



CLUSTER
Trading Services

UNIT
Cleansing and Solid Waste

DEPARTMENT
Plant and Engineering

PROCUREMENT DOCUMENT
INFRASTRUCTURE

Documents are to be obtained, free of charge, in electronic format, from the [National Treasury's eTenders website](#) or the [eThekweni Municipality's website](#).

Contract No: 25686(6W)

Contract Title: Buffelsdraai Landfill: Leachate Treatment Plant Upgrade – Phase 1

Est. CIDB Grade/ Class: 6 ME

CLARIFICATION MEETING AND QUERIES

Clarification Meeting: Compulsory Clarification Meeting

Meeting Location, Date, Time: Buffelsdraai Landfill Administration Offices]
On [02 July 2024] at 11h00

Queries can be addressed to: TGC Engineers G J Payne Pr Eng
The Employer's Agent's: Tel: 083-326-4458
Representative: eMail: graham@tgcengineers.co.za
email queries to be submitted by 11 July 2024 and consolidated questions and answers to queries will be uploaded on 18 July 2024

TENDER SUBMISSION

Delivery Location: The Tender Box in the foyer of the Municipal Building
166 KE Masinga Road, Durban

Closing Date/ Time: Friday, 26 July 2024 at 11h00

FACSIMILE, eMAIL, or POSTED TENDERS WILL NOT BE ACCEPTED

Issued by:

ETHEKWINI MUNICIPALITY

Deputy Head: Plant and Engineering

Date of Issue: 21/06/2024

Document Version 24/02/2023(c)

FOR OFFICIAL USE ONLY

Tenderer Name:			VAT Registered: Yes No
	Price (excl)	VAT	Price (incl)
Submitted: R		R	R
Corrected: R		R	R

INDEX to PROCUREMENT DOCUMENT

TENDER PART	Part T1	TENDERING PROCEDURES		Page
		T1.1	Tender Notice and Invitation to Tender	
		T1.1.1	Tender Notice and Invitation to Tender	2
		T1.2	Tender Data	
		T1.2.1	Standard Conditions of Tender	3
		T1.2.2	Tender Data (<i>applicable to this tender</i>)	3
		T1.2.3	Additional Conditions of Tender	12
	Part T2	RETURNABLE DOCUMENTS		Page
		T2.1	List of Returnable Documents	16
		T2.2	Returnable Schedules, Forms and Certificates	17

CONTRACT PART	Part C1	AGREEMENT AND CONTRACT DATA		Page
		C1.1	Form of Offer and Acceptance	
		C1.1.1	Offer	58
		C1.1.2	Acceptance	59
		C1.1.3	Schedule of Deviations	60
		C1.2	Contract Data	
		C1.2.1	Standard Conditions of Contract	61
		C1.2.2	Contract Data	61
		C1.2.3	Additional Conditions of Contract	67
	Part C2	PRICING DATA		Page
		C2.1	Pricing Assumptions / Instructions	69
		C2.2	Bill of Quantities (separate page numbering system)	71
	Part C3	SCOPE OF WORK		Page
		C3.1	Project Description and Scope of Contract	97
		C3.2	Project Specifications	98
		C3.3	Standard Specifications	104
		C3.4	Particular Specifications	125
		C3.5	Contract and Standard Drawings	215
	Part C4	SITE INFORMATION		Page
		C4.1	Locality Plan	229
		C4.2	Conditions on Site	229
		C4.3	Contract Notice Board	231

PART T1: TENDERING PROCEDURES**T1.1.1: TENDER NOTICE AND INVITATION TO TENDER**

Tenders are hereby invited for the works required to upgrade the Leachate Treatment Plant at the Buffelsdraai Landfill. The Upgrade is to be carried out in two Phases with this contract covering Phase 1 of the project. The works include earthworks, the construction of a reinforced concrete treatment tank and the supply and installation of aerators and dosing equipment together with associated pipework and fittings. It also includes the construction of reedbeds lined with HDPE membrane.

Subject	Description	Tender Data Ref.
Employer	The Employer is the eThekweni Municipality as represented by: Deputy Head: Plant and Engineering	F.1.1.1
Tender Documents	Documents can only be obtained in electronic format, issued by the eThekweni Municipality. Documentation can be downloaded from the National Treasury's eTenders website or the eThekweni Municipality's Website . The <u>entire document</u> should be printed (on A4 paper) and suitably bound by the tenderer.	F.1.2
Eligibility	It is <u>estimated</u> that tenderers should have a CIDB contractor grading designation of 6 ME (or higher). The CIDB provisions in relation to a Contractor's Potentially Emerging (PE) status <u>do not</u> apply.	F.2.1.1
Clarification Meeting	Buffelsdraai Landfill Administration Offices] On [02 July 2024] at 11h00	F.2.7
Seek Clarification	Queries relating to these documents are to be addressed to the Employer's Agent's Representative whose contact details are: TGC Engineers G J Payne Pr Eng Tel: 083-326-4458 eMail: graham@tgcengineers.co.za email queries to be submitted by 11 July 2024 and consolidated questions and answers to queries will be uploaded on 18 July 2024	F.2.8
Submitting a Tender Offer	Tender offers shall be delivered to: The Tender Box in the foyer of the Municipal Building 166 KE Masinga Road, Durban	F.2.13
Closing Time	Tender offers shall be delivered on or before Friday, 26 July 2024 at or before 11h00 .	F.2.15
Evaluation of Tender Offers	The 80/20 Price Preference Point System, as specified in the PPPFA Regulations 2022 will be applied in the evaluation of tenders. Refer to Clause F.3.11 of the Tender Data for the Specific Goal(S) for the awarding of Preference Points, and other related evaluation requirements.	F.3.11

Requirements for sealing, addressing, delivery, opening and assessment of tenders are further stated in the Tender Data

PART T1: TENDERING PROCEDURES

T1.2: TENDER DATA

T1.2.1 STANDARD CONDITIONS OF TENDER

The conditions of tender are the Standard Conditions of Tender as contained in Annex F of the CIDB Standard for Uniformity in Construction Procurement (July 2015) as published in Government Gazette No 38960, Board Notice 136 of 2015 of 10 July 2015.

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.

T1.2.2 TENDER DATA

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

F.1: GENERAL

F.1.1 The employer: The Employer for this Contract is the eThekweni Municipality as represented by: Deputy Head: **Plant and Engineering**

F.1.2 Tender documents: The Tender Documents issued by the Employer comprise:

- 1) This procurement document.
- 2) "General Conditions of Contract for Construction Works – 3rd Edition 2015" issued by the South African Institution of Civil Engineering (GCC 2015). This document is obtainable separately, and Tenderers shall obtain their own copies.
- 3) "City of Durban Technical Specifications" hereinafter referred to as the Standard Engineering Specifications. This document is obtainable separately, and Tenderers shall obtain their own copies of the applicable Sections.
- 4) Drawings, issued separately from this document, or bound in Section C3.4 (as an Annexure).
- 5) In addition, Tenderers are advised, in their own interest, to obtain their own copies of the following acts, regulations, and standards referred to in this document as they are essential for the Tenderer to get acquainted with the basics of construction management, the implementation of preferential construction procurement policies, and the participation of targeted enterprise and labour.
 - The Employer's current (as at advertising date) Supply Chain Management Policy.
 - The Preferential Procurement Policy Framework Act No 5 of 2000, and the Preferential Procurement Policy Framework Act Regulations (2022).
 - The Occupational Health and Safety Act No 85 and Amendment Act No 181 of 1993, and the Construction Regulations (2014).
 - The Construction Industry Development Board Act No 38 of 2000 and the Regulations issued in terms of the Act (July 2013).
 - SANS 1921:2004 – Construction and Management Requirements for Works Contract, Parts 1-3.
 - Any other eThekweni Policy documents referenced in the Tender Documents.

Electronically downloaded documentation is obtainable from the National Treasury's **eTenders Website** or the **eThekweni Municipality's Website** at URLs:

- <https://www.etenders.gov.za/>
- <https://www.durban.gov.za/pages/business/procurement>

The entire downloaded document should be printed on white A4 paper (single-sided) and suitably bound by the tenderer.

F.1.4 Communication and employer's agent: The Employer's Agent's Representative is:

TGC Engineers G J Payne Pr Eng

Tel: 083-326-4458

eMail: graham@tgcengineers.co.za

email queries to be submitted by 11 July 2024 and consolidated questions and answers to queries will be uploaded on 18 July 2024

The Tenderer's contact details, as indicated in the Contract Data: Clause C1.2.2.2 "Data to Be Provided by Contractor", shall be deemed as the only valid contact details for the Tenderer for use in communications between the Employer's Agent and the Tenderer.

F.2: TENDERER'S OBLIGATIONS

F.2.1.1 Eligibility: General

A Tenderer will not be eligible to submit a tender if:

- (a) the Tenderer does not comply with the legal requirements as stated in the Employer's current SCM Policy.
- (b) the Tenderer cannot provide proof that he is in good standing with respect to duties, taxes, levies and contributions required in terms of legislation applicable to the work in the contract.
- (c) In the event of a Compulsory Clarification Meeting:
 - i) the Tenderer fails to attend the Compulsory Clarification Meeting.
 - ii) the Tenderer fails to have form "Certificate of Attendance at Clarification Meeting / Site Inspection" (in T2.2) signed by the Employer's Agent or his representative.
- (d) in the case of JV submissions, two or more JV entities have common directors / shareholders or common entities tendering for the same works.
- (e) at the time of closing of tenders, the Tenderer is not registered on the National Treasury Central Supplier Database (CSD) as a service provider. In the case of a Joint Venture, this requirement will apply individually to each party in the Joint Venture.
- (f) The tenderer has not submitted, with this tender, a valid Letter of Good Standing from the Compensation Commissioner as proof of being registered and in good standing with the compensation fund. Reference is to be made to Returnable Document T2.2.13.
- (g) The tender fails to complete and sign the Declaration of Municipal Fees in T2.2: "Returnable Documents" and submits the required documentation. Reference is to be made to Returnable Document T2.2.12.

SCM Policy (CI.14(4)) requires suppliers/ service providers/ contractors to be registered on the eThekweni Municipality Central Supplier Database or be in a position to be so before the award.

In the event of the Tenderer not being registered on the eThekweni Municipality's Central Supplier Database, the tenderer must register on the internet at www.durban.gov.za by following these links:

- Business
- Supply Chain Management (SCM)
- Accredited Supplier and Contractor's Database.

The following are to be noted:

- (a) The information for registration as in the possession of the eThekweni Municipality will apply.
- (b) It is the Tenderer's responsibility to ensure that the details as submitted to the Municipality are correct.
- (c) Tenderers are to register prior to the submission of tenders.

F.2.1.2 Eligibility: CIDB

Only those tenderers who are registered (as "Active") with the CIDB (at time of tender closing), 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 **ME** class of construction work, are eligible to have their tenders evaluated.

Joint ventures are eligible to submit tenders provided that:

- (a) Every member of the joint venture is registered (as "Active") with the CIDB (at time of tender closing),
- (b) The lead partner has a contractor grading designation in the **ME** class of construction work and has a grading designation of not lower than one level below the required grading designation, and
- (c) The combined contractor grading designation calculated in accordance with the Construction Industry Development Regulations (2013) is equal to or higher than a contractor grading designation determined in accordance with the sum tendered for a **ME** class of construction work or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations.

It should be noted that this contract is not part of a Targeted Development Programme (TDP). The CIDB provisions in relation to a Contractor's Potentially Emerging (PE) status do not apply.

F.2.2.2 The cost of the tender documents: Replace this paragraph with the following:

"Documents are to be obtained, free of charge, in electronic format, from the **National Treasury's eTenders website** or the **eThekweni Municipality's Website**. The entire electronically downloaded document should be printed on white A4 paper (single-sided) and suitably bound by the tenderer.

F.2.6 Acknowledge addenda: Add the following paragraphs to the clause:

"Addenda will be published, in electronic format, on the websites specified in F.1.2. Tenderers are to ensure that the eTenders website is consulted for any published addenda pertaining to this tender up to three days before the tender closing time as stated in the Tender Data."

"Acknowledgement of receipt of the addenda will be by the return of the relevant completed, dated, and signed portion of the addenda, to the physical or email address as specified on the addenda.

Failure of the tenderer to comply with the requirements of the addenda may result in the tender submission being made non-responsive."

F.2.7 Clarification meeting:
Buffelsdraai Landfill Administration Offices]
On [02 July 2024] at 11h00

In the event of a Compulsory Clarification Meeting, Tenderers must sign the attendance register in the name of the tendering entity. The Tenderer's representative(s) at the clarification meeting must be able to clearly convey the discussions at the meeting to the person(s) responsible for compiling the entity's tender offer.

F.2.12 Alternative tender offers: No alternative tender offers will be considered.

F.2.13 Submitting a tender offer: Submissions must be submitted on official submission documentation issued (in electronic format) by the eThekweni Municipality.

Identification details to be shown on each tender offer package are:

- Contract No. : **25686(6W)**
- Contract Title : **Buffelsdraai Landfill: Leachate Treatment Plant Upgrade – Phase 1**

The Employer's address for delivery of tender offers is:

The Tender Box in the foyer of the Municipal Building
166 KE Masinga Road, Durban

Tenderers are to include, with their paper ("hard copy") submission, a memory-stick containing an electronically scanned (300 dpi resolution) Public Document Format (PDF) copy of their complete bid submission. This PDF file should be named using the contract number and the Tenderer's name, eg. "**WS-7451 – Tenderers Name.PDF**". The memory-stick must be labelled with the Tenderer's name and securely fixed to the paper submission.

Telephonic, telegraphic, telex, facsimile or e-mailed tender offers will not be accepted.

F.2.15 Closing time: The closing time for delivery of tender offers is:

- Date : **Friday, 26 July 2024**
- Time : **11h00**

F.2.16 Tender offer validity: The Tender Offer validity period is 120 Days from the closing date for submission of tenders.

F.2.20 Submit securities, bonds, policies: The tenderer is required to submit with his tender a letter of intent from an approved insurer undertaking to provide the Performance Bond to the format included in T2.2 of this procurement document.

F.2.23 Certificates: Refer to **T2.1** for a listing of certificates that must be provided with the tender. All certificates must be valid at the time of tender closing.

Tenderers are to include, at the back of their tender submission document, a printout of the required documents/ certificates.

The Form of Offer (C1.1.1), Data to be provided by the Contractor (C1.2.2.2), and the Bill of Quantities (C2.2) are also required to be completed in full.

Tax Clearance

Reference is also to be made to returnable form T2.2.3: "Tax Compliance Status PIN/ Tax Clearance Certificate".

SARS has introduced a new Tax Compliance Status System. Tenderers must submit a **Tax Compliance Status PIN** (TCS PIN) instead of an original Tax Clearance Certificate. This TCS PIN can be used by third parties to certify the taxpayer's real-time compliance status. This TCS PIN is to be entered on Returnable Document T2.2.1: "Compulsory Enterprise Questionnaire". Separate Tax Clearance Certificates / TCS PINs are required for each entity in a Joint Venture.

Failure to comply will make the tender non-responsive.

Compensation Commissioner

Reference is also to be made to returnable form T2.2.13: "Eligibility: Registration with Compensation Commissioner".

The tenderer is to supply proof of being registered and in good standing with the compensation fund by submitting a valid **Letter of Good Standing** from the Compensation Commissioner.

Failure to comply will make the tender non-responsive.

Central Supplier Database (CSD)

Reference is also to be made to returnable form T2.2.14: "Eligibility: CSD Registration Report".

The entities (full) **CSD Registration Report**, obtained from the National Treasury Central Supplier Database, is to be included in the tender submission (<https://secure.csd.gov.za>).

Separate CSD Registration Reports are required for each entity in a Joint Venture.

CIDB Registration

Reference is also to be made to returnable form T2.2.15: "Eligibility: Verification of CIDB Registration and Status".

Registration with the CIDB must be reflected as "Active" at time of tender closing.

Tenderers are to include with their submission a printout of their **CIDB Registration**, obtained from the CIDB website (<https://registers.cidb.org.za/PublicContractors/ContractorSearch>).

The Joint Venture Grading Designation Calculator should be used when submitting as a Joint Venture (<https://registers.cidb.org.za/PublicContractors/JVGradingDesignationCalc>).

The date of obtaining the CIDB printout(s) is to be indicated on the printout.

F.3: THE EMPLOYER'S UNDERTAKINGS

- F.3.1.1 Respond to requests from the tenderer:** Replace the words "five working days" with "three working days".
- F.3.2 Issue addenda:** Add the following paragraph: "Addenda will be published, in electronic format, on the same platform(s) as the Tender Notification (refer to F.1.2)."
- F.3.4 Opening of Tender Submissions:** Tenders will be opened immediately after the closing time for tenders. The public reading of tenders will take place in the SCM Boardroom, 6th Floor, Engineering Unit Building, 166 KE Masinga Road, Durban.

F.3.11 Evaluation of Tender Offers:**Eligibility**

Tenders will be checked for compliance with the ELIGIBILITY requirements, as specified in T1.2.2 Clause F.2.1. Tenderers not in compliance will be deemed non-responsive.

Evaluation of the products offered will be used as an evaluation requirement. The tenderers will be checked if they meet the mandatory requirements. Any tenderer that does not meet any of the mandatory requirement will be deemed non-responsive.

The following are mandatory requirements:

- Full details of the equipment offered, must be provided and it must meet the specifications as per the scope of work. (Refer to Returnable Schedule: Page 50).

F.3.11.9 Scoring Quality (Functionality)

FUNCTIONALITY will be evaluated to determine the responsiveness of tenders received. The minimum score for FUNCTIONALITY is 60 points. Those tenders not achieving the minimum score will be deemed non-responsive.

The functionality Criteria, Sub-Criteria, Points per Criteria/ Sub-Criteria, Returnable Documentation and Schedules, Method of Evaluation, and Prompts for Judgement are as specified in T1.2.3: "Additional Conditions of Tender".

Preference Point System

The financial offer will be reduced to a comparative basis using the **Tender Assessment Schedule**.

The procedure for the evaluation of responsive tenders is **PRICE AND PREFERENCE** in accordance with the Employer's current SCM Policy, the Preferential Procurement Policy Framework Act (5 of 2000), and the Preferential Procurement Policy Framework Act Regulations (2022).

Price Points

The **80/20** preference point system will apply.

Preference Points

Reference is also to be made to T2.2.7: "MBD 6.1: Preference Points Claim".

The Preference Points (either 20) will be derived from points allocated/ claimed for **Specific Goals** as indicated in the table(s) below, according to the specified **Goal/ Category Weightings**.

- **Ownership Goal**

Goal Weighting: 50%

The tendering entity's **Percentage Ownership**, in terms of the **Ownership Category(s)** listed below, is to be used in the determination of the tenderer's claim for **Preference Points**.

Ownership Categories	Criteria	80/20	90/10
Race: Black (w1)	Equals 0%	0	n/a
	Between 0% and 51%	4	n/a
	Greater or equal to 51% and less than 100%	8	n/a
	Equals 100%	10	n/a
Gender: Female (w2)	Equals 0%	0	n/a
	Between 0% and 51%	4	n/a
	Greater or equal to 51% and less than 100%	8	n/a
	Equals 100%	10	n/a
Maximum Goal Points:		20	n/a

The **Weightings** of the **Ownership Categories** will be:

- w1 = 80%, w2=20%, w3=0% (where: w1 + w2 + w3 = 100%)

Proof of claim as declared on MBD 6.1 (1 or more of the following will be used in verifying the tenderer's status)

- Companies and Intellectual Property Commission registration document (CIPC)
- CSD report.
- B-BBEE Certificate of the tendering entity.
- Consolidated BBBEE Certificate if the tendering entity is a Consortium, Joint Venture, or Trust (Issued by verification agency accredited by the South African Accreditation System).
- Agreement for a Consortium, Joint Venture, or Trust.

- **RDP Goal: The promotion of South African owned enterprises**

Goal Weighting: 25%

The tendering entity's **Address** (as stated on the National Treasury Central Supplier Database (CSD) or on the eThekweni Municipality Vendor Portal) is to be used in the determination of the tenderer's claim for **Preference Points** for this Specific Goal.

Location	80/20	90/10
Not in South Africa	0	n/a
South Africa	5	n/a
Kwa Zulu Natal	10	n/a
eThekweni Municipality	20	n/a
Maximum Goal Points:		n/a

Proof of claim as declared on MBD 6.1 (1 or more of the following will be used in verifying the tenderer's status)

- CSD report

• **RDP Goal: Creation of new jobs to address black youth unemployment**

Goal Weighting: 25%

The tendering entity's **Commitment to Appointment or Actual Appointment**, in terms of the categories below, is to be used in the determination of the tenderer's claim for **Preference Points** for this Specific Goal.

Number of jobs created	80/20	90/10
0 – 49	5	n/a
50 – 100	10	n/a
Over 100	20	n/a
Maximum Goal Points:	20	n/a

Proof of claim as declared on MBD 6.1 (1 or more of the following will be used in verifying the tenderer's status)

- Commitment letter to appoint youth from local ward (for a year or more)
- Appointment letters signed by local councillor or chief (for a year or more)
- Consider other evidence etc Copies of IDs and proof of address in Ethekwini

F.3.13 Acceptance of tender offer: In addition to the requirements of Clause F.3.13 of the Standard Conditions of Tender, tender offers will only be accepted if:

- The tenderer submits a **valid Tax Clearance Certificate OR Tax Compliance Status PIN**, issued by the TCS System of the South African Revenue Services, or has made arrangements to meet outstanding tax obligations.
- The tenderer is **registered, and "Active", with the Construction Industry Development Board**, at time of tender closing, in an appropriate contractor grading designation.
- 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 not:
 - Abused the Employer's Supply Chain Management System; or
 - Failed to perform on any previous contract and has been given a written notice to this effect.
- 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.
- The tenderer is **registered and in good standing with the compensation fund or with a licensed compensation insurer**.
- 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**.

The Municipality does not bind itself to accept the lowest or any tender. It reserves the right to accept the whole or any part of a tender to place orders. Bidders shall not bind the Municipality to any minimum quantity per order. The successful Tenderer (s) shall be bound to provide any quantities stipulated in the specification.

The municipality has a firm intention to proceed with the work, subject to funding being identified. Notwithstanding clause F.1.1.3 of the Standard Conditions of Tender, the municipality reserves the right to award or not award the tender based on the municipalities available budget.

F.3.15 Complete adjudicator's contract: Refer to the [General Conditions of Contract](#) and the [Contract Data](#).

F.3.17 Copies of contract: The number of paper copies of the signed contract to be provided by the Employer is [ONE \(1\)](#).

Tenderers are to include, with their "hard copy" submission, a memory-stick containing an electronically scanned (300 dpi resolution) Public Document Format (PDF) copy of their complete bid submission. This PDF file should be named using the contract number and the Tenderer's name, eg. "**WS-XXXX – Tenderers Name.PDF**". The memory-stick must be labelled with the Tenderer's name and securely fixed to the paper submission.

T1.2.3 ADDITIONAL CONDITIONS OF TENDER**T1.2.3.1 Appeals**

In terms of Regulation 49 of the Municipal Supply Chain Management Regulations persons aggrieved by decisions or actions taken by the Municipality, may lodge an appeal within 14 days of the decision or action, in writing to the Municipality. All appeals (clearly setting out the reasons for the appeal) and queries with regard to the decision of award are to be directed to:

The City Manager
Attention Ms S. Pillay eMail: Simone.Pillay@durban.gov.za
 P O Box 1394
 DURBAN, 4000

T1.2.3.2 Prohibition on awards to persons in the service of the state

Clause 44 of the Supply Chain Management Regulations states that the Municipality or Municipal Entity may not make any award to a person:

- (a) Who is in the service of the State;
- (b) If that person is not a natural person, of which a director, manager, principal shareholder or stakeholder is a person in the service of the state; or
- (c) Who is an advisor or consultant contracted with the municipality or a municipal entity.

Should a contract be awarded, and it is subsequently established that Clause 44 has been breached, the Employer shall have the right to terminate the contract with immediate effect.

T1.2.3.3 Code of Conduct and Local Labour

The Tenderers shall make themselves familiar with the requirements of the following policies that are available on web address: <ftp://ftp.durban.gov.za/cesu/StdContractDocs/>:

- Code of Conduct;
- The Use of CLOs and Local Labour.

T1.2.3.4 Targeted Procurement

Targeted Procurement provisions are not applicable to this tender.

T1.2.3.5 Functionality Specification

The value of W2 is 100. The Functionality criteria (and sub-criteria if applicable) and maximum score in respect of each of the criteria are as follows:

Functionality Criteria / Sub Criteria		Maximum Points Score
Tenderer's Experience		40
Project Organogram and Experience of Key Staff	Contracts Manager	20
	Site Agent	20
	Foreman	10
Preliminary Programme		5
Construction Methodology and Quality Control		5
Maximum possible score for Functionality (M _s)		100

The minimum number of evaluation points for Functionality is **60**. Only those tenderers who achieve the minimum number of Functionality evaluation points (or greater) will be eligible to have their tenders further evaluated.

Functionality shall be scored by not less than three evaluators and the scores of each of the evaluators will be averaged, weighted and then totalled to obtain the final score for Functionality. Each evaluation criteria will be assessed in terms of six indicators and scores allocated according to the following table:

Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
0	20	40	60	80	100

Evaluation criteria will be adjudicated according to submissions made in accordance with the following schedules, which are found in Part T2.2: Returnable Schedules:

Functionality criteria / Sub criteria	Returnable Schedules
Tenderer's Experience	Experience of Tenderer
Project Organogram and Experience of Key Staff	- Proposed Organisation and Staffing - Key Personnel - Experience of Key Personnel
Preliminary Programme	Preliminary Programme
Construction Methodology and Quality Control	Construction Approach, Methodology and Quality Control Statement

Unless otherwise stated, evaluation criteria will be adjudicated with respect to the contract specific Scope of Work, as specified in Part C.3. In this regard the following definitions apply to the evaluation criteria prompts for judgement:

- **“successfully completed”** implies a project has been completed on time and to specification;
- **“similar nature”** a combination of projects, which have involved the supply and installation and commissioning of mechanical and electrical infrastructure for water and/or waste water treatment works and industrial effluent treatment facilities.
- **“experience”** implies experience on projects of a similar nature;
- **“accredited degree / diploma”** implies a minimum 3 year qualification within the mechanical/electrical disciplines, from a registered University or Institute of Technology.

Criterion: Tenderer's Experience	
Note: Projects of a similar nature that will be considered shall be one, or a combination of projects, including the installation and commissioning of mechanical and electrical infrastructure for new and/or upgrades water or effluent treatment facilities.	
Level 0	No information provided; OR submission of no substance / irrelevant information provided
Level 1	To have successfully completed <u>1 project</u> of a similar nature within the past 10 years.
Level 2	To have successfully completed <u>2 projects</u> of a similar nature within the past 10 years.
Level 3	To have successfully completed <u>3 to 4 projects</u> of a similar nature within the past 10 years.
Level 4	To have successfully completed <u>5 to 6 projects</u> of a similar nature within the past 10 years.
Level 5	To have successfully completed <u>7 or more projects</u> of a similar nature within the past 10 years.

Criterion: Project Organogram and Experience of Key Staff

Note 1: "experience" implies experience within the same role on projects of a similar nature that will be considered shall be one.

Note 2: "accredited degree / diploma" implies a minimum 3 yr. qualification within the disciplines of mechanical or electrical engineering, from a registered University or Institute of Technology.

	CONTRACTS MANAGER	SITE AGENT	Foreman
Level 0	No information provided OR submission of no substance / irrelevant information provided OR less than 2 years' experience OR Relevant accredited diploma / degree and less than 1 years' experience.	No information provided OR submission of no substance / irrelevant information provided OR less than 2 years' experience OR Relevant accredited diploma / degree and less than 1 years' experience.	No information provided OR submission of no substance / irrelevant information provided OR less than 2 years' experience
Level 1	Relevant accredited diploma / degree and minimum 1 years' experience.	Relevant accredited diploma / degree and minimum 1 years' experience.	Minimum 2 years' experience
Level 2	Relevant accredited diploma / degree and minimum 2 years' experience.	Relevant accredited diploma / degree and minimum 2 years' experience.	Minimum 3 years' experience
Level 3	Relevant accredited diploma / degree and minimum 4 years' experience.	Relevant accredited diploma / degree and minimum 4 years' experience.	Minimum 5 years' experience
Level 4	Relevant accredited diploma / degree and minimum 7 years' experience.	Relevant accredited diploma / degree and minimum 7 years' experience.	Minimum 8 years' experience
Level 5	Relevant accredited diploma / degree and minimum 9 years' experience.	Relevant accredited diploma / degree and minimum 9 years' experience.	Minimum 10 years' experience

Criterion: Preliminary Programme

Level 0	No information provided OR submission of no substance / irrelevant information provided
Level 1	Programme <u>does not cover</u> all the applicable individual activities which are in an acceptable sequence, with appropriate durations, and is in accordance with generally accepted construction practice, and not in line with Clause 1.1.1.14 of the Conditions of Contract (time for achieving Practical Completion).
Level 2	Programme <u>covering</u> all the applicable individual activities which are in an acceptable sequence, with appropriate durations, and is in accordance with generally accepted construction practice, and is in line with Clause 1.1.1.14 of the Conditions of Contract (time for achieving Practical Completion).
Level 3	Programme <u>covering</u> all the applicable individual activities which are in an acceptable sequence, with appropriate durations, and is in accordance with generally accepted construction practice, and is in line with Clause 1.1.1.14 of the Conditions of Contract (time for achieving Practical Completion). <u>Plus:</u> Shows critical path with logical linking of tasks/activities
Level 4	Programme <u>covering</u> all the applicable individual activities which are in an acceptable sequence, with appropriate durations, and is in accordance with generally accepted construction practice, and is in line with Clause 1.1.1.14 of the Conditions of Contract (time for achieving Practical Completion). <u>Plus:</u> - Shows critical path with logical linking of tasks/activities, and - Detailed activity and resources breakdown. - Cash flow included
Level 5	Programme <u>covering</u> all the applicable individual activities which are in an acceptable sequence, with appropriate durations, and is in accordance with generally accepted construction practice, and is in line with Clause 1.1.1.14 of the Conditions of Contract (time for achieving Practical Completion). <u>Plus:</u> - Shows critical path with logical linking of tasks/activities, and - Detailed activity and resources breakdown. - Cash flow included - Detailed Plant and equipment resource breakdown

Criterion: Construction Methodology & Quality Control	
Level 0	No information provided; OR submission of no substance / irrelevant information provided
Level 1	The technical approach / methodology, plant and equipment is poor and gives no relevant information in satisfying the projects objectives Quality control statement is poor with no relevant information
Level 2	The technical approach and/or methodology is less than acceptable and unlikely to satisfy project objectives or requirements. Plant and equipment is unlikely to provide adequate protection of the works. Quality control statement is generic.
Level 3	Brief overview of a site specific methodology which encompasses all programmed activities in appropriate order and includes staff, plant and equipment resources, including subcontractors if applicable, a brief description of preparatory work, construction processes including finishing works for each activity. Quality control statements are site specific with statements covering required sampling and testing requirements for the programmed activities.
Level 4	The methodology is specifically tailored to address specific project requirements. The methods and approach to managing risk etc. are specifically tailored to the critical characteristics of the project. The plant and equipment are specifically tailored to the project requirements and are sufficiently adaptable to accommodate changes that may be required during execution Quality control statements are site specific covering required sampling and testing for programmed activities including site specific quality control checklist for programed activities
Level 5	Besides meeting the “above Level 4” rating, the important issues are approached in an innovative and efficient way, indicating that the tenderer has excellent knowledge of working in the projects environment and producing the required final product. Plant and equipment proposals and ownership/provision arrangements are most likely to ensure a satisfactory project outcome. Quality control statements are site specific covering required sampling and testing for all programmed activities including site specific quality control checklist for all programmed activities

PART T2: RETURNABLE DOCUMENTS

T2.1 LIST OF RETURNABLE DOCUMENTS

T2.1.1 General

The Tender Submission Documentation must be submitted in its entirety. All forms must be properly completed as required.

The Tenderer is required to complete each and every Schedule and Form listed below to the best of their ability as the evaluation of tenders and the eventual contract will be based on the information provided by the Tenderer. Failure of a Tenderer to complete the Schedules and Forms to the satisfaction of the Employer will inevitably prejudice the tender and may lead to rejection on the grounds that the tender is non-responsive.

T2.1.2 Returnable Schedules, Forms and Certificates

Entity Specific

T2.2.1	Compulsory Enterprise Questionnaire	18
T2.2.2	Certificate of Attendance at Clarification Meeting	20
T2.2.3	Tax Compliance Status PIN / Tax Clearance Certificate	21
T2.2.4	Contractor's Health and Safety Declaration.....	22
T2.2.5	MBD 4: Declaration of Interest	24
T2.2.6	MBD 5: Declaration for Procurement Above R10 Million	26
T2.2.7	MBD 6.1: Preference Points Claim Form ITO the Preferential Regulations	27
T2.2.8	MBD 8: Declaration of Bidder's Past SCM Practices	30
T2.2.9	MBD 9: Certificate of Independent Bid Determination	32
T2.2.10	Joint Venture Agreements (if applicable)	35
T2.2.11	Record of Addenda to Tender Documents (if applicable).....	36

Eligibility

T2.2.12	Eligibility: Declaration of Municipal Fees	37
T2.2.13	Eligibility: Registration with Compensation Commissioner	38
T2.2.14	Eligibility: CSD Registration Report	39
T2.2.15	Eligibility: Verification of CIDB Registration and Status	40

Technical or Functionality Evaluation

T2.2.16	Experience of Tenderer	41
T2.2.17	Proposed Organisation and Staffing	42
T2.2.18	Key Personnel.....	43
T2.2.19	Experience of Key Personnel.....	44
T2.2.20	Preliminary Programme	45
T2.2.21	Construction Approach, Methodology, and Quality Control	46
T2.2.22	Schedule of Proposed Subcontractors	47
T2.2.23	Plant and Equipment.....	48
T2.2.24	Contractor's Health and Safety Plan	49
T2.2.25	Details of Equipment Offered	50

T2.2 RETURNABLE SCHEDULES, FORMS, AND CERTIFICATES

The returnable schedules, forms, and certificates, as listed in T2.1.2, can be found on pages [18](#) to [41](#).

NOTE

The **Form of Offer** (C1.1.1), The **Data to be Provided by Contractor** (C1.2.2.2), and the **Bill of Quantities** (C2.2) are also required to be completed by the tenderer.

T2.2.1 COMPULSORY ENTERPRISE QUESTIONNAIRE

Ref	Description	Complete or Circle Applicable
1.1	Name of enterprise	
1.2	Name of enterprise's representative	
1.3	ID Number of enterprise's representative	
1.4	Position enterprise's representative occupies in the enterprise	
1.5	National Treasury Central Supplier Database Registration number	MAAA
1.6	eThekwini Supplier Database: Reference number (PR), if any:	PR
1.7	VAT registration number, if any:	
1.8	CIDB registration number, if any:	
1.9	Department of Labour: Registration number	
1.10	Department of Labour: Letter of Good Standing Certificate number	
2.0	Particulars of sole proprietors and partners in partnerships (attach separate pages if more than 4 partners)	
	Full Name	Identity No.
2.1		
2.2		
2.3		
2.4		
3.0	Particulars of companies and close corporations	
3.1	Company registration number, if applicable:	
3.2	Close corporation number, if applicable:	
3.3	Tax Reference number, if any:	
3.4	South African Revenue Service: Tax Compliance Status PIN:	

4.0 Record in the service of the state (Insert on a separate page if necessary)

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 | ☐ a member of any provincial legislature |
| ☐ an official of any municipality or municipal entity | ☐ a member of an accounting authority of any national or provincial public entity |
| ☐ a member of the board of directors of any municipal entity | ☐ a member of the National Assembly or the National Council of Province |
| ☐ 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 1 of 1999) | ☐ an employee of Parliament or a provincial legislature |

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 mths

5.0 Record of spouses, children and parents in the service of the state (Insert on a separate page if necessary)

Indicate by marking the relevant boxes with a cross, if any spouse, child or parent of 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 |
| ☐ an official of any municipality or municipal entity | ☐ a member of an accounting authority of any national or provincial public entity |
| ☐ a member of the board of directors of any municipal entity | ☐ a member of the National Assembly or the National Council of Province |
| ☐ 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 1 of 1999) | ☐ 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 mths

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

- authorizes the Employer to verify the tenderers tax clearance status from the South African Revenue Services that it is in order.
- confirms that the 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 of 2004.
- confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption.
- 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.
- confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.2 CERTIFICATE OF ATTENDANCE AT CLARIFICATION MEETING / SITE INSPECTION

Reference is to be made to Clauses F.2.1(c) and F.2.7 of the Tender Data.

This is to certify that:

(tenderer name):

of (address):

was represented by the person(s) named below at the Clarification Meeting held for all tenderers, the details of which are stated in the Tender Data (F.2.7).

I / We acknowledge that the purpose of the meeting was to acquaint myself / ourselves with the site of the works and / or matters incidental to doing the work specified in the tender documents in order for me / us to take account of everything necessary when compiling our rates and prices included in the tender.

Particulars of person(s) attending the meeting:

Name:

Name:

Signature:

Signature:

Capacity:

Capacity:

Attendance of the above person(s) at the meeting is confirmed by the Employer's Agent's Representative, namely:

Name:

Signature:

Date:

T2.2.3 TAX COMPLIANCE STATUS PIN / TAX CLEARANCE CERTIFICATE

Reference is to be made to Clauses F.2.23 and F.3.13(a) of the Tender Data.

SARS has introduced a new Tax Compliance Status System. Tenderers can submit a Tax Compliance Status PIN (TCS PIN) instead of an original Tax Clearance Certificate. This TCS PIN can be used by third parties to certify the taxpayer's real-time compliance status.

Separate Tax Clearance Certificates / TCS PINs are required for each entity in a Joint Venture.

The TCS PIN(s) are to be entered under item 3.4 on form **T2.1.2.1: Compulsory Enterprise Questionnaire**.

Tenderers are to include, at the back of their tender submission document, a printout of their Tax Compliance Status PIN (TCS PIN) OR an original Tax Clearance Certificate.

Failure to include the required document will make the tender submission non-responsive.

*I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, **and that the requested documentation has been included in the tender submission.***

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.4 CONTRACTOR'S HEALTH AND SAFETY DECLARATION

If Functionality is applicable as part of tender evaluation, reference is to be made to Clause F3.11.9 of the of the Conditions of Tender.

Reference is to be made to Clauses F.2.1(e) and F.2.23 of the Tender Data.

In terms of Clause 5(1)(h) of the OHS 1993 Construction Regulations 2014 (referred to as "the Regulations" hereafter), a Principal Contractor may only be appointed to perform construction work if the Client is satisfied that the Principal Contractor has the necessary competencies and resources to carry out the work safely in accordance with the Occupational Health and Safety Act No 85 of 1993 and the OHS 1993 Construction Regulations 2014.

To that effect, a person duly authorised by the tenderer, must complete and sign the declaration hereafter in detail.

Declaration by Tenderer

- 1 I, the undersigned, hereby declare and confirm that I am fully conversant with the Occupational Health and Safety Act No 85 of 1993 (as amended by the Occupational Health and Safety Amendment Act No 181 of 1993), and the OHS 1993 Construction Regulations 2014.
- 2 I hereby declare that my company has the competence and the necessary resources to safely carry out the construction work under this contract in compliance with the Construction Regulations and the Employer's Health and Safety Specifications.
- 3 I propose to achieve compliance with the Regulations by one of the following **(Tenderers are to Circle Applicable - Yes or No)**:

(a) From my own competent resources as detailed in 4(a) hereafter.

(b) From my own resources still to be appointed or trained until competency is achieved, as detailed in 4(b) hereafter:

(c) From outside sources by appointment of competent specialist Subcontractors as detailed in 4(c) hereafter:

Circle Applicable	
Yes	NO
Yes	NO
YES	NO

- 4 Details of resources I propose:

(Note: Competent resources shall include safety personnel such as a construction supervisor and construction safety officer as defined in Regulation 8, and competent persons as defined in Regulations 9, 10, 11, 12, 13, 14, 16, 17, 20, 21, 22, 23(1), 24, 25, 26, 27, 28 and 29, as applicable).

- (a) Details of the competent and qualified key persons from my company's own resources, who will form part of the contract team:

NAMES OF COMPETENT PERSONS	POSITIONS TO BE FILLED BY COMPETENT PERSONS

(b) Details of training of persons from my company's own resources (or to be hired) who still have to be trained to achieve the necessary competency:

(i) By whom will training be provided?

(ii) When will training be undertaken?

(iii) Positions to be filled by persons to be trained or hired:

(c) Details of competent resources to be appointed as subcontractors if competent persons cannot be supplied from own company:

Name of proposed subcontractor:

Qualifications or details of competency of the subcontractor:

- 5 I, the undersigned, hereby undertake, if this tender is accepted, to provide, before commencement of the works under the contract, a suitable and sufficiently documented Health and Safety Plan in accordance with Regulation 7(1) of the Construction Regulations, which plan shall be subject to approval by the Client.
- 6 I, the undersigned, confirm that copies of this company's approved Health and Safety Plan, the Client's Safety Specifications as well as the OHSA 1993 Construction Regulations 2014 will be provided on site and will at all times be available for inspection by the Principal Contractor's personnel, the Client's personnel, the Employer's Agent, visitors, and officials and inspectors of the Department of Labour.
- 7 I, the undersigned, hereby confirm that adequate provision has been made in the tendered rates and prices in the Bill of Quantities to cover the cost of all resources, actions, training and all health and safety measures envisaged in the OHSA 1993 Construction Regulations 2014, and that I will be liable for any penalties that may be applied by the Client in terms of the said Regulations (Regulation 33) for failure on the Principal Contractor's part to comply with the provisions of the Act and the Regulations.
- 8 I, the undersigned, agree that failure to complete and execute this declaration to the satisfaction of the Client will mean that this company is unable to comply with the requirements of the OHSA 1993 Construction Regulations (2014) and accept that this tender will be prejudiced and may be rejected at the discretion of the Client.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.5 MBD 4: DECLARATION OF INTEREST

MSCM Regulations: “**in the service of the state**” means to be:

- (a) a member of:
 - (i) any municipal council.
 - (ii) any provincial legislature.
 - (iii) the national Assembly or the national Council of provinces.
- (b) a member of the board of directors of any municipal enterprise.
- (c) an official of any municipality or municipal enterprise.
- (d) an employee of any national or provincial department, national or provincial public enterprise or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999).
- (e) a member of the accounting authority of any national or provincial public enterprise.
- (f) an employee of Parliament or a provincial legislature.

“**Shareholder**” means a person who owns shares in the company and is actively involved in the management of the company or business and exercises control over the company.

- 1 No bid will be accepted from persons **in the service of the state**¹.
- 2 Any person, having a kinship with persons **in the service of the state**, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to **persons in service of the state**, it is required that the bidder or their authorised representative declare their position in relation to the evaluating/adjudicating authority and/or take an oath declaring his/her interest.
- 3 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

3.1 Name of enterprise	Complete T2.1.2.1 Item 1.1
Name of enterprise's representative	Complete T2.1.2.1 Item 1.2
3.2 ID Number of enterprise's representative	Complete T2.1.2.1 Item 1.3
3.3 Position enterprise's representative occupies in the enterprise	Complete T2.1.2.1 Item 1.4
3.4 Company Registration number	Complete T2.1.2.1 Item 3.1 or 3.2
3.5 Tax Reference number	Complete T2.1.2.1 Item 3.3
3.6 VAT registration number	Complete T2.1.2.1 Item 1.7
3.7 The names of all directors / trustees / shareholders / members / sole proprietors / partners in partnerships, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below. In the case of a joint venture, information in respect of each partnering enterprise must be completed and submitted.	

- 3.8 Are you presently in the service of the state?

If yes, furnish particulars:

.....

- 3.9 Have you been in the service of the state for the past twelve months?

If yes, furnish particulars:

.....

Circle Applicable

YES

NO

YES

NO

3.10 Do you have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid?

YES

NO

If yes, furnish particulars:

.....

3.11 Are you, aware of any relationship (family, friend, other) between any other bidder and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid?

YES

NO

If yes, furnish particulars:

.....

3.12 Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state?

YES

NO

If yes, furnish particulars:

.....

3.13 Are any spouse, child or parent of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state?

YES

NO

If yes, furnish particulars:

.....

3.14 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract?

YES

NO

If yes, furnish particulars:

.....

- 4 The names of all directors / trustees / shareholders / members / sole proprietors / partners in partnerships, their individual identity numbers and state employee numbers must be indicated below. In the case of a joint venture, information in respect of each partnering enterprise must be completed and submitted

Full Name	Identity No.	State Employee No.	Personal income tax No.
Use additional pages if necessary			

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.6 MBD 5: DECLARATION FOR PROCUREMENT ABOVE R10 MILLION
(ALL APPLICABLE TAXES INCLUDED)

For all procurement expected to exceed R10 million (all applicable taxes included), bidders must complete the following questionnaire.

Circle Applicable	
YES	NO
1.0 Are you by law required to prepare annual financial statements for auditing? 1.1 If YES, submit audited annual financial statements for the past three years or since the date of establishment if established during the past three years.	
2.0 Do you have any outstanding undisputed commitments for municipal services towards any municipality for more than three months or any other service provider in respect of which payment is overdue for more than 30 days? 2.1 If NO, this serves to certify that the bidder has no undisputed commitments for municipal services towards any municipality for more than three months or other service provider in respect of which payment is overdue for more than 30 days. 2.2 If YES, provide particulars. 	
3.0 Has any contract been awarded to you by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract? 3.1 If YES, provide particulars. 	
4.0 Will any portion of goods or services be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality / municipal entity is expected to be transferred out of the Republic? 4.1 If YES, provide particulars. 	

If required by 1.1 above, tenderers are to include, at the back of their tender submission document, a printout of their audited annual financial statements.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, and, if required, that the requested documentation has been included in the tender submission.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.7 MBD 6.1: PREFERENCE POINTS CLAIM
In terms of THE PREFERENTIAL PROCUREMENT REGULATIONS (2022)

Reference is to be made to Clause F.3.11 of the Tender Data.

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

1.0 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).
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 **Either the 80/20 or 90/10 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the applicable system once tenders are received.**

1.3 Preference Points for this tender shall be awarded for:

- **Price and Specific Goals:** Either 80 or 90 (price) and 20 or 10 (specific goals), in terms of 1.2 above.
- The total Preference Points, for Price and Specific Goals, is 100.

1.4 Failure on the part of the tenderer to submit the required proof or documentation, in terms of the requirements in the Conditions of Tender for claiming specific goal preference points, will be interpreted that preference points for specific goals are not claimed.

1.5 The Municipality 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 of preferences, in any manner required by the Municipality.

2.0 DEFINITIONS

2.1 **“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.

2.2 **“price”** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts.

2.3 **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes.

2.4 **“tender for income-generating contracts”** means a written offer in the form determined by Municipality 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 Municipality and a third party that produces revenue for the Municipality, 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.

2.5 **“the Act”** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3.0 FORMULA FOR CALCULATION OF PREFERENCE PRICE POINTS

3.1 PROCUREMENT OF GOODS AND SERVICES

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

<u>80 / 20 Points System</u>	OR	<u>90 / 10 Points System</u>
$P_s = 80 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right)$		$P_s = 90 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right)$

Where:

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmin = Price of lowest acceptable tender

4.0 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 goal(s) stated in **Table 1** below, as supported by proof/documentation stated in the **Conditions of 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 maximum points for each goal are indicated per the table below.

Tenderers are to indicate their points claim for each of the Specific Goals in the shaded blocks.

The Specific Goals to be allocated points in terms of this tender	Maximum Number of points ALLOCATED (80/20 system)	Maximum Number of points ALLOCATED (90/10 system)	Number of points CLAIMED (80/20 system)	Number of points CLAIMED (90/10 system)
Ownership Goal: Race (black)	8	4		
Ownership Goal: Gender (female)	2	1		
Ownership Goal: Disabilities	0	0		
RDP Goal: The promotion of South African owned enterprises.	5	2.5		
RDP Goal: The Creation of new jobs to address black youth unemployment	5	2.5		
Total CLAIMED Points (20 or 10 Maximum)				

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, certify that the points claimed, based on the specific goals as specified in the tender, qualifies the tendering entity for the preference(s) shown.

I acknowledge that:

- 1) The information furnished is true and correct.
- 2) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form.
- 3) 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.
- 4) 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.
 - (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.

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.8 MBD 8: DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

- 1.0 This Municipal Bidding Document must form part of all bids invited.
- 2.0 It serves as a declaration to be used by municipalities and municipal entities in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.
- 3.0 The bid of any bidder may be rejected if that bidder, or any of its directors have:
- a) abused the municipal entity's supply chain management system or committed any improper conduct in relation to such system.
 - b) been convicted for fraud or corruption during the past five years.
 - c) wilfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years.
 - d) been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004).
- 4.0 In order to give effect to the above, the following questions must be completed and submitted with the bid.

- 4.1 Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector?

(Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer / Authority of the institution that imposed the restriction after the audi alteram partem rule was applied.)

The Database of Restricted Suppliers now resides on the National Treasury's website (www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.

Circle Applicable	
YES	NO

- 4.1.1 If YES, provide particulars.

.....

.....

- 4.2 Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)?

The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.

YES	NO
-----	----

- 4.2.1 If YES, provide particulars.

.....

.....

- 4.3 Was the bidder or any of its directors convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?

YES	NO
-----	----

- 4.3.1 If YES, provide particulars.

.....

.....

4.4 Does the bidder or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?

YES

NO

4.4.1 If YES, provide particulars.

.....

.....

4.5 Was any contract between the bidder and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?

YES

NO

4.5.1 If YES, provide particulars.

.....

.....

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

I accept that, in addition to cancellation of a contract, action may be taken against me should this declaration prove to be false.

NAME (Block Capitals):

Date

SIGNATURE:

.....

T2.2.9 MBD 9: CERTIFICATE OF INDEPENDENT BID DETERMINATION**NOTES**

- 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.
- 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.

- 1.0 This Municipal Bidding Document (MBD) must form part of all **bids**¹ invited.
- 2.0 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 *pe se* prohibition meaning that it cannot be justified under any grounds.
- 3.0 Municipal Supply Regulation 38 (1) prescribes that a supply chain management policy must provide measures for the combating of abuse of the supply chain management system, and must enable the accounting officer, among others, to:
- a. take all reasonable steps to prevent such abuse;
 - b. reject the bid of any bidder if that bidder or any of its directors has abused the supply chain management system of the municipality or municipal entity or has committed any improper conduct in relation to such system; and
 - c. cancel a contract awarded to a person if the person committed any corrupt or fraudulent act during the bidding process or the execution of the contract.
- 4.0 This MBD 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**.
- 5.0 In order to give effect to the above, the attached Certificate of Bid Determination (MBD 9) must be completed and submitted with the bid.

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

(Name of Municipality / Municipal Entity)

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

I certify, on behalf of:

(Name of Bidder)

that:

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.
 - (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.
 - (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.
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.

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.10 JOINT VENTURES AGREEMENTS

Joint Venture agreement and Power of Attorney Agreements to be attached here (if applicable).

T2.2.11 RECORD OF ADDENDA TO TENDER DOCUMENTS

I / We confirm that the following communications received from the Employer or his representative before the date of submission of this tender offer, amending the tender documents, have been taken into account in this tender offer.

ADD.No	DATE	TITLE OR DETAILS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

It is also confirmed that the requirements, as stated on the Addenda, have been complied with.

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.12 ELIGIBILITY: DECLARATION OF MUNICIPAL FEES

Reference is to be made to Clause F.2.1(f)(ii) of the Tender Data.

I, the undersigned, do hereby declare that the Municipal fees of:

.....
(full name of Company / Close Corporation / partnership / sole proprietary/Joint Venture)

(hereinafter referred to as the TENDERER) are, as at the date hereunder, fully paid or an Acknowledgement of Debt has been concluded with the Municipality to pay the said charges in instalments.

The following account details relate to property of the said TENDERER:

<u>Account</u>	<u>Account Number: to be completed by tenderer</u>											
Consolidated Account												
Electricity												
Water												
Rates												
JSB Levies												
Other												

I acknowledge that should the aforesaid Municipal charges fall into arrears, the Municipality may take such remedial action as is required, including termination of any contract, and any payments due to the Contractor by the Municipality shall be first set off against such arrears.

- Where the tenderer's place of business or business interests are outside the jurisdiction of eThekweni municipality, a copy of the accounts/ agreements from the relevant municipality are to be provided.
- Where the tenderer's Municipal Accounts are part of their lease agreement, then a copy of the agreement, or an official letter to that effect, is to be provided.

Tenderers are to include, at the back of their tender submission document, a printout of the above account's and or agreements signed with the municipality.

Failure to include the required document will make the tender submission non-responsive.

*I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, **and that the requested documentation has been included in the tender submission.***

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.13 ELIGIBILITY: REGISTRATION WITH COMPENSATION COMMISSIONER

Reference is to be made to Clause F.2.1(f)(i) of the Tender Data.

The Occupational Injuries and Diseases Act (130 of 1993 as amended) (the Act) refers. A summary of the pertinent Clauses are listed below. The act is to be referenced for the full text of the clauses.

Clause 80: Employer to register with commissioner and furnish him with particulars

The Act requires that an Employer carrying out business in the Republic to register with the Compensation Commissioner. Any person who fails to comply with the provisions of the this clause is guilty of an offence.

Clause 82: Employer to furnish returns of earnings

The Act requires an Employer to furnish the commissioner with a return showing:

- The amount of earnings paid by him to his employees.
- Any further information as may be prescribed or as the commissioner may require.

Any Employer who fails to comply with the provisions of the this clause is guilty of an offence.

Clause 86: Assessment to be paid by an employer to commissioner

The Act states that an Employer will receive notices of assessment from the commissioner. The Employer must pay the commissioner the assessment amount on the notices.

Clause 89: Mandators and contractors

The Act requires a contractor (a person with a contract with a mandator) to register as an Employer in accordance with the provisions of the Act and pay the necessary assessments. Failing registration or payment of assessments, the mandator is required to pay the assessments in respect of the employees of the contractor. The mandator is allowed to recover the assessment amounts paid from the contractor.

The Department of labour issues contractors with a **Letter of Good Standing** if the contractor has complied with the requirement(s) of the Act and is in "good standing" with the Compensation Fund. Employers can check the validity of such Letters of Good Standing on the internet (<https://cfoonline.labour.gov.za/VerifyLOGS>).

Tenderers are to include, at the back of their tender submission document, a printout of their most recent Letter of Good Standing from the Department of Labour.

Failure to include the required document will make the tender submission non-responsive.

*I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, **and that the requested documentation has been included in the tender submission.***

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.14 ELIGIBILITY: CSD REGISTRATION REPORT

Reference is to be made to Clauses F.2.1(e) and F.2.23 of the Tender Data.

The Conditions of Tender, Clause F.2.1: Eligibility, requires a tenderer to be registered, at the time of tender closing, on the **National Treasury Central Supplier Database (CSD)** as a service provider.

CSD Registration Reports can be obtained from the National Treasury's CSD website at <https://secure.csd.gov.za/Account/Login>.

The date of obtaining the printout is to be indicated on the printout.

The following is an example of the beginning of the printout obtained from the above website.

SUPPLIER IDENTIFICATION			
Supplier number		Have Bank Account	
Is supplier active?		Total annual turnover	
Supplier type		Financial year start date	
Supplier sub-type		Registration date	
Legal name		Created by	
Trading name		Created date	
Identification type		Edit by	
Government breakdown		Edit date	
Business status		Restricted Supplier	
Country of origin		Restriction Last Verification Date	
South African company/CC registration number			

Tenderers are to include, at the back of their tender submission document, a printout of their (full) CSD Registration Report.

*I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, **and that the requested documentation has been included in the tender submission.***

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.15 ELIGIBILITY: VERIFICATION OF CIDB REGISTRATION AND STATUS

Reference is to be made to Clause F.2.1.1 and F.2.23 of the Tender Data.

The Conditions of Tender, **Clause F.2.1.1: Eligibility**, requires a tenderer to be registered, as "Active", with the CIDB (at time of tender closing), 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. The required class of construction work is specified in Clause F.2.1.1.

CIDB Registrations can be obtained from the CIDB website at <https://registers.cidb.org.za/PublicContractors/ContractorSearch>. The date of obtaining the printout is to be indicated on the printout.

The following is an example of the beginning of the printout obtained from the above website.

Home

Contractor Detail Print

Contractor Detail

CRS Number: Type of Enterprise:

Contractor Name: Registration Date:

Trading Name: Expiry Date:

Status:

Contractor Grades

Grade:

Back

Copyright © cidb 2011. All rights reserved
[Website technical enquires contact](#)

01/01/2017

Tenderers are to include, at the back of their tender submission document, a printout of their registration with the CIDB.

*I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct, **and that the requested documentation has been included in the tender submission.***

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.17 PROPOSED ORGANISATION and STAFFING

Refer to Clause F3.11.9 for Functionality Points evaluation prompts .

The tenderer should propose the structure and composition of their team i.e. the main disciplines involved, the key staff member / expert responsible for each discipline, and the proposed technical and support staff and site staff.

The roles and responsibilities of each key staff member / expert should be set out as job descriptions. In the case of an association / joint venture / consortium, it should, indicate how the duties and responsibilities are to be shared.

The tenderer must attach his / her organization and staffing proposals to this page. (this is to include both the on-site and off-site staffing resources used for this project)

In addition to any lists, this information should also be shown in an organogram format (flow chart) clearly indicating the staff hierarchy and reporting lines, again for on- and off-site resources.

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise, confirms that the contents of this schedule are within my personal knowledge and are to the best of my belief both true and correct.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.18 KEY PERSONNEL

Refer to Clause F3.11.9 for Functionality Points evaluation prompts (if applicable).

The Tenderer shall list below the personnel which he intends to utilize on the Works, including key personnel (Contract's Manager, Site Agent, and Foremen) which may have to be brought in from outside if not available locally.

CATEGORY OF EMPLOYEE	NUMBER OF PERSONS	
	KEY PERSONNEL, PART OF THE CONTRACTOR'S ORGANISATION	KEY PERSONNEL TO BE IMPORTED IF NOT AVAILABLE LOCALLY
Site Agent, Project Managers		
Foremen, Quality Control and Safety Personnel		
Technicians, Surveyors, etc		
Artisans and other Skilled workers		
Plant Operators		
Unskilled Workers		
Others:		
.....		

Note: CVs of key personnel may be requested during the contract period.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.19 EXPERIENCE OF KEY PERSONNEL

Refer to Clause F3.11.9 for Functionality Points evaluation prompts

The experience of assigned staff member in relation to the Scope of Work will be evaluated from three different points of view:

- 1) General experience (total duration of professional activity), level of education and training and positions held of each discipline specific team leader.
- 2) The education, training, skills and experience of the Assigned Staff in the specific sector, field, subject, etc which is directly linked to the scope of work.
- 3) The key staff members' / experts' knowledge of issues which the tenderer considers pertinent to the project e.g. local conditions, affected communities, legislation, techniques etc.

A CV of the contract manager, site agent(s) and general foreman of not more than 2 pages should be attached to this schedule:

Each CV should be structured under the following headings:

- a) Personal particulars
 - name
 - date and place of birth
 - place (s) of tertiary education and dates associated therewith
 - professional awards
- b) Qualifications (degrees, diplomas, grades of membership of professional societies and professional registrations)
- c) Skills
- d) Name of current employer and position in enterprise
- e) Overview of post-graduate / diploma experience (year, organization and position)
- f) Outline of recent assignments / experience that has a bearing on the scope of work

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals): _____

Date

SIGNATURE: _____

T2.2.21 CONSTRUCTION APPROACH, METHODOLOGY, AND QUALITY CONTROL

Refer to Clause F3.11.9 for Functionality Points evaluation prompts

Construction Approach and Methodology

The construction approach and methodology must respond to the Scope of Work and outline the proposed approach to undertake the work showing a detailed programme including health and safety aspects, the use of plant and resources for this Project.

Quality Control

The quality control statement must discuss what tests and control measures are to be employed on site to attain the specified results and is to cover the program associated activities.

The tenderer must attach his / her Construction Methodology and Quality Control information to this page.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):**Date****SIGNATURE:**

T2.2.23 PLANT and EQUIPMENT

Refer to Clause F3.11.9 for Functionality Points evaluation prompts (if applicable).

The following are lists of major items of relevant equipment that I / we presently own or lease and will have available for this contract if my / our tender is accepted.

(a) Details of major equipment that is owned by me / us and immediately available for this contract.

DESCRIPTION (type, size, capacity etc)	QUANTITY	YEAR OF MANUFACTURE

Attach additional pages if more space is required

(b) Details of major equipment that will be hired, or acquired for this contract if my / our tender is accepted

DESCRIPTION (type, size, capacity etc)	QUANTITY	HOW ACQUIRED	
		HIRE/ BUY	SOURCE

Attach additional pages if more space is required

The Tenderer undertakes to bring onto site without additional cost to the Employer any additional plant not listed but which may be necessary to complete the contract within the specified contract period.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.24 CONTRACTOR'S HEALTH AND SAFETY PLAN

Refer to Clause F3.11.9 for Functionality Points evaluation prompts (if applicable).

At tender stage only a brief overview (**to be attached to this page**) of the tenderers perception on the safety requirements for this contract will be adequate.

Only the successful Tenderer **shall submit separately** the Contractor's Health and Safety Plan as required in terms of Regulation 7 of the Occupational Health and Safety Act 1993 Construction Regulations 2014.

The detailed safety plan will take into consideration the site specific risks as mentioned under **C.3: Project Specification**. A generic plan will not be acceptable.

I, the undersigned, who warrants that they are authorised to sign on behalf of the Tenderer, confirms that the information contained in this form is within my personal knowledge and is to the best of my belief both true and correct.

NAME (Block Capitals):

Date

SIGNATURE:

T2.2.25 DETAILS OF EQUIPMENT OFFERED

Refer to Clause F.3.11.9 for mandatory requirement criteria prompts.

I I) DETAILS OF MECHANICAL PLANT, PUMPING PLANT AND ANCILLARY EQUIPMENT

I II) TECHNICAL DATA SHEETS

THE RETURNABLE SCHEDULES CONTAINED HEREIN ARE COMPULSORY AND MUST BE COMPLETED FOR EACH ITEM OF EQUIPMENT OFFERED AND MUST BE RETURNED WITH THE TENDER.

IMPORTANT NOTE: ALL PUMPS TO BE SIMILAR AND EQUAL APPROVED AS PER GRUNDFOS PUMPS

I) DETAILS OF MECHANICAL PLANT, PUMPING PLANT AND ANCILLARY EQUIPMENT**DETAILS OF PUMPING PLANT AND ANCILLARY EQUIPMENT****1.0 REPLACEMENT PUMP AT SBR 1 RAW LEACHATE**

- a) Manufacturer of pump
- b) Name of Local Agent
- c) Local Agent Address & Contact no.
.....
- d) Type of pump
- e) Model No.
- f) No. of Stages
- g) Pump speed

Characteristics of pump (characteristic curves to be supplied)

- (i) Closed valve head m

Head m	Output m ³ /h	Efficiency %	kW at Coupling
1 Pump	1 Pump	1 Pump	1 Pump

- h) Impeller diameter
- i) Pipe diameter: Suction mm
Delivery mm
- j) Details of bearings
- k) Type of coupling

- l) Materials of manufacture:-.....
- (i) Casing
- (ii) Impeller
- (iii) Shaft
- (iv) Glands
- (v) Gland packing
- m) Manufacturer of motor
- n) Type of motor
- o) Rating continuous kW amps @ rpm
- p) Motor starting current
- q) Motor characteristics :-
- | | Full load | $\frac{3}{4}$ | $\frac{1}{2}$ |
|--------------|-----------|---------------|---------------|
| Efficiency | % | % | % |
| Power Factor | % | % | % |
- r) Thermistors or anti-condensate heaters provided/rating
- s) Total mass of assembled pump, motor and baseplate

1.1 DETAILS OF VALVES

1.1.1 BUTTERFLY OR RSV VALVES

Manufacturer

Description, size and type

Details of seat

Actuator

1.1.2 ELECTRICALLY ACTUATED VALVES (N/A)

Manufacturer

Description, size and type

Details of seat

Actuator

1.1.3 TERMINAL TYPE BUTTERFLY VALVE

Manufacturer

Description and type

Details of seat

Actuator

1.1.4 NON-RETURN VALVE

Manufacturer

Description, size and type

Details of seat

Actuator

1.2 PIPEWORK PROPOSED

Diameter of suction/deliver branch

Diameter of suction/delivery manifold

Type and class of pipe

Coating proposed

Name of applicator

Type and make of pressure gauges

5.0 DETAILS OF ELECTRICAL EQUIPMENT

Tenderers must give the following data relating to the Electrical Equipment offered under this contract:

Note that the equipment shall comply with the preferred equipment schedule in accordance with Clause EPS.3.8.2 of the Project Specification or other equal approved. Approval to be obtained from Engineer for alternative equipment and quoted as an alternative offer.

Description		Make	Ref No.	Type
a)	Control panel	.....	.....	.....
b)	Electronic motor controller	.....	.....	.....
c)	Hour metre	.....	.....	.....
d)	Cables, wire	.....	.....	.....
e)	Cable tray, cable ladder, trunking	.....	.....	.....
f)	Cable glands	.....	.....	.....
g)	No flow switches i) Electronic type	.....	.....	.....
h)	Float switch i) Chemical type	.....	.....	.....
i)	Telemetry unit	.....	.....	.....

II) TECHNICAL DATA SHEETS

SHEET 1: PUMPING EQUIPMENT

SHEET 2: FLOW METERS

Sheet 1: Pumping Equipment

Pump	Raw Leachate Feed	Treated Leachate
Manufacturer of Pump		
Place of Manufacture		
Local Agent & Contact		
Pump Model No		
Speed of rotation (rpm)		
Suction diameter (mm)		
Delivery diameter (mm)		
Type of bearings		
Materials of wear rings		
Type of impeller		
Material of casing		
Material of shaft		
Method of lubrication		
Method of gland sealing		
Manufacturer of motor		
Speed of rotation		
Rated power at site (kW)		
Overall mass of pump, motor and baseplate (kg)		
Type of coupling		
Material of bedplate		
Operation at duty point		
Delivery (l/s)		
Head (m)		
Efficiency (%)		
Absorbed power (kW)		
Type of piping offered		
Name of manufacturer		
Make and class of gate valves		
Make and class of reflux valves		
Pressure gauges		

NAME : (Block Capitals)

SIGNATURE :
(of person authorised to sign on behalf of the Tenderer)

DATE:

Sheet 2: Flow Meters

Flow Meter	Raw Leachate
Manufacturer	
Local Agent and Contact	
Place of Manufacture	
Model No	
Principle of flow measurement	
Suction diameter (mm)	
Flow meter diameter (mm)	
Upstream length required	
Downstream length required	
Material of body	
Corrosion protection of body	
Kiosk material	
Kiosk corrosion protection	

NAME : (Block Capitals)

SIGNATURE : DATE:
 (of person authorised to sign on behalf of the Tenderer)

PART C1: AGREEMENT AND CONTRACT DATA**C1.1: FORM OF OFFER AND ACCEPTANCE****C1.1.1: OFFER**

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract in respect of the following works:

Contract No: **25686(6W)**

Contract Title: **Buffelsdraai Landfill : Leachate Treatment Plant Upgrade Phase 1**

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

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 Value Added Tax is:**

R..... (In words
.....)

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 to the Tenderer before the end of the period of validity stated in the Tender Data, whereupon the Tenderer becomes the party named as the Contractor in the Conditions of Contract identified in the Contract Data.

For the Tenderer:

*** Name of Tenderer** (organisation) :

*** Signature** (of person authorized to sign the tender) :

*** Name** (of signatory in capitals) :

Capacity (of Signatory) :

Address :

:

Telephone :

Witness:

Signature : **Date** :

Name (in capitals) : :

Notes:

*** Indicates what information is mandatory.**

Failure to complete the mandatory information and sign this form will invalidate the tender.

C1.1: FORM OF OFFER AND ACCEPTANCE**C1.1.2: FORM OF ACCEPTANCE****This Form will be completed by the Employer**

By signing this part of the 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 : Agreement and Contract Data, (which includes this Agreement)
- Part C2 : Pricing Data, including the Bill of Quantities
- Part C3 : Scope of Work
- Part C4 : Site Information

and the schedules, forms, 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 said documents are valid unless contained in this Schedule, which must be duly signed by the authorised representatives of both parties.

The Tenderer shall within two weeks 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 fulfill 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 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 (*person authorized to sign the acceptance*) :

Name (*of signatory in capitals*) :

Capacity (*of Signatory*) :

Name of Employer (*organisation*) :

Address :

:

Witness:

Signature : **Date** :

Name(*in capitals*) : :

C1.1.3: SCHEDULE OF DEVIATIONS

This form will be completed by THE EMPLOYER and ONLY THE SUCCESSFUL TENDERER

- 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.

FOR THE EMPLOYER

.....	Signature	.....
.....	Name (<i>in capitals</i>)	.....
.....	Capacity	.....
.....	Name and Address of	.....
.....	Organisation	.....
.....		
.....		
.....	Witness Signature	.....
.....	Witness Name	.....
.....	Date	.....

C1.2: CONTRACT DATA

C1.2.1 CONDITIONS OF CONTRACT

C1.2.1.1 GENERAL CONDITIONS OF CONTRACT

The Conditions of Contract are the **General Conditions of Contract for Construction Works (2015 3rd Edition)**, (GCC 2015) 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, Fax: 011-805-5971, E-mail: civilinfo@saice.org.za).

The Contract Data (including variations and additions) shall amplify, modify, or supersede, the GCC 2015 to the extent specified below, and shall take precedence and shall govern.

Each item of data given below is cross-referenced to the clause in the GCC 2015 to which it mainly applies.

C1.2.2 CONTRACT DATA

C1.2.2.1 DATA TO BE PROVIDED BY THE EMPLOYER

1.1.1.13 The **Defects Liability Period**, from the date of the Certificate of Completion, is **1 Year**

1.1.1.14 The **time for achieving Practical Completion**, from the Commencement Date is **24 Weeks**. The period as stated in 5.3.2, and the 7 days referred to in 5.3.3, are included in the above time for achieving Practical Completion. The special non-working days as stated in 5.8.1 are excluded from the above time for achieving Practical Completion.

1.1.1.15 The Employer is the eThekwin Municipality as represented by:
Deputy Head: **Plant and Engineering**

1.2.1.2 The address of the Employer is:
Physical: 22 Electron Road, Springfield ,Durban 4001
Postal: 22 Electron Road, Springfield ,Durban 4001
Telephone: 031 322 4575
Fax: 031 322 2521
E-Mail: Logan.Moodley2@durban.gov.za

1.1.1.16 The **name of the Employer's Agent** is TGC Engineers, G J Payne Pr Eng

1.2.1.2 The address of the Employer' Agent is:
Physical: Suite 6, 4 The Crescent, Westway Office Park, Westville, 3629
Postal: P O Box 446, PAVILION, 3611
Telephone: 031 265 1777
Fax: 031 265 2727
E-Mail: tgc@tgcengineers.co.za

1.1.1.26 The **Pricing Strategy** is by **Re-measurement Contract**.

3.2.3 The Employer's Agent shall obtain the **specific approval of the Employer** before executing any of his functions or duties according to the following Clauses of the General Conditions of Contract:

- 6.3: Council approval in order to authorise any expenditure in excess of the Tender Sum plus **10% contingencies**.

- 4.11.1 To carry out and complete the works, the Contractor shall employ a competent Site Agent and Foreman as part of the key staff. It is a requirement for the Contractor's Site Agent and Foreman to each have a minimum of 3 years relevant experience including experience on projects of a similar nature. The CV's of the Site Agent and the Foreman should be submitted to the Employer's Agent's Representative for acceptance by the Department (reference is made to Cl.5.3.1 of the Contract Data).

Note:

- i) "similar nature" implies projects that were of a value of at least 70% of this tender's value, and had a comparable Scope of Work in terms of technical requirements and operations.
- ii) "experience" implies experience on projects of a similar nature.
- iii) "accredited degree / diploma" implies a minimum 3-year qualification within the built environment, from a registered University or Institute of Technology.

- 5.3.1 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)
- CV(s) of Key Site Staff (refer to Clause 4.11.1)
- CPG Implementation Plan (if applicable)

- 5.3.2 The **time to submit the documentation** required before commencement with Works is **14 Days**.

- 5.3.3 Add the following paragraph:

"If a construction work permit, in terms of Clause 3(1) of the Construction Regulations (2014), is applicable, the instruction to commence carrying out of the works may only be issued once the construction work permit has been obtained by the Employer's Agent. If a construction work permit is applicable, the contractor shall allow for a minimum period of 37 days, after the submission (or re-submission) of the documentation referred to in Clause 5.3.1., for the issuing of the construction work permit."

- 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 The **non-working days** are **Saturdays and** Sundays.

- (5.1.1) The **special non-working** days are:

- All statutory holidays as declared by National or Regional Government.
- The year-end break:
 - Commencing on the first working day after 15 December.
 - Work resumes on the first working day after 5 January of the next year.

- 5.8.1 Delete the words "sunset and sunrise" and replace with "17:00 and 07:00".

- 5.12.2.2 **Abnormal Climatic Conditions (Rain Delays)** - The numbers of days per month, on which work is expected not to be possible as a result of rainfall, for which the Contractor shall make provision, is given in the table below. During the execution of the Works, the Employer's Agent's Representative will certify a day lost due to rainfall only if at least 75% of the work force and plant on site could not work during that specific working day.

Extension of time as a result of rainfall shall be calculated monthly being equal to the number days certified by the Employer's Agent's Representative as lost due to rainfall, less the number of days allowed for as in table below, which could result in a negative figure for certain months. The total extension of time for which the Contractor may apply, shall be the cumulative algebraic sum of the monthly extensions. Should the sum thus obtained be negative, the extension of time shall be taken as NIL.

<u>Month</u>	<u>Days Lost</u>	<u>Average Rainfall</u>	<u>Month</u>	<u>Days Lost</u>	<u>Average Rainfall</u>
January	4*	134	July	1	39
February	3	113	August	2	62
March	3	120	September	2	73
April	2	73	October	3	98
May	2	59	November	3	108
June	1	28	December	1*	102
TOTAL	27	1009mm	* = The number of working days lost allows for the annual statutory Construction holiday in December and January of each year.		

5.13.1 The **penalty for delay** in failing to complete the Works is **R 3000** (per Day).

5.14.1 The **requirements for achieving Practical Completion** will be determined by the Employer's Agent (in consultation with the Contractor) and recorded in the minutes of the first Site Meeting / Handover Meeting. (Refer to 1.1.1.24 for a generic definition.) The requirements are to be regularly reviewed with respect to any variations to the Contract.

5.16.3 The **latent defect liability** period is **10 Years**.

6.2.1 **Security (Performance Guarantee)**: Delete the word "selected" and replace it with "stated".

The liability of the Performance Guarantee shall be as per the following table:

Value of Contract (incl. VAT)	Performance Guarantee Required
Less than or equal to R 1m	Nil
Greater than R 1m and less than or equal to R 10m	5% of the Contract Sum
Greater than R 10m	10% of the Contract Sum

6.5.1.2.3 The **percentage allowance** to cover overhead charges for daywork are as follows:

- **80%** of the gross remuneration of workmen and foremen actually engaged in the daywork;
- **20%** on the net cost of materials actually used in the completed work.

No allowance will be made for work done, or for materials and equipment for which daywork rates have been quoted at tender stage.

6.8.2 **Contract Price Adjustment Factor**: The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule (GCC 2015 - page 86) with the following Indices / Descriptions / Coefficients:

- The proportion not subject to adjustment: **x = 0.10**.
- The base month will be the month prior to the month in which tenders close.
- The Index for Labour, Plant, and Materials shall be based on **December 2021 = 100**.
- The Index for Fuel shall be based on **December 2020 = 100**.

	STATS SA Statistical Release	Table	Description	Coefficient
• "L" is the "Labour Index"	P0141	Table A	Geographic Indices; CPI per Province; Kwa-Zulu Natal	a = 0.28
• "P" is the "Contractor's Equipment Index"	P0151.1	Table 4	Plant and Equipment	b = 0.28
• "M" is the "Materials Index"	P0151.1	Table 6	Civil Engineering Material (excluding bitumen)	c = 0.38
• "F" is the "Fuel Index"	P0142.1	Table 1	Coke, petroleum, chemical, rubber and plastic products; Coal and petroleum products; Diesel	d = 0.06

6.8.3 Price adjustments for **variation in the cost of the special material(s)** listed below, will not be allowed.

6.10.1.5 The **percentage advance** on materials not yet built into the Permanent Works is **80%**.

The **percentage advance** on Plant not yet supplied to Site: 80%

6.10.3 **Retention Money:** Delete the word "selected".

The percentage retention on the amounts due to the Contractor is 10%.

The limit of "retention money" is 5% of the Contract Sum.

Should the Contract Price exceed the Contract Sum then the limit of "retention money" is 5% of the Contract Price.

Interest will not be paid on retention withheld by the Employer.

8.6.1.1.2 The **value of Plant and materials** supplied by the Employer to be included in the insurance sum: **Not Required.**

8.6.1.1.3 The **amount to cover professional fees** for repairing damage and loss to be included in the insurance sum: **Not Required.**

8.6.1.2 **SASRIA Coupon Policy** for Special Risks to be issued in joint names of Council and Contractor for the full value of the works (including VAT).

8.6.1.3 The limit of indemnity for **liability insurance**: **R 10 000.00.**

8.6.1.4 **Ground Support Insurance:**

- Minimum amount for any one occurrence, unlimited as to the number of occurrences, against any claim for damages or loss caused by vibration and / or removal of lateral support: **R 2,000,000.**
- Maximum first excess: **R 10,000.00.**

8.6.1.5 Furthermore, the insurance cover effected by the Contractor shall meet the following requirements:

Third Party Insurance (Public Liability)

- Minimum amount for any one occurrence, unlimited as to the number of occurrences, for the period of the contract, inclusive of the maintenance period: **R 2.000.000.**
- Consequential loss to be covered by policy: **Yes**
- Liability section of policy to be extended to cover blasting: **R 2,000,000.**
- Maximum excess per claim or series of claims arising out of any one occurrence: **R10,000.**

Principal's own surrounding Property Insurance

- Minimum amount for any one occurrence unlimited as to the number of occurrences against any claim for damage which may occur to the Council's own surrounding property: **R500,000.**
- Maximum first excess: **R 10,000.**

Insurance of Works

- Minimum amount for additional removal of debris (no damage): **Nil.**
- Minimum amount for temporary storage of materials off site, excluding Contractor's own premises: **Nil.**
- Minimum amount for transit of materials to site: **Nil**

8.6.5 **Approval by Employer:** At the end of the sub-clause, add the following paragraph:

"Except where otherwise provided in the Special Conditions of Contract, the insurance cover effected by the Contractor in terms of this clause shall not carry a first loss amount greater than those set out below:

Contract Price	First Loss
Less than R 100,000	R 5,000
R 100,000 to R 500,000	R 10,000
R 500,000 to R 1,000,000	R 20,000
R 1,000,000 to R 2,000,000	R 30,000
R 2,000,000 to R 4,000,000	R 40,000
Greater than R 4,000,000	R 50,000

The insurance policy shall contain a specific provision whereby cancellation of the policy prior to the end of the period referred to in Cause 8.2.1 cannot take place without the prior written approval of the Employer."

10.7.1 Failing ad-hoc adjudication, the determination of disputes shall be by arbitration.

C1.2.2.2 DATA TO BE PROVIDED BY CONTRACTOR

1.1.1.9 The legal name of Contractor is:

.....

.....

.....

.....

1.2.1.2 The Physical address of the Contractor is:

.....

.....

.....

.....

The Postal address of the Contractor is:

.....

.....

.....

.....

The contact numbers of the Contractor are:

Telephone:

Fax:

The E-Mail address of the Contractor is:

.....

C1.2.3 ADDITIONAL CONDITIONS OF CONTRACT

C1.2.3.1 COMMUNITY LIAISON OFFICER

The Ward Councillor(s) in whose ward(s) work is to be done will, collectively, identify a community liaison officer (CLO) for the project and make the person known to the Contractor within two days of being requested to do so. The Contractor will be required to enter a written contract with the CLO that specifies:

- The hours of work and the wage rate of the CLO (200% of the Civil Engineering Industry minimum wage).
- The duration of the appointment.
- The duties to be undertaken by the CLO which could include:
 - Assisting in all respects relating to the recruitment of local labour.
 - Acting as a source of information for the community and councillors on issues related to the contract.
 - Keeping the Contractor advised on community issues and issues pertaining to local security.
 - Assisting in setting up any meetings or negotiations with affected parties.
 - Keeping a written record of any labour or community issue that may arise.
 - Any other duties that may be required by the Contractor.

Responsibility for the identification of a pool of suitable labour shall rest with the CLO, although the Contractor shall have the right to choose from that pool. The Contractor shall have the right to determine the total number labourers required at any one time and this may vary during the contract.

The Contractor shall have the right to replace labour that is not performing adequately. Should such occasion arise, it must be done in conjunction with the CLO.

Payment: The CLO will be reimbursed from the PC Sum item in the Preliminary & General Section of the Bill of Quantities.

C1.2.3.2 EMPLOYMENT OF LOCAL LABOUR

It is a condition of contract that the contractor will be required to employ local labour as specified in eThekweni Council Policy “The use of CLOs and Local Labour”. The contractor will be required to ensure that a minimum of 50% of the labour force is made up of local labour. For the purposes of this contract, “Local labour” will be deemed to be any **persons who reside within Ward(s) 59**. The contractor will be required to provide proof of authenticity of local labour. Signed confirmation by the appointed CLO will suffice for this.

No additional costs will be entertained due to this Particular Specification. The contractor will remain responsible for providing proper supervision of all labour and will be responsible for the quality of work produced.

C1.2.3.3 CONTRACTOR PARTICIPATION GOAL (CPG)

It is a condition of contract that the contractor must allow for a minimum of **30%** of the contract value (excluding PC Sum items and Fixed Cost allowances) to be subcontracted to contractors who are **>51% Black Owned**. Proof of payment to the subcontractors will be required to verify that the minimum has been achieved.

The penalty for not achieving the specified CPG will be 0.5% of the contract value (excluding PC Sum items and Fixed Cost allowances) for every 1% of CPG not achieved.

C1.2.3.4 FTE (Full Time Equivalent) EMPLOYMENT INFORMATION

It is a condition of contract that the Contractor supplies the Employer's Agent's Representative with information in respect of the employment of all foremen, artisans and labour (skilled and unskilled) employed to work on this contract. The information required is:

- Initials (per ID doc)
- Last Name (per ID doc)
- ID Number
- Disability (y / n)
- Education Level

Level 1 Unknown	Level 2 No Schooling	Level 3 Grade 1-3	Level 4 Grade 4	Level 5 Grade 5-6
Level 6 Grade 7-8	Level 7 Grade 9	Level 8 Grade 10-11	Level 9 Grade 12	Level 10 Post Matric

- Category of Employment

Category A: Employed as Local Labour for this contract only Category B: Temporarily employed by the Contractor Category C: Permanently employed by the Contractor
--

In addition, the following information is required in respect of each person listed above, on a monthly basis:

- Number of days worked during the month;
- Daily wage rate;
- Number of training days during the month.

The information is to be forwarded in a format acceptable to the Employer's Agent's Representative, but preferably in the form of an emailed EXCEL file (an original file, to be used as a template, will be issued to the Contractor). Contractors without computer facilities will be required to submit a hard copy of the information in a format as agreed to between the Contractor and the Employer's Agent's Representative.

In addition to the tax invoice, to be submitted by the Contractor with his monthly statement, mentioned in Clause 6.10.4 of GCC 2015, the Employer reserves the right to withhold payment until the monthly FTE information has been forwarded to the Employer's Agent's Representative. No additional payment for complying with the above will be made and the Contractor is to make allowance for complying through the time related P & G items (sum) under Part AA: Preliminaries, of the Bill of Quantities.

C1.2.3.5 PERFORMANCE MONITORING OF SERVICE PROVIDERS

[For contract awards over R10m] The Contractor shall be subjected to "Performance Monitoring" assessments in terms of the applicable Section (S.53) of the Employer's Supply Chain Management Policy.

Key Performance Indicators (KPIs) are specified in the C3: Scope of Works, or will be discussed and agreed with the Contractor before commencement of the contract.

C1.2.3.6 EXCEPTED RISKS (Clause 8.3)

Pursuant to Clause 8.3 of the Conditions of Contract (GCC 2015), the Employer shall not be liable for the payment of standing time costs as a result of the occurrence of any of the "Excepted Risks" as defined under Clause 8.3.

However, the Employer shall reimburse the Contractor in respect of plant de-establishment and re-establishment costs as a result of "Excepted risks" when a written instruction to de-establish is issued to the Contractor.

C2.1: PRICING ASSUMPTIONS / INSTRUCTIONS

C2.1.1 GENERAL

The Bill of Quantities forms part of the Contract Documents and must be read and priced in conjunction with all the other documents comprising the Contract Documents (refer to F.1.2 of the Tender Data).

C2.1.2 PRICING INSTRUCTIONS AND DESCRIPTION OF ITEMS IN THE SCHEDULE

Measurement and payment shall be in accordance with the relevant provisions of **Clause 8 of each of the Standard Engineering Specifications** referred to in the Scope of Work. The Preliminary and General items shall be measured in accordance with the provisions of **C2.1.8**.

The descriptions of the items in the Bill of Quantities are for identification purposes only and comply generally with those in the Standard Engineering Specification.

Clause 8 of each Standard Engineering Specification, read together with the relevant clauses of the Scope of the works, set out what ancillary or associated work and activities are included in the rates for the operations specified. Should any requirements of the measurement and payment clause of the applicable Standard Engineering Specification, or the Scope of the works, conflict with the Bill of Quantities, the requirements of the Standard Engineering Specification or Scope of the work, as applicable, shall prevail.

C2.1.3 QUANTITIES REFLECTED IN THE SCHEDULE

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Employer's Agent's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured

net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

C2.1.5 MONTHLY PAYMENTS

Unless otherwise specified in the Specifications and Project Specifications, progress payments in Interim Certificates, referred to in **Clause 6.10.1 of the General Conditions of Contract**, in respect of "sum" items in the Bill of Quantities shall be by means of interim progress instalments assessed by the Employer's Agent and based on the measure in which the work actually carried out relates to the extent of the work to be done by the Contractor.

C2.1.4 PROVISIONAL SUMS / PRIME COST SUMS

Where Provisional Sums or Prime Cost sums (PC Sum) are provided for items in the Bill of Quantities, payment for the work done under such items will be made in accordance with **Clause 6.6 of the General Conditions of Contract**. The Employer reserves the right, during the execution of the works, to adjust the stated amounts upwards or downwards according to the work actually done under the item, or the item may be omitted altogether, without affecting the validity of the Contract.

The Tenderer shall not under any circumstances whatsoever delete or amend any of the sums inserted in the "Amount" column of the Bill of Quantities and in the Summary of the Bill of Quantities unless ordered or authorized in writing by the Employer before closure of tenders. Any unauthorized changes made by the Tenderer to provisional items in the schedule, or to the provisional percentages and sums in the Summary of the Bill of Quantities, will be treated as arithmetical errors.

C2.1.6 PRICING OF THE BILL OF QUANTITIES

The prices and rates to be inserted by the Tenderer in the Bill of Quantities shall be the full inclusive prices to be paid by the Employer for the work described under

the several items, and shall include full compensation for all costs and expenses that may be required in and for the completion and maintenance during the defects liability period of all the work described and as shown on the drawings as well as all overheads, profits, incidentals and the cost of all general risks, liabilities and obligations set forth or implied in the documents on which the Tender is based.

Each item shall be priced and extended to the "Total" column by the Tenderer, with the exception of the items for which only rates are required (Rate Only), or items which already have Prime Cost or Provisional Sums affixed thereto. If the Contractor omits to price any items in the Bill of Quantities, then these items will be considered to have a nil rate or price.

All items for which terminology such as "inclusive" or "not applicable" have been added by the Tenderer will be regarded as having a nil rate which shall be valid irrespective of any change in quantities during the execution of the Contract.

All rates and amounts quoted in the Bill of Quantities shall be in Rands and Cents and shall include all levies and taxes (other than VAT). VAT will be added in the Summary of the Bill of Quantities.

C2.1.7 "RATE ONLY" ITEMS

The Tenderer shall fill in rates for all items where the words "Rate Only" appear in the "Total" column. "Rate Only" items have been included where:

- (a) an alternative item or material is contemplated;
- (b) variations of specified components in the make-up of a pay item may be expected; and
- (c) no work under the item is foreseen at tender stage but the possibility that such work may be required is not excluded.

For "Rate Only" items no quantities are given in the "Quantity" column but the quoted rate shall apply in the event of work under this item being required. The

Tenderer shall however note that in terms of the Tender Data the Tenderer may be asked to reconsider any such rates which the Employer may regard as unbalanced.

C2.1.8 PRELIMINARY AND GENERAL

The Preliminary and General Section is provided to cover the Contractor's expenses incurred in complying with the requirements of the tender documents and consists of the following parts:

- SANS 1200A: General
- Part AH: Occupational Health and Safety

Fixed Charge Items: Each item should be priced separately and, subject to the Engineer certifying in terms of **Clause 6.7 of the General Conditions of Contract** that the work has been done, payment will be made as follows:

- (i) the total amount due when the certified value fixed charge items in this section is less than 5% of the net contract price;
- (ii) when the certified value of fixed charge items in this section is greater than 5% of the net contract price, payment will be limited to 5% of the net contract price. The remainder will be paid when the value of the work done under the contract, excluding the value of fixed charge items in this section, is greater than 50% of the net contract price, excluding the value of fixed charge items in this section.

Time Related Items: Any Time Related items not priced shall be deemed to be covered by the prices of other items in the section.

Payment of Time Related items in this section will be made throughout the contract period, the amount per month being the value of the item divided by the completion in months or, if specified in weeks, the equivalent number of months, in terms of **Clause 5.5 of the General Conditions of Contract**. The final monthly increment will only be paid upon the issue of a completion certificate.

C2.2: BILL OF QUANTITIES

The Bill of Quantities follows and comprises of 23 pages. The pages are numbered BoQ 72 to BoQ 95

SECTION 1 : FIXED CHARGE ITEMS

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.1	8.3	SABS 1200 A : GENERAL SCHEDULED FIXED CHARGE & VALUE RELATED ITEMS				
1.1.1	8.3.1	Contractual Requirements				
1.1.1.1	8.3.1	Formal contract	Sum	1		
1.1.1.2	8.3.1	Sureties	Sum	1		
1.1.1.3	8.3.1	Insurance of works, etc and damage to persons and property	Sum	1		
1.1.1.4	8.3.1	Third party insurance	Sum	1		
1.1.1.5	8.3.1	Workmens Compensation	Sum	1		
1.1.1.6	8.3.1	Contractors obligation in respect of the Occupational Health and Safety Act	Sum	1		
1.1.1.7	8.3.1	Initial supply of plant, materials, labour and services required by the Contractor	Sum	1		
1.1.2	8.3.2	Establishment of Facilities on the Site				
1.1.2.1	8.3.2.1	Facilities for the Engineer				
1.1.2.1.1		c) Notice board	Sum	1		
1.1.2.2	8.3.2.2	Facilities for the Contractor				
1.1.2.2.1		a) Office and storage sheds	P C Sum	1		
1.1.2.2.2		b) Workshops	Sum	1		
1.1.2.2.3		c) Ablution and latrine facilities	Sum	1		
1.1.2.2.4		d) Tools and equipment	Sum	1		
1.1.2.2.5		e) Water supplies, electricity and communications	Sum	1		
1.1.3	8.3.3	Allow for the following additional items which the tenderer requires to be priced separately:- a) b)				
1.1.4	8.3.4	Removal of site establishment	Sum	1		
TOTAL SECTION 1 : CARRIED TO SUMMARY						

SECTION 1 : TIME RELATED ITEMS

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SABS 1200 A : GENERAL				
1.2	8.4	TIME RELATED ITEMS				
1.2.1	8.4.1	Contractual Requirements				
1.2.1.1		Contractor's superintendence	Sum	1		
1.2.1.2		Formal contract	Sum	1		
1.2.1.3		Sureties	Sum	1		
1.2.1.4		Insurance of works, etc and damage to persons and property	Sum	1		
1.2.1.5		Workmens Compensation	Sum	1		
1.2.1.6		Contractors obligation in respect of the Occupational Health and Safety Act	Sum	1		
1.2.1.7		Initial supply of plant, materials, labour and services on site	Sum	1		
1.2.2	8.4.2	Operation and maintenance of facilities on site, for the duration of construction, except where otherwise stated				
1.2.2.1	8.4.2.1	Facilities for the Engineer				
1.2.2.1.1		c) Notice board	Sum	1		
1.2.2.2	8.4.2.2	Facilities for the Contractor				
1.2.2.2.1		a) Office and storage sheds	Sum	1		
1.2.2.2.2		b) Workshops	Sum	1		
1.2.2.2.3		c) Ablution and latrine facilities	Sum	1		
1.2.2.2.4		d) Tools and equipment	Sum	1		
1.2.2.2.5		e) Water supplies, electricity and communications	Sum	1		
1.2.3		Setting out	Sum	1		
1.2.4		Watching and Lighting	Sum	1		
TOTAL CARRIED FORWARD						

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						
1.2.5		Care of works, damage to persons and property	Sum	1		
1.2.6		Provision of plant, materials and labour	Sum	1		
1.2.7		Clearance of site during contract and on completion	Sum	1		
1.2.8	PS.5	Cost of samples and contractor's preliminary and site control testing	Sum	1		
1.2.9	PS.10.3	Compliance with Occupational Health & Safety Regulations	Sum	1		
1.2.10	PS.9.2	Accommodation of traffic	Sum	1		
	8.4.5	Allow for the following additional items which the tenderer requires to be priced separately:- a) b) c)				
1.3	8.5	SUMS STATED PROVISIONALLY BY THE ENGINEER				
1.3.1	PSA-8.5(b)	1) Cost of acceptance testing	PC Sum	1		5 000.00
1.3.2	PSA-8.5(b)	2) As built survey	PC Sum	1		5 000.00
1.3.3	PSA-8.5(b)	3) Community Liaison Officer	PC Sum	1		100 000.00
1.3.4	PSA-8.5(b)	4) Environmental Management Plan Audits	PC Sum	1		18 000.00
1.3.5	PSA-8.5(b)	5) Purchase of Spares	PC Sum	1		100 000.00
1.3.6	PSA-8.5(b)	6) Provision of Mobile Generator	PC Sum	1		500 000.00
1.3.7	PSA-8.5(b)	Contractor's mark-up on above	%	728 000		
TOTAL SECTION 1 : CARRIED TO SUMMARY						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
2.1	1200 C	SECTION 2: LEACHATE TREATMENT PLANT SABS 1200 C : SITE CLEARANCE				
2.1.1	8.2.1	Clear and grub	ha	0.055		
2.1.2	8.2.2	Remove and grub large trees and stumps of girth:				
2.1.2.1		a) Over 1,0m and up to 2,0m	Nº	2		
2.1.3	8.2.3	Take down existing security fence	m	5		
2.1.4	8.2.7	Dismantle and remove:				
2.1.4.1		a) HDPE 90mm pipeline	m	20		
2.2	1200 D	SABS 1200 D : EARTHWORKS				
2.2.1	8.3.1.2	Remove topsoil	m³	55		
2.2.2	8.3.2	Bulk Excavation a) Excavate in all materials and use for:				
2.2.2.1		1) Disposal at site stockpile	m³	740		
		b) Extra over for:				
2.2.2.4		1) Intermediate excavation	m³	100		
2.2.3	8.3.3	Restricted Excavation a) Excavate for:				
2.2.3.1		1) Foundation/tanks	m³	155		
2.2.3.2		2) Trenches up to 1,5m deep	m³	40		
		b) Extra over for:				
2.2.3.4		1) Intermediate	m³	10		
2.2.3.5		2) Hard rock	m³	5		
SUB-TOTAL CARRIED FORWARD						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
2.2.4	8.3.4	Importing of material:				
2.2.4.1		a) Commercial source sand				
2.2.4.2		1) Sand for pipe bedding and backfill	m ³	15		
2.2.4.3		2) 19mm Stone chip layer	m ³	35		
2.2.5	8.3.5 PSD-8.3.5	Extra excavation in all material to provide working space	m ³	100		
2.2.6	8.3.8	Existing services				
2.2.6.1		c) Excavate by hand in soft material	m ³	10		
2.2.7	8.3.9	Extra over for backfill or fill material structures				
2.2.7.1		a) Sand backfill	m ³	20		
2.2.7.2		b) Stone layer	m ³	50		
2.2.8	8.3.10	Topsoiling				
2.2.8.1		a) 100mm Thick	m ²	120		
2.2.8.2		b) Into grass block paving	m ²	60		
2.2.9	8.3.11	Grassing				
2.2.9.1		a) Stolons	m ²	120		
2.3	1200 DB	SABS 1200 DB : PIPE TRENCHES				
2.3.1	8.3.2	Excavate in all materials for trenches, backfill and compact	m ³	40		
2.3.2	8.3.2	b) extra over Item 3.1 for excavation in:				
2.3.2.1		1) Intermediate material	m ³	15		
2.3.2.2		2) Rock	m ³	5		
2.3.3		c) Excavate and dispose of unsuitable material from trench bottom	m ³	5		
SUB-TOTAL CARRIED FORWARD						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
2.3.4	8.3.3.1	Make up difference in backfill material from:				
2.3.4.1		c) By importation of coarse grained sand	m ³	5		
2.3.4.2		c) By importation of 19mm stone chips	m ³	2		
2.4	1200 DM	SABS 1200 DM : EARTHWORKS (ROAD SUBGRADE)				
2.4.1	8.3.3	Treatment of roadbed				
		a) Road bed preparation and compaction of materials to 95% Mod AASHTO	m ³	65		
2.5	1200 G	SABS 1200 G : CONCRETE (STRUCTURAL)				
2.5.1		Formwork				
2.5.1.1	8.2.1	Rough (vertical)	m ²	15		
2.5.1.2	8.2.2	Smooth				
2.5.1.2.1		1) Vertical	m ²	640		
2.5.1.2.2		2) Horizontal	m ²	70		
2.5.1.2.3		3) Vertical less than 300mm wide	m ²	65		
2.5.1.2.4		4) Build in 160mm dia. pipes to walls	Nº	6		
2.5.1.3		Extra over for circular formwork	m ²	230		
2.5.2		Reinforcement				
2.5.2.1	8.3.1	High tensile	t	17.40		
2.5.2.2	8.3.2	Mild steel	t	0.35		
2.5.2.3	8.3.2	High tensile mesh Ref. 245	m ²	640		
2.5.2.4		20m dia. High tensile galvanised tie bar 1,7m	Nº	270		
SUB-TOTAL CARRIED FORWARD						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
2.5.3	8.4	Concrete				
2.5.3.1	8.4.3	1) 30 MPa in walls	m ³	80		
2.5.3.2		2) 30 MPa in ground slabs	m ³	57		
2.5.3.3		3) 30 MPa in suspended walkway and stairs	m ³	13		
2.5.3.4		4) 15 MPa mass concrete fill	m ²	49		
2.5.4		Unformed Surface				
2.5.4.1	8.4.4	b) Steel float				
2.5.4.1.1		1) Base of tanks	m ²	230		
2.5.4.1.2		2) Top of walls	m ²	15		
2.5.5	8.5	Joints				
2.5.5.2		Construction joint with water bar in tank wall	m	202		
2.5.5.3		Joint at base of tank with water bar	m	202		
2.6	1200 HA	SABS 1200 HA : STRUCTURAL STEELWORK				
2.6.1	8.3.2	Handrails: Supply and fix in place b) Ball type handrail to walkways and staircases	m	90		
2.7	1200 LC	SABS 1200 LC : CABLE DUCTS				
2.7.1	8.2.2	Excavation				
2.7.1.1	8.2.2	a) Excavate all materials for trenches	m ³	75		
2.7.2	8.2.2	b) Extra over for:				
2.7.2.1		1) Intermediate material	m ³	15		
2.7.2.2		2) Rock	m ³	10		
SUB-TOTAL CARRIED FORWARD						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
2.7.3	8.2.5	Supply, lay bed and prove duct 110mm dia. Class 4 uPVC	m	75		
2.7.4	8.2.7	Construct draw pits	No	3		
2.7.5	8.2.6	Imported bedding coarse grained sand	m ³	7		
2.7.6	8.2.8	Cable markers	No	5		
2.8	1200 LD	SABS 1200 LD : SEWERS				
2.8.1	8.2.1	Supply, lay, joint and bed Class 34 uPVC pipe 110mm dia.	m	10		
2.8.2	8.2.1	Supply, lay, joint and bed 110mm dia. Class 4 perforated pipe as leachate detection drain	m	10		
2.9	1200 ME	SABS 1200 ME : SUBBASE				
2.9.1	8.3.3	Construct subbase coarse with material from commercial sources (G5 gravel) 150mm compacted thickness	m ³	50		
2.9.2	8.3.3	Construct subbase coarse with material from commercial sources (G5 gravel) 100mm compacted thickness	m ³	40		
2.9.3	8.3.5	Process subbase material by:				
2.9.3.1		d) Stabiliser	m ³	40		
2.9.4	8.3.8	Stabilising agent				
2.9.4.1		c) Portland blast furnace cement	t	5		
2.10	1200 MF	SABS 1200 MF : BASE				
2.10.1	8.3.3(b)	Construct base with graded crushed stone G2 150mm compacted thickness	m ³	50		
SUB-TOTAL CARRIED FORWARD						

SECTION 2 : LEACHATE TREATMENT PLANT

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
2.11	1200 MJ	SABS 1200 MJ : SEGMENTED PAVING				
2.11.1	8.2.2	Supply, lay and bed concrete grass blocks to tank farm hard standing	m ²	150		
2.11.2	8.2.2	Supply, lay and bed concrete pavers to foot paths 60mm thick	m ²	400		
2.11.3		Extra over item 3.11.6 to form edge restraint using concrete paving brick on edge	m	300		
TOTAL SECTION 2 : CARRIED TO SUMMARY						

SECTION 3 : REED BEDS

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
3.1	1200 C	SECTION 3: REED BEDS				
		SABS 1200 C : SITE CLEARANCE				
3.1.1	8.2.1	Clear and grub	ha	0.18		
3.2	1200 D	SABS 1200 D : EARTHWORKS				
3.2.1	8.3.1.2	Remove topsoil to nominal depth 50mm	m ³	90		
3.2.2	8.3.2	Bulk Excavation				
3.2.2.1		a) Excavate in all materials and use for embankment	m ³	370		
3.2.2.2		b) Extra over for:				
3.2.2.2.1		1) Intermediate excavation	m ³	50		
3.2.2.2.2		2) Hard rock excavation	m ³	25		
3.2.3	8.3.3	Restricted excavation for chambers and stockpile	m ³	10		
3.2.3.1		c) Extra over for:				
3.2.3.1.1		1) Intermediate	m ³	10		
3.2.3.1.2		2) Hard rock	m ³	5		
3.2.8	8.3.10	Topsoiling				
3.2.8.1		a) 100mm Thick	m ²	820		
3.2.9	8.3.11	Grassing				
3.2.9.1		a) Stolons	m ²	820		
3.2.10		Planting of reeds in reed bed				
3.2.10.1		a) Phragmites Australis	PC Sum	1		50 000.00
3.2.10.2		b) Bullrush (Typha capensis)	PC Sum	1		50 000.00
SUB-TOTAL CARRIED FORWARD						

SECTION 3 : REED BEDS

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
3.3	1200 DB	SABS 1200 DB : EARTHWORKS (PIPE TRENCHES)				
3.3.1	8.3.2	Excavation				
3.3.1.1		a) Excavate in all materials for trenches, backfill, compact and dispose of surplus material	m ³	31		
3.3.1.2		b) Extra over for:				
3.3.1.2.1		1) Intermediate excavation	m ³	11		
3.4	1200 DK	SABS 1200 DK : GABIONS AND PITCHING				
3.4.1	8.2.4	Geotextile (or geomembrane)				
3.4.1.1		a) Non Woven Needle Punched Geofabric 270g/m ²	m ²	2210		
3.4.1.2		b) 2mm HDPE geomembrane	m ²	1105		
3.4.2	8.2.5	Pitching				
3.4.2.1		a) 13.2mm stone chips to reedbeds	m ³	500		
3.4.2.2		b) 300 - 500 size hand packed stone pieces to reedbeds embankments	m ²	350		
3.5	1200 DM	SABS 1200 DM : EARTHWORKS (ROAD SUBGRADE)				
3.5.1	8.3.3	Treatment of roadbed				
3.5.1.1		a) Road bed preparation and compaction of materials to 95% Mod AASHTO	m ³	250		
3.5.2	8.3.6	Gravel surface layer	m ³	85		
3.6	1200 HA	SABS 1200 HA : STRUCTURAL STEELWORK				
3.6.1	8.3.1	Structural steel 76 x 38 x 7mm channel galvanised fixed to concrete to support grid	t	0.02		
3.6.2	8.3.4	Flooring rectagrid (1700 dia)	m ²	2.3		
SUB-TOTAL CARRIED FORWARD						

SECTION 3 : REED BEDS

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
3.7	1200 LB	SABS 1200 LB : BEDDING PIPES				
3.7.1	8.2.2	Supply of bedding by importation from commercial source				
3.7.1.1	8.2.2.3	a) Coarse sand	m ³	3.5		
3.8	1200 LD	SABS 1200 LD : SEWERS				
3.8.1	8.2.1	Supply, lay, joint and bed HDPE pipe				
3.8.1.1		a) 110mm dia	m	10		
3.8.1.2		b) 160mm dia	m	15		
3.8.1.3		c) 110mm dia perforated uPVC class	m	39		
3.8.1.4		d) 110mm dia half-round uPVC class	m	39		
3.8.2	8.2.5	Inspection chambers				
3.8.2.1		a) 1050 dia concrete ring manhole complete				
3.8.2.1.1		1) 0.5m - 1.0m	Nº	2		
3.8.2.2		b) 1500 dia concrete ring manhole complete				
3.8.2.2.1		1) 1.0m - 1.5m	Nº	2		
3.9	1200 MFL	SABS 1200 MFL : BASE (LIGHT PAVEMENT STRUCTURES)				
3.9.1	8.3.3	Construct subbase coarse with material from commercial sources (G5 gravel) 100mm compacted thickness	m ³	90		
3.9.2	8.3.5	Process subbase material by:				
3.9.2.1		d) Stabilisation	m ³	90		
3.9.3	8.3.8	Stabilising agent				
3.9.3.1		c) Portland blast furnace cement	t	7		
TOTAL SECTION 3 : CARRIED TO SUMMARY						

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
4.1	EM.6.2.1	SECTION 4: MECHANICAL WORKS				
4.1.1		REFURBISH VALVES				
4.1.1.1		Raw leachate pump installation 110 dia.	No.	2		
4.1.2		Treated leachate pump installation 110 dia.	No.	1		
4.1.3		Sludge discharge from SBR 1, 150 dia.	No.	1		
4.1.4		Tanker filling point 110 dia.	No.	1		
4.1.5		Treated leachate balancing tank 110 dia.	No.	1		
4.1.6		Reed beds 150 dia.	No.	2		
4.2	EM.6.2.1	REPLACEMENT PUMPS				
4.2.1		Select and Integrate				
4.2.1.1		Raw leachate pump installation	No.	2		
4.2.1.2		Treated leachate pump installation	No.	1		
4.2.2		Supply, deliver and store				
4.2.2.1		Raw leachate pump installation	No.	2		
4.2.2.2		Treated leachate pump installation	No.	1		
4.2.3		Handle, install and final paint				
4.2.3.1		Raw leachate pump installation	No.	2		
4.2.3.2		Treated leachate pump installation	No.	1		
4.2.4		Test and commission				
4.2.4.1		Raw leachate pump installation	No.	2		
4.2.4.2		Treated leachate pump installation	No.	1		
4.3	EM.6.2.1	REPLACEMENT EXTERNALLY MOUNTED VENTURI AERATORS				
4.3.1		Select and Integrate				
4.3.1.1		SBR 1	No.	3		
4.3.2		Supply, deliver and store				
4.3.2.1		SBR 1	No.	3		
SUB-TOTAL CARRIED FORWARD						

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
4.3.3	EM.6.2.1	Handle install and final paint				
4.3.3.1		SBR 1	No.	3		
4.3.4		Test and Commission				
4.3.4.1		SBR 1	No.	3		
4.4		REPLACEMENT CHEMICAL STORAGE TANKS				
4.4.1		Select and Integrate				
4.4.1.1		Phosphoric acid (1 000l flow bin)	No.	1		
4.4.2		Supply, deliver and store				
4.4.2.1		Phosphoric acid	No.	1		
4.4.3		Handle and install				
4.4.3.1	EM.6.2.1	Phosphoric acid	No.	1		
4.4.4		Test and commission				
4.4.4.1		Phosphoric acid	No.	1		
4.5		REPLACEMENT CHEMICAL DOSING PUMPS				
4.5.1		Select and Integrate				
4.5.1.1		Sodium hydroxide	No.	2		
4.5.1.2		Phosphoric acid	No.	2		
SUB-TOTAL CARRIED FORWARD						

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
4.5.2		Supply, deliver and store				
4.5.2.1		Sodium hydroxide	No.	2		
4.5.2.2		Phosphoric acid	No.	2		
4.5.3		Handle, install and paint				
4.5.3.1		Sodium hydroxide	No.	2		
4.5.3.2		Phosphoric acid	No.	2		
4.5.4		Test and commission				
4.5.4.1		Sodium hydroxide	No.	2		
4.5.4.2		Phosphoric acid	No.	2		
4.6	EM.6.2.1	REMOVE ACTUATED BELL MOUTH STOPPER AND REPLACE WITH FIXED BELL MOUTH				
4.6.1		SBR 1	No.	1		
4.7	EM.6.2.1	NEW TREATED LEACHATE PUMP SET WITH PIPEWORK AND VALVES				
4.7.1		Preparation of shop drawings				
4.7.1.1		SBR 2	No.	1		
4.7.2		Fabricate, supply, deliver and store				
4.7.2.1		SBR 2	No.	2		
4.7.3		Handle, install and paint				
4.7.3.1		SBR 2	No.	1		
4.7.4		Test and commission				
4.7.4.1		SBR 2	No.	1		
SUB-TOTAL CARRIED FORWARD						

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
4.8	EM.6.2.1	NEW AERATORS				
4.8.1		Preparation of shop drawings				
4.8.1.1		SBR 2	No.	3		
4.8.2		Fabricate, supply, deliver and store				
4.8.1		SBR 2	No.	3		
2.8.3		Handle, install and paint				
4.8.3.1		SBR 2	No.	3		
4.8.4		Test and commission				
4.8.4.1		SBR 2	No.	3		
4.9	EM.6.2.1	TEE PIECE ARRANGED TO FEED NEW SBR2 WITH RAW LEACHATE, INCLUDING VALVES				
4.9.1		Preparation of shop drawings				
4.9.1.1		Raw leachate balancing tank	No.	1		
4.9.2		Fabricate, supply, deliver and store				
4.9.4.1		SBR 2	No.	1		
4.9.3		Handle, install and paint				
4.9.3.1		SBR 2	No.	1		
4.9.4		Test and Commission				
4.9.4.1		SBR 2	No.	1		
2.10	EM.6.2.1	NEW PIPEWORK FOR RAW LEACHATE ENTRY TO SBR				
4.10.1		Preparation of shop drawings				
4.10.1.1		SBR 2	No.	1		
4.10.2		Fabricate, supply, deliver and store				
4.10.4.1		SBR 2	No.	1		

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL CARRIED FORWARD						
SUB-TOTAL BROUGHT FORWARD						
4.10.3	EM.6.2.1	- Handle, install and paint				
4.10.3.1		SBR 2	No.	1		
4.10.4		Test and Commission				
4.10.4.1		SBR 2	No.	1		
4.11		- NEW PIPEWORK AND VALVE FOR SLUDGE DISCHARGE FROM SBR				
4.11.1		Preparation of shop drawings				
4.11.1.1		- SBR 2	No.	1		
4.11.2		Fabricate, supply, deliver and store				
4.11.4.1		SBR 2	No.	1		
4.11.3		Handle, install and paint				
4.11.3.1		SBR 2	No.	1		
4.11.4		Test and Commission				
4.11.4.1		SBR 2	No.	1		

SECTION 4 : MECHANICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL SECTION 4 : CARRIED TO SUMMARY						

SECTION 5 : ELECTRICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		SECTION 5: ELECTRICAL WORKS				
		Note: All items to cover Design, engineer, manufacture, supply, deliver to site and store, then install, test and commission				
5.1	EM.6.2.2	RAW LEACHATE PUMPS				
5.1.1		New emergency stops	Sum	1		
5.1.2		Power and control cables for new actuated valves	Sum	1		
5.2	EM.6.2.2	SBR 1 NEW AERATORS				
5.2.1		New emergency stops	Sum	1		
5.3	EM.6.2.2	SBR 1 TREATED LEACHATE PUMP				
5.3.1		New emergency stop	Sum	1		
5.4	EM.6.2.2	SBR 2 NEW AERATORS				
5.4.1		Power and control cables complete	Sum	1		
5.4.2		Emergency stops	Sum	1		
5.5	EM.6.2.2	SBR 2 TREATED LEACHATE PUMP				
5.5.1		Power and control cables complete	Sum	1		
5.5.2		Emergency stops	Sum	1		
5.6	EM.6.2.2	EXISTING CHEMICAL DOSING PUMPS				
5.6.1		Emergency stops where required	Sum	1		
5.7	EM.6.2.2	ELECTRICALLY ACTUATED VALVES				
5.7.1		Power and control cables complete	Sum	1		
5.8	EM.6.2.2	MOTOR CONTROL CENTRE				
5.8.1		- MCC enclosure	Sum	1		
5.8.2		- Motor drives (all drives to filed equipment)	Sum	1		

SECTION 5 : ELECTRICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
5.8.3		Controls (marshalling cubicle)	Sum	1		
SUB-TOTAL CARRIED FORWARD						
SUB-TOTAL BROUGHT FORWARD						
5.8.4		Connections with circuit breakers to domestic electrical installation, sub-distribution board rated at 80 Amps, three phase	Sum	1		
5.9	EM.6.2.2	LIGHTNING PROTECTION				
5.9.1		Earthing and bonding	Sum	1		
5.10	EM.6.2.2	SHOP DRAWINGS				
5.10.1		Preparation of shop drawings for the installation for the combined works	Sum	1		
5.11	EM.6.2.2	AS BUILT DRAWINGS				
5.11.1		Provide a full set of "as built" drawings	Sum	1		

SECTION 5 : ELECTRICAL

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
TOTAL SECTION 5 : CARRIED TO SUMMARY						

SECTION 6 : INSTRUMENTATION AND SCADA

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
6		SECTION 6: INSTRUMENTATION AND SCADA				
6.1	EM.6.2.3	Preparation of shop drawings, supply and install the following replacement equipment				
6.1.1		- Level control equipment in treated leachate balancing tank	Sum	1		
6.1.2		Level control equipment in SBR 1	Sum	1		
6.1.3		Level control equipment in treated leachate balancing tank	Sum	1		
6.1.4		Level control equipment in reed bed 1	Sum	1		
6.1.5		Level control equipment in reed bed 2	Sum	1		
6.1.6		Level control equipment in NaOH storage tank	Sum	1		
6.1.7		Level control equipment in Phosphoric acid storage tank	Sum	1		
6.1.8		Level control equipment in anti-foam storage tank	Sum	1		
6.1.9		Electrical conductivity equipment in ground water detection chamber	Sum	1		
6.1.10		Dissolved oxygen probe in SBR 1	Sum	1		
6.1.11		pH measuring equipment in SBR 1	Sum	1		
6.1.12		Electro magnetic flow meter in raw leachate suction line	Sum	1		
6.1.13		Electromagnetic flow meter in treated leachate discharge main from SBR 1	Sum	1		
6.1.14		Electromagnetic flow meter in treated leachate line to reed beds	Sum	1		
SUB-TOTAL CARRIED FORWARD						

SECTION 6 : INSTRUMENTATION AND SCADA

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
6.2	EM.6.2.3	Preparation of shop drawings for the following new equipment				
6.2.1		Level control equipment in SBR 2	Sum	1		
6.2.2		Level control equipment in reed beds 3 and 4	Sum	1		
6.2.3		Dissolved oxygen probe in SBR 2	Sum	1		
6.2.4		pH probe in SBR 2	Sum	1		
6.2.5		Electro magnetic flow meters in rising main from raw leachate pumps to SBR1 and SBR 2	Sum	1		
6.2.6		Cabling systems for all new equipment	Sum	1		
6.3	EM.6.2.3	Supply, deliver and store the following new equipment				
6.3.1		Level control equipment in SBR 2	Sum	1		
6.3.2		Level control equipment in reed beds 3 and 4	Sum	1		
6.3.3		Dissolved oxygen probe in SBR 2	Sum	1		
6.3.4		pH probe in SBR 2	Sum	1		
6.3.5		Electro magnetic flow meters in rising main from raw leachate pumps to SBR1 and SBR 2	Sum	1		
6.3.6		Cabling systems for all new equipment	Sum	1		
6.4	EM.6.2.3	Handle and install the following new equipment				
6.4.1		Level control equipment in SBR 2	Sum	1		
6.4.2		Level control equipment in reed beds 3 and 4	Sum	1		
6.4.3		Dissolved oxygen probe in SBR 2	Sum	1		
6.4.4		pH probe in SBR 2	Sum	1		
SUB-TOTAL CARRIED FORWARD						

SECTION 6 : INSTRUMENTATION AND SCADA

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SUB-TOTAL BROUGHT FORWARD						
6.4.5	EM.6.2.3	- Electro magnetic flow meters in rising main from raw leachate pumps to SBR1 and SBR 2	Sum	1		
6.4.6		Cabling systems for all new equipment including actuated valves	Sum	1		
6.5		Test and commission				
6.5.1	EM.6.2.3	Test and commission entire instrumentation and control system	Sum	1		
6.6		PLC and SCADA system				
6.6.1		Preparation of shop drawings	Sum	1		
6.6.2		Procurement of computer and associated hardware	Sum	1		
6.6.3		Fabrication of control panel and installation of all equipment	Sum	1		
6.6.4		Supply and install telephone auto dialling system for alarms	Sum	1		
6.6.5		Supply of software	Sum	1		
6.6.6		Installation of software including setting up and interfacing software with the various components	Sum	1		
6.6.7		Testing and commissioning	Sum	1		
6.7	EM.6.2.4	Training and Manuals				
6.7.1	EM.6.2.4	Supply a Complete Set of Manuals	Sum	1		
6.8	EM.6.2.5	Operations and Maintenance	Month	6		
TOTAL SECTION 6 : CARRIED TO SUMMARY						

DURBAN SOLID WASTE**Buffelsdraai Landfill: Leachate Treatment Plant Upgrade – Phase 1****CONTRACT № 25686(6W)****SUMMARY OF BILL OF QUANTITIES**

	Amount
SECTION 1 : PRELIMINARY & GENERAL	
1200 A Fixed Charge Items	R
1200 B Time Related Charges	R
SECTION 2 : LEACHATE TREATMENT PLANT	R
SECTION 3 : REED BEDS	R
SECTION 4 : MECHANICAL WORKS	R
SECTION 5 : ELECTRICAL WORKS	R
SECTION 6 : INSTRUMENTATION AND SCADA	R
SUB-TOTAL	R
Add 15% VAT of Sub-total	R
TOTAL CARRIED TO TENDER FORM	R

COMPANY NAME :

SIGNATURE : DATE:

(of person authorised to sign on behalf of the Tenderer)

PART C3: SCOPE OF WORK

	<u>PAGE</u>
C3.1 PROJECT DESCRIPTION AND SCOPE OF CONTRACT	79
C3.2 PROJECT SPECIFICATIONS	98
PS.1 Programme, Method Of Work, and Accommodation of Traffic	
PS.2 Services and Infrastructure	
PS.3 Management of the Environment	
PS.4 Occupational Health and Safety	
PS 5 Special Materials Rate of Exchange	
C3.3 STANDARD SPECIFICATIONS	104
C3.3.1 Listing of the Standard Specifications	
C3.3.2 Amendments to the Standard Specifications	
C3.4 PARTICULAR SPECIFICATIONS	125
C3.4.1 Part AH - OHS 1993 Safety Specification (2014)	
C3.4.2 Standard Environmental Management Plan for Civil Engineering Construction Works	
C3.4.3 Part LGM – Geomembrane Liner	
C3.4.4 General MEISA Specification	
C3.5 CONTRACT AND STANDARD DRAWINGS	215
C3.5.1 Contract Drawings / Details	
C3.5.2 Standard Drawings	

C3.1: PROJECT DESCRIPTION AND SCOPE OF CONTRACT**C3.1.1 Description of Works**

The contract covers the works required to for the first phase of the upgrading of the existing leachate treatment plant.

Details of the works are:-

1. Civil Works : Bulk earthworks to form a platform for the second SBR and reed beds.
2. Structural : The construction of an Aeration Tank (SBR) (dia. 15m, height 6,25m).
3. Leachate drains include pipework and manholes/chambers to connect the SBR, reed beds and other tanks.
4. Two reed new beds (65m x 6m).
5. Electrical and Mechanical works involving the supply of equipment for the new SBR and to upgrade the equipment at the existing SBR.

C3.1.2 Description of Site and Access

The site of the works is the Buffelsdraai Landfill located approximately 8,0 km north-west of Verulam. Access is from Verulam along Todd Street which becomes Main Road 98 (Oakford Priory Road) to a sign posted turnoff approximately 8km from Verulam. From the turnoff the entrance is about 2,5km. An alternative access exits from Redcliff and approaches the site from the south.

Refer to Item C4.1 : Locality Sketch.

C3.1.3 Nature of Ground and Subsoil Conditions

The site is underlain by Dwyka Tillite bedrock which is overlain by up to 3,0m of clayey soils. Excavation to a depth of 1,5m is generally in soft material although isolated nodes of harder excavation may be encountered. Geotechnical reports for each Cell are available if required.

C3.2: PROJECT SPECIFICATION

PREAMBLE

In the event of any discrepancy between a part or parts of the Standard or Particular Specifications and the Project Specification, the Project Specification shall take precedence. In the event of a discrepancy between the Specifications, (including the Project Specifications) and the drawings and / or the Bill of Quantities, the discrepancy shall be resolved by the Employer's Agent before the execution of the work under the relevant item.

C3.2.1 GENERAL

PS.1 PROGRAMME, METHOD OF WORK, AND ACCOMMODATION OF TRAFFIC

This Clause is to be read in conjunction with the provisions and obligations as contained in **SANS 1921-1 and SANS 1921-2**.

PS.1.1 Preliminary Programme

The Contractor shall include with his tender a preliminary programme on the prescribed form (see **Part T2.2 : Preliminary Programme**) to be completed by all Tenderers. The programme shall be in the form of a simplified bar chart with sufficient details to show clearly how the works will be performed within the time for completion as stated in the Contract Data.

Tenderers may submit tenders for an alternative Time for Completion in addition to a tender based on the specified Time for Completion. Each such alternative tender shall include a preliminary programme similar to the programme above for the execution of the works, and shall motivate his proposal clearly by stating all the financial implications of the alternative completion time.

The Contractor shall be deemed to have allowed fully in his tendered rates and prices as well as in his programme for all possible delays due to normal adverse **weather conditions** (refer to **Clause 5.12.2.2**) and special non-working days (refer to **Clause 5.1.1.1**) as specified in the in the Contract Data.

PS.1.2 Programme in Terms of Clause 5.6 of the General Conditions of Contract

It is essential that the construction programme, which shall conform in all respects to **Clause 5.6 of the General Conditions of Contract**, be furnished within the time stated in the Contract Data (refer to **Clause 5.3.1/2**).

The preliminary programme to be submitted with the tender shall be used as basis for this programme.

The Tenderer's attention is drawn to the fact that a number of factors will affect the programming of and method of carrying out the works. The more important of these are:

- (1) The site is an operational landfill with Cell 2 being landfilled at present. The Contractor will be required to accommodate access by their vehicles to this cell at all times.
- (2) Time allowances are to be made for the ordering of the mechanical and electrical equipment.

PS.2 SERVICES AND INFRASTRUCTURE

This Clause is to be read in conjunction with the provisions and obligations as contained in SANS 1921-1 and SANS 1921-2.

PS PS.2.1 Existing Services and Infrastructure

The Tenderer's attention is drawn to the existing services in the area of the works, including infrastructure installed as part of previous works. Although every effort has been made to depict the services and infrastructure accurately the positions shown must be regarded as approximate. The infrastructure includes electrical cables and leachate pipes.

PS.2.2 Proving Underground Services

This clause must be read in conjunction with Clause DB.5.1.2, the requirements of which shall be extended to cover all earthworks operations whether for trenching or bulk earthworks, in the vicinity of underground services.

It is stressed that all services in a particular area must be proven before commencing work in that area.

Insofar as bulk earthworks are concerned, where services are indicated on the drawings or where from site observations can reasonably be expected that such services are likely to exist where excavations are to take place, the Contractor shall without instructions from the Employer's Agent carefully excavate by hand to expose and prove their positions.

The cost of the proving trenches is to be included in the work covered by Clause DA.8.3.

When a service is not located in its expected position the Contractor shall immediately report such circumstances to the Employer's Agent who will decide what further searching or other necessary action is to be carried out and shall instruct the Contractor accordingly. The cost of this additional searching shall be to the Council's cost and shall be paid for under DB.8.19 - Proving Existing Services.

Should any service be damaged by the Contractor in carrying out the works and should it be found that the procedure as laid down in this clause has not been followed then all costs in connection with the repair of the service will be to the Contractor's account.

PS.2.3 Exposing existing Infrastructure

Before commencing any work in the vicinity of existing landfill infrastructure the contractor shall without instruction from the Engineer carefully excavate by hand to confirm the extent and position of the infrastructure which may include existing leachate pipes. The cost of this work shall be included in the rates tendered for bulk earthworks and earthworks for pipe trenches.

When the infrastructure cannot be located in its expected position the Contractor shall immediately report such circumstances to the Engineer who will decide what further searching or other necessary action is to be carried out and shall instruct the Contractor accordingly. The cost of this additional searching shall be to the Council's cost and shall be paid for under **DB.8.19 - Proving Existing Services**.

Should any infrastructure be damaged by the Contractor in carrying out the works and should it be found that the procedure as laid down in this clause has not been followed then all costs in connection with the repair will be to the Contractor's account.

Once the infrastructure is exposed any additional work required to expose it to allow connection and tie-ins shall be paid separately.

PS.2.4 Accommodation of Services and Infrastructure

Further to **Clauses PS.1 and PS.2** of this specification, tenderers are to note that allowance must be made under this item and / or the appropriate rates, for all costs incurred as a result of complying with these clauses. It shall also cover liaison with the services organisations and accommodation of their work gangs / contractors on site.

PS.3 MANAGEMENT OF THE ENVIRONMENT

The Contractor shall pay special attention to the following:

PS.3.1 Natural Vegetation

The Contractor shall confine his operation to as small an area of the site as may be practical for the purpose of constructing the works.

Only those trees and shrubs directly affected by the works and such others as the Employer's Agent may direct in writing shall be cut down and stumped. The natural vegetation, grassing and other plants shall not be disturbed other than in areas where it is essential for the execution of the work or where directed by the Engineer.

PS.3.2 Fires

The Contractor shall comply with the statutory and local fire regulations. He shall also take all necessary precautions to prevent any fires. In the event of fire the Contractor shall take active steps to limit and extinguish the fire and shall accept full responsibility for damages and claims resulting from such fires which may have been caused by him or his employees.

PS.3.3 Environmental Management Plan

In addition to the above, all requirements according to the Environmental Management Plan as detailed in **C3.4: Particular Specifications**, will be adhered to.

PS.4 OCCUPATIONAL HEALTH AND SAFETY**PS.4.1 General Statement**

When considering the safety on site the Contractor's attention is drawn to the following:

- (1) The area of works is within an operational landfill with heavy plant and trucks working in the vicinity of the site.
- (2) The treatment plant is operational and this must be accommodated during the contract.

It is a requirement of this contract that the Contractor shall provide a safe and healthy working environment and to direct all his activities in such a manner that his employees and any other persons, who may be directly affected by his activities, are not exposed to hazards to their health and safety. To this end the Contractor shall assume full responsibility to conform to all the provisions of the Occupational Health and Safety Act No 85 and Amendment Act No 181 of 1993, and the OHS Act 1993 Construction Regulations 2014 issued on 7 February 2014 by the Department of Labour.

For the purpose of this contract the Contractor is required to confirm his status as mandatory and employer in his own right for the execution of the contract by entering into an agreement with the Employer in terms of Section 37(2) of the Occupational Health and Safety Act.

PS.4.2 Health and Safety Specifications and Plans to be submitted at tender stage**PS.4.2.1 Employer's Health and Safety Specification**

The Employer's Health and Safety Specification is included in **Part C3.4: Particular Specifications**.

In addition to this specification the following risks associated with working on or within the vicinity of a landfill are:-

- The Buffelsdraai Landfill Site is an operational site and, as such, large amounts of **LANDFILL GAS** (containing methane) may be generated within the site. The Contractor and staff are warned against the risk of **EXPLOSIVE ATMOSPHERES** on site because of the presence of landfill gas and dissolved methane in the **LANDFILL LEACHATE**.
- **NAKED FLAMES AND SMOKING ARE NOT PERMITTED** anywhere on the site and due care must be taken, in compliance with all the laws, when working on the site. Operations resulting in spark, ignition, flames etc. must be strictly supervised and all workmen appropriately warned of the risks.
- **DUE CARE AND DILIGENCE** should also be exercised when work is carried out in the vicinity and/or adjacent to the disposal operations.
- **ALL LIQUIDS** emanating from the landfill and surroundings are deemed to be **DANGEROUS**. Thus no liquid may be collected or used for any purpose, whatsoever.

- For health and safety reasons, **NO SALVAGING** (scavenging) of any materials deposited on the landfill will be permitted. The Contractor is to ensure that all his workers as well as his Subcontractors comply with this requirement. Failure to do so will be sufficient grounds to remove persons off site who are in contravention of any of the above.
- **NO ENTRY** into enclosed areas without the use of methane and oxygen monitor is allowed, due to the presence of landfill gas, which can cause asphyxiation.
- Extreme caution and maximum supervision is required when working in enclosed areas or trenches.
- **NO ENTRY** into any **MANHOLES** on site by the Contractor or any other persons shall be permitted without the written approval by the eThekweni Municipality who must be satisfied by the abovementioned persons that all safety precautions and requirements will be complied with for working in or entering these manholes.

IT SHALL BE THE CONTRACTORS RESPONSIBILITY THAT ALL STAFF IS AWARE OF THE ABOVE SAFETY WARNING.

PS.4.2.2 Tenderer's Health and Safety Plan

At tender stage only a brief overview of the tenderers perception on the safety requirements for this contract will be adequate. This will be attached to **Part T2.2: Contractor's Health and Safety Plan**.

Only the successful Tenderer shall submit a separate Health and Safety Plan as required in terms of Regulation 7 of the Occupational Health and Safety Act 1993 Construction Regulations 2014, and referred to in **Part T2.2 : Contractor's Health and Safety Plan**.

The detailed safety plan will take into consideration the **site specific risks as mentioned under PS.4.2.1** and must cover at least the following:

- (i) A proper risk assessment of the works, risk items, work methods and procedures in terms of Regulations 9 to 29;
- (ii) Pro-active identification of potential hazards and unsafe working conditions;
- (iii) Provision of a safe working environment and equipment;
- (iv) Statements of methods to ensure the health and safety of subcontractors, employees and visitors to the site, including safety training in hazards and risk areas (*Regulation 7*);
- (v) Monitoring health and safety on the site of works on a regular basis, and keeping of records and registers as provided for in the Construction Regulations;
- (vi) Details of the Construction Supervisor, the Construction Safety Officers and other competent persons he intends to appoint for the construction works in terms of Regulation 8 and other applicable regulations; and
- (vii) Details of methods to ensure that his Health and Safety Plan is carried out effectively in accordance with the Construction Regulations 2014.

The Contractor's Health and Safety Plan will be subject to approval by the Employer, or amendment if necessary, before commencement of construction work. The Contractor will not be allowed to commence work, or his work will be suspended if he had already commenced work, before he has obtained the Employer's written approval of his Health and Safety Plan.

Time lost due to delayed commencement or suspension of the work as a result of the Contractor's failure to obtain approval for his safety plan, shall not be used as a reason to claim for extension of time or standing time and related costs

A generic plan will not be acceptable.

PS.4.3 Cost of compliance with the OHSA Construction Regulations

The rates and prices tendered by the Contractor shall be deemed to include all costs for conforming to the requirements of the Act, the Construction Regulations and the Employer's Health and Safety Specification as applicable to this contract. Should the Contractor fail to comply with the provisions of the Construction Regulations, he will be liable for penalties as provided in the Construction Regulations and in the Employer's Health and Safety Specification.

Items that may qualify for remuneration will be specified in the Employer's Health and Safety Specification.

C3.3: STANDARD SPECIFICATIONS

C3.3.1 The Specifications on which this contract is based are the South African National Standards (SANS) 1200: Standardised Specification for Civil Engineering Construction (hereafter referred to as the Standard Engineering Specifications). This document is obtainable separately, and Tenderers shall obtain their own copies of the applicable Sections.

Part	Description
1200 A	General Specifications
1200 C	Site Clearance
1200 D	Earthworks General
1200 DB	Earthworks for Pipe Trenches
1200 DK	Gabions & Pitching
1200 G	Concrete
1200 HA	Structural Steel (Sundry items)
1200 DM	Earthworks (Roads, Subgrade)
1200 L	Medium Pressure Pipelines
1200 LC	Cable Ducts
1200 LB	Bedding (Pipes)
1200 LD	Sewers
1200 LE	Stormwater Drainage

Standard Drawings

The Standard Drawings to which these Standard Engineering Specifications refer are listed below. Copies of the relevant drawings are included in Part C3.4.

Dwg No	Description	Date of Issue	
TGC/01	Ring Manholes	February	1990
TGC/03	Stormwater Brick Manholes	February	1990

C3.3.2 AMENDMENTS TO THE STANDARD SPECIFICATIONS

INTRODUCTION

In certain clauses the standard, standardized and particular specifications allow a choice to be specified in the project specifications between alternative materials or methods of construction and for additional requirements to be specified to suit a particular contract. Details of such alternative or additional requirements applicable to this contract are contained in this part of the project specifications. It also contains additional specifications required for this particular contract.

The number of each clause and each payment item in this part of the project specifications consists of the prefix **PS** followed by a number corresponding to the number of the relevant clause or payment item in the standard specifications. The number of a new clause or payment item, which does not form part of a clause or a payment item in the standard specifications and which is included here, is also prefixed by PS, but followed by a new number which follows on the last clause or item number used in the relevant section of the standard specifications.

PSA GENERAL

PSA-5 CONSTRUCTION

- ***Add the following additional Subclauses:***

PSA-5.7 Safety

- ***Add the following:***

“The Contractor will refer to section, C3.4, Particular Specifications, for the OHSA 1993 Safety Specification entitled Occupational Health & Safety Unit Specification Rev. 2”.

- ***and:***

“The Contractor shall provide security watchmen and all measures necessary to secure the works for the contract as he deems fit. The cost thereof will be deemed to be included in the relevant rates tendered. The Contractor must ensure that all his employees as well as the employees of his subcontractors are able to identify themselves as members of the construction team.

The Contractor shall also take cognisance of the fact that the site is a hazardous area and effective protective equipment must be provided and precautions implemented during the contract. Methane gas is present and workers must not enter confirmed spaces without ventilation and other safety equipment. Smoking must be prohibited within the site area.

PSA-5.9 Site Diary

A site diary in triplicate format, which shall be supplied by the Contractor must be filled in on a daily basis and submitted to the Engineer on a weekly basis. No claims will be considered without the site diary's schedules property completed (on a daily basis) and submitted.

PSA-5.10 Accommodation of Traffic

The Contractor will be required to accommodate traffic in and around the area of construction works. Any amendments to the current traffic routes must be discussed with and approved by the Engineer.

PSA-8 MEASUREMENT AND PAYMENT**PSA-8.4 Schedule Time Related Items****PSA-8.4.2 Operation and Maintenance of Facilities on Site****PSA-8.4.2.1 Facilities for Engineer**

- **Add the following clause:**

"e) Cleaner for Engineers office Unit: Sum."

PSA-8.7 Dayworks

Day works are covered in a separate Particular Specification and is therefore measured in its own section.

- **Add the following clause:**

PSA-8.5 Sums stated provisionally by Engineer

PSA-8.5(b) (i) Acceptance Testing Unit: Prov Sum

The provisional sum covers the cost of acceptance testing specifically ordered by the Engineer.

(ii) As-Built Survey Unit: Prov Sum

On completion of the works the Contractor is required to undertake an as-built survey of the works providing the following details:

- | | | |
|------------------------|---|--|
| 1. Stormwater drainage | : | manholes/headwall covers and inverts levels and centre co-ordinates. |
| 2. Ducts | : | end co-ordinates |
| 3. Subsoils | : | end co-ordinates and bend points |

(iii) Community Liaison Officer Unit: Prov Sum

The provisional sum covers the cost of the Community Liaison Officer who will be employed by the Contractor for the duration of the contract.

(iv) Environmental Construction Management Plan Audits Unit: Prov Sum

The sum covers the cost of Environmental Construction Management Plan audit by an independent Environmental Professional as ordered by the Engineer.

(v) Purchase of Spares Unit: Prov Sum

The provisional sum covers the cost of the purchase of any additional spares considered necessary by the Engineer.

PSC SITE CLEARANCE
PSC-3 MATERIALS**PSC-3.1 Disposal of Materials**

- ***Add the following clause:***

Material obtained from clearing and grubbing may be disposed of on site in a position agreed to by the Engineer.

PSC-8 MEASUREMENT AND PAYMENT**PSC-8.2 Scheduled Items**

PSC-8.2.13 Demolition of existing manholes and Headwalls Unit: No

The rate shall cover the careful demolition of existing leachate manholes and headwall o enable the existing leachate pipes to be extended to accommodate the raising of the stability berm. It is noted that the manholes and inlets are in use and the existing flows must be accommodated. Rubble is to be disposed of at the landfill. The unit of measure shall be Number (No.).

PSD EARTHWORKS**PSD-1 SCOPE**

The work covered under this specification comprises the bulk earthworks required to form the platforms for the new SBR and reed beds. It excludes trenching and the construction of layerworks.

PSD-2 INTERPRETATIONS**PSD-2.3 Definitions**

- ***Add the following:***

Leachate: Waste effluent produced during the decomposition of the waste.

Clay Liner: Clay material placed in a 300mm layer or thicker to contain leachate and other runoff from the landfill.

Synthetic Liner: 2,0m thick High density polyethylene (HDPE) sheeting laid as a barrier either in drains, and/or liners.

PSD-3 MATERIALS**PSD-3.2 Classification for placing purposes**

- ***Add the following:***

PSD-3.2.4 Synthetic Liner (Geomembrane)

The material supplied as the synthetic liner shall comply with SABS 952-1985 and the Particular Specification LGM Geomembrane Liner. The liner shall comprise 2,0m HDPE.

PSD-3.2.5 Clay Liner Material

The material used for this layer shall have a Plasticity Index of between 5 and 15 and a maximum particular size of 25mm. It shall be compacted to a density not less than 85% of Proctor maximum dry density at a moisture content of Proctor Optimum

PSD-3.3 SelectionPSD-3.3.2 Backfilling & Embankments

- **Add the following:**

Excavated material shall be placed either into fill or stockpile. As the properties of the material are required for the various uses discussed (i.e. topsoil, selected layer/backfill) the Contractor will be required to select the material excavated for use for specific operations. The identification of the various types of material will be made by the Engineer and it will be the Contractor's responsibility to carefully select the material and ensure it is not mixed with other types.

PSD-5 CONSTRUCTION**PSD-5.1 Precautions**PSD-5.1.1 SafetyPSD-5.1.1.2 Safeguarding of excavations

- **Add the following additional subitems:**

"(g) The Contractor or his agent or his representative shall **not** require or allow any person to work under unsupported overhanging material or in an excavation which is more than 1,5 m deep, and any excavation which has not been adequately supported or braced if there is a danger of the overhanging material or the sides of the excavation collapsing. The support, shoring or bracing to be designed and constructed by the Contractor, shall be strong and sturdy enough to support the sides of the excavation in question."

PSD-5.2 Method and ProceduresPSD-5.2.3 Placing & Compaction

- **Add the following item:**

PDS-5.2.3.2 Backfilling of trenches and backfilling or filling against structuresa) General

Amend layer thickness to 150mm.

b) Restricted

Amend layer thickness to 150mm.

PSD-5.2.3.3 Selected Layers

After completion of the bulk earthworks the Contractor may be required to place a layer comprising selected clay material and a protection/liner system. The material shall be selected from site excavation to comply with the requirements of Clause PSD-3.2.5 and shall be placed *in layers of 150mm thickness to a density of not less than 95% of Proctor maximum dry density at a moisture content of Proctor Optimum to Proctor Optimum +2%.*

PSD-5.2.4 Finishing

PSD-5.2.4.2 Topsoiling

- **Delete the last sentence and replace with:**

"The final thickness of the topsoil shall be 100mm."

PSD-5.2.4.3 Grass or Other Vegetation

The grass supplied for this contract shall be either Buffalo or Cynodon Dactylon.

PSD-5.2.5 Transport for Earthworks

PSD-5.2.5.1 Freehaul

- **Add the following:**

"For this contract all haul will be regarded as free haul and the cost of transportation of all materials will be deemed to be included in the rates and prices tendered in the Schedule of Quantities."

PSD-5.2.5.2 Overhaul

Overhaul will not be payable on this contract.

PSD-8 MEASUREMENT AND PAYMENT

PSD-8.1 Basic Principles

- **Add the following:**

PSD-8.1.1 Restricted excavation shall only be measured for the reinforced concrete structures and reed beds below the platform level. Payment for excess excavation will only be made as follows:

- (i) Reinforced concrete tanks 1,0m measured from external face of concrete.
- (ii) Under the reinforced concrete tanks, in rock excavation to remove loose rock.

The reinforced concrete tanks at the treatment plant will be founded on the in-situ material which is likely to comprise intermediate material to rock. After excavation all loose material is to be removed and any outbreak made up with mass concrete. Pockets of soft material shall be removed and the level made up with mass concrete."

PSD-8.2 Computation of Quantities**▪ Add the following:**

PSD-8.2.1 Measurement of the bulk earthworks for this contract shall be in cubic metres (m³) calculated by Digital Terrain Model (D.T.M.). The measurement shall be based on the total cut volume measured after site clearance and the topsoil has been stripped.

PSD-8.3 Scheduled Items**PSD-8.3.3 Restricted Excavation**

This item shall also cover the excavation for open drains and for excavation into the front face of the existing stability berm to create benches so the new earthworks can be tied into the existing berm. The quantity shall be for the channel excavation shall be measured in place prior to excavation and the benching shall be measured as the volume cut into the existing face on the berm in cubic meters.

PSD-8.3.4 Importing of Materials

The rate for the importation of material shall cover the cost of procuring the materials, placing and spreading into position.

PSD-8.3.6 Overhaul

This item is deleted.

PSD-8.3.7 Lateral Support

This item is not measured and allowance for lateral support must be included in the relevant rates.

PSD-8.3.11 Grassing or other Vegetation Cover

Grass planting on this contract shall distinguish between stolons (runners) and sodding. Supply of grass shall be from the Contractor's own source but the type of grass shall be subject to the Engineer's approval.

PSDB EARTHWORKS FOR PIPE TRENCHES**PSDB-1 SCOPE**

This Section of the specification shall be extended to include open drains. Excavations for subsoils & leachate drainage and stormwater pipework shall also be included.

PSDB-3 MATERIALS**PSDB-3.5 Geofabric Blanket*****Add the following:***

Geofabrics required for this project shall comply with the following:-

Description	Grab Strength		Trapezoidal tear Min N	Normal Permeability 1×10^{-3} m/s	Burst Strength MPa
	Min N	Elongation %			
Type 3	665	70-95	330	4,5	2,1
Type 4	850	70-95	375	4,9	2,5
Type 5	1045	70-95	480	5,4	3
Test Method	ASTM D4632-86	ASTM D4533-85	ASTM D4533-85	SABS D221-88	ASTM D4533-88

PSDB-8 MEASUREMENT AND PAYMENT**PSDB-8.3.2 Excavation for Open Drains**

- **Add:**

PSDB.8.3.2(d) Excavation for open drains Unit: m³

The excavation, trimming, base compaction to 93% Mod AASHTO density, or as approved, and other relevant operations as per Clause DB.8.5 for the open drains shall be measured under this item. It shall allow for removing the surplus soil to the site stockpile.

PSDB-8.3.3.4 Overhaul

There will be no overhaul measured in this contract. All haulage including that from commercial sources will be considered as freehaul. The cost of all haulage is deemed to be covered by other rates in the Schedule of Quantities.

PSDM EARTHWORKS (Road Subgrade)**PSDM-1 SCOPE**

The scope of this specification is expanded to include the construction of liner layers.

PSDM-2 INTERPRETATION**PSDM-2.3 Definitions and Abbreviations**

- ***Add the following:***

Leachate : Toxic effluent produced during the decomposition of waste.

Liner System : A layered barrier to prevent the escape of leachate into the environment.

Synthetic Materials : A geomembrane 2mm thick High Density Polyethylene (HDPE) sheeting.

PSDM-3 MATERIALS**PSDM-3.2 Classification for Placing Purposes**

The materials classified shall be expanded to cover all the natural materials required for the liner system either obtained from site or imported. The following shall be added:

PSDM-3.2.5 Selected Layer (Roadworks)

- ***Replace with the following:***

The material supplied for the selected layer is to comply with the following requirements:

Grading

Maximum size of 63mm and a minimum grading modulus of 1,5mm

Atterberg Limits

Liquid Limit (maximum)	30
Plasticity Index (maximum)	30
Linear Shrinkage (%) (maximum)	30
Linear Shrinkage % passing 0,425mm sieve (maximum)	30

Strength and Swell

CBR after soaking of greater than 30% at 95% Mod AASHTO and a maximum swell of 0,5% at 100% Mod AASHTO density.

PSDM-4 PLANT

Further to this clause the plant used on this site shall be selected after careful consideration as to the nature of the works and in particular the necessity to work on slopes and the special requirements needed when working in close proximity to sensitive, costly materials. Plant used above the synthetic liner layers must be 'light' but capable of achieving the specified tolerances and compaction.

PSDM-5 CONSTRUCTION**PSDM-5.2 Methods & Procedures****PSDM-5.2.3 Treatment of Roadbed**

The in-situ shall be treated by scarifying to a depth of 150mm, mixing the material, trimming and compacting to 93% Mod AASHTO. Moisture content shall be within 2% of optimum. Areas of hard or stony material shall be removed and replaced with selected material excavated from site.

PSDM-5.2.3.2 Removal of Unsuitable Material

Where required by the Engineer, areas of in-situ material are to be excavated below formation to a depth of 150mm to remove 'hard/unsuitable' material that could damage the liner layers. This material shall be replaced by selected material excavated from site.

In areas which contain a significant proportion of rock where directed by the Engineer, the formation is to be ripped and scarified to a depth of 150mm and removed and replaced with suitable material. The formation shall then be worked to tolerance and compacted to a nominal density of 90% Mod AASHTO density, or as accepted by the Engineer, on slopes of up to around 1v:3h (18°) as specified under Clause DA 5.5.

The layer shall be finished to be free draining and to a tolerance of $\pm 35\text{mm}$ in 3m (no gap greater than 70mm to be measured under a 3m straight edge), or as accepted by the Engineer."

PSDM-5.2.4 Fill**PSDM-5.2.4.2 Placing and Compaction****c) Breaking down of material**

Further to this clause, material from site where reserved for use in the base and protection layers may require additional treatment by sieving and/or breaking down/rolling to reduce the particle size to that specified.

PSDM-5.2.8 Transport

PSDM-8.2.8.2 Overhaul

▪ **Add the following:**

The overhaul distance is to be increased to cover the entire site.

PSDM-6 TOLERANCES

The tolerances applied to the road bed and selected layers shall be as indicated in the relevant clauses. With regard to the selected layer the average level of a layer shall be such that the thickness of the following layer shall not be less than that specified.

PSDM-8 MEASUREMENT AND PAYMENT

PDDM-8.1 Basic Principles

It is noted that road bed preparation shall be measured over the entire cell area. It shall be measured along the actual ground surface and not in plan. Similarly, the selected layer for the liner system shall be measured along the actual surface not plan.

PSDM-8.3 Scheduled Items

PSDM-8.3.3 Treatment of Road Bed

▪ **Add the following:**

1. Minimum of 93% Mod AASHTO."

PSDM-8.3.12 Overhaul Unit: m³

No overhaul shall be measured under this Contract. All rates will be considered to have made allowance for all haulage.

PSDM-8.3.17 Catchwater Banks Unit: m

In addition to the requirements of Clause PS.5 and other relevant clauses allowance should be made for the stormwater banks to have nominal volume of 1m³/metre length and be compacted to 90% Mod AASHTO density. Other banks measured under this item shall be measured separately and differentiated based on the volume of material required for their construction.

PSG CONCRETE**PSG CONCRETE WORKS****PSG-1 SCOPE**

This Specification is to be expanded to cover the construction of ground slabs and concrete lined drains.

PSG-5 CONSTRUCTION**PSG-5.5 Concrete****PSG-5.5.7 Construction Joints**

- ***Add the following subclause:***

PSG-5.5.7.4 Various types of construction joints have been indicated.

These joints will only be formed where shown on the drawings or where approved by the Engineer. Where the joints incorporate a water bar the bar shall be installed strictly in accordance with the surplus specification. Joint details include:

1. Horizontal joint in tank walls. This joint includes a water bar.
2. Vertical joint around tank base (RLBT).
3. Lined drain joint

Joints are to be formed in the lined channels at 4,5m intervals by casting alternate panels and hence placing fresh concrete against a previously placed section.

Every fourth joint is to act as an expansion joint and is to be constructed in accordance with the detail indicated on the drawing. Intermediate joints will act as contraction joints and be allowed to crack. A “vee” is to be formed in the concrete at the interface between the fresh and previously placed concrete.

PSG-8 MEASUREMENT AND PAYMENT

Add the following items :

PSG-8.9 Concrete Lined Drains Unit: m

The unit of measure shall be the liner metre (m) and the rate shall cover the supply, erection and stripping of the formwork, the supply, placing and compacting the concrete, finishing the surface to Class 3 - Wood float finish and the formation of the contraction joints. The different types of drains are scheduled separately.

PSG-8.10 Joints**(b) Lined Drain Expansion Joint Unit: No.**

The unit of measure shall be number (No) and the rate shall cover full compensation for the costs of supplying all materials and forming the joint as detailed. The joints for each type of drain shall be scheduled separately.

PSHA STRUCTURAL STEELWORK (SUNDRY ITEMS)**PSHA-1 SCOPE**

The scope of this specification is expanded to cover the corrugated material tanks and corrosion protection by galvanising in accordance with SABS 1200 HC.

PSHA-3 MATERIALS

- *Add the following:*

PSHA-3.11 Rectagrid or similar Flooring

The rectagrid floor shall comprise sheets manufactured from 50mm deep flat sections, cut to suit the size required. The sheets shall be hot dipped galvanized.

PSHA-8 MEASUREMENT AND PAYMENT**PSHA-8.3.6 Corrosion Protection**

This item is to be deleted and corrosion protection comprising hot dipped galvanizing is to be allowed for in all the rates.

PSL MEDIUM PRESSURE PIPELINES

PSL.1 SCOPE

The scope of this part of the specifications covers the interconnecting pipework between the tanks reedbeds etc.

PSL.2 INTERPRETATIONS**PSL.2.1.2 Supporting Specifications**

In addition to the requirements of Clause PF.2.1, the applicable standards include any standard superseding those given in Clause PF.2.1 and including SABS ISO 4427 and DIN 8074.

PSL.3 MATERIALS

All piping shall be **HDPE PE 100 SDR 21 PN 8** unless otherwise approved by the Engineer. . Couplings and pipes shall be by the same manufacturer. The Contractor shall include the cost of these joints in the pipework item.

Storage and handling of the pipe shall be in accordance with the Manufacturer's recommendation. Care is to be taken that pipes are not dragged across the ground and damaged. All pipes shall be kept free of any solid particles or contaminants and sealed as required to achieve this.

PE100 shall be black and shall contain the necessary density of pigmentation to provide protection against ultra violet radiation.

Unless stated otherwise on the drawings, all pipe flanges, including black finish hexagon bolted polyethylene flanges shall be protected by Denso paste, Denso mastic or Denso tape, or equivalent, or shall be stainless steel.

No metal whatsoever shall be used below ground without the Engineer's specific approval.

PSL.8 MEASUREMENT AND PAYMENT**PSL.8.2.3 Supplying, Fixing and Bedding of Valves Unit: No.**

In addition to the requirements of Clause PSL.8.2.3, the rate tendered shall allow for the supply of all the flanges, gaskets, bolts or any other fittings required and their installation for lever operated butterfly type valves. The valve shall offer fine control of the opening angle. The Contractor's attention is drawn to the corrosion characteristics of landfill leachate, and the Contractor is required to ensure the suitability of the valves offered for use in contact with these liquids. Thermoplastic butterfly valves shall be 10 bar rated Chemical Duty with FPM seat and seals, glass reinforced vinyl ester and 316ss shaft, as manufactured by Durapipe or similar equal approved. All thermoplastic butterfly valves shall be lever operated and have a plate indicating percentage open to closed.

All thermoplastic valves on the well heads shall be capable of a wide range and accurate control of gas flows. The valves shall be of a butterfly type (or as approved by the Engineer) and shall be EC Certified for the use of Gas Applications.

All valves shall be subject to the approval of the Engineer.

PSL 8.2.14 Manholes Unit: No.

In addition to the requirements of Clause PSL.8.2.14 the rate shall include for :

The manholes required to be allowed for under this item are standard precast ring manholes as shown on Durban Council Standard Drawing Numbers 38570 and 38571 but with a stone base and lockable glass reinforced plastic or equal approved lockable ventilated cover. The tendered sum for each manhole under this item is to be extended from the requirements of Clauses PSL 3.11, 5,7 and 6.4 to include for:

- a) The manholes to be painted internally and externally, before installation, with ABE Super Laycold or similar approved bitumen emulsion as a protection against corrosion by landfill gas. The joints between units are to be sealed with an approved bituminous product "Bitujoint" or similar approved product.
- b) The **excavation and backfilling** for the manholes in all materials including Municipal Solid Waste.

The rate shall differentiate between manholes of different diameters and in different depth categories.

PSL.8.2.15 Marker Posts Unit: No.

The rate shall include for the supply, transporting, handling and complete erection (inclusive of hole excavation and backfilling of 1200mm long x 75mm x 75mm posts precast in 30MPa concrete, suitably reinforced, painted and marked as specified and meeting with the approval of the Engineer. Marker posts shall be at 50m spacing and at each special fitting or valve and at each change of pipe direction.

PSLC CABLE DUCTS**PSLC.8 MEASUREMENT AND PAYMENT****PSLC.8.2.5 Supply, lay, bed and prove duct**

The requirements of Clause PSLC.8.2.5 shall be applicable, added to as below:

All ducts shall be provided with a draw cord for future provision of additional cabling, unless agreed otherwise with the Engineer.

All bends shall be long radius, unless stated otherwise.

The Contractor shall seal the ends of the cable ducts with expanding foam following cable laying and cable testing.

All ducts shall be laid to 600 mm cover except under roads and hardstandings where cover shall be 1000 mm unless shown otherwise on the drawings. All ducts beneath roads shall be concrete encased unless otherwise specified.

PSLC.8.2.7 Drawpits/manholes

▪ **Add the following:**

a) 750mm diameter ring manholes

In addition to the requirements of Clause PSL.8.2.14 the rate shall include for :

The manholes required to be allowed for under this item are 750mm diameter standard precast ring manholes as shown on Durban Council Standard Drawing Numbers 38570 and 38571 with a heavy duty precast concrete cover and lockable lid. The tendered sum for each manhole under this item is to be extended from the requirements of Clauses PSL 3.11, 5,7 and 6.4 to include for:

- i) The manholes to be painted internally and externally, before installation, with ABE Super Laycold or similar approved bitumen emulsion as a protection against corrosion by landfill gas. The joints between units are to be sealed with an approved bituminous product "Bitujoint" or similar approved product.
- ii) The **excavation and backfilling** for the manholes in all materials including Municipal Solid Waste.
- iii) Provision of a heavy duty precast concrete cover and lockable lid.
- iv) Breaking out of the side walls and making good around ducts or drainage outlets as required to the satisfaction of the Engineer.

b) Underground junction box

In addition to the requirements of Clause PSL.8.2.14 the rate shall include for :

The underground junction boxes required to be allowed for under this item are 600mm square with a 50mm thick concrete slab above and below one course of brickwork laid to accommodate the duct piping.

PSLC.8.2.9 Overhaul

No overhaul shall be applicable to any of the operations covered under this specification. There will be no overhaul measured in this contract. All haulage including that from commercial sources will be considered as freehaul. The cost of all haulage is deemed to be covered by other rates in the Schedule of Quantities. Material on site will generally be hauled within the Bisasar Landfill site area.

PSLC.8.2.10 Imported backfill materials Unit: m³

- ***The requirements of Clause PSDB.8.3.3 shall be applicable, added to as below:***

Backfill shall be G7 quality material either imported from a commercial source or site borrow.

PSLC.8.2.11 Encasing of Ducts in Concrete Unit: m³

- ***The requirements of Clause PSLB.8.2.4 shall be applicable, amended as below:***

This item shall be modified to cover all sizes of duct being encased in Grade 25/19 concrete. All other aspects of the standard specification shall apply.

PSLD SEWERS**PSLD-1 SCOPE**

This Specification shall be expanded to cover the installation of leachate pipes and stormwater pipes.

PSLD-3 MATERIALS**PSLD-3.1 Pipes, Filling & Pipe Joints**

PSLD-3.1.5 uPVC pipes shall be heavy duty class 34 pipes

- ***Add the following:***

PSLD-3.1.8 HDPE Pipes (Solid wall)

The pipes required for this contract shall be manufactured using High Density Polyethylene (HDPE) and shall have a strength grading of Class 12.

PSLD-3.1.9 HDPE Pipes (Perforated)

The pipes shall be manufactured from HDPE and shall have 2 x 10mm dia. holes or similar perforations to allow the ingress of effluent at 200mm cts.

PSLD-3.7 Geotextiles

PSLD-3.7.1 Geotextiles

The geotextile supplied shall be permeable to water and leachate and shall comply with the requirements of Clause PSDB-3.5.

PSLD-5 CONSTRUCTION**PSLD-5.6 Manholes / Inspection Chamber**

PSLD-5.6.1 General

- ***Add the following:***

- (f) The manholes required to be allowed for under this item are standard precast ring manholes as shown on Standard Drawing Numbers 38570 and 38571.

The manholes to be painted internally and externally, before installation, with ABE Super Laycold or similar approved bitumen emulsion as a protection against corrosion by landfill gas. The joints between units are to be sealed with an approved bituminous product "Bitujoint" or similar approved product.

PSLD-5.11 Installation of Geotextile

The geotextile shall be laid loosely over the area required and/or around the pipe/stone layer. Joints in the fabric are to be lapped a minimum of 300mm.

C3.4: PARTICULAR SPECIFICATIONS

In addition to the Standardized and Project Specifications the following Particular Specifications / Policies shall apply to this contract:

- C3.4.1 Part AH - OHS 1993 Safety Specification
- C3.4.2 Standard Environmental Management Plan for Civil Engineering Construction Works
- C.3.4.3 Part LGM - Geomembrane Liner
- C.3.4.4 EM - General MEICA Specification

C3.4.1: PART AH - OHS 1993 SAFETY SPECIFICATION

PARTICULAR SPECIFICATION PAM: OHS 1993 HEALTH AND SAFETY SPECIFICATION

CONTENTS

- 1: SCOPE
- 2: DEFINITIONS
- 3: APPLICATION FOR CONSTRUCTION WORK PERMIT
- 4: TENDERS
- 5: NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION WORK
- 6: RISK ASSESSMENT
- 7: APPOINTMENT OF EMPLOYEES AND SUBCONTRACTORS
- 8: APPOINTMENT OF SAFETY PERSONNEL
- 9: RECORDS AND REGISTERS
- 10: CONTRACTOR'S RESPONSIBILITIES
- 11: MEASUREMENT AND PAYMENT

OCCUPATIONAL HEALTH AND SAFETY SPECIFICATION

1: SCOPE

This specification covers the health and safety requirements to be met by the Contractor to ensure a continued safe and healthy environment for all workers, employees and subcontractors under his control and for all other persons entering the site of works.

This specification shall be read with the Occupational Health and Safety Act (Act No 85 and amendment Act No 181) 1993, and the corresponding Construction Regulations 2014, and all other safety codes and specifications referred to in the said Construction Regulations.

In terms of the OHSA Agreement in Section C1.2.4 of the Contract document, the status of the Contractor as mandatory to the Employer (client) is that of an employer in his own right, responsible to comply with all provisions of OHSA 1993 and the Construction Regulations 2014.

This safety specification and the Contractor's own Safety Plan as well as the Construction Regulations 2014, shall be displayed on site or made available for inspection by all workers, employees, inspectors and any other persons entering the site of works.

The following are possible risks associated with this project:

- Potentially dangerous existing services, i.e. gas lines, water and sewerage mains, electrical high voltage cables, on the bridge, buried and overhead,
- Movement of construction vehicles on site, taking into consideration steep slopes, other traffic and existing services,
- Exposure to possible injuries due to mishandling or failure of power and hand tools,
- Risks related to general safety and security on site.

Additional risks may arise from specific methods of construction selected by the Contractor which are not necessary covered in the above.

2: DEFINITIONS

For the purpose of this contract the following shall apply:

- (a) **"Employer"** where used in the contract documents and in this specification, means the Employer as defined in the General Conditions of Contract and it shall have the exact same meaning as **"client"** as defined in the Construction Regulations 2014. **"Employer"** and **"client"** is therefore interchangeable and shall be read in the context of the relevant document.
- (b) **"Contractor"**, wherever used in the contract documents and in this specification, shall have the same meaning as **"Contractor"** as defined in the General Conditions of Contract.

In this specification the terms **"principal contractor"** and **"contractor"** are replaced with **"Contractor"** and **"subcontractor"** respectively.

For the purpