the materials, equipment, methods, testing and work required for the repair and maintenance of existing water distribution networks. Such distribution networks may comprise:

- (a) Primary and secondary distribution pipelines
- (b) Valves
- (c) Bulk water meters
- (d) Domestic water meters
- (e) Chambers
- (f) Pumping stations
- (g) Borehole installations
- (h) Reservoirs
- (i) Irrigation pipe networks and sprinklers.

This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with portion 3: Additional Specifications included in this document.

Where a particular specification has been included in the documents to supplement Technical Specification CE: Water distribution networks, this technical specification shall act as a guideline to the Particular Specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence. The Contractor shall at all times adhere to this technical specification, unless otherwise specified in the applicable Particular Specification.

CE 02 STANDARD SPECIFICATIONS

CE 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

SANS 1200 D - Earthworks
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 G - Concrete (structural)
SANS 1200 L - Medium-pressure pipelines
SANS 1200 LB - Bedding (pipes)

CE 02.02 OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993

The Contractor shall be required to comply with the Occupational Health and Safety Act 85 of 1993, Construction Regulations 2014 and related regulations.

CE 02.03 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

CE 02.04 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

CE 03 OPERATING AND MAINTENANCE MANUALS

The Contractor shall at the start of the Contract be given all available as-built information and operating and maintenance manuals.

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

CE 04 EXECUTION OF REPAIR WORK

CE 04.01 GENERAL

The Contractor shall investigate and inspect all areas of the installation to confirm the extent of the repair work required and shall report to the Engineer. The Engineer will thereafter demarcate any areas to be repaired and shall instruct the Contractor with regard to the repair work to be done.

At the start of the repair Contract all the systems, installations and equipment shall be repaired as specified in the Particular Specification. This repair work shall include but not be limited to the specified Particular Specification details.

All repair work shall be executed using approved materials and equipment suitable to the systems and/or installations they serve.

All materials and equipment shall comply fully with the requirements as specified for each installation.

The said repair work shall be executed in accordance with the relevant codes of practice, standards, regulations, municipal laws and by-laws, manufacturer's specifications and codes of practice and all additional and particular specifications included in this document.

All new equipment, materials and systems shall be furnished with a written guarantee with a defects liability period of 12 months from date of completion of repair work. These guarantees shall be furnished in favour of the Department of Public Works. On completion of the required and specified repair work the systems, installations and equipment shall be commissioned and handed over if the satisfaction of the Engineer has been obtained.

Repair work items for the water distribution systems shall be categorised under the following headings:

- (a) Repair of existing pipelines
- (b) Cleaning of existing pipelines
- (c) Repair of fittings
- (d) Repair of existing structures.

CE 04.02 REPAIR OF EXISTING PIPELINES

This section covers the requirements for the repair of the water distribution pipelines for defects such as pipe breaks and leakage for distribution pipelines.

CE 04.02.01 General

Repair work to the water distribution system may include but not be limited to the following:

- (a) Initial unblocking and clearing of all water distribution pipes and manholes;
- (b) Introduction of additional connections to the water distribution system;
- (c) Reinstatement and making good of walls, concrete, road surfaces, etc, to an approved acceptable level where any repair, upgrade and/or service work has been executed;
- (d) Test pipe system for leakage;
- (e) Replace valves, which shall include new gaskets, gland packings, seals, bolt and nuts, etc;
- (f) Pressure test and sterilise repaired new installation and equipment;

CE 04.02.02 Construction

The Engineer will indicate the pipeline sections in need of repair and shall instruct the Contractor with regard to the repair work to be done.

(a) Excavation

The width of the excavation shall be sufficient to allow the proper laying, bedding and backfilling of the pipelines. The width of the excavation for each type and size of pipeline shall be as set out in SANS 1200 DB.

The depth of the excavation for each type and size of pipeline shall depend on site conditions and the amount by which the excavation is to exceed the proposed level of the invert of the pipeline and shall be sufficient to allow the type and thickness of bedding material instructed by the Engineer.

Where excavation is to be carried out through asphalt premix or concrete, the asphalt/concrete shall be cut neatly and vertically with approved sawing equipment before the asphalt/concrete is removed.

Cutting, breaking out and replacing of concrete pavements will be paid under Subclause CA.02.

Excavations shall extend such that, where possible cut in may be reduced by lifting adjacent pipes.

(b) Classification of excavation

All excavations shall be classified as follows for payment purposes:

(i) Hard material

Material which cannot be excavated except by drilling and blasting or with the use of pneumatic tools or mechanical breakers and boulders exceeding 0,10 m³ shall be classified as hard material.

Where more than 40% of any material (by volume) consists of boulders each exceeding 0,10 m³ in size, the material shall be classified as hard material.

(ii) Soft material

All material not classified as hard material shall be classified as soft material.

Notwithstanding the above classification, all material excavated from previously constructed fills, sub grades and sub bases shall be classified as soft material.

(c) Disposal of excavated material

Where excavated material does not comply with the requirements for backfilling material as specified or is surplus to backfilling requirements, such excavated material shall be removed from the site.

Material suitable for use in the works, however, shall be used as prescribed.

(d) Removal of damaged pipelines

Where indicated by the Engineer damaged sections of pipelines shall be completely removed and replaced.

(e) Pipe couplings

Repair sections will be joined, utilising existing pipe sockets and collars where possible. Repair couplings shall be used with the approval of the Engineer.

(f) Laying of uPVC pipelines

New sections of uPVC pipelines shall be laid on a granular bed suitable for flexible pipelines as directed by the Engineer. The inside of the pipes shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2% or as directed by the Engineer. Refer to SANS 1200 LB: Bedding (pipes), for the specification on bedding.

(g) Laying of fibre cement, concrete or galvanised mild steel pipelines

New sections of the pipelines shall be laid on class A or B bedding as directed by the Engineer. The inside of the pipes shall be smooth and without any displacement and all pipes shall be laid true to line and level with a minimum slope of 2% or as directed by the Engineer.

Refer to SANS 1200 LB: Bedding (pipes), for the specification on bedding.

(h) Rock foundation

Where rock, shale or hard material is encountered on the bottom of excavations a bed of fine material as required for class B bedding shall be placed before laying the pipe.

(i) Concrete encasement

Where instructed by the Engineer pipes shall be encased in concrete. All such encasing shall be done in accordance with the Engineer's instructions and sufficient allowance shall be made for movement joints.

(j) Extension of existing pipelines

Where existing pipelines require extension or where damaged sections are replaced the new sections shall be placed at the same grade and, where they join the existing service, at the same level as the existing pipeline.

Existing chambers or other structures which may obstruct any new work shall be demolished and removed. The demolition and reconstruction of new structures shall be paid for under the relevant sections in the specification.

(k) Construction in existing roads

Road crossings shall either be constructed utilising sufficient provision of bypass roads or utilising the half width of the road. At all times a through route shall be maintained for all traffic.

(l) Repairing of leaks

Where leaks occur at pipe sockets or collars the affected section shall be cut from the pipeline and repaired using repair couplings.

Where obvious leaks occur due to displaced sealing rubbers, the rubbers shall be replaced if the replacement can be done economically by lifting adjacent pipes.

(m) Replacement of pipes damaged by exposure to extensive ultraviolet light

Pipes damaged as a result of excessive exposure to sunlight shall be replaced where indicated by the Engineer.

CE 04.02.03 Quality standard

Pipelines shall be laid at even gradients within the points of correction, to the satisfaction of the Engineer and the applicable specifications.

CE 04.02.04 Materials

Materials and equipment to be used for repair items shall be suitable and/or adaptable to the existing installation and shall comply with the following:

(a) Super cast cast-iron pipes and fittings

Super cast cast-iron pipes can be used for underground and above ground installations. Plain-ended cast-iron pipes and fittings shall be used, manufactured from 150, Grade A, grey iron in accordance with SANS 1034. Fittings and pipes shall be free of pinholes, blowholes, blemishes, flash and foundry sand and have a smooth bore. All pipes and fittings shall be sand blasted and coated on the inside and outside by submersion in a corrosion inhibiting oxide primer or bitumen paint.

The pipes and fittings shall be joined by means of stainless steel neoprene couplings as supplied by the manufacturer's of the pipe system. The coupling shall be installed according to the manufacturer's specification and is to be tightened with a torque wrench to a torque of 6,8 Nm.

(b) uPVC pipe and fittings under ground

uPVC pipes and fittings can be used for above ground installations.

For pipe sizes larger than 160 mm diameter, uPVC class 6 pressure pipe to SANS 966 shall be used with prefabricated uPVC bends and junctions. Prefabrication shall be done by means of hot-air welding of fittings to be covered with three layers of fibreglass reinforced lining over welded sections. The resin to be used shall be as specified by the manufacturer for usage with PVC. Bends shall be manufactured out of 3 to 4 sections per bend. Pipe joints shall be done by means of couplings fixed with solvent cement for PVC piping. This joint shall be reinforced with a fibreglass lining of three layers.

Piping is to be supported and bracketed with properly sized and designed brackets consisting of two half sections clamped over the pipe and hung with two hanger rods.

Pipes are to be pressure tested in sections as specified in this specification.

(c) Prefabricated galvanised steel piping and fittings above ground

Prefabricated galvanised steel piping can be used for above ground rainwater drainage systems. The pipe to be used shall be plain-ended medium gauge uncoated pipe to SANS 62, galvanised to SANS 763. All fittings are to be manufactured out of the same material, welded with flanged ends or rolled ends to fit clambon fittings. Fittings are only to be galvanised after manufacturing. All joints are to be either

flanged or equipped with clambon couplings. All fittings and junction to be 45° sections.

The pipe system must be properly secured and bracketed at regular intervals with correctly sized and designed galvanised brackets.

Pipes are to be pressure tested in sections as specified in this specification.

(d) Geberit or similar approved equivalent HDPE pipe and fittings

Geberit or similar approved equivalent HDPE pipes and fittings can be used for underground and above ground installations where specified. Pipes shall be plain ended and only Geberit or similar approved equivalent HDPE bends and fittings shall be used. Jointing of pipes and fittings shall be done by butt welding, electro-sleeve couplings and/or flanged joints. Pipes and fittings shall only be installed by Geberit approved installers and the Contractor shall furnish a certificate to this effect. Pipes and fittings shall be installed strictly according to the Geberit application technique.

Pipes are to be pressure tested in sections as specified in this specification

(e) Galvanised steel pipe installations

- (i) All galvanised steel pipes shall be medium gauge mild steel screwed and socketed pipes to SANS 62 and shall be normalised and marked as such by the manufacturer. Pipes shall be hot-dipped galvanised to SANS 763 and shall be approved by the Galvanising Association of South Africa.
- (ii) All fittings shall be malleable cast-iron fittings to SANS 509 and galvanised to SANS 763 and shall be approved by the Galvanising Association of South Africa.
- (iii) All 80 diameter and larger pipes shall be joined with Class 16 flanged couplings to SANS 1123/1600. The bolts, nuts and spring washers to be used on these joints shall be cadmium plated.
- (iv) In pipe ducts and elsewhere pipes shall be fixed onto walls, soffits, etc, with approved type of supports, holder bats, clamps, etc. Brackets shall be designed to structurally support and fix the pipe system and shall have enough clearance from walls, soffits, etc, to insulate hot-water pipes and maintain equipment.
- (v) Pipes shall be supported according to the manufacturer's specifications with approved brackets at the following maximum intervals:

NORMAL SIZE (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15 dia to 20 dia	1 200	1 830
32 dia to 40 dia	1 830	2 450
50 dia to 150 dia	2 450	3 050

- (vi) Pipes shall be installed in such a manner as to prevent airlocks. A minimum rise of 1:250 shall be maintained to high points, which shall be fitted with suitable air release valves.
 - (vii) All pipes shall be marked according to SANS 10140 or as specified by the Engineer. All surface pipes shall be painted.
 - (viii) Pipes shall be installed flush unless otherwise instructed by the Engineer.
 - (ix) Provision shall be made for thermal contraction and expansion.
 - (x) The type of pipe joint compound shall be approved by the Engineer and used sparingly with good quality hemp. For pipes larger than 80 mm diameter a jointing compound such as Epidermix 32 shall be used.
 - (xi) Any pipes buried shall have at least 900 mm cover and be coated and wrapped to SANS 1117 and tested in the presence of the Engineer.
 - (xii) All exposed hot-water pipes shall be lagged as specified.
 - (xiii) All pipework and fittings shall be pressure tested and sterilised as specified.
 - (xiv) Valves shall be installed on all branch pipes and ball-o-stop valves on all connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings.
 - (xv) Approved type expansion bellows shall be installed where required for expansion and contraction to prevent excessive stain on fittings and pipe joints.
- (f) uPVC underground pipe installations
- (i) uPVC piping shall conform to SANS 966 with rubber ring type joints.
 - (ii) All bends shall be uPVC type fittings with rubber ring joints.
 - (iii) All other fittings such as T-pieces, reducers, flanges, etc, shall be bitumen-dipped cast iron rubber ring jointed fittings to SANS 546.
 - (iv) No solvent weld type fittings will be allowed.
 - (v) All cast iron fittings shall be coated and wrapped to SANS 1117.
 - (vi) All pipes shall be laid on a 100 mm sand-bedding cradle and covered with 300 mm sand before backfilling.
 - (vii) All backfilling shall be to the Engineer's specification and approval.

(viii) Pipe trenching and bedding shall be as follows:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soil Crete
Under surface bed	600		Soil Crete
Other areas	900		90% of modified AASHTO density

- (ix) All thrust blocks shall be cast between the pipe and the undisturbed trench material.
 - (x) No concrete shall come into direct contact with the uPVC pipe. At the thrust blocks the bend shall be wrapped with Densopol 80 HT Tape or approved equivalent.
 - (xi) DPE pipe connections to UPVC pipes up to 50 mm diameter can be done by means of SG iron manufactured saddles with the appropriate gaskets and cadmium-plated bolts and nuts.
 - (xii) All pipe crossings under traffic areas shall be backfilled with soilcrete and compacted as specified.
 - (xiii) All pipework shall be pressure tested with all joints uncovered, to the satisfaction of the Engineer.
 - (xiv) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.
- (g) HDPe underground pipe installations
- (i) HDPe piping shall be Type 4 HDPe pipe to SANS 533.
 - (ii) All fittings shall be of Plasson compression type, conforming to ISO/DIS 3458.
 - (iii) All pipes shall be laid on a 100 mm sand bedding cradle and covered with 300 mm of sand of selected material.
 - (iv) All backfilling shall be to the Engineer's specification and approval.

(v) Pipe trenching and bedding shall be as follows:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle traffic	1 100	Flexible pipe bedding as per SANS 1200 LB	Soil Crete
Under surface bed	600		Soil Crete
Other areas	900		90% of modified AASHTO density

- (vi) No concrete shall come into direct contact with the HDPE pipe. At these points the fittings shall be wrapped with a Densopol 80 HT tape or approved equivalent.
- (vii) All pipe crossings under traffic areas shall be backfilled with soil Crete and compacted as specified.
- (viii) All pipework shall be pressure tested with all joints uncovered to the satisfaction of the Engineer.
- (ix) Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipeline.

(h) Valves

- (i) Gate valves underground in valve chambers to connect to uPVC piping (65 mm NB and larger)

Gate valves are to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadine rubber-covered gate, stainless steel spindle, nitrile butadine rubber O-rings and seals, cast iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 664 and/or 665, and shall be capable of withstanding a working pressure of 1 600 kPa.

The valve shall be fitted with a square key spindle top to close the valve in a clockwise direction and socket ends to SANS 665 to fit into uPVC Class 12 pipe and installed to detail.

- (ii) Gate valves underground in valve chamber to connect to HDPE piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776 Class 125. The valve shall be able to withstand a working pressure of 1 600 kPa. The valve shall be fitted with a hand wheel on an extended spindle shaft of 700 mm to close in a clockwise direction and installed to detail.

- (iii) Gate valves above ground for temperatures up to 40 °C to connect to steel piping (65 mm NB and larger)

Gate valves to be equipped with non-rising spindle, spherical graphite iron body to SANS 936 Grade 42, cast-iron nitrile butadine rubber-covered gate, stainless steel spindle, nitrile butadine rubber O-rings and seals, cast iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 664 and/or 665, and shall be capable of withstanding a working pressure of 1 600 kPa.

The valves shall be fitted with flanged ends to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

- (iv) Gate valves above ground for temperatures above 40 °C to connect to steel piping (65 mm NB and larger)

Gate valve shall be equipped with non-rising spindle, spherical graphite iron body to SANS 963 Grade 42, cast-iron gate, gunmetal seat and gate rings, high-tensile bronze spindle, cast-iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SANS 665 and shall be capable of withstanding a working pressure of 1 600 kPa and a temperature of 90 °C.

The valve shall be fitted with flanged ends to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

- (v) Gate valves above-ground to fit to copper pipes (65 mm NB and larger)

Gate valves shall be equipped with non-rising spindle, gunmetal bronze or dezincified brass body, gunmetal or dezincified brass gate, graphite asbestos packing in the gland.

The valve shall be fitted with a hand wheel to close in a clockwise direction and installed in an upright position or sideways to maximum 90° from upright.

The valve shall be equipped with flanges to SANS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

- (vi) Gate valves above-ground for temperatures up to 100 °C (up to 50 mm NB)

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSP threaded socket ends. The valve shall conform to SANS 776-1965 Class 125.

The valve shall be able to withstand a working pressure of 1 600 kPa.

The valve shall be equipped with a hand wheel to close in a clockwise direction.

The valve shall be installed in an upright position or sideways to a maximum 90° from upright and shall be so placed with other fittings to be removable without cutting the pipework.

(vii) Ball-O-Stop valves (15 mm diameter - 25 mm diameter)

This valve shall be a full-way ballcock type with BSP threaded ends. This valve shall conform to SABS 1056 Part 3, 1985, shall be rated for a test pressure of 2 000 kPa, and shall be chrome-finished where exposed.

(viii) Angle regulating valves

This valve shall be a 15 mm diameter chromium-plated angle regulating valve with a 350 mm chromium-plated copper tube and cap nuts where required.

(i) Strainers

(i) Strainers for connection to steel or uPVC pipes (65 mm NB and larger)

These strainers shall be of the Y-type with cast-iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends to SABS 1123/1600. The whole size of the strainer element shall be maximum 1 mm diameter and be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90 °C at a 1 000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

(ii) Strainers for connection to steel and copper pipes (up to 50 mm NB)

The strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with BSP threaded socket ends. The whole size of the strainer element shall be maximum 0,8 mm diameter. The strainer shall be suitable for a temperature of up to 90 °C at a pressure rating of 1 000 kPa and installed with the element facing downwards or a maximum of 45° sideways.

(j) Non-return valves

(i) Non-return valves for cold water (65 mm NB and larger)

The non-return valve shall be of the spring-loaded dual flap plate type fitted between two flanges (wafer).

The non-return valve shall be equipped with a cast-iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for a working pressure of 1 000 kPa.

- (ii) Non-return valves for hot water (up to 100 mm diameter) and cold water (up to 50 mm NB)

The non-return valve shall be of the spring-loaded piston type, with bronze or dezincified brass body, stainless steel spring and bronze disc with neoprene seal fitted with BSP threaded socket ends. The valve shall be suitable for a working pressure of 1 000 kPa and a temperature of up to 90 °C. All valves shall be installed as to be removable without extensive pipework removal.

(k) Air release valves and vacuum breakers

- (i) Double orifice double-acting air release valves with sizes from 50 mm NB to 200 mm NB

The air release valve shall be fitted with small and large orifice. The air release valve shall be fitted with a cast-iron or stainless steel body, stainless steel or fibreglass balls, integral shut-off valve and flanged ends to SABS 1123/1600. The valve shall be equipped with an anti-shock facility.

The valve shall be suitable for maximum pressure of 1 600 kPa.

- (ii) Single orifice air release valves for main water lines with sizes from 25 mm NB to 50 mm NB

The air release valve shall be fitted with a small orifice, cast iron or stainless steel body, fibre glass or stainless steel ball float and BSP threaded inlet.

When the valve is installed a shut-off valve shall be installed on the inlet side. The valve shall be equipped with an anti-shock facility.

The valve shall be suitable for maximum pressure of 1 600 kPa.

- (iii) Single orifice double purpose air release valves for domestic water lines up to 15 mm NB

The air release valves shall be fitted with a stainless steel float, brass or cast steel body with an integral shut-off valve fitted.

The valve shall be capable to withstand a working pressure of 1 000 kPa at 110 °C.

- (iv) Vacuum breaker up to 40 mm diameter

The vacuum breakers shall be fitted with neoprene seal, spring-loaded disc in a dezincified brass or bronze body. The valve shall seal watertight and shall be designed to withstand a working pressure of 1 000 kPa and a temperature of 90 °C.

(l) Pressure-reducing valves

(i) Combination pressure reducing stations

Where a high peak flow can occur as well as a small flow and the small flow is out of the range of the large pressure-reducing valve, a small pressure-reducing valve shall be installed in parallel with the large pressure-reducing valve. The two pressure-reducing valves in parallel shall be set according to the manufacturer's specification.

(ii) Large pressure-reducing valves (65 mm NB and larger)

The pressure reducing valve shall be equipped with a cast iron body, neoprene-nylon reinforced diaphragm, bronze seal disc washer, stainless steel shaft and flanged ends. The valve shall be pilot operated and shall be designed to handle high flows at a minimum head loss.

The valve must be adjustable to handle a wide range of incoming pressure at a constant downstream pressure.

The valve shall be equipped with flanged ends to SABS 1123/1600.

(iii) Small pressure-reducing valves (15 mm NB - 50 mm NB)

The pressure-reducing valve shall be equipped with brass body, balanced single seat and integral strainer. The valve shall be able to handle a wide range of incoming pressure while the downstream pressure stays constant with maximum inlet pressure of 1 000 kPa and a maximum water temperature of 40 °C.

The valve shall be equipped with BSP male threaded brass union couplings.

(m) Water meters

(i) Combination water meters

Where high peak flow as well as a low flow can occur, and the low flow is out of the registration range of large water meter, a small diameter water meter shall be installed in parallel with the large water meter to cater for the low flows with integral automatic change-over valves. These valves shall be designed to have a minimum pressure drop at the operating point.

(ii) Water meters (50 mm NB and larger)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SABS 1123, cast-iron body with high quality corrosion proof coating. The meter must be protected from magnetic fields and sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40 °C. The scale of meter must be in cubic metre (m³) and equipped with needle indicators reading in litres. The accuracy of the meter shall be not less than 98%.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturer's specification.

(iii) Water meters (up to 50 mm NB)

The meter shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter reading must be in kilolitres. The meter shall have an accuracy of not less than 98%. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40 °C.

The meters shall be installed with leading and trailing lengths of pipes to the manufacturers specification.

CE 05 TESTS AND INSPECTIONS ON COMPLETION OF REPAIR WORK

Except where otherwise provided in the Contract, the Contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary for carrying out such tests. The Contractor shall make arrangements for such tests and he shall give at least 72 hour's notice to the Engineer, in writing, prior to commencement of the test.

In the event of the plant or installation not passing the test, the Employer shall be at liberty to deduct from the Contract price all reasonable expenses incurred by the Employer or the Engineer attending the repeated test.

Whenever any installation or equipment is operated for testing or adjusting as provided for above, the Contractor shall operate the entire system for as long a period as may be required to prove satisfactory performance at all times in the occupied space served by that system for up to twenty-four hours a day continuously until the system is handed over.

The Contractor shall provide all labour and supervision required for such operation and the Employer may assign operating personnel as observers, but such observation time shall not be counted as instruction time.

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the Engineer.

The Contractor shall submit certificates of tests carried out to prove the quality and proper functioning of all equipment and also certificates to be obtained from all relevant authorities and statutory bodies, etc.

CE 06 QUALITY ASSURANCE SYSTEM

The Contractor shall institute an approved quality assurance (QA) system which shall be submitted to the Employer or Engineer for approval. The records of this QA system shall be kept throughout the duration of the Contract and be submitted to the Engineer at regular intervals as required.

CE 07 MEASUREMENT AND PAYMENT

CE.01 WATER DISTRIBUTION PIPELINES

CE.01.01 New pipelines..... Unit: metre (m)

The unit of measurement shall be per metre length of pipe installed. In each case the Contractor shall agree on the length of pipe to be installed and the method of coupling the pipes.

The tendered rate shall include full compensation for cleaning and grubbing, excavation (in all material types except hard rock excavation which shall be measured for payment elsewhere), dealing with water logged conditions, provision of bedding and additional backfill material, logging and backfilling of installed pipeline, finishing, repair of kerbs, road surfaces, accommodation of traffic, excavation in all materials, removal of unsuitable material from the trench, disposal and haul of surplus materials.

The provision of the pipes and fittings will be measured separately under CE 01.02.

CE.01.02 Provision of materials

(a) Pipelines..... Unit: metre (m)

The unit of measurement shall be the metre of pipe replaced.

(b) Fittings..... Unit: number

The unit of measurement shall be the number of fittings installed.

The tendered rates shall include full compensation for all transport to the place of installation, storage, labour costs.

Separate pay items shall be listed for the pipe materials and fittings per diameter and class.

CE.01.03 Replacement of manhole covers, grid inlets and the like

(a) SABS 558 Type 4 - covers, grids, etc, only:

- (i) Maximum dimension up to 300 mm..... Unit: number
- (ii) Maximum dimension 301 mm - 600 mm..... Unit: number
- (iii) Maximum dimension 601 mm - 900 mm Unit: number
- (iv) Maximum dimension over 900 mm..... Unit: number

(b) SABS 558 Type 4 - frames only for covers, grids, etc:

- (i) Maximum dimension up to 300 mm..... Unit: number
- (ii) Maximum dimension 301 mm - 600 mm..... Unit: number
- (iii) Maximum dimension 601 mm - 900 mm Unit: number
- (iv) Maximum dimension over 900 mm..... Unit: number

(c) SABS 558 Type 2A - covers, grids, etc, only:

- (i) Maximum dimension up to 300 mm..... Unit: number
- (ii) Maximum dimension 301 mm - 600 mm..... Unit: number
- (iii) Maximum dimension 601 mm - 900 mm Unit: number
- (iv) Maximum dimension over 900 mm..... Unit: number

(d) SABS 558 Type 2A - frames only for covers, grids, etc:

- (i) Maximum dimension up to 300 mm..... Unit: number
- (ii) Maximum dimension 301 mm - 600 mm..... Unit: number
- (iii) Maximum dimension 601 mm - 900 mm Unit: number
- (iv) Maximum dimension over 900 mm..... Unit: number

The unit of measurement shall be the number of covers or frames installed. The classification of the size of each cover or frame will be based on the nominal dimensions of the unit and not on the actual dimensions.

The tendered rates shall include full compensation for procuring, furnishing and placing the new covers, grids and/or frames. The tendered rates shall also include full compensation for removing and disposing of the damaged covers, grids and/or frames from the site.

CE.02 REPAIR OF FIRE WATER PIPE RETICULATION NETWORK

Measurement and payment items from CE 01, CE 03, CE 04 and CE 05 will be utilised for work done on the external fire water pipe reticulation.

CE.03 CLEANING OF PIPELINE

CE.03.01 Cleaning of deposits in pipeline by mechanical means for pipes of diameters of:

- (a) Up to 100 mm dia Unit: metre (m)
- (b) 101 to 200 mm dia..... Unit: metre (m)
- (c) 201 to 300 mm dia..... Unit: metre (m)
- (d) 301 to 400 mm dia..... Unit: metre (m)

CE.03.02 Scouring of pipeline to remove trapped debris for pipes of diameters of:

- (a) Up to 100 mm dia Unit: metre (m)
- (b) 101 to 200 mm dia..... Unit: metre (m)
- (c) 201 to 300 mm dia..... Unit: metre (m)
- (d) 301 to 400 mm dia..... Unit: metre (m)

The unit of measurement shall be metre length of pipe cleaned or scoured.

The unit rate of measurement for item CA.03.01 shall include full compensation for the emptying of the pipeline, cleaning, refilling and reporting on the condition of the pipe after

cleaning. The rate shall also include the disposal of waste material in and appropriate manner.

The unit of measurement for item CA.03.02 shall include full compensation for the scouring of the pipeline and refurbishing of the pipeline. The unit of measurement shall be the total length of filled pipeline from which the water is scoured. The length shall be agreed with the Engineer prior to scouring.

The provision of additional scour points shall also be included in the rate.

CE.05.04 Marker posts Unit: number

The unit of measurement shall be the number of marker posts installed.

The tendered rate shall include full compensation for the manufacture and installation complete as shown on the drawings.

CE.06 TESTS AND INSPECTIONS OF REPAIR WORK

CE.06.01 Pressure testing

(a) Pressure test pipeline in sections of pipes with diameter of:

(i) Up to 100 mm dia Unit: metre (m)

The unit of measurement shall be the metre length of pipe tested.

The tendered rate shall include full compensation for isolation of test section, filling of section with water, testing for required duration and reporting on performance of pipes, the provision of any additional water shall also be included in the rate. The rate shall also include the provision of all equipment, labour and supervision necessary for the completion of the pressure test.

CE.07 STERILIZATION OF RESERVOIR

Before the reservoir is sterilized, the pipelines serving the reservoir shall have been sterilized. The reservoir shall then be thoroughly cleaned out and washed down with clean water.

The roof and walls shall thereafter be thoroughly sprayed down, using pressurised equipment, and the walls, roof and floors shall be scrubbed with the solution specified in subclause 5.10 of SABS 1200 L.

On completion of the sterilization, the sterilizing solution shall be run to waste before the reservoir is filled for testing water tightness.

Should additional work be required to be done inside the reservoir after the water tightness tests has been completed, the reservoir shall be resterilized at the Contractor's expense.

TECHNICAL SPECIFICATION

EA BOREHOLE PUMP SYSTEMS

CONTENTS

EA 01	SCOPE
EA 02	STANDARD SPECIFICATIONS
EA 03	DESCRIPTION OF SERVICING AND TESTING WORK
EA 04	TESTING AND COMMISSIONING
EA 05	MEASUREMENT AND PAYMENT

EA 01 SCOPE

This specification covers the decommissioning, removal, service and reconditioning, installation, testing, commissioning and maintenance of borehole pumping equipment, motor control devices and low-voltage cables. It also includes the pump testing of all boreholes to determine the borehole yield and optimum use of each borehole. The function of borehole pump systems shall be delivery of raw water at a specified flow rate and head to the required location.

EA 02 STANDARD SPECIFICATIONS

EA 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

- | | |
|-----------------|--|
| BS 5316, Part 1 | - Acceptance tests for centrifugal, mixed flow and axial pumps |
| SANS 948 | - Three-phase induction motors |
| SANS 1222 | - Enclosures for electrical equipment (classified according to the degree of protection that the enclosure provides) |
| BS 4999 | - General requirements for rotating electrical machines |
| ISO 281/1 | - Rolling bearings – dynamic load ratings and rating life. |

EA 03 DESCRIPTION OF SERVICING AND TESTING WORK

EA 03.01 PUMP TESTING OF BOREHOLES

This section covers the requirements of the pump testing of the boreholes.

EA 03.01.01 Testing

It will be the responsibility of the Contractor to arrive on site with all equipment and materials required to complete the work without interruption.

The Contractor shall provide suitable plant to enable the installed pumping equipment to be removed and reinstalled. This includes the removal and reinstallation of motorised pumps and may also include the recovery of existing pumping equipment previously lowered into a borehole.

(a) Arrival-on-site actions

The Contractor shall firstly establish whether or not the borehole is equipped. If so, the Contractor will be required to:

- (1) Remove the equipment, taking care not to damage either the equipment or the installation,
- (2) inspect the equipment for defects, and
- (3) note down all particulars regarding the equipment and the installation.

The latter shall include but not be limited to the make and type of pump (and motor if motorised), the depth to which the pump was installed, the power rating of the motor and the diameter, length and quantity of pump column sections.

The Contractor shall next establish whether there are any other boreholes in the vicinity that need to be tested. Should this be the case, the following information shall be gathered and recorded for each borehole:

- (1) The straight-line distance (in metres) between each such borehole to be tested;
- (2) whether the borehole is equipped, open or sealed and, if equipped,
- (3) whether the installation is operational or not.

Depending on the degree of access available to such a borehole, the Contractor shall improve the access until it is adequate to reach the borehole and establish whether there is water in the borehole and if so, measure and record:

- (1) The depth to the ground-water rest level;
- (2) the height of the borehole collar above ground level, and
- (3) the depth of the borehole.

The final activities to be carried out prior to the actual installation of the test pump into the borehole to be tested shall comprise measuring and recording:

- (1) The diameter of the borehole;
- (2) the depth of the borehole as determined by means of a weighted line or plumb bob, and
- (3) the depth to the ground-water rest level in the borehole, with reference to a date level.

(b) Test pump installation

The conduit tube shall be attached and secured to the first section of pump column behind the pump element and the test pump installed to the required depth, attaching and securing the conduit tube to the riser main every 2 to 3 metre. If the pump installation depth has not been specified by the Engineer beforehand, then the depth must be determined on the basis of the guidelines provided.

GUIDELINES FOR TEST PUMP INSTALLATION DEPTH IF NOT SPECIFIED

DEPTH OF WATER IN BOREHOLE	TEST PUMP INSTALLATION DEPTH
Less than 5 m	Do not install the test pump
Between 5 m and 30 m	± 2 m above the bottom of the borehole
Between 30 m and 60 m	± 3 m above the bottom of the borehole
Between 60 m and 90 m	± 4 m above the bottom of the borehole
More than 90 m	± 5 m above the bottom of the borehole
NOTE: 1. Depth of water in borehole is calculated as the difference between the total depth of the borehole and the depth to the ground-water rest level as measured. 2. ± denotes a variation of not more than 0,5 m either way.	

(c) Equipment set-up and pre-test actions

Where possible, the discharge pipe must be laid in a downhill direction from the borehole to be tested, provided this will take the pipe in the direction of or past another borehole located in the vicinity of the borehole to be tested. In such instances, lay the discharge pipe in a downhill direction that will take its furthest end as far as possible away from any other borehole in the vicinity.

In field situations where the terrain is extremely flat, the length of the discharge pipe shall be extended from 50 m to at least 300 m if any possibility exists that the discharged water may infiltrate to the ground-water resource within the

radius of influence of the test. The dip meter should be inserted into the installed conduit tube and run down this tube to the bottom. Make sure that it passes freely down the full length of the tube. If the dip meter used is not graduated to an accuracy of 0,01 m, the position is to be marked on the dip meter cable indicating the depth to the ground-water rest level, and the end of the graduated tape attached at this position on the cable ensuring that the zero mark of the graduated tape corresponds exactly to this mark. Slowly lower the dip meter and graduated tape down the conduit tube, in the process securing the tape to the dip meter cable every 2 to 3 metre. Ensure that there is no slack between each point where the tape is secured to the dip meter cable. Also make sure that the dip meter cable and graduated tape combination passes freely along the full length of the conduit tube. The Contractor will be remunerated for this work per set-up at the rate tendered for one such activity as set out in the Schedule of Quantities.

(d) Final pre-test measurements

The Contractor shall ensure that all the basic information required on the field data sheet is collected and recorded as completely as possible. The basic information data entry fields can be used as a checklist for information to be measured/collected and recorded. The Contractor shall not guess any information which has not been measured.

Payment for this work shall be incorporated into the payment for data recording as described below.

(e) Data recording

(i) Discharge measurements

The measurement of discharge (yield or pumping rate) must be consistently accurate and reliable and shall be appropriate to meet this requirement. Where volumetric calculation methods are applied, time will be measured using a stopwatch and the container volume must be accurately known. The volumetrically measured yields recorded on the field data sheets shall be based on the average obtained from a set of three sequential measurements. Guidelines for the number and periodicity of discharge rate measurements for each type of test are given below.

NUMBER OF PERIODICITY OF DISCHARGE RATE MEASUREMENTS

TYPE OF TEST	DISCHARGE RATE MEASUREMENTS	
	NUMBER	PERIODICITY
Calibration test	2 per step	At ± 5 and ± 10 minutes into each step
Stepped discharge test	5 per step	At ± 5 , ± 15 , ± 30 , ± 60 and ± 90 minutes into each step
Constant discharge test	See periodicity column	At ± 5 , ± 15 , ± 30 , ± 60 , ± 90 and ± 120 minutes into test and every 60 minutes thereafter for the full duration of pumping

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(ii) Water-level measurements

Rigid guidelines for the periodicity of water-level measurements for each type of test are given in table EA 04.02.01/3. This information can be found duplicated on the field data sheets which must be filled in as a record of all data collection activities carried out for a pumping test. The type of water-level measurement values required to be recorded on the field data sheets are the actual (or true) draw down values. These values represent measurements which reflect the depth of the water level below the ground-water rest level depth, ie which already take into account the ground-water rest level depth below the reference measuring point. It shall be noted that the more basic type of measurement which reports the depth of the dynamic water level as a distance below the reference measuring point, ie which combines the depth of the water level below the ground-water rest level depth and the depth of the ground-water rest level below the reference measuring point, gives only an apparent (or false) draw down value. All water-level measurements must be measured to an accuracy of at least 0,01 m (10 mm). The water-level data shall be plotted on the semi-logarithmic graph paper provided with each set of field data sheets. The plotting of the data shall be done as the test proceeds, ie each water-level measurement shall be plotted on the graph as soon as possible after measuring. The field data sheets and accompanying water-level graphs shall be shown to authorised supervisory personnel at request and shall be up-to-date at the time of such request.

(iii) Other information

The Contractor shall also record any extraordinary observations made during the test. These may include:

- (1) Changes in the colour of the discharged water;
- (2) changes in the turbidity of the discharged water;
- (3) the presence of air in the discharged water, and
- (4) rainfall events which occur during a test.

PERIODICITY (IN MINUTES) OF MEASUREMENTS DURING PUMPING TESTS

CALIBRATION TEST	STEPPED DISCHARGE TEST	CONSTANT DISCHARGE TEST	RECOVERY TEST
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
7	7	7	7
9	9	9	9
12	12	12	12
15	15	15	15
	20	20	20
	25	25	25
	30	30	30
	40	40	40
	50	50	50
	60	60	60
	70	70	70
	80	80	80
	90	90	90
	100	120	120
		150	150
		180	180
		210	210
		240	240

(f) Test pumping of boreholes

The Contractor may be required to test existing "older" boreholes which may or may not already be equipped with pumping installations.

Test pumping serves two primary objectives. The first of these is an assessment of the productive capacity (yield potential) of the borehole. The second objective addresses the productivity of the ground-water resource. These objectives are met by various types of borehole tests performed separately and often sequentially.

These tests are identified as:

- (i) the slug test
- (ii) the calibration test
- (iii) the stepped discharge test
- (iv) the constant discharge test
- (v) the recovery test.

Factors determining which of these tests shall be performed include:

- The potential yield of the borehole, and
- the amount of water which it will be required to supply.

(i) **The slug test**

The slug test provides a rapid means of assessing the potential yield of especially low yielding (less than 1 litre/s) boreholes (Vivier et al, 1995). The results may indicate whether it is feasible and warranted to perform other tests on the borehole. As with any of the other tests, a slug test can be executed in any borehole and not necessarily only newly drilled boreholes.

The test involves measuring the water-level response in a borehole to the rapid displacement of water therein. This displacement might cause either -

- (1) a rise in water level, as would result from the introduction of a slug below the rest water level, or
- (2) a drop in water level, as would be caused by the removal of a quantity of water from the borehole.

In instances where a slug is introduced, the water level will recede to its original level. The sudden removal of a quantity of water from the borehole will cause the water level to rise to its original level. The rate of recession or rise provides an indication of the yield of the borehole. In qualitative terms the more rapid this is, the higher the potential yield of the borehole.

(ii) **The calibration test**

A calibration test requires that water be pumped from the borehole at three or more different rates over short (15 minutes) sequential periods. The response of the water level to each known pumping rate is measured and recorded. The calibration test provides a means of assessing the yield potential of borehole according to the magnitude of the water-level decline associated with each pumping rate. This information is used to select appropriate pumping rates at which to perform a stepped discharge test or a pumping rate at which to perform a constant discharge test.

(iii) **The stepped discharge test**

Also known as a step draw down test, this test is performed to assess the productivity of a borehole. It also serves to more clearly define the optimum yield at which the borehole can be subjected to constant discharge testing if required. The test involves pumping the borehole at three or more sequentially higher pumping rates, each maintained for an

equal length of time, generally not less than 60 minutes and seldom longer than 120 minutes. A step length of 100 minutes is recommended.

The magnitude of the water-level draw down in the borehole in response to each of these pumping rates must be measured and recorded in accordance with a prescribed time schedule. The actual pumping rate maintained during each "step" must also be measured and recorded. As a rule, the rate of water-level recovery for a period of time immediately following the period of pumping should also be monitored according to the same time schedule as during pumping.

(iv) **The constant discharge test**

A constant discharge test is performed to assess the productivity of the aquifer according to its response to the abstraction of water. This response can be analysed to provide information in regard to the hydraulic properties of the ground-water system and arrive at an optimum yield for the medium to long-term utilisation of the borehole. This test entails pumping the borehole at a single pumping rate which is kept constant for an extended period of time. The test duration shall not be less than 12 hours and, in some instances, might last up to 72 hours or more. The duration is generally determined by the importance which is attached to the borehole and ground-water resource not only in terms of its yield potential but also in terms of its intended application. The pumping rate is set at a yield which it is considered the borehole and ground-water system will be able to maintain for the entire planned duration of the test and, in the process, utilising better than 70 per cent but not exhausting the available draw down. It is critical that the pumping rate during the entire duration of the test be kept as constant as possible. The draw down in water level in the borehole during the course of the test is again measured and recorded according to a prescribed time schedule. In the case of this type of test, it is imperative that water-level measurements be made during the recovery period following the end of pumping.

(v) **The recovery test**

This test provides an indication of the ability of a borehole and ground-water system to recover from the stress of abstraction. This ability can again be analysed to provide information with regard to the hydraulic properties of the ground-water system and arrive at an optimum yield for the medium to long-term utilisation of the borehole. Although referred to as a test, it rather represents a period of monitoring activity following a period of pumping. The rate at which the water level in the tested borehole (or any other borehole affected by the abstraction) recovers towards its starting level (the ground-water rest level before pumping started) is monitored in this period. The duration of this monitoring is generally equal to that of the preceding period of pumping unless the rate of recovery is sufficiently rapid so that the starting water level is reached in a shorter period of time.

(g) General approach and methodology

The Engineer will formulate a test pumping schedule for each borehole. The flow diagram presented overleaf provides an indication of the considerations which determine the scope of test pumping based on a logical decision-making process.

All project-related test pumping activities will also be carried out under the direct supervision of the Engineer. The execution of a pumping test in accordance with established scientific protocols must be undertaken by a suitably experienced and equipped testing contractor. The South African Bureau of Standards (SANS) is finalising a Standard Code of Practice titled The test-pumping of water boreholes.

A draft of this Standard has been considered in the compilation of this document. It will be the task of the Engineer to evaluate and analyse the data, draw conclusions with regard to the productivity of the borehole and the aquifer, and make recommendations with regard to a suitable operating schedule for the borehole and the optimum exploitation of the ground-water resource.

Both the practical and analytical aspects of test pumping benefit greatly from prior information regarding the borehole and the aquifer which it taps into. This information is gleaned during the drilling and the construction of the borehole. It includes knowledge of:

- (1) The amount of water blown out of the borehole during drilling operations;
- (2) the depth(s) at which water was struck in the borehole;
- (3) the construction of the borehole in terms of the setting of especially perforated (slotted) casing, and
- (4) the nature of the rock formation at the depth(s) where water was struck.

This information will be communicated to the testing contractor by the Engineer prior to the testing of any borehole.

The Contractor shall keep a full record of the test pumping which is undertaken and submit the record on completion of the test. This record must include the following basic information:

- (1) The depth to water level before the start of testing;
- (2) the depth at which the test pump was installed;
- (3) the type, make and model of the test pump used;
- (4) the pumping rate as measured at regular intervals during the test, and
- (5) the water level in the borehole as measured according to a prescribed time schedule both during and after pumping.

The Contractor must be sufficiently well-equipped to gather this information with acceptable accuracy. The rationale behind the flow diagram is explained as follows. A slug test should be performed on a borehole in instances where there is no prior indication of its possible yield. The result of the slug test will indicate whether additional test pumping is warranted. A slug test shall also be performed in instances where the possible yield of a borehole from prior information is indicated to be less than 0,3 litre/s. The result of the slug test will again indicate whether additional test pumping is warranted. In instances where the possible yield of a borehole from prior information is indicated to be equal to or greater than 0,3 litre/s, then a calibration test followed by a stepped discharge test shall be performed.

The result of the stepped discharge test will indicate whether further test pumping in the form of a constant discharge test is warranted or whether the borehole is judged to be sufficiently weak (potential production yield less than 0,5 litre/s) to make a utilisation recommendation without further testing. Should the result of the stepped discharge test indicate that a constant discharge is warranted, then the Engineer will need to make an assessment of the possible operational duty to which the borehole might be subjected.

The operational duty describes the number of hours per day for which the borehole must operate in order to meet the local water demand. By implication, the potential production yield of the borehole must be compared to the water demand. In qualitative terms, a lower yielding borehole would need to operate for a longer period per day to meet a given demand than a higher yielding borehole would need to. Further, the water demand is often too great for even a high yielding borehole pumping continuously to meet. The flow diagram indicates, however, that any borehole which reveals the potential to yield more than 0,5 litre/s and which will operate for a period in excess of 8 hours per day must be subjected to a constant discharge test of 48 to 72 hours duration. A borehole which does not fit this category requires an assessment of its possible operational intensity.

The operational intensity describes the yield at which a higher yielding borehole must operate in order to meet a water demand in a pumping period of eight hours or less per day. By implication, a high operational intensity requires the borehole to be pumped at a yield approaching its maximum, whereas a low operational intensity will place less stress on the borehole. These considerations will indicate whether a 24 to 48 hour or a 12 to 24 hour duration constant discharge test respectively will be performed. The final step in the flow diagram requires the Engineer to make a borehole utilisation recommendation.

EA 03.01.02 Equipment and materials

This represents the test unit and all ancillary equipment and materials required to accurately and efficiently perform borehole testing. Details are provided below.

(a) Test unit

The test unit shall comprise a positive displacement (PD) type pump element and a pump head driven by a motor fitted with an accelerator, gearbox and clutch. The unit must be in good working order and capable of maintaining a minimum of 72 hours of continuous operation.

The unit must be capable of delivering water at a rate in excess of the expected maximum yield of the borehole to be tested. It may be acceptable under certain circumstances to employ a submersible pump for testing purposes. This must, however, be identified in the tender enquiry document. It is imperative that any submersible pump used for testing purposes be equipped with a non-return valve fitted at the bottom of the pump column (rising main).

(b) Discharge piping

Discharge piping comprises both the pipe (rising main or pump column) which brings the water to surface and the pipe (discharge hose) used to lead the pumped water away from the borehole being tested. The Contractor shall supply sufficient rising main to set the test pump at a depth of at least 100 m below the surface. It may, however, be required under certain circumstances to set the test pump at a greater depth in the borehole. Where necessary it shall be discussed with the Engineer prior to the installation of the test pump. The pump column must be of uniform diameter throughout. The Contractor shall also provide at least 50 m discharge piping. This must be free of leaks for its entire length. It may again, under certain circumstances, be required to discharge the pumped water at a point further away than 50 m (possibly in excess of 300 m) from the borehole being tested. In such instances, a similar procedure to that discussed above in regard to the rising main must be followed.

(c) Discharge measuring equipment/Instrumentation

This equipment/instrumentation must be adequate to accurately measure the pumping rate within the range of yields expected from successful project boreholes. If volumetric methods are used, a stopwatch for measuring time to an accuracy of at least one-tenth of a second is required. The full capacity of each container shall be determined accurately. The Contractor shall also ensure that a container stands level when used for discharge measurements. Guidelines regarding the use of different size containers for volumetric discharge rate measurements in specific yield ranges are given in table below. Other acceptable instruments that may be used for discharge measuring are: (1) an orifice weir and (2) a flow meter. The use of these instruments is subject to various application criteria.

(i) Orifice weirs

These must be installed in a horizontal position at the end of the discharge pipe. The orifice plate opening must be sharp, clean, bevelled to 45 degrees and have a diameter less than 80 per cent of the diameter of the approach tube to which it is fixed. The orifice plate must be vertical and centred on the end of the approach tube. There must be no leakage around the perimeter of the orifice plate mounting. The piezometer tube must not contain entrained air bubbles at the time of pressure head measurement. The latter measurement must be at least three times the diameter of the orifice.

YIELD RANGE VERSUS CONTAINER SIZE FOR VOLUMETRIC MEASUREMENTS

YIELD RANGE	CONTAINER SIZE
Less than 2 litre/s	20 litre
2 litre/s to 5 litre/s	50 litre
5 litre/s to 20 litre/s	210 litre
20 litre/s to 30 litre/s	500 litre
30 litre/s to 50 litre/s	1000 litre
More than 50 litre/s	Other suitable methods

The orifice weir equipment must be calibrated for various combinations of approach tube and orifice diameters so that pressure head readings can be converted to accurate discharge measurements.

(ii) Flow meters

Flow meters must be calibrated and of similar diameter to that of the discharge pipe. The latter must be straight and of uniform diameter for a distance of four times the diameter of the pipe before the position of the meter. There must be no turbulent flow or entrained air in the discharge pipe before the meter. The discharged water must be free of solid material carried in suspension.

It is recognised that some water leakage will generally occur especially at the borehead during pumping. This is acceptable provided that: (1) such leakage does not interfere with any water-level monitoring and (2) the total amount of leakage to the end of the discharge pipeline does not exceed one per cent of the pumping rate as measured at the end of this pipeline.

(d) Water-level measuring equipment/instrumentation

The Contractor shall provide at least three water-level measuring devices which are each capable of providing an accuracy of at least 0,01 m (10 mm) and are of sufficient length to match the pump installation depth. If ungraduated electrical contact meters (dip meters) are used for this purpose, each such instrument must be equipped with a measuring tape of an acceptable length and approved standard and which is graduated to an accuracy of at least 0,01 m (10 mm). These instruments must be in good working order and number at least one spare for each two on site.

The Contractor shall further provide conduit tubing of sufficient length to match the pump installation depth. The diameter of this tube must be large enough (minimum 15 mm) to allow free movement of the dip meter probe and cable therein. The tubing must be made of material strong enough to withstand reasonable pressure on its sidewall which might cause a constriction. The tube

must be open at its lower end to allow the free entrance of water into the tube. This is facilitated by perforating the bottom section of the conduit tube sidewall. Precautions shall also be taken to prevent the dip meter probe from passing beyond the bottom end of the conduit tube and, as a result of entanglement, not able to be withdrawn.

(e) Other materials

No pumping test should commence without field data sheets on which to record all data and information relevant to the test pumping activities in an acceptable format. These can either be provided by the Contractor or the Engineer.

EA 03.02

GROUND-WATER SAMPLING

(a) Sampling for macro-element analysis

A water sample shall be collected from the end of the discharge pipeline no sooner than 15 minutes before the scheduled end of a pumping test, whether of a calibration, stepped discharge or constant discharge nature. This will ensure that a water sample is collected in case testing does not proceed to include either one or both of the latter two types of test. The standard amount of sample normally collected is in a clean, sterilised plastic bottle of capacity 2000 millilitre with a watertight screw-on cap. The Hydrogeologist will advise on this matter in instances where the Contractor is required to collect samples, in which case the Hydrogeologist will provide sample bottles containing preservative chemicals if required. All other materials such as tie-on labels and sample custody forms are to be provided by the Hydrogeologist.

(i) Sampling procedure

Rinse the sample bottle three times with the water to be samples, i.e. the water being pumped from the borehole. Fill the bottle so that a space of five to ten millimetres is left at the top. Add the preservative as instructed.

(ii) Sample custody

Fill in the information requested on the tie-on label and attach this securely to the neck of the sample bottle. Place the sample bottle in a cooler or ice-box and keep it stored under chilled conditions. Complete the sample custody form (DWAF form DW45). The water sample and its custody form will be collected by the Hydrogeologist. The above procedures shall be adhered to and complied with to the satisfaction of the Hydrogeologist.

EA 03.03

ABORTED TESTS AND BREAKDOWNS

The Hydrogeologist may at any stage during the execution of a pumping test request the testing contractor to abort a test if, in the opinion of the Hydrogeologist, continuation of the test is not in the interests of the project. Factors which may contribute to such a decision by the Hydrogeologist are:

- Sufficient data having been collected for an adequate scientific evaluation thereof;
- the execution of the test not meeting project criteria and requirements (such as for constancy of yield, accuracy of yield measurements or accuracy of water-level measurements, sufficiency of discharge line length, etc), or
- a mechanical breakdown occurring during pumping which causes a test to be interrupted or aborted.

(a) Tests aborted due to sufficiency of data

The Hydrogeologist will fully motivate his decision to abort the test in a written statement to the User Client. In such instances, the testing contractor will be remunerated for the actual duration of testing (including recovery testing) at the hourly rates set out in the Schedule of Quantities.

(b) Tests aborted due to incorrect execution

The testing contractor will be required to remedy the cause(s) for an abort decision by the Hydrogeologist. The test shall be restarted, as if it were the first attempt, after the water-level has recovered to within five per cent of the pre-test rest water-level or the contractor is instructed thereto by the Hydrogeologist. The testing contractor shall not be entitled to remuneration for any test which is aborted under these circumstances irrespective of the time elapsed up to receipt of the instruction to abort.

(c) Tests aborted due to breakdowns

The following procedures are recommended when a mechanical breakdown occurs during pumping which causes a test to be interrupted or aborted.

(i) Calibration test

Start immediately with the measurement and recording of the water-level recovery rate according to the periodicity given in the Table below. Irrespective of how long after the start of pumping the breakdown occurs or how rapidly the breakdown can be fixed, continue with water-level recovery measurements until the water level is within five per cent of the pre-test rest water level or, at the discretion of the Engineer, may be discontinued. Restart the calibration test as if it is the first attempt. The Testing Contractor shall not be entitled to remuneration for a calibration test which is aborted under such circumstances.

(ii) Stepped discharge test

Record the time of the breakdown and start immediately with the measurement and recording of the water level recovery according to the periodicity given in the Table below. If the breakdown occurs during the first or second steps of the test, continue with water-level recovery measurements until the water-level is within five per cent of the start rest water level and then restart the stepped discharge test as if it is the first attempt. If the breakdown occurs during the third step of the test, can be

fixed and the pump restarted to produce the same yield (as before the breakdown) within five minutes of the breakdown occurring, continue with the test at this yield after measuring and recording the water level immediately before restarting the pump. Only one such breakdown event is allowed.

If a second breakdown occurs, proceed as described for a first step breakdown. If the breakdown occurs during the fourth or later step of the test, can be fixed and the pump restarted to produce the same yield (as before the breakdown) within five minutes of the breakdown occurring, continue with the test and complete it at this yield after measuring and recording the water level immediately before restarting the pump. If a breakdown at this stage can not be fixed within five minutes, continue with water-level recovery measurements as if the test has been fully completed.

The Contractor shall not be entitled to remuneration for a stepped discharge test which is aborted: (1) within the first or second step, or (2) within the third step and can not be restarted within the time allowed for repair.

(iii) Constant discharge test

Note the time of the breakdown and start immediately with the measurement and recording of the water-level recovery according to the periodicity given in Table below. If the breakdown occurs within the first two hours after the start of pumping, continue with water-level recovery measurements until the water-level is within five per cent of the pre-test (start) rest water level and then restart the test. If the breakdown occurs later than two hours into the test, can be fixed and the pump restarted to produce the same yield as before the breakdown within the time periods (after the breakdown occurring) given in Table below, continue with the test at this yield after measuring and recording the water level immediately before restarting the pump.

If the breakdown can not be fixed and the pump started within one hour of the breakdown occurring, continue with water-level recovery measurements until the water level is within five per cent of the pre-test rest water level and then restart the constant discharge test as if it is the first attempt unless the following condition has been met. If the breakdown occurs after approximately 80 per cent of the planned duration of the constant discharge test has been successfully completed, continue with water-level recovery measurements as if the test has been fully completed. The allowable elapsed time (in hours) with regard to selected constant discharge test total durations in order for this specification to be acceptable is given in Table.

PERIOD ALLOWED FOR BREAKDOWN REPAIR AND CONTINUATION OF TESTING

TIME BREAKDOWN AFTER START OF TEST	PERIOD ALLOWED FOR REPAIR
2 hours to 4 hours	6 minutes
4 hours to 6 hours	12 minutes
6 hours to 8 hrs hours	18 minutes
8 hours to 10 hours	24 minutes
10 hours to 12 hours	30 minutes
12 hours to 14 hours	36 minutes
14 hours to 16 hours	42 minutes
16 hours to 18 hours	48 minutes
18 hours to 20 hours	54 minutes
Longer than 20 hrs	60 minutes

PERIOD ALLOWED FOR BREAKDOWN REPAIR AND CONTINUATION OF TESTING

CONSTANT DISCHARGE TEST DURATION	ALLOWABLE TIME ELAPSED TO BREAKDOWN
24 hours	20 hours (equivalent to 80 % of total time)
36 hours	30 hours (equivalent to 83 % of total time)
48 hours	38 hours (equivalent to 79 % of total time)
72 hours	60 hours (equivalent to 77 % of total time)

The Contractor shall not be entitled to remuneration for a constant discharge test which is aborted under circumstances which preclude its restart within the time allowable for repair and continuation. The contractor will, however, be entitled to remuneration for a constant discharge test which is aborted after approximately 80 per cent of the planned duration of the constant discharge test has been successfully completed, payment being made for the actual duration of the test (including the recovery test) at the hourly rates set out in the Schedule of Quantities.

EA 04 TESTING AND COMMISSIONING

EA 04.01 TESTS TO BE PERFORMED

- (a) At least one of each type or size of pump supplied shall be subject to a delivery flow rate test. Flow rate or volumetric flow testing facilities will be supplied by others, unless otherwise specified in the detail specification.

The operating point of each pump shall be determined.

- (c) Efficiency tests will only be performed when specified in the detail specification.

NPSH tests will only be performed when specified in the detail specification.

EA 04.02 PUMP OPERATING POINT

During the day 1 commissioning tests the pump operating point shall be determined by observing the following:

- (a) Pump delivery and suction pressures, and
- (b) Electric motor power consumption.

If no efficiency tests are required in the detail specification then the motor power consumption shall be calculated from the voltage and current measurements obtained during the commissioning test.

The Contractor shall supply the necessary adaptors, fittings and pressure gauges to measure the suction and delivery pressures. If no gauge fittings exist on the suction side, then the suction pressure conditions will be calculated from the system properties.

EA 04.03 FLOW RATE (DELIVERY), EFFICIENCY AND NPSH TESTS

- (a) Testing will be done in accordance with BS 5316 Part 1, class C tests.
- (b) Power consumption of electric motors shall be as determined by the three-wattmeter method where efficiency tests are required in the detail specification.

EA 04.04 TEST CONDITIONS

- (a) All tests will be performed in situ.
- (b) The pumped medium or liquid specified as the process liquid in the detail specifications shall be utilised during the tests. The Contractor shall obtain from the pump manufacturer the test point for clean water corresponding to the specified duty point for the pumped liquid, in order to relate the measured performance to the pump supplier's curves which are based on water.

EA 05 MEASUREMENT AND PAYMENT

EA.01 PUMP TESTING OF BOREHOLES..... Unit: number

The unit of measurement shall be the number of boreholes tested on the written instructions of the Engineer.

The tendered rate shall include full compensation for all labour, equipment and material required for the complete testing of the boreholes in accordance with the specification.

EA.02 SUPPLEMENTARY WORK:

EA.02.01 Removal of existing pumping equipment..... Unit: number

The unit of measurement shall be the number of boreholes from which equipment is removed prior to testing the borehole. The tendered rate shall cover the removal of existing pumping equipment from a borehole to be tested. Payment for removal up to an installed depth per meter shall be made at the unit rate tendered for in the Schedule of Quantities.

EA.02.02 Recovery of lost equipment..... Unit: number

The unit of measurement shall be the number of boreholes from which all the lost equipment is retrieved. The tendered rate shall cover the recovery of lost pumps and pipework for boreholes.

EA.02.03 Installation of temporary pumps Unit: number

The unit of measurement shall be the number of temporary pumps installed and later retrieved. The tendered rate shall be fully inclusive of the pump and pipes required to effectively test the boreholes in accordance with the specifications.

EA.02.04 Ground-water sampling Unit: number

The unit of measurement shall be the number of boreholes of which the water is sampled. The tendered rate shall be fully inclusive of the requirements of the specification irrespective of the number of samples taken from a borehole.

EA 02.05 Compilation of borehole report Unit: number

The unit of measurement shall be the number of boreholes regarding which approved reports is compiled. The tendered rate shall be fully inclusive of the work required to compile and produce two copies of each borehole recommendation report.

EA.02.06 Reinstallation of existing pumping equipment Unit: number

The unit of measurement shall be the number of boreholes in which removed equipment is re-installed. The tendered rate shall cover the reinstallation of existing pumping equipment in a borehole following test pumping of the borehole. Payment for installation up to a depth of 100 m shall be made at the unit rate tendered for in the Schedule of Quantities. Reinstallation depths in excess of 100 m shall be remunerated for the first

100 m at the tendered unit rate and, for each full metre thereafter, at the rate per metre tendered in the Schedule of Quantities.

The existing pumping equipment shall be reinstalled and left in working condition as it was found before removal unless the Contractor is instructed otherwise by the Hydrogeologist / Engineer.

EA.03 CLEAN AREA AROUND BOREHOLE.....Unit: number

The unit of measurement shall be the number of boreholes around which the area is cleaned and levelled.

The tendered rate shall cover full compensation for the cleaning of an area 5m x 5m around each borehole.

EA.04 SERVICING OF EQUIPMENT

EA.04.01 De-commissioning and removal of submersible pumping equipment Unit: number

The unit of measurement shall be the number of submersible pumps and motors de-commissioned and removed.

The tendered rates shall include full compensation for tools, transport, site handling and labour necessary for the complete de-commissioning and removal of pumping equipment.

EA.04.02 Servicing of submersible borehole pumps..... Unit: number

The unit of measurement shall be the number of pumps serviced. The tendered rate shall include full compensation for servicing (including all consumables), cleaning, corrosion protection (including pump and motor base), adjusting, aligning, including disassembling and re-assembling. The tendered rate shall include all labour, tools, equipment and spare parts that form part of servicing as set out in the operating and maintenance manuals or as specified by the supplier.

EA.04.03 Reconditioning of pumping equipment..... Unit: number

The unit of measurement shall be the number of pumps and motors reconditioned.

The tendered rates shall include full compensation for replacement of components and materials and for, tools, transport, site handling and labour necessary for the complete reconditioning of pumping equipment to conform to all the requirements in this document.

EA.04.04 Commissioning..... Unit: number

The unit of measurement shall be the number of borehole installations commissioned.

The tendered rate shall include full compensation for all labour and equipment supplied and for the re-installation and commissioning of each borehole installation.

TECHNICAL SPECIFICATION

FN CLEAR-WATER PUMP SYSTEMS

CONTENTS

FN 01	SCOPE
FN 02	STANDARD SPECIFICATIONS
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FN 04	PUMP DESIGN AND REQUIREMENTS
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FN 07	PROTECTION AND CONTROL DEVICES
FN 08	DETAIL OF WORK
FN 09	TESTING AND COMMISSIONING
FN 10	MEASUREMENT AND PAYMENT

FN 01 SCOPE

This specification covers the decommissioning, removal, repair and reconditioning, installation, testing, commissioning and maintenance of pumping equipment, motor control devices and low-voltage cables. The function of clear-water pump systems shall be the delivery of water at a specified flow rate and head to the required location.

This specification shall form an integral part of the repair and maintenance contract document and shall be read in conjunction with portion 3: Additional Specifications included in this document.

This specification shall act as a guideline to the Particular Specification and, in the event of any discrepancies between the Technical Specification and the Particular Specification, the latter shall take precedence.

FN 02 STANDARD SPECIFICATIONS

FN 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

BS 5316, Part 1	- Acceptance tests for centrifugal, mixed flow and axial pumps
SANS 948	- Three-phase induction motors
SANS 1222	- Enclosures for electrical equipment classified by IP code
BS 4999	- General requirements for rotating electrical machines
BS 1486, Part 2	- Heavy duty lubrication nipples
ISO 281/1	- Rolling bearings – dynamic load ratings and rating life

FN 02.02 OCCUPATIONAL HEALTH AND SAFETY ACT OF 1993

The Contractor shall be required to comply with the Occupational Health and Safety Act 85 of 1993, Construction Regulations 2014 and related regulations.

FN 02.03 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

FN 02.04 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

FN 03 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

The Contractor shall at the start of the Contract be given all available as-built information and operating and maintenance manuals.

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

This shall be done in accordance with Additional Specification SB: Operating and Maintenance Manuals.

FN 04 PUMP DESIGN AND REQUIREMENTS

- (a) The pump shaft shall be manufactured from stainless steel and shall be sealed where it enters the casing with double mechanical face seals.
- (b) The impeller shall be suitable for pumping the type of clear water as specified in Clause FN 08 (Detail of work) of this specification.
- (c) The impeller shall be manufactured from stainless steel or, in the case of other materials, it shall be coated with an approved material resistant to abrasion and corrosion prevalent to the conditions under which the impeller shall operate. For pumps rated below 2 kW non-metallic impellers may be utilised.
- (d) The impeller shall be statically, dynamically and hydraulically balanced. No holes may be drilled in the impeller to balance it with regard to mass distribution.
- (e) Only permanently sealed ball or roller bearings shall be installed.
- (f) Bearings shall have a B-10 life rating of 100 000 hours.
- (g) The pump shall be a currently catalogued product.

- (h) Performance curves shall be based on a reproducible and certified test carried out in an approved testing facility, such as the SANS.
- (i) The flow rate at break-off point of the curve for the impeller selected shall be at least 1,5 times that of the maximum flow rate specified.
- (j) The head at zero delivery of the curve of the impeller selected shall be at least 1,2 times the maximum head in the pump's operational range.
- (k) Each pump shall be clearly labelled. The label shall be a 0,5 mm thick stainless steel plate of dimensions 100 mm x 50 mm. The label shall be fixed to the pump exterior with an approved adhesive or other method after the completion of corrosion protection on the pump. It may be bent to follow the shape of the pump exterior but shall not be bent to accommodate sharp folds. Under no circumstances shall the stainless steel plate of the label influence, damage or otherwise have a detrimental effect on the corrosion protection system. The label shall include the following information:
 - pump rates
 - pump head
 - power required
 - NPSH (r) rotational speed
 - impeller detail.
- (l) All new submersible pumps shall be supplied with a length of power cable to suit the installation shown on the drawings.
- (m) All new pumps shall be fitted with double flush mechanical seals, which shall be included in the cost of the pumps. The pump shafts shall be hardened and accurately ground where the seal bears on the shaft. The rotating seal face shall be mounted on a flexible member, sealing on the shaft as well. The flexible member shall be manufactured from rubber, PTFE or equivalent material suitable for the operating environment.
- (n) Centrifugal pumps shall comply with relevant and applicable items under the clause on technical requirements regarding all pump types, as well as the following:
 - (i) Preference shall be given to pumps of the self-regulating type and where the power consumption characteristic is such that the power consumption decreases with an increase in delivery to beyond a certain limit, thus ensuring that the motor is not overloaded in the event of a large reduction in pumping head.
 - (ii) The casing for centrifugal pumps shall be horizontally or vertically split to allow removal of parts.
 - (iii) The efficiency of the pump shall not be less than 95 % of its maximum efficiency at the selected operating point, where the latter shall not be less than 80 %.

FN 05 **MOTOR DESIGN AND REQUIREMENTS**

- (a) Electric motors shall comply with the requirements of SANS 948.
- (b) Imported motors forming an integral part of the pump shall be submitted to the South African Bureau of Standards to be tested in accordance with the requirements of SANS 948.
- (c) All motors shall be standard catalogue models and shall be readily available.
- (d) All motors shall, where possible, be from the same manufacturer and shall have the same interchangeable frames. Variations in type and size shall, where possible, be limited to make stocking a variety of special spares unnecessary.
- (e) All motors shall have dynamically balanced rotors supported by maintenance-free, sealed-for-life ball bearings.
- (f) All motors shall be suitably coated to ensure the satisfactory operation of the motor under the specified class of service.
- (g) All terminal boxes shall be waterproof and suited for submersion up to the depth as specified for the pumps.
- (h) An adequate length of waterproof cable, purpose-made for submerging, shall be supplied with each submersible motor. The coupling of this cable to the normal power-distribution cable, which usually is of the PVC type with steel-wire armour, shall be placed at least 1,0 m above the maximum water level by means of a purpose-made, weatherproof, outdoor junction box. The submerged cable shall be supported to minimise any movement of the cable, which result from turbulence caused by the operation of the equipment or the flow of the water.
- (i) Thermistor protection or Klixon type temperature switches shall be provided for submersible motors.
- (j) Seal monitors shall be provided for submersible motors, together with the required seal monitor relays. The cost for the seal monitor relays shall be deemed to be included in the rates tendered for the equipment.

FN 06 **WORKING VOLTAGE AND SUPPLY SYSTEMS**

The motors shall be capable of operating within ± 10 % of the nominal supply voltage without risk of damage. All motors shall be suitable for operating continuously at the specified three-phase voltage system under actual service conditions, including the ± 10 % voltage tolerance, without exceeding the specified temperature rise determined by the resistance on a basic full load heat run.

All motors shall be capable of operating continuously under actual service conditions at any supply frequency between 48 and 51 Hz together with any voltage between ± 5 % of the nominal supply voltage.

The slip-in speed of any motor at 80 % of the nominal voltage at 50 Hz shall not exceed a percentage agreed on by the Engineer, and the motors shall be capable of operating at this voltage for a period of five minutes without deleterious heating.

FN 07 PROTECTION AND CONTROL DEVICES

Submersible pumping equipment shall have float switches to switch the pump motor on and off, according to the level of the liquid. Switches shall operate freely and not be hindered by cables or other switches and shall switch off at a level where no damage to the pump or motor will occur.

Three level switches shall operate a pump control system:

- (a) Level switch one shall switch off pumps at low level;
- (b) Level switch two shall switch on one pump at an intermediate level, to draw the liquid down to level 1. When the level again rises to where level switch two was switched on, the pump duty shall rotate and start the motor parallel to the one which ran the first time;
- (c) Level switch three shall switch on both pumps to run in parallel at a high level.

In the event of a pump failing to start, the other pump must automatically be restarted.

Pumps shall be operated in both manual and automatic modes.

FN 08 DETAIL OF WORK

FN 08.01 GENERAL

The Contractor shall investigate and inspect all areas of the installation to confirm the extent of the repair work required and shall report to the Engineer. The Engineer will thereafter demarcate any areas to be repaired and shall instruct the Contractor with regard to the repair work to be done.

FN 08.02 TESTING EQUIPMENT

All electrical and mechanical equipment shall be checked at the start of the Contract to establish which items need to be repaired, reconditioned or replaced.

FN 08.03 PUMPING EQUIPMENT

If no detail of the existing pumps is available, such detail shall be determined by removing the pumps.

Reconditioning or repair of pumping equipment shall be carried out if necessary.

FN 08.04 MOTOR CONTROL CENTRE

- (a) The inside and outside of all surfaces of the motor control centre must be thoroughly cleaned and metal surfaces treated for rust and corrosion and repainted to specification.
- (b) Float switches for level sensing shall be checked. Missing, damaged or faulty switches shall be replaced with new switches of similar and equal type. The switches must be installed and supported on suitable brackets to prevent the cables and switches from tangling, due to the inflow of the sewage water.
- (c) Check and tighten all terminations of all equipment.
- (d) Clean out all switchgear and equipment properly to remove dust and spider webs.
- (e) Dismantle and clean all moving parts and contacts of magnetic contactors and starters, reassemble, check overload trip units and adjust correctly. Test for correct functioning on completion of repair work.
- (f) Replace any damaged ammeters, switches and lamps on the control with parts similar and equal to the existing types on the panel.
- (g) Wiring diagrams of all electrical panels and MCC panels shall be compiled.

FN 08.05 MOTOR CONTROL CENTRE (BULK WATER)

- (a) The existing motor control centre for the control of the water pumping equipment is situated in the raw water pump room or bore hole pump rooms. The existing motor control centre shall be replaced to comply with the following requirements:
- (b) The new replacement motor control centre for the water pumps shall be wired to comply with the requirements as set out in this clause.
- (c) The power supply cable from the MCC to the borehole pump shall be tested for conformity to be re-used. In the event that the cable might not pass such testing by the Contractor, the Contractor shall inform the Engineer in writing. The Engineer will instruct the Contractor with regard to a new cable to be installed. Remuneration, in the event of a new power supply cable being required from the MCC to the borehole pump, will be measured under the re-measurable electrical repair quantities and must **not** be included in the payment item for the replacement and equipping of the Motor Control Centre!
- (d) Provide an engraved label on the door of the MCC with the relevant MCC number on. The label shall be secured with screws and nuts.

- (e) The existing level float switches will be tested and replaced if defective. The float control switches (2 off) shall be installed, tested and commissioned in the pressed steel tanks for the level sensing functions, as follows:
 - When the pressed steel tank is 50 % full, the pump shall start to fill the tank until it is full
 - When the pressed steel tank is full, the pump shall switch off
 - Where applicable the two pumps will be rotated every 8 hours
- (f) Switchgear and equipment shall be installed in the MCC to:
 - Automatically regulate the start and stop of the pump as set out in (e)
 - Indicate the time that the pump has been operating since commissioning (hour meters)
 - Start/ stop the pump manually.
 - Indicate that the pump is running
 - Indicate that the pump has tripped
 - Manually override the pump
 - Timer in order to alternate the pumps every 8 hours
- (g) Test for correct functioning on completion of electrical repair work.
- (h) Emergency stop buttons shall be installed at the borehole in all-weather box for emergency stop functions.

FN 09 TESTING AND COMMISSIONING

FN 09.01 TEST TO BE PERFORMED

- (a) All pumping equipment shall be subject to the commissioning tests as described in the applicable specification.
- (b) At least one of each type or size of pump supplied, repaired or reconditioned, shall be subject to a delivery flow rate test. The Contractor shall supply flow rate or volumetric flow testing facilities.
- (c) The operating point of each pump shall be determined.
- (d) Efficiency tests shall be performed.
- (e) NPSH tests shall be performed.

FN 09.02 PUMP OPERATING POINT

During the day 1 commissioning tests the pump operating point shall be determined by observing the following:

- (a) pump delivery and suction pressures, and
- (b) electric motor power consumption.

If no efficiency tests are required, then the motor power consumption shall be calculated from the voltage and current measurements obtained during the commissioning test.

The Contractor shall supply the necessary adaptors, fittings and pressures gauges to measure the suction and delivery pressures. If no gauge fittings exist on the suction side, then the suction pressure conditions will be calculated from the system properties.

FN 09.03 FLOW RATE (DELIVERY), EFFICIENCY AND NPSH TESTS

- (a) Testing shall be done in accordance with BS 5316 Part 1, class C tests.
- (b) Power consumption of electric motors shall be as determined by the three-wattmeter method where efficiency tests are required in the detail specification.

FN 09.04 TEST CONDITIONS

- (a) All tests shall be performed in situ.
- (b) The pumped medium or liquid shall be water.

FN 09.05 ADDITIONAL TESTS

Additional tests may be specified in the detail of work.

FN 10 MEASUREMENT AND PAYMENT

FN.01 SUPPLY AND DELIVERY OF PUMPING EQUIPMENT Unit: number

The unit of measurement shall be the number of pumping equipment units supplied and delivered. The tendered rates shall include full compensation for the design, manufacture, corrosion protection, patent rights, pre-delivery testing and test certificates, transport for delivery to site and off-loading, including all handling of the equipment. The equipment shall include the following:

- (a) The pump and motor as an integrated unit
- (b) Electrical power cable.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.02 INSTALLATION, TESTING AND COMMISSIONING OF PUMPING EQUIPMENT Unit: number

The unit of measurement shall be the number of pumping equipment units tested and commissioned.

The tendered rates shall include full compensation for the site handling and positioning of the pumping equipment, including the fastening of the equipment in its designated position. The following shall also be included in the tendered rates:

- (a) Installation of the guide rails and sealing frame;
- (b) Coupling of all required pipes flanges, including all required gaskets, nuts, bolts and washers;
- (c) Routing and fastening of the power cable up to the isolator box;
- (d) All required installation materials, labour and consumables to render a complete and working installation.

The tendered rates shall also include full compensation for all preliminary tests, delivery and efficiency tests if required and commissioning tests. Commissioning tests shall comply with the section dealing with testing and commissioning.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.03 DECOMMISSIONING AND REMOVAL OF PUMPING EQUIPMENT Unit: number

The unit of measurement shall be the number of pumping equipment units decommissioned and removed.

The tendered rates shall include full compensation for all labour, machinery, tools, transport and site handling necessary for the decommissioning and removal of pumping equipment.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.04 RECONDITIONING OF PUMPING EQUIPMENT Unit: number

The unit of measurement shall be the number of pumps and motors reconditioned.

The tendered rates shall include full compensation for replacement of components and materials, and for tools, transport, site handling and labour necessary for the complete reconditioning of pumping equipment to conform to all the specifications in Clauses FN 04: Pump design and requirements, and FN 05: Motor design and requirements.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.05 REPAIR OF PUMPING EQUIPMENT Unit: number

The unit of measurement shall be the number of pumps and motors repaired.

The tendered rate shall include full compensation for supply of an identification label, resetting the spacer between impeller and back plate and ensuring that impeller rotates freely, as well as cleaning and corrosion protection and installing a new hoisting chain.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

**FN.06 RECONDITIONING OF MCC BOARDS OR OTHER
ELECTRICITY BOARDS Unit: number**

The unit of measurement shall be the number of MCC boards or other electricity boards reconditioned.

The tendered rates shall include full compensation for replacement of components and materials and for tools, transport, site handling and labour necessary for the complete reconditioning of all components of the board.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

FN.07 COMPILATION OF WIRING DIAGRAMS Unit: number

The unit of measurement shall be the number of wiring diagrams compiled.

The tendered rates shall include full compensation for drawing, printing, computer time and any other associated costs necessary for the compilation of a wiring diagram.

PARTICULAR SPECIFICATION

PFN PUMP INSTALLATIONS AND MOTOR AND PUMP CONTROL

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PFN 9	TESTING AND COMMISSIONING
PFN 10	MEASUREMENTS AND PAYMENT

PFN 01 SCOPE

This specification covers the installation, testing and commissioning of pumping equipment, motor control devices, telemetric systems and low-voltage cables. The function of systems, installations and equipment indicated shall be for the processing and delivery of water.

PFN 02 STANDARD SPECIFICATIONS

PFN 02.01 GENERAL STANDARD SPECIFICATIONS, REGULATIONS AND CODES

The latest edition, including all amendments up to date of tender, of the following specifications, publications and codes of practice shall be read in conjunction with this specification and shall be deemed to form part thereof:

BS 5316, Part 1	-	Acceptance tests for centrifugal, mixed flow and axial pumps
SANS 948	-	Three-phase induction motors
SANS 1222	-	Enclosures for electrical equipment classified by IP code
BS 4999	-	General requirements for rotating electrical machines
BS 1486, Part 2	-	Heavy duty lubrication nipples
ISO 281/1	-	Rolling bearings – dynamic load ratings and rating life

PFN 02.02 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall be required to comply with the Occupational Health and Safety Act 85 of 1993, Construction Regulations 2014 and related regulations. Non-compliance with these regulations, in any way whatsoever, will be adequate reason for suspending the Works.

PFN 02.03 MANUFACTURERS' SPECIFICATIONS, CODES OF PRACTICE AND INSTALLATION INSTRUCTIONS

All equipment and materials shall be installed, serviced and repaired strictly in accordance with the manufacturers' specifications, instructions and codes of practice.

PFN 02.04 MUNICIPAL REGULATIONS, LAWS AND BY-LAWS

All municipal regulations laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

PFN 03 AS-BUILT INFORMATION AND OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of an inventory list and operating and maintenance manuals.

PFN 04 PUMP DESIGN AND REQUIREMENTS

- (a) The pump shaft shall be manufactured from stainless steel and shall be sealed where it enters the casing with double mechanical face seals.
- (b) The impeller shall be suitable for pumping the type of clear water as specified in Clause FN 08 (Detail of work) of this specification.
- (c) The impeller shall be manufactured from stainless steel or, in the case of other materials; it shall be coated with an approved material resistant to abrasion and corrosion prevalent to the conditions under which the impeller shall operate. For pumps rated below 2 kW non-metallic impellers may be utilised.
- (d) The impeller shall be statically, dynamically and hydraulically balanced. No holes may be drilled in the impeller to balance it with regard to mass distribution.
- (e) Only permanently sealed ball or roller bearings shall be installed.
- (f) Bearings shall have a B-10 life rating of 100 000 hours.
- (g) The pump shall be a currently catalogued product.
- (h) Performance curves shall be based on a reproducible and certified test carried out in an approved testing facility, such as the SABS.
- (i) The flow rate at break-off point of the curve for the impeller selected shall be at least 1,5 times that of the maximum flow rate specified.
- (j) The head at zero delivery of the curve of the impeller selected shall be at least 12 times the maximum head in the pump's operational range.

- (k) Each pump shall be clearly labelled. The label shall be a 0,5 mm thick stainless-steel plate of dimensions 100 mm x 50 mm. The label shall be fixed to the pump exterior with an approved adhesive or other method after the completion of corrosion protection on the pump. It may be bent to follow the shape of the pump exterior but shall not be bent to accommodate sharp folds. Under no circumstances shall the stainless-steel plate of the label influence, damage or otherwise have a detrimental effect on the corrosion protection system. The label shall include the following information:
- Pump rate
 - Pump head
 - Power required
 - Rotational speed NPSH (r)
 - Impeller detail.
- (l) All new submersible pumps shall be supplied with a length of power cable to suit the installation shown on the drawings.
- (m) All new pumps shall be fitted with double flush mechanical seals, which shall be included in the cost of the pumps. The pump shafts shall be hardened and accurately ground where the seal bears on the shaft. The rotating seal face shall be mounted on a flexible member, sealing on the shaft as well. The flexible member shall be manufactured from rubber, PTFE or equivalent material suitable for the operating environment.
- (n) Centrifugal pumps shall comply with relevant and applicable items under the clause on technical requirements regarding all pump types, as well as the following:
- (iv) Preference shall be given to pumps of the self-regulating type and where the power consumption characteristic is such that the power consumption decreases with an increase in delivery to beyond a certain limit, thus ensuring that the motor is not overloaded in the event of a large reduction in pumping head.
 - (v) The casing for centrifugal pumps shall be horizontally or vertically split to allow removal of parts.
 - (vi) The efficiency of the pump shall not be less than 95 % of its maximum efficiency at the selected operating point, where the latter shall not be less than 80 %.
- (o) Materials:

Materials in general

All parts of the pump shall be manufactured of the most suitable material to prevent wear as far as possible. Full specification in this respect shall accompany the tender.

Design in general

All parts of the pump shall be designed so as to ensure easy dismantling for inspection and repair.

Casings

Pumps casings shall be of high-grade cast iron or steel rigidly secured to a bed plate or base.

Impellers

The pump impellers shall be manufactured from hard wearing high chrome cast steel or similar materials and shall be carefully bored and keyed. All parts inaccessible to machining shall be finished smooth.

Pump seals

The pump seals shall be fitted with mechanical seals with tungsten carbide or ceramic seats.

Bearings

Preference will be given to ball or roller bearings. In designing bearings, conservative loadings shall be applied to ensure absolute independability and freedom from heating troubles.

Pump Shafts

Pump shafts shall preferably be manufactured from stainless steel. They shall be statically and dynamically balanced with their respective rotors, and impellers

PFN 05

THE DIESEL ENGINE IN GENERAL

It is an important requirement that spares will be available for a long period in the future and Tenderers must satisfy the Department that this would be the case. Engine having a high local content in their manufacture will receive preference.

The engine must be a well-designed and proved air-cooled diesel engine. The cooling must be effected by an axial blower driven via a double V-belt from the front crankshaft end. An air duct incorporated in the blower must direct the cooling air to the cylinders and the cylinder head. The hot air shall be duct to the outside of the pump house in an approved manner and of which full particulars are to be included in the tender. The V-belts must run on double V-pulleys. The belts must be of the highest quality and each belt must be strong enough to carry the full load so that the duplicate belt may be looked upon as a standby safety measure.

The engine shall have a pressure feed lubrication system for the main and crankpin bearings, timing gear, camshaft and valve gear.

The engine shall be equipped with a 12 Volt axial flywheel engaging starter motor and an oil pressure actuated safety starter motor disengagement. The pinion of the starter shall engage with the starter ring on the flywheel before the rotor revolves.

The engine shall also be equipped with a governor of the mechanical all-speed type, integral with the injection pump, and a stop control lever on the governor.

The rating of the engine shall be 10% more than the full load power absorbed by the pump when operating under any of the specified conditions.

Power absorbed by the plant in meeting the maximum duty required of the pump, must be taken into account in selecting a suitable diesel engine for this service, to ensure that it complies in all respects with the specification.

The engine shall be fitted with a flywheel coupling and guard or cover, fuel tank of 6 hours full load capacity, and exhaust pipe fitted with silencers. The exhaust shall be taken outside the pump house or terminate as specified elsewhere.

It must be the most reliable of its type, capable of running under full load for a minimum period of 6 hours. To ensure that it shall do so, it must therefore be rated in accordance with specifications B.S 649 or A to DIN 6270 for Internal Combustion Engines continuous rating + 10% overload).

PFN 06

MOTOR DESIGN AND REQUIREMENTS

- (k) Electric motors shall comply with the requirements of SANS 1804.
- (l) Imported motors forming an integral part of the pump shall be submitted to the South African Bureau of Standards to be tested in accordance with the requirements of SANS 1804.
- (m) All motors shall be standard catalogue models and shall be readily available.
- (n) All motors shall, where possible, be from the same manufacturer and shall have the same interchangeable frames. Variations in type and size shall, where possible, be limited to make stocking a variety of special spares unnecessary.
- (o) All motors shall have dynamically balanced rotors supported by maintenance-free, sealed-for-life ball bearings.
- (p) All motors shall be suitably coated to ensure the satisfactory operation of the motor under the specified class of service.
- (q) All terminal boxes shall be waterproof and suited for submersion up to the depth as specified for the pumps.
- (r) An adequate length of waterproof cable, purpose-made for submerging, shall be supplied with each submersible motor. The coupling of this cable to the normal power-distribution cable, which usually is of the PVC type with steel-wire armour, shall be placed at least 1.0 m above the maximum water level by means of a purpose-made, weatherproof, outdoor junction box. The submerged cable shall be supported to minimise any movement of the cable, which result from turbulence caused by the operation of the equipment or the flow of the water.
- (s) Thermistor protection or Klixon type temperature switches shall be provided for submersible motors.
- (t) Seal monitors shall be provided for submersible motors, together with the required seal monitor relays. The cost for the seal monitor relays shall be deemed to be included in the rates tendered for the equipment.

PFN 07

WORKING VOLTAGE AND SUPPLY SYSTEMS

The motors shall be capable of operating within $\pm 10\%$ of the nominal supply voltage without risk of damage. All motors shall be suitable for operating continuously at the specified three-phase voltage system under actual service conditions, including the $\pm 10\%$ voltage tolerance, without exceeding the specified temperature rise determined by the resistance on a basic full load heat run.

All motors shall be capable of operating continuously under actual service conditions at any supply frequency between 48 and 51 Hz together with any voltage between $\pm 5\%$ of the nominal supply voltage.

The slip-in speed of any motor at 80 % of the nominal voltage at 50 Hz shall not exceed a percentage agreed on by the Engineer, and the motors shall be capable of operating at this voltage for a period of five minutes without deleterious heating.

PFN 08

MOTOR CONTROL CENTRE DESIGN

All pumps will be controlled by the Motor Control Centre (MCC). Float- and pressure switches shall be used to switch the pump motors on and off, according to the applicable water levels.

- (i) New MCC for water pumps, sewer pumps, aerators, borehole pumps, mixers, motor drive valves etc. shall be wired to comply with the requirements as set out in this clause.

- a. Wiring

Allowance shall be made for the entire electrical installation and wiring of the pumps and controls, including level control probes. Three phase supply cables must be supplied to the control boards of the pumping plants. The cable needed to supply power to the pump house from the nearest convenient point will be measured separately.

- b. Control Boards

The control boards housing the starting and control equipment shall be of the free standing, weatherproof, corrosion resistant, kiosk type.

Control boards shall be properly sealed by suitable rubber gaskets or similar materials.

The material must be of 2.0mm thick IP65, 3CR12, coated steel.

The face plate of the motor control centre must be inside the complete panel and the complete panel must have a lockable door, capable of locking with a padlock.

The faceplate of the motor control centre must have a lockable isolator to ensure that the panel is off when the face plate cover is opened.

An engraved labelling must be used on the door of the Control Board with the relevant MCC number on. The label shall be secured with screws and nuts.

All labelling on the face plates of the control board shall be engraved and must indicate all the functions of the Control Board on each section.

c. Hour meters

Hour meters as per clause 9.7 of the Standard Specifications for Electrical Equipment and Installation for Mechanical Services shall be provided for each pump

d. Earth leakage protection

The electrical motors for the pumps are not to be equipped with earth leakage protection. All other electrical fittings however must be provided with earth leakage protection as per clause 7.3 of the Standard Specifications.

e. Flexible cables

Flexible cables between control boards and pumps shall have sufficient slack to enable the pumps to be withdrawn from the castings by at least 1m, without the necessity of disconnecting the cable.

f. Float switches

The float switches to be used in the contract, shall be of the hermetically sealed, mercury switch type.

g. Motor

The motor shall have a speed not exceeding 1500 r/min and shall be suitable for the pump offered. It shall be of sufficient capacity to bring the unit up to maximum speed against full load and shall have a rating of not less than 25% in excess of the maximum power required to drive the unit when working under normal maximum load.

h. Lightning arrester

The control boards shall be equipped with lightning/surge arresters.

i. Lightning and socket point

For external motor control a board lightning with an illumination of 200 lux and one industrial 3 pin outlet point is to be provided.

j. Volt and Amp meter

Each MCC shall be equipped with one interchangeable (between L1, L2 & L3) voltmeter. Each electrical motor shall be equipped with one amp meter.

k. Adjustable 24 Hour Quarts Clock

If specified the electrical control panel is to be equipped with an adjustable (at half an hour intervals) 24 hour cycle quarts clock/time switch, which must be capable of activating the pump any number of timers per day (48 minimum) at any preselected time intervals. The timer shall only provide an on impulse when each of the preselected times is reached. If the pumps have not switched off and are still running when the next preselected time is reached, it must only be confirmed by the timer that the pump should be running. The quarts clock unit shall have its own nickel cadmium battery unit incorporated and must power itself for at least 72 hours in case of a power failure. The clock and battery unit shall be as MICOREX QT, R150 HOUR with reference no.926401 or similar approved (dimensions 52 x 102mm).

l. Electrical control panel and batteries for the diesel engines

The nickel cadmium batteries shall be capable of ten consecutive starts, each at least 5 seconds in duration, without recharging, against full compression.

The control panel shall be of the totally enclosed, floor mounted type incorporating 12 volt semi-sealed nickel cadmium battery, double wound air cooled transformer 220V/12V, full wave silicon rectifier, smoothing choke, low rate charging resistor, 12 Volt A.C. signal lamp to indicate "Mains On", 12 Volt D.C. signal lamp to indicate "High Charging Rate". The control equipment must have the necessary relays and electronic features to accommodate any of the requirements as specified.

The nickel cadmium battery offered is to be steel cased of the semi-sealed high power type as "SAFT KPH 50" or other approved.

The battery is to be provided with suitable approved sensing devices to monitor the battery voltage to ensure that the trickle charger automatically selects the correct high or low charging rate required to maintain the battery in perfect condition. The tenderer must submit a certificate from the battery supplier stating that he is fully aware of the requirements for the correct maintenance of the battery and that he is satisfied that all apparatus incorporated in the control equipment for monitoring and charging this battery, is suitable and fully approved by him.

It is essential that Performance Data for the battery offered be submitted for information of the Department, indicating clearly its discharge characteristics under peak load starting conditions when fully and 50% discharged, i.e. simulated repeat starting in accordance with the specification.

- (j) In the event of an existing MCC being replaced by a new MCC, the power supply cable from the MCC to the pump shall be tested for conformity to be re-used. In the event that the cable might not pass such testing by the Contractor, the Contractor shall inform the Engineer in writing. The Engineer will instruct the Contractor with regard to a new cable to be installed. Remuneration, in the event of a new power supply cable being required from the MCC to the borehole pump, will be measured under the re-measurable electrical repair quantities and must

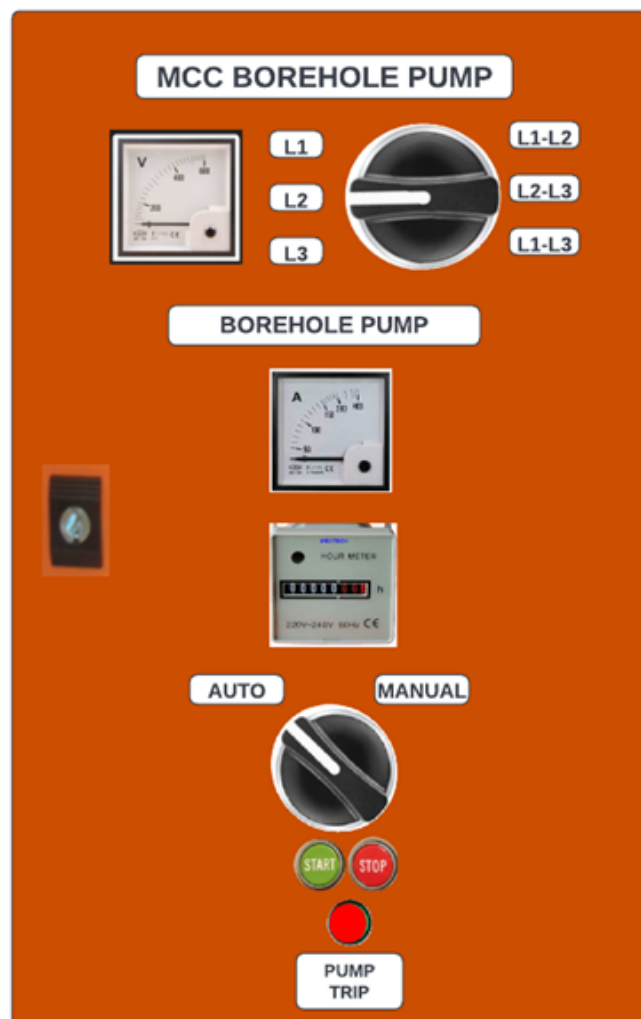
not be included in the payment item for the replacement and equipping of the MCC.

- (k) Provide an engraved label on the door of the MCC with the relevant MCC number on. The label shall be secured with screws and nuts.
- (l) Switchgear and equipment shall be installed in the MCC to:
 - Automatically regulate the start and stop of the pump
 - Indicate the time that the pump has been operating since commissioning (hour meters)
 - Start/ stop the pump manually.
 - Indicate that the pump is running
 - Indicate that the pump has tripped
 - Manually override the pump
 - Timer in order to alternate the pumps every 8 hours
 - Indicate Amps for each pump
 - Indicate Main Supply Voltage (L1, L2 & L3) & ((L1/L2, L2/L3 & L3/L1)
 - Ensure Phase failure protection
 - Switchgear and equipment shall be installed in the MCC to:
- (m) Submersible equipment protection devices are installed separately to ensure the following:
 - Insulation resistance before start-up
 - Temperature (Tempcon, Pt sensor and PTC/thermal switch)
 - Overload/under load
 - Overvoltage/under voltage
 - Phase sequence
 - Power factor
 - Power consumption
 - Harmonic distortion
 - Run and start capacitor (single-phase)
 - Operating hours and number of starts
 - Lightning and surge protection
- (n) Test for correct functioning on completion of electrical repair work.
- (o) Emergency stop buttons shall be installed at the borehole installation in all-weather boxes for emergency stop functions.

PFN 08.01 SPECIFIC DESIGN REQUIREMENTS FOR ELECTRICAL EQUIPMENT

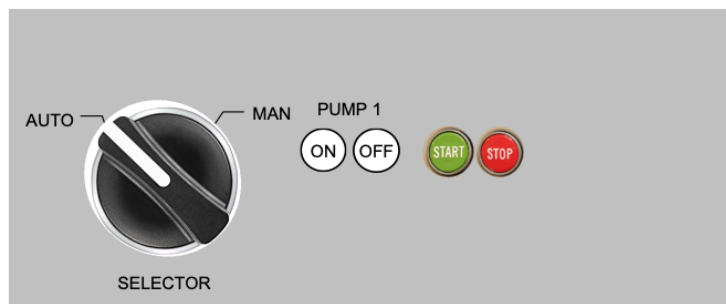
PFN 08.01.01 MIXERS, SUBMERSIBLE SEWAGE PUMPS, WATER SUPPLY PUMPS FOR WATER PURIFICATION, BULK SUPPLY IRRIGATION AND BOREHOLES

Where equipment forms part of one installation all of the relevant equipment will be housed in the same type of MCC's, which shall be of the free standing weather and waterproofed kiosk type. The controls will be accessible from a single opening door and the panel will be divided in two halves one section of the control panel must be allocated for the incoming breaker and cables and the other section for selector switches specified controls. A typical example of a Motor Control Cabinet is shown below.



PFN 08.01.01.01 SUBMERSIBLE CENTRIFUGAL BOREHOLE PUMPS (UP TO 3 KW)

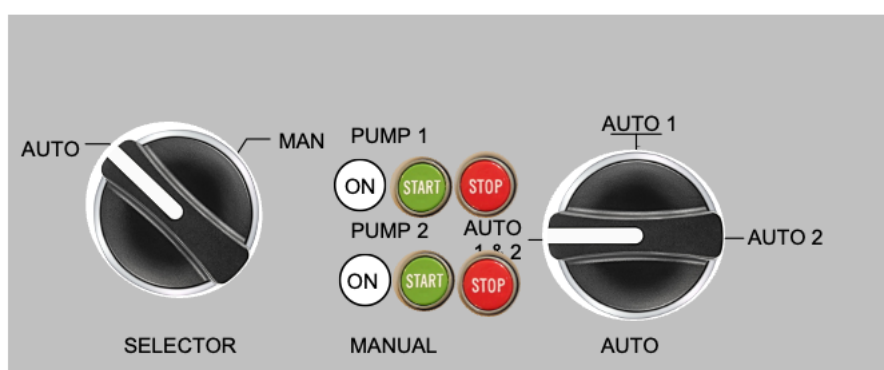
- (a) The pumps shall be controlled by both a pump selector switch and a mode selector switch mounted on the switchboard panel. These switches are shown below.



- (b) The pump shall be able to operate in both manual and automatic mode. In the manual mode the pump selected shall operate by means of push button ON/OFF switches incorporating LED lights. In addition, the pumps shall however be stopped by means of a low level float control preventing the pumps from running dry.
- (c) In the automatic mode the pumps shall be activated by means of a 24-hour timer adjustable in 24 hour increments.

PFN 08.01.01.02 CONTROL OF INSTALLATIONS FOR SETS OF TWO CLOSE COUPLED CENTRIFUGAL PUMPS FOR VARIOUS APPLICATIONS 2.5Kw

- (a) The pump set shall be controlled by both a pump selector and mode selector switch mounted on the control panel. Each installation consists of two electrical pumps, and the switches for each of these pump sets are as follow:



- (b) The pumps shall be able to operate in both manual and automatic mode. In the manual mode the pumps shall be operated by means of push buttons incorporating LED lights. The pumps will be switched off if the water level in the supply tank reaches a minimum level to prevent the pumps from running dry.

- (c) In the automatic mode both pumps shall be activated by means of a 24-hour time switch capable of switching the pumps ON and OFF at hour intervals.
- (d) The timer shall have the function to override the hour intervals to enable continuous 24-hour operation in the automatic mode if so required.
- (e) Due to the design of the purification process the pumps could operate continuously.

To prevent on-going operation of one pump, in addition to normal stopping and starting the pump shall be controlled by means of a 24-hour time switch adjustable in 1-hour increments.

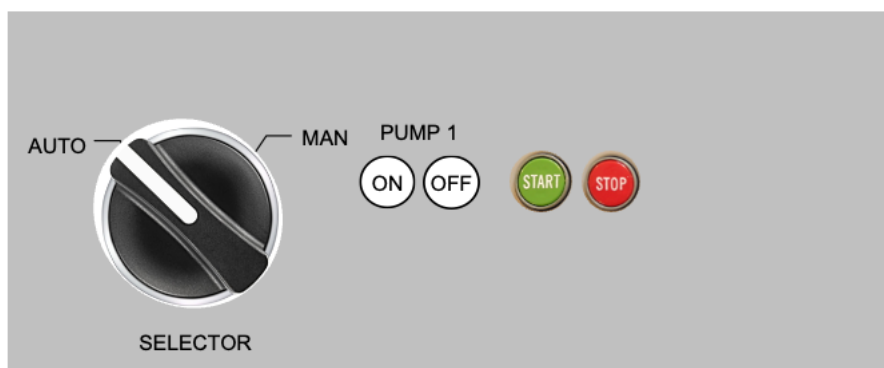
In automatic mode the pump running after 10 hours continuous operation must be switched OFF, immediately starting the other pump to continue operation.

- (f) Due to on-going stopping and starting in automatic mode, automatic stepping between the pumps shall occur when the mode selector switch is set at AUTO Pump 1 and Pump 2. In the event of one pump failing to switch on, the other pump must automatically be switched on again.

PFN 08.01.01.03 IRRIGATION PUMP INSTALLATION (2.5 KW)

The control board must be a free-standing weather and waterproofed kiosk type.

- a) The pumps shall be controlled by a mode selector switch mounted on the switch board panel. The switches are shown below:



- b) The pump shall be able to operate in both manual and automatic modes. In the manual mode the pump can be operated by means of push button ON/OFF switches incorporating LED lights.

In addition, the pump shall however be switched off at the low level probe in the storage tank to prevent the pump from running dry.

- c) In the automatic mode the pump shall be switched on by means of a 24-hour time switch capable of switching the pump ON and OFF at half hour intervals. In addition, the pumps shall be switched off at the low level in the existing storage tank controlled by float switch. If the timer is in the switch on mode the pump will restart as soon as the water level in the sump reaches high level norm. The pump will keep on pumping until the set time period has run out.

PFN 09 TESTING AND COMMISSIONING

PFN 09.01 TEST TO BE PERFORMED

- (f) All pumping equipment shall be subject to the commissioning tests as described in the applicable specification.
- (g) At least one of each type or size of pump supplied, repaired or reconditioned shall be subject to a delivery flow rate test. The Contractor shall supply flow rate or volumetric flow testing facilities.
- (h) The operating point of each pump shall be determined.
- (i) Efficiency tests shall be performed.
- (j) NPSH tests shall be performed.

PFN 09.02 PUMP OPERATING POINT

During the Day 1 commissioning tests, the pump operating point shall be determined by observing the following:

- (c) pump delivery and suction pressures, and
- (d) electric motor power consumption.

If no efficiency tests are required, then the motor power consumption shall be calculated from the voltage and current measurements obtained during the commissioning test.

The Contractor shall supply the necessary adaptors, fittings and pressure gauges to measure the suction and delivery pressures. If no gauge fittings exist on the suction side, then the suction pressure conditions will be calculated from the system properties.

PFN 09.03 FLOW RATE (DELIVERY), EFFICIENCY AND NPSH TESTS

- (c) Testing shall be done in accordance with BS 5316 Part 1, Class C tests.
- (d) Power consumption of electric motors shall be as determined by the three-wattmeter method where efficiency tests are required in the detail specification.

PFN 09.04 TEST CONDITIONS

- (b) All tests shall be performed in situ.
- (b) The pumped medium or liquid shall be water.

PFN 09.05 ADDITIONAL TESTS

Additional tests may be specified in the detail of work.

PFN 10 MEASUREMENT AND PAYMENT

PFN 10.01 SUPPLY, DELIVERY AND INSTALLATION OF EQUIPMENT .. Unit: number

The unit of measurement shall be the number of pumping and other equipment units supplied, delivered and installed.

The tendered rates shall include full compensation for the design, manufacture, corrosion protection, patent rights, pre-delivery testing and test certificates, transport for delivery to the site and off-loading, including all handling of the equipment. The equipment shall include the following:

- (c) The pump and motor as an integrated unit
- (d) Electrical power cable.
- (e) Installation of the guide rails and sealing frame;
- (f) Coupling of all required pipes flanges, including all required gaskets, nuts, bolts and washers;
- (g) Routing and fastening of the power cable up to the isolator box;
- (h) All required installation materials, labour and consumables to render a complete and working installation.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

**PFN 10.02 REPAIR, SERVICE, TESTING AND COMMISSIONING OF EQUIPMENT
..... Unit: number**

The unit of measurement shall be the number of pumping equipment unit's air blowers, dosing units, level switching controls etc. tested and commissioned.

The tendered rates shall include full compensation for the site handling and positioning of the equipment, including the fastening of the equipment in its designated position.

The tendered rates shall include full compensation for all preliminary tests, efficiency tests if required and commissioning tests. Commissioning tests shall comply with the section dealing with testing and commissioning.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

PFN 10.03 DECOMMISSIONING AND REMOVAL OF EQUIPMENT.....Unit: number/meter

The unit of measurement for the decommissioning and removal of pumping equipment shall be as follows:

Motors, pumps, valves, non-return valves.....Unit: number
Pipes, rods, cables.....Unit: meter

The tendered rates shall include full compensation for all labour, machinery, tools, transport and site handling necessary for the decommissioning and removal of pumping equipment.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment.

PFN 10.04 SUPPLY AND INSTALLATION, TESTING AND COMMISSIONING OF MCC BOARDS OR OTHER ELECTRICITY BOARDS.....Unit: number

The unit of measurement shall be the number of MCC boards or other electricity boards manufactured and installed. The tendered rates shall include the compilation of shop drawings and line diagrams prior to delivery of the Control Board.

The tendered rates shall include full compensation for all components and materials and for tools, transport, site handling and labour necessary for the complete installation of all components of the board.

The unit of measurement shall be the number of MCC boards or other electricity boards tested and commissioned. Commissioning must be carried out as described in specification SC General Decommissioning, Testing and Commissioning Procedures.

Separate items will be listed in the Schedule of Quantities for different motor control systems.

PFN 10.05 COMPILATION OF WIRING DIAGRAMS Unit: number

The unit of measurement shall be the number of wiring diagrams compiled.

The tendered rates shall include full compensation for drawing, printing, computer time and any other associated costs necessary for the compilation of a wiring diagram.

PFN 10.06 RECONDITIONING OF TELEMETRIC SYSTEMS..... Unit: number

The unit of measurement shall be the number of telemetric systems repaired/reconditioned.

The tendered rates shall include full compensation for the replacement of components and materials and for tools, transport, site handling and labour necessary for the complete reconditioning/repair of all components of the telemetric system.

PFN 10.07 DECOMMISSION, RECONDITION, TEST AND COMMISSION MCC BOARDS OR OTHER ELECTRICITY BOARDS AND RELATED EQUIPMENT.....Unit: number

The unit of measurement shall be the number of MCC boards or other electricity boards reconditioned/serviced.

The tendered rates shall include full compensation for the replacement of components and materials and for tools, transport, site handling and labour necessary for the complete reconditioning of all components of the board.

The tendered rate shall further include full compensation for the cleaning and opening of MCC or kiosk, vermin protection, checking of MCBs, checking and tightening of wire terminations, and fitting of labels and blank covers.

The tendered rate shall include for replacement of all defective components and parts on the face of the motor control centre which shall include selector switches, hour meters, AMP meters, Volt Meters, Pilot lights, push buttons, door control, hinges, rubbers and labels.

The replacement of electrical/electronic equipment within the motor control centre interior components shall be limited to all types of relays (time sequencing, level control, pump sequencing, on/off control, protection, monitoring, etc), wiring, phase sequencing and phase failure protection.

Contactors, PLCs, circuit breakers and all types of medium and low-voltage circuit breakers and contactors shall not be included in the rate.

Separate items will be listed in the Schedule of Quantities for different types and sizes of equipment or the location of the motor control centre. The condition of the existing motor control centre will be made evident during the compulsory site inspection but shall not limit the requirements of work to be executed to render the motor control centre in a complete working condition as per the intended design requirement.

ADDITIONAL SPECIFICATION

SC GENERAL DECOMMISSIONING, TESTING AND COMMISSIONING PROCEDURES

CONTENTS

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SC 04	COMMISSIONING COMMUNICATION CHANNELS
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SC 07	MATERIAL AND EQUIPMENT PROCUREMENT AND PROTECTION
SC 08	TESTING OF EQUIPMENT PRIOR TO RECOMMISSIONING
SC 09	TESTING OF MATERIAL AND EQUIPMENT SPECIFICATIONS AND WORKMANSHIP
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SC 11	RECOMMISSIONING, COMMISSIONING AND COMPLETION OF INSTALLATIONS
SC 12	MEASUREMENT AND PAYMENT

SC 01 SCOPE

This specification encompasses all aspects of the repairs of systems and services that form part of an installation, including the factory and on-site testing, decommissioning, installation and commissioning of all equipment, instrumentation and materials reconditioned, supplied and installed as part of an installation as defined in Additional Specification SA: General Maintenance.

The specified procedures are the minimum requirements to be supplemented by various technical and particular specifications in this document. These requirements shall apply to all commissioning work scheduled as part of the initial repair work on installations, as well as commissioning work that is part of the routine preventive and corrective maintenance.

SC 02 PHASED REPAIRS AND UPGRADING OF THE INSTALLATION

When an installation consists of parallel systems or components, the complete installation and all its components shall be repaired without taking the complete installation out of commission at any time, unless otherwise specified in the Technical Specifications.

In order to schedule the repairs of an installation, all work shall be done in phases as specified in the Technical Specifications and illustrated in detail on the Drawings. Repairs of each part shall terminate with the successful reconditioning of that part. Each part of the system shall be decommissioned and recommissioned in the sequence specified in the Technical Specifications and on the Drawings.

The Contractor shall install all the necessary temporary specials, spool pieces, supporting frames and brackets to provide a functional link between each repaired and upgraded part of the system and the part of the installation that has not yet been repaired

and upgraded during recommissioning. Electrical and instrumentation Contractors and subcontractors shall ensure that the system remains operational as specified, using either existing or newly installed instruments, cables and controls.

Payment is based on the successful recommissioning of a specific part of the installation.

SC 03 DETAILED COMMISSIONING PROGRAMME

No work of any kind on any part of the existing installation shall take place prior to the Engineer's approval of a detailed commissioning programme. This programme shall be submitted in addition to the general programme for planning and monitoring contract progress, at least two weeks prior to any programmed shutdown. The programme shall be the coordinated product of the Engineer and the User Client. Commissioning programmes shall take all process requirements into account. The detailed commissioning programme shall indicate all actions necessary for:

- (a) Decommissioning
- (b) Recommissioning of parts of the installation
- (c) Commissioning of the installation as a whole.

All work deemed necessary for practical completion of the installation shall be indicated on the commissioning programme.

The programme shall indicate the milestones to be achieved before shutdown and decommissioning as activities of zero duration, all of which shall be prerequisites linked to the "start" of decommissioning.

The following specific actions shall be included in the programme, clearly indicating the time allowed for:

- (a) Communication, including the time for confirmation of the official shutdown;
- (b) Draining parts of the installation to sumps, where available, or to other storage facilities provided by the Contractor;
- (c) Installation of temporary blanked flanges or other means of isolation where necessary;
- (d) Partial decommissioning and removal of existing material and equipment to perform work, including protection of pipework against hot work, cutting into pipework, loosening bolts, flanges and all other work necessary for recommissioning;
- (e) Installation of temporary functional links (pipe specials) between any two parts of the installation;
- (f) Each individual field weld, subject to the Engineer's approval;
- (g) Non-destructive testing of materials, for manufacturing/construction quality and for producing test results;
- (h) Installation of all instruments and their connection to SCADA systems;

- (i) Installation and connection of all power cables;
- (j) De-aeration of all pipe sections;
- (k) Communication between the Contractor, the Engineer, the Employer and the User Client;
- (l) Start-up of the complete system, indicating start-up procedures.

Inspection of the prefabricated installation, testing of all equipment prior to final commissioning, pressure testing and non-destructive testing shall be clearly scheduled in the project progress programme.

Day 30 tests and instruction/training sessions with the User Client shall be scheduled in the project progress programme.

SC 04 COMMISSIONING COMMUNICATION CHANNELS

The Contractor shall communicate with the User Client's operating and maintenance managers via the Engineer to finalise start-up after decommissioning in accordance with the specified procedures.

The following key parties shall be involved before and during shutdown and decommissioning of any part of the system:

Contractor:	Site Agent
Engineer:	Resident Engineer
Employer:	Representative of Area Manager
User Client:	Operating and Maintenance Manager.

SC 05 COMMISSIONING RISK CONTROL AND PENALTIES

- (a) The Contractor shall be required to comply with the Occupational Health and Safety Act 85 of 1993, Construction Regulations 2014 and related regulations.
- (b) The Contractor shall not be allowed to work on any part of the installation without obtaining a commissioning check permit on the day of shutdown. A typical example of a commissioning check permit is included in this document, referring to the minimum required milestones to be achieved prior to decommissioning.
- (c) Payment reductions for exceeding the maximum permissible down-time during maintenance shall apply as stipulated in the General Conditions of Contract and the Contract Data. This stipulation does not include shutdowns during programmed routine preventive maintenance work.

SC 06 DELAYS OF SCHEDULED SHUTDOWNS

Specific dates on which an installation shall be shut down for decommissioning shall be finalised during coordination meetings of all the parties involved, including the Engineer, the Employer, the User Client and the Contractor.

Although a date for each shutdown will be scheduled at the coordination meetings, the actual date of the shutdown shall be determined by the process requirements and user demands, allowing for a window of seven (7) calendar days from the date of the planned shutdown.

Prospective bidders shall make allowances in their bid rates for the shutdown to occur at any time during this seven-day period. No additional payment shall be due if the shutdown occurs within this seven-day period.

If the Contractor fails to commence with the shutdown and decommissioning of the installation within the scheduled period, all additional costs arising from the shutdown at a later stage shall be for the Contractor's account.

SC 07 MATERIAL AND EQUIPMENT PROCUREMENT AND PROTECTION

It is the responsibility of the Contractor to ensure the functionality of all units of new equipment prior to decommissioning, before installation of any specific part of the system. If the equipment, whether free-issued or not, does not conform to the functionality specifications during pre-installation testing, the Contractor shall notify the Engineer in writing without delay.

SC 08 TESTING OF EQUIPMENT PRIOR TO RECOMMISSIONING

The equipment shall be tested for functionality after pre-installation of equipment in parts of the installation.

- (a) The Contractor shall inform the Engineer well in advance of his intention to perform the first tests and start-up of equipment in order to allow a representative of the Engineer to witness the tests. The extent of all precommissioning tests and checks shall be agreed with the Engineer prior to commencement.
- (b) The Contractor shall first conduct his own tests of the equipment. When he is satisfied that the equipment complies with the specifications, he shall notify the Engineer that he is ready for the official tests on completion. The Contractor shall not conduct an official test without the Engineer's presence or approval. All equipment shall conform to the specified requirements.
- (c) Before starting up any part of the installation or filling the tanks and sumps with liquid, the Contractor shall clean out the tanks, pipes, fittings, equipment or structures and, if necessary, make arrangements with other Contractors to remove their building rubble from the structures, check that all safety devices and alarms have been set and activated, all nuts have been tightened correctly, that all the equipment is complete and ready for start-up, that the plant has been installed

correctly, and that copies of the operating manuals have been handed to the Engineer.

- (d) The Contractor shall start up each section of equipment after ensuring that oil fillings, lubrication, vibration monitoring, cable termination and so on have been correctly completed. He is also responsible for the first refilling of all lubricating oils and for adjusting the plant to operate according to the specifications. Before any equipment is started or energised, the Contractor shall ensure that it is safe in terms of the personnel and equipment on the site to do so. The Contractor's tendered rates and sums shall allow for these costs.

All equipment shall be tested according to the relevant specifications that form part of this document.

No shutdown or decommissioning of any part of the system shall take place unless all the equipment to be installed have been tested by the Contractor and approved by the Engineer.

SC 09 TESTING OF MATERIAL AND EQUIPMENT SPECIFICATIONS AND WORKMANSHIP

All results of the required non-destructive, precommissioning and manufacturing testing shall be submitted to the Engineer well in advance of testing the equipment on recommissioning. All such test results shall be submitted before Day 1 commissioning tests and no certificate of practical completion shall be issued prior to receipt of the required test results.

SC 10 DECOMMISSIONING

The decommissioning period shall commence on the instant of the entire system shutdown. The recommissioning period shall start in parallel with decommissioning.

Shutdown and decommissioning shall not proceed without compliance with all the milestones in the detailed commissioning programme. The list of milestones in this document is not complete but indicates the minimum requirements. Milestones to be achieved prior to shutdown and decommissioning may be added to the programme at the Engineer's discretion.

The Contractor is responsible for the safe decommissioning of all material, equipment, components and instrumentation to avoid damage to parts or components of the installation.

SC 11 RECOMMISSIONING, COMMISSIONING AND COMPLETION OF INSTALLATIONS

SC 11.01 RECOMMISSIONING

Recommissioning means the commissioning of all sections or systems that form part of the installation to meet the required functional specifications for the individual section or system prior to commissioning of the repaired and upgraded installation.

The Contractor is responsible for the recommissioning of all parts of the system and he shall perform the tasks listed below.

- (a) Prior notice shall be given to and proper arrangements shall be made for recommissioning with the Employer, the Engineer, the User Client and the suppliers of equipment that is affected by recommissioning and testing.
- (b) If plant and equipment supplied by others are to be commissioned, the supplier's specific permission together with all requirements related to commissioning shall be obtained prior to recommissioning without in any way altering the General Conditions of Contract and the Contract Data with reference to the Contractor's liability in terms of defects.
- (c) The new and reconditioned parts of the installation shall be thoroughly inspected by a responsible representative of the Contractor to ensure that manufacture/construction and installation work have been completed according to the specifications.

SC 11.02 COMMISSIONING AND COMPLETION OF REPAIRS AND UPGRADING WORK

Commissioning means; commissioning of the repaired and upgraded installation as a whole to perform in perfect working order.

- (a) The commissioning period for each installation as a whole:
 - (i) Commences with the Day 1 tests of the complete repaired and upgraded installation;
 - (ii) Includes commissioning of all sections and systems that have been recommissioned prior to the Day 1 tests;
 - (iii) Includes training of the User Client's operating personnel and the maintenance teams;
 - (iv) Terminates with a Day 30 test in compliance with the commissioning report.
- (b) The purpose of the Day 1 tests is to ensure that:
 - (i) The electronic, electrical and mechanical equipment and materials are functional and in perfect working order with respect to each other and the installation as a whole;
 - (ii) The commissioning period, including training, commences on successful completion of the Day 1 tests;

- (iii) The Contractor is entitled to a certificate of practical completion for the repairs and upgrading of the installation on successful completion of the Day 1 tests;
- (iv) The Contractor becomes responsible for maintenance of the installation and is entitled to performance-based payments in compliance with Additional Specification SA: General Maintenance.
- (c) Commissioning shall be undertaken over a trouble-free period up to Day 30. During this period the Contractor shall train the User Client's operators and his maintenance team for operating and maintaining the installation. This training shall allow for all possible operational conditions, including emergency conditions, the correct servicing of every part, the type of oil or grease to be used, and similar tasks. The training shall take place by means of demonstrations, and the operating and maintenance manuals shall be referred to for this purpose.
- (d) Day 30 commissioning tests shall be performed thirty calendar days after the successful completion of the Day 1 tests. The commissioning period of the installation terminates upon the successful completion of the Day 30 tests.
- (e) The Contractor shall conduct all the tests required to satisfy the Engineer that the installation is performing according to specification, and shall make allowance for these tests in his bid rates and prices. These tests shall be conducted to certify that the installation, as repaired, upgraded and installed, is in perfect working order in terms of the specified functional requirements. The Contractor shall note that all equipment is to be tested as part of an installation, where appropriate, and will not be passed if all protection devices, interlocking with other equipment, etc, are not fully functional.
- (f) The Engineer shall provide commissioning sheets to the Contractor at least three weeks before the commissioning period commences, for all the equipment supplied, reconditioned and installed by the Contractor. The Contractor shall complete the commissioning sheets during the commissioning period and all items listed shall be entered. No completion certificate will be issued for an installation of which the equipment has incomplete commissioning reports. Information that is not available or applicable, or instances where certain tests have not been carried out, are subject to the Engineer's decision.
- (g) Commissioning of the plant (which includes the thirty days between the Day 1 and Day 30 tests) includes operating under conditions that adequately prove that all the specifications have been met. All safety devices, standby plant, automatic controls and protection devices shall be adequately tested for reliability and correct functioning. The Contractor may be called upon to repeat testing during the maintenance period if the performance of the equipment is suspected to be substandard. Costs related to such tests shall be for the Contractor's account and shall comply with the specified requirements. Copies of updated commissioning reports shall be provided to the Engineer within two days after a test has been performed.
- (h) The Contractor is responsible for providing all labour and materials (including testing equipment) during the commissioning period and shall carry out all the servicing and adjustments to ensure that the installation operates as specified.

Valid calibration certificates shall be available for all testing equipment on the site during the commissioning period.

- (i) Programmes for the Day 1 tests, Day 30 tests and instruction/training sessions with the User Client's operators and maintenance team shall be prepared by the Contractor and submitted to the Engineer at least two weeks before the commissioning period commences. The Contractor shall provide weekly updates of these schedules for the duration of the commissioning period.
- (j) The Contractor shall note that if any equipment fails during the commissioning period, the equipment shall be repaired or replaced by the Contractor, and testing and commissioning shall commence from scratch.
- (k) Successful commissioning of an installation entitles the Contractor to a certificate of completion for the installation.

SC 12 MEASUREMENT AND PAYMENT

SC.01 DECOMMISSIONING AND REMOVING PARTS OF THE INSTALLATION Unit: sum

The unit of measurement shall be a sum.

The sum bid shall include full compensation for all actions and labour required for shutdown and decommissioning of the entire installation as specified to enable decommissioning and removal of parts of the installation as listed in the Bill of Quantities.

The sum bid shall include full compensation for the decommissioning and removal of the parts and components of an installation as listed individually in the Bill of Quantities, including actions and/or costs resulting from such work, to enable the recommissioning of parts of the repaired and/or upgraded installation.

The sum bid shall include full compensation for final dismantling of decommissioned materials and equipment and the removal of all such items to stores on site, as directed by the Engineer.

SC.02 COMMISSIONING AND TESTING OF PARTS OF THE INSTALLATION....Unit: sum

The unit of measurement shall be a sum.

The sum bid shall include full compensation for commissioning and testing parts of the installation to be operational while still incomplete in relation to the entire repaired and/or upgraded system or installation.

Separate payment items shall be billed for separate parts of the system.

SC.03 COMMISSIONING AND TESTING OF THE INSTALLATION..... Unit: sum

The unit of measurement shall be a sum.

The sum bid shall include full compensation for commissioning the upgraded installation as a whole and for all costs and expenses related to labour, removal, repair, reinstallation and testing of material and equipment during the commissioning period for each part of the installation. The sum bid shall include full compensation for the final commissioning and testing, including Day 1 and Day 30 tests, of all parts and components of the installation to the specified functional condition.

Payment shall be based on successful completion of the Day 30 tests.

SC.04 PROVISION FOR SAFETY AND HOT WORK REQUIREMENTS DURING SHUTDOWNUnit: number

The unit of measurement shall be the number of shutdowns during which all the required safety and hot work requirements are provided.

The bid rates shall include full compensation for all the required safety and hot work requirements and arrangements in accordance with the specifications during a shutdown period, including all labour, personnel, equipment, materials and consumables required.

C3.3 Annexures

C3.3.1 Additional Specification: Site Specific Inventory

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SS SITE SPECIFIC INVENTORY

CONTENTS

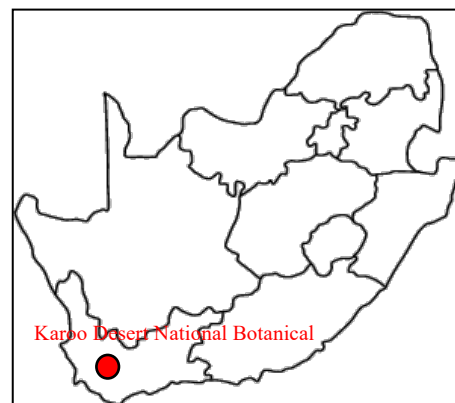
SS 01	SCOPE
SS 02	SITE LOCALITY INFORMATION
SS 03	SITE INVENTORY

SS 01 SCOPE

This Additional Specification (SS: Site Specific Inventory) covers the inventory of Karoo Desert National Botanical Garden included as part of the contract in order to assist the Contractor with the scope of work regarding specific repair and refurbishment requirements. Additional Specification SS: Site Specific Inventory, should be read in conjunction with all other technical and additional specifications applicable to this contract.

SS 02 SITE LOCALITY INFORMATION

The Karoo Desert National Botanical Garden cultivates and displays a wide variety of arid and semi-arid plants. The 154-hectare Garden lies at the foot of the Hex River Mountain range, 120 km north of Cape Town. Only 11 hectares are cultivated, and the remaining 143 hectares are comprised of natural vegetation. The garden houses approximately 6 residing personnel, 34 day-staff personnel and services about 60 visitors per day on average. Water is supplied from the municipality and sewer is handled by septic tank and municipal systems. There is an existing borehole that is *NOT* operational, approximately 4 hectares of plants to be irrigated and an unused damaged concrete reservoir of 250 m³.



The Karoo Desert National Botanical Garden is situated at Roux Rd, Panorama, (off National Rd), Worcester, Western Cape, South Africa.

GPS Co-ordinates: 33°37'00.2"S; 19°27'01.7

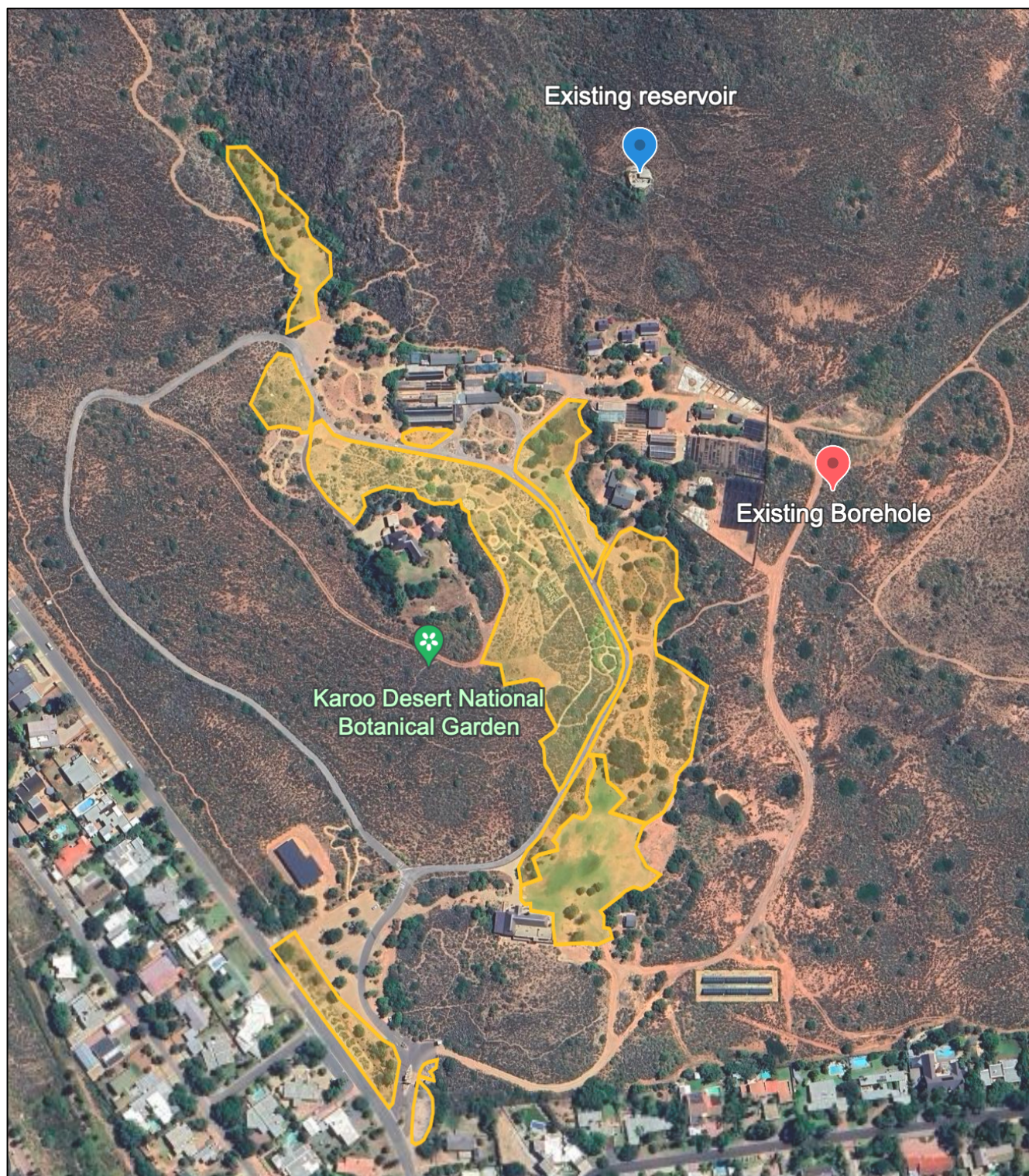


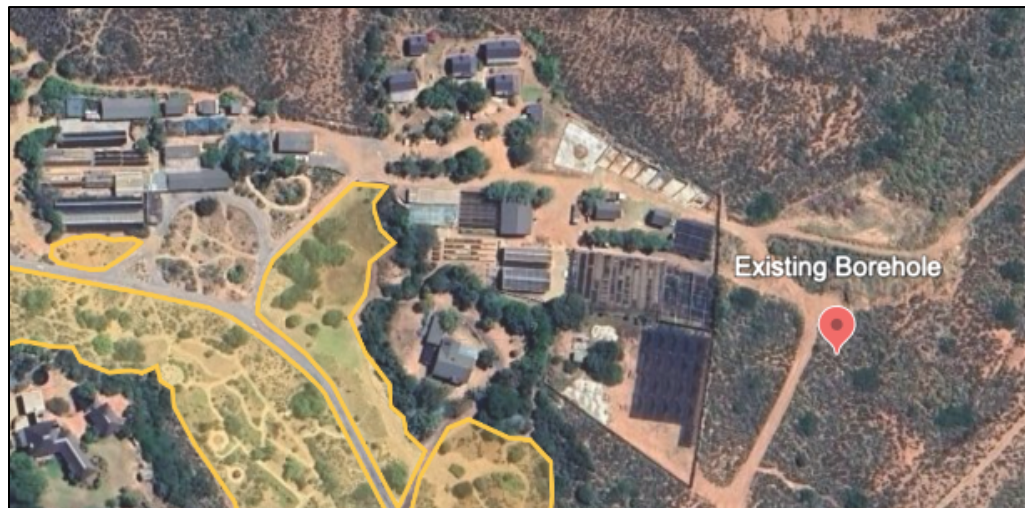
Figure 2.1: Irrigation Zones, Reservoir and Borehole

SS 03 **SITE INVENTORY**

SS 03.01 **BOREHOLE**

There is currently one borehole at the botanical garden. This borehole is situated on the outside of the perimeter fence east of the residential houses

Co-ordinates: 33°36'48" S; 19°27'11" E



The existing borehole is not operational and extensive repair work will be required to repair and equip the existing borehole, which will include:

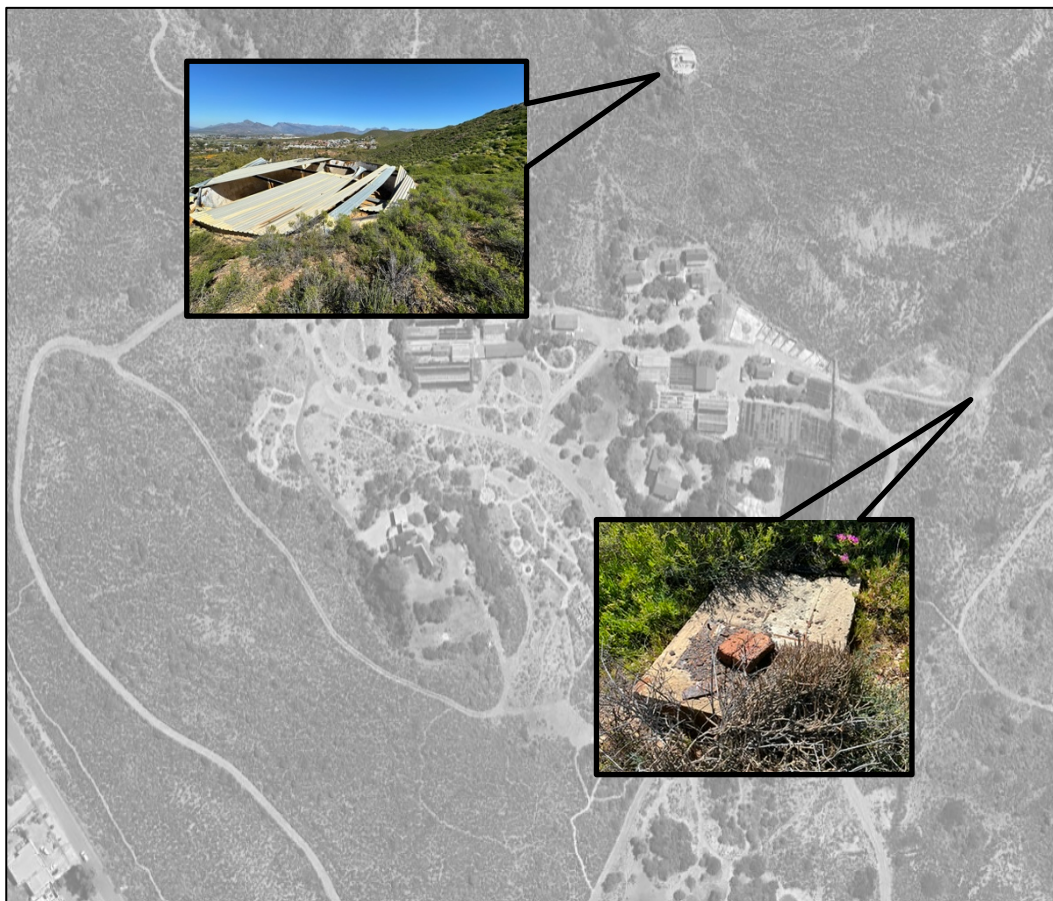
- Borehole testing
- Test pumping of boreholes complete inclusive of establishment, plant setup, and de-establishment
- Remove existing equipment (if any)
- Recovery of lost equipment (if needed)
- Installation of temporary pumps
- Ground water sampling and analysis for risk assessment i.t.o. SANS 241-2: 2015
- Compile borehole report

Should the existing borehole not be repairable or able to deliver adequate water, it is proposed that a Hydrogeological Consultant be appointed as part of the contractor's scope of work as allowed for in the contract schedule of quantities for the drilling of a possible new borehole.



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SS 03.02 WATER PURIFICATION PLANT

The Karoo Desert National Botanical Garden currently receives all potable, as well as irrigation water, from the Worcester Municipality. This water is suitable for human consumption and does not require any form of purification. Water from the borehole shall only be used for irrigation purposes and municipal water will be used for domestic purposes. This should negate the installation of a water purification plant, yet allowance has been made for a water purification should the borehole water not be fit for purpose.

SS 03.03 CONCRETE RESERVOIR

The existing concrete service reservoir is situated approximately 80 m north of the residential houses and approximately 30 m above the highest point on the terrain where water is required for irrigation. The reservoir is therefore ideally suited to provide water for irrigation by means of gravity (no pumping required). The reservoir is in a dilapidated state and will require extensive repairs to make it serviceable for use.

- Remove damaged roof sheeting.
- Remove all timber rafters.
- Break down concrete pillars inside reservoir.
- Concrete repairs to reservoir.
- The existing damaged PVC liner will be replaced with a HDPE liner.
- The inlet and outlet pipework and valves must be replaced.

The external concrete structure is in a fair condition, although it is not watertight, which indicates that a HDPE liner will have to be installed. All columns, supporting the collapsed roof, will have to be removed and a new 75 mm screed will be cast on the existing floor to smooth it to accept the HDPE liner.

	
Damaged roof structure. Reservoir condition fair.	
	
Repairs required to reservoir	Remove all damaged material

SS 03.04 IRRIGATION SYSTEM

The areas to be irrigated at Karoo Desert National Botanical Garden is approximately 3.55 hectares.

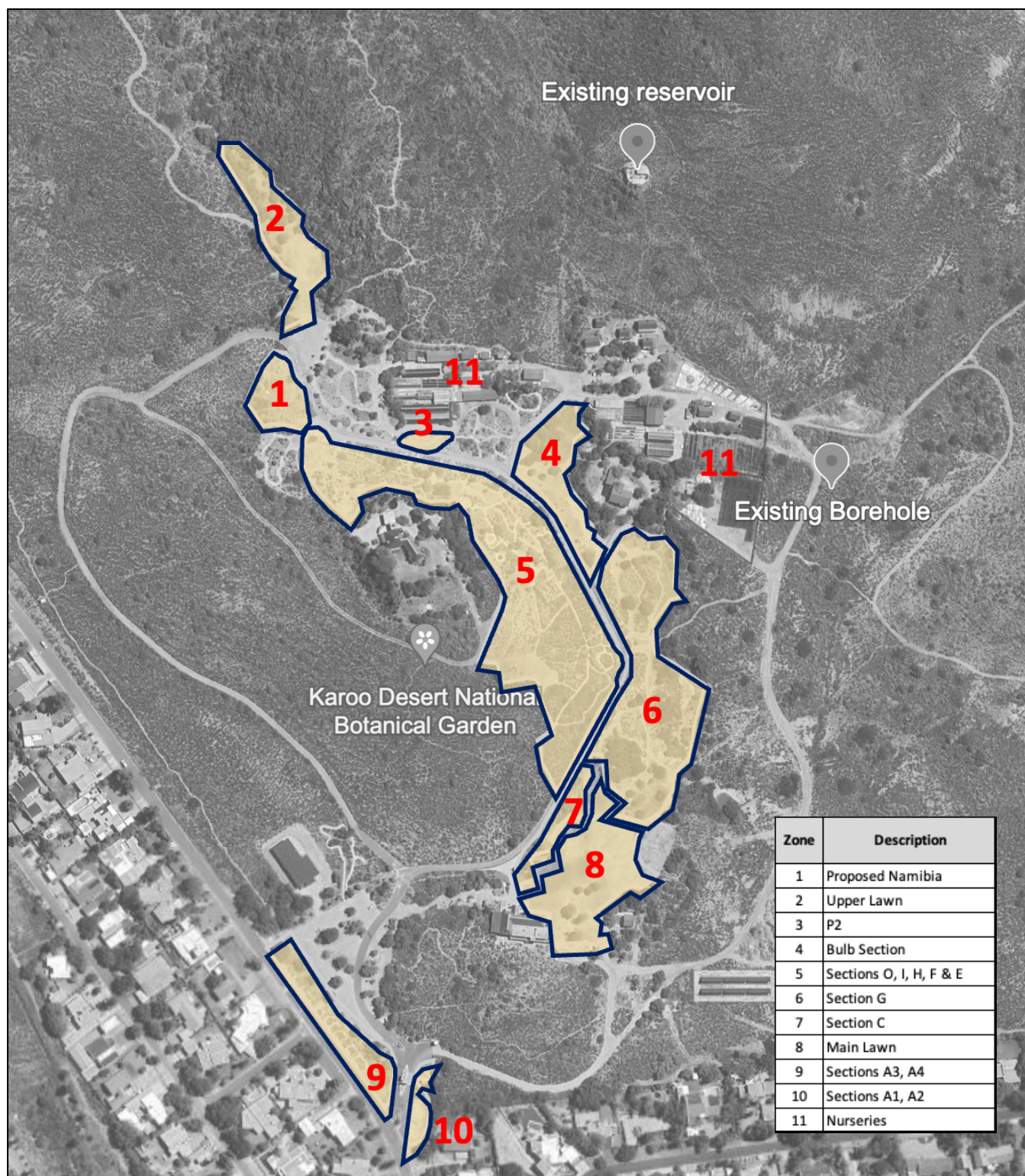


Figure 3.1: Proposed Irrigation Ring Main

Zone	Description	Perimeter (m)	Area (m ²)	mm/month	Volume (m ³)	Water Required - l/s
1	Proposed Namibia	128	1,248	75	94	0.036
2	Upper Lawn	284	2,429	300	729	0.281
3	P2	62	239	100	24	0.009
4	Bulb Section	269	2,387	100	239	0.092
5	Sections O, I, H, F & E	743	12,662	75	950	0.366
6	Section G	465	7,482	75	561	0.216
7	Section C	157	992	200	198	0.077
8	Main Lawn	386	4,794	300	1438	0.555
9	Sections A3, A4	230	2,249	200	450	0.174
10	Sections A1, A2	134	471	200	94	0.036
11	Nurseries	95	551	250	138	0.053
TOTAL			35,504		4914	1.896
Required Borehole Capacity (Pumped @ 67%)						2.844

Table 3.2: Irrigation Zone Demands

PROPOSED IRRIGATION ZONES 1 - 11



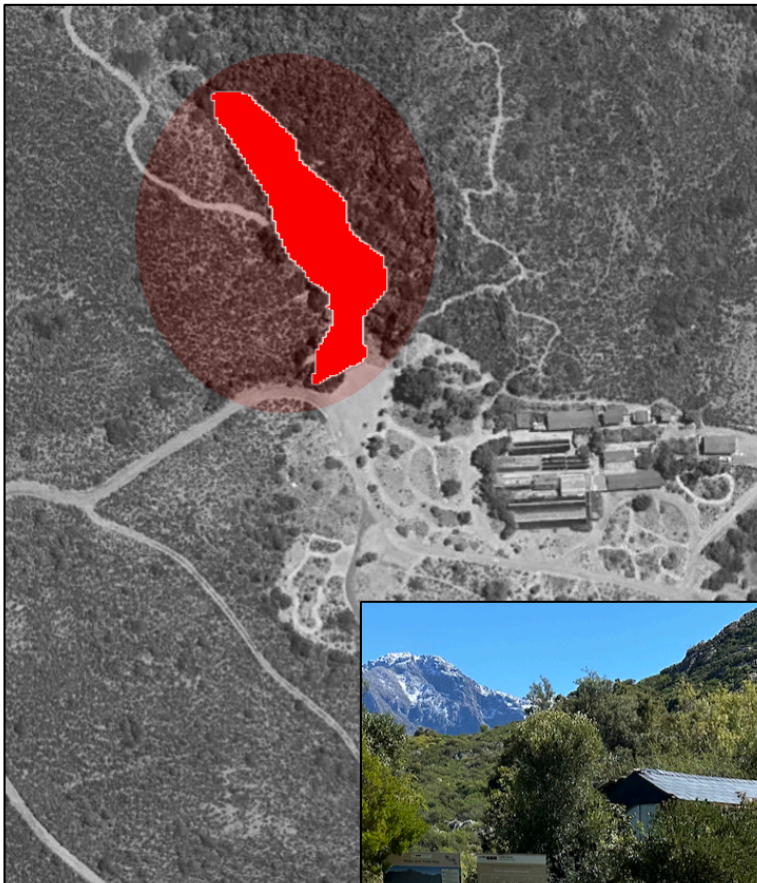
ZONE 1: PROPOSED NAMIBIA

- Perimeter: 128 m
- Area: 1,248 m²
- Semi desert area – Water requirement 75 mm/month
- Monthly delivery required for irrigation purposes: 94 m³ @ 0.036l/s



ZONE 2: UPPER LAWN

- Perimeter: 284 m
- Area: 2,429 m²
- Public lawn area – Water requirement 300 mm/month
- Monthly delivery required for irrigation purposes: 729 m³ @ 0.281l/s



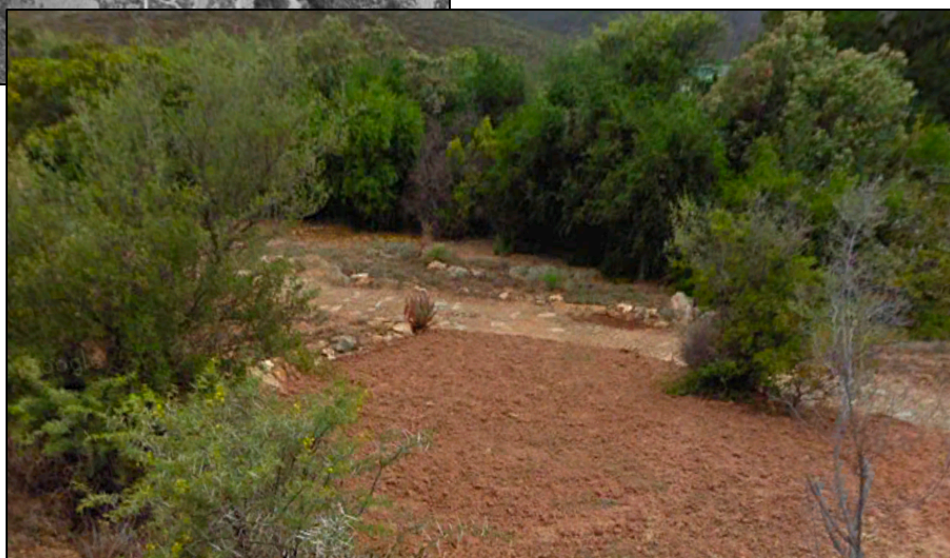
ZONE 3: P2

- Perimeter: 62 m
- Area: 239 m²
- Dry Karoo area – Water requirement 100 mm/month
- Monthly delivery required for irrigation purposes: 24 m³ @ 0.009l/s



ZONE 4: BULB SECTION

- Perimeter: 269 m
- Area: 2,387 m²
- Dry Karoo area – Water requirement 100 mm/month
- Monthly delivery required for irrigation purposes: 239 m³ @ 0.092l/s



ZONE 5: SECTIONS O, I, H, F & E

- Perimeter: 743 m
- Area: 12,662 m²
- Dry Karoo/Namaqualand area – Water requirement 75 mm/month
- Monthly delivery required for irrigation purposes: 950 m³ @ 0.367l/s



ZONE 6: SECTION G

- Perimeter: 465 m
- Area: 7,482 m²
- Semi desert area – Water requirement 75 mm/month
- Monthly delivery required for irrigation purposes: 561 m³ @ 0.216l/s



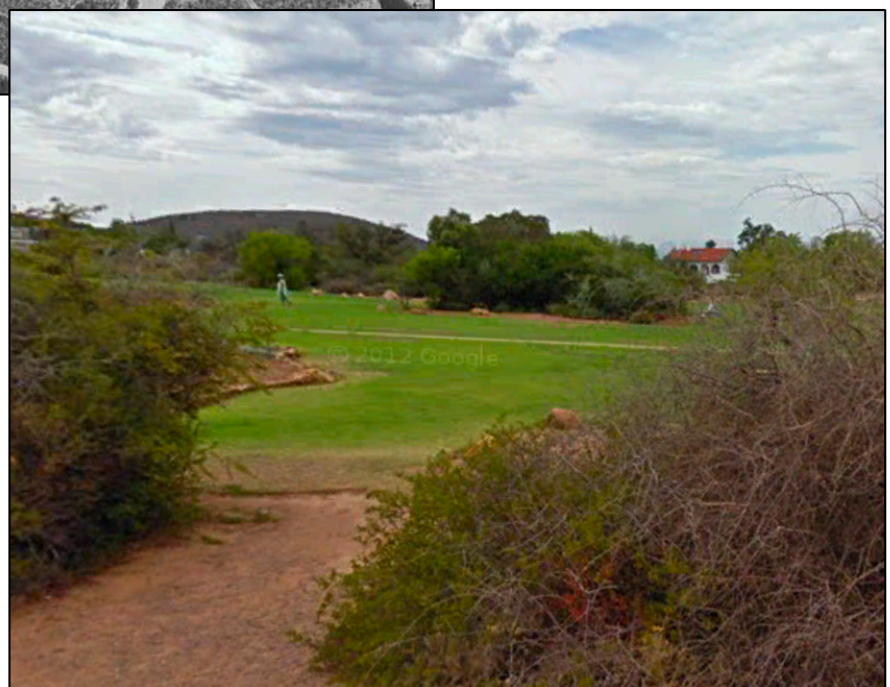
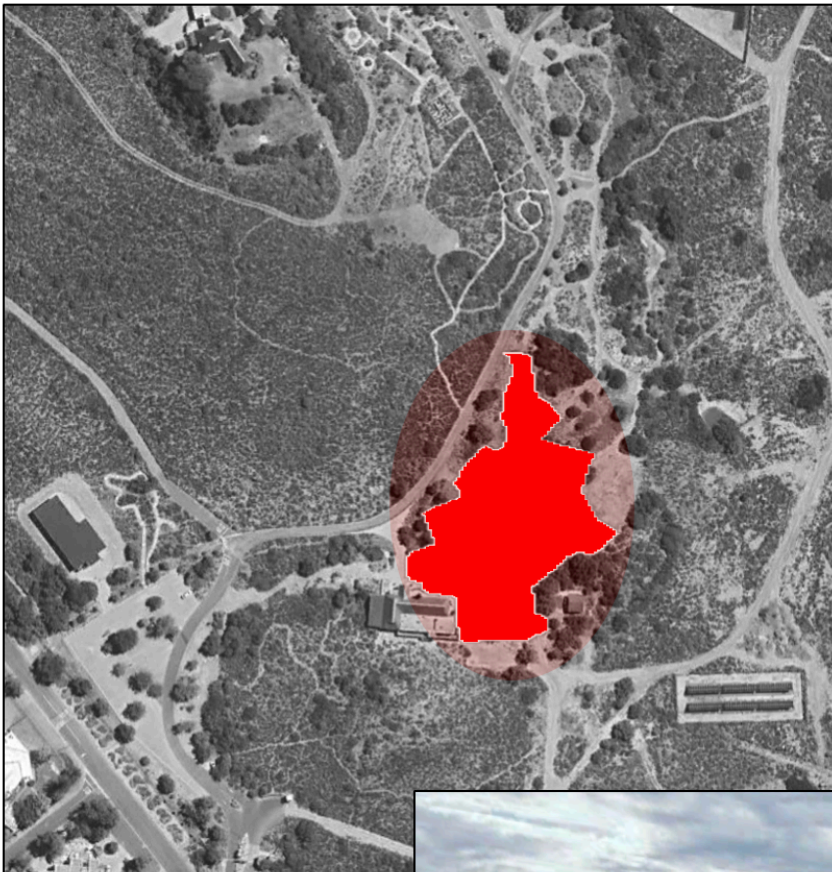
ZONE 7: SECTION C

- Perimeter: 157 m
- Area: 992 m²
- Namaqualand – Water requirement 200 mm/month
- Monthly delivery required for irrigation purposes: 198 m³ @ 0.077l/s



ZONE 8: MAIN LAWN

- Perimeter: 386 m
- Area: 4,794 m²
- Public lawn – Water requirement 300 mm/month
- Monthly delivery required for irrigation purposes: 1438 m³ @ 0.555l/s



ZONE 9: SECTIONS A3 & A4

- Perimeter: 230 m
- Area: 2,249 m²
- Entrance gardens – Water requirement 200 mm/month
- Monthly delivery required for irrigation purposes: 450 m³ @ 0.174l/s



ZONE 10: SECTIONS A1 & A2

- Perimeter: 134 m
- Area: 471 m²
- Entrance gardens – Water requirement 200 mm/month
- Monthly delivery required for irrigation purposes: 94 m³ @ 0.036l/s



ZONE 11: NURSERIES

- Perimeter: 95 m
- Area: 551 m²
- Nurseries – Water requirement 250mm/month
- Monthly delivery required for irrigation purposes: 138m³ @ 0.053l/s



C4 Site Information

PA HEALTH AND SAFETY SPECIFICATION

PA1 DESCRIPTION OF WORK

The Contract shall comprise the supply of all labour, materials, workmanship, machinery, equipment, transport, attendance on others and everything stated or implied which is, or may be, necessary in and for the entire completion of all the following works:

- Establishment
- Scope of works:
 - Testing of an existing borehole (not in use)
 - Drilling and equipping a new borehole
 - Water quality testing and analysis
 - Water treatment of irrigation water
 - Repair of irrigation reservoir
 - New irrigation water main
 - New automated irrigation system (zoned)
 - New potable water storage reservoir
- Compliance to regulations relating to Health and Safety and the Environmental Management Acts

PA2 DESCRIPTION OF THE SITE

The Karoo Desert National Botanical Garden (NBG) is located in Worcester in the Western Cape.

GPS Co-ordinates: 33°37'00.2"S; 19°27'01.7"E.

PA3 APPLICATION OF CONSTRUCTION REGULATIONS 2014

The intended construction work falls within the scope of "construction work" as defined in the Construction Regulations, 2014 made under the Occupational Health and Safety Act no. 85 of 1995, as amended ("the Act").

PA4 POTENTIAL SOURCES OF RISK

The following potential sources of risk to the health and safety of persons on the site have been identified, and must, as a minimum, be appropriately addressed by the Principal Contractor in the Principal Contractor's Health and Safety Plan. In addition, the Principal Contractor must perform its own risk assessments to enable it to take the necessary precautions to protect the health and safety of persons on the site, to comply with the Principal Contractor's obligations under the Act and all Regulations made there under, including the Construction Regulations. All such precautionary measures and procedures must be included in the Principal Contractor's Health and Safety Plan, which must be submitted to the Client for review and approval and where applicable should include:

- Excavation work
Ground conditions for the purposes of safe excavation shall be assessed by a competent person.
The ground type and condition and water table shall be logged in accordance with Civil Engineering practice.
- Scaffolding
- Material hoists
- Construction vehicles and mobile equipment
- Electrical installations and electrical machinery
- Housekeeping
- Stacking and storage practices

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- Fire risks and fire precautions
- Welfare facilities on the site
- Air compressors
- Hot work (steel cutting and welding)
- Noise
- Portable electrical tools
- Compressed gases and vessels under pressure
- Intoxicated persons on site
- Existing underground water, electricity and other services
- Use of ladders
- Dust
- Inadequate or fragile coverings
- Explosives
- Testing of pipelines. The contractor's attention is drawn to large forces existing on pipelines, specials and supports during pressure testing, and shall ensure that structures are properly secured during testing to withstand the pressures and forces.

PA5 HEALTH AND SAFETY MANAGEMENT SYSTEM**Health and Safety Philosophy**

The Client is required to ensure a working environment which, as far as reasonably practicable, is safe and without risk to the health of persons on the site.

PA5.1 Contractor Health and Safety Management System

The Principal Contractor will ensure and demonstrate to the Client that he, and all contractors to be appointed on this construction project, has adequately allowed for the cost of health and safety measures which may be required during the construction work.

PA5.2 Appointment of Client's Health and Safety Adviser

The Client will appoint a Health and Safety Adviser who will visit the site regularly to monitor and audit the execution of the contractor's Health and Safety Plans on behalf of the Client, without thereby limiting the contractor's own responsibility for health and safety, or attracting any vicarious responsibility or liability for the contractor's acts or omissions.

PA5.3 Occupational Health and Safety Act Section 37(2) Agreements

The Principal Contractor, as well as all contractors, must sign the Client's Section 37(2) agreement before commencement of their particular work.

For purposes of general communication regarding construction work progress, the Client appoints the Engineer.

PA6 CONTRACTOR HEALTH AND SAFETY PLANS

Each contractor and sub-contractor working on the site must prepare a Health and Safety Plan to address and manage all applicable sources of risk as per items under point 4 of this specification as well as any other sources of risk which are identified during the contractor's own risk assessments. The Principal Contractor shall incorporate these into a single Health and Safety Plan for the execution of the entire contract works ("the Health and Safety Plan"). Should any further risks be identified in the course of the construction work, such risks must be assessed and addressed in amended Health and Safety Plans which must then be submitted to the Client for approval.

The Health and Safety Plan must also address the following matters:

- i) Legal appointments required by the Act and any Regulations under the Act.
- ii) Procedures for compliance with all requirements of the Act and in particular Sections 8 and 9 of the Act.
- iii) Undertaking and procedure to stop any work which endangers the safety or health of any person.
- iv) System for recording and reporting of incidents both internal and external to the Department of Labour.
- v) Copy of the Act and its Regulations to be kept on the site and to be readily available to employees.
- vi) Incident register to be kept on the site.
- vii) Employment of only persons who are competent and have the necessary knowledge, training, qualifications and experience to perform the required construction work safely and effectively.

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- viii) Appointment of only competent, knowledgeable, trained, qualified and experienced persons to supervise the construction work.
- ix) Procedures and arrangements for first aid facilities on the site.
- x) Procedures and arrangements for prompt reporting of injuries and other losses / incidents.
- xi) Emergency plans to deal effectively with potential site emergencies.
- xii) Use of effective processes for the identification and close out of root causes of incidents and accidents.
- xiii) Attendance by all contractors of monthly site health and safety meetings.
- xiv) Demonstration by all contractors of their health and safety monitoring and auditing systems to ensure compliance with their Health and Safety Plans, as part of their Health and Safety Plans.
- xv) Effective site health and safety induction programme for all workers on the site.

PA7 ADDITIONAL DUTIES OF PRINCIPAL CONTRACTOR

- i) The Principal Contractor must notify the Department of Labour of the intention to carry out construction work.
- ii) The Principal Contractor must coordinate the activities of all contractors and sub-contractors in the interest of health and safety.
- iii) The Principal Contractor must carry out all other duties described in Regulation 5 of the Construction Regulations 2003.
- iv) The Principal Contractor must register in terms of the Compensation for Occupational Injuries and Diseases Act or any other compensation funds approved by the Commissioner for its workmen, and provide to the Client proof thereof and also that it is in good standing with the Compensation Commissioner or approved insurer.

PA8 GENERAL

- i) Nothing contained in or omitted from this Health and Safety Specification, or the Health and Safety Plan based on this specification, shall relieve the Principal Contractor of any of its obligations or liabilities.
- ii) The Client shall not be liable for any civil claim because of anything contained in or omitted from this Health and Safety Specification.

PA9 MEASUREMENT AND PAYMENT

In addition to the allowance that the contractor would normally make in his rates for Health and Safety Aspects, the contractor shall price for all things necessary required to fulfil the requirements of the OHS Act and Regulations in the items scheduled in Schedule 1, General A.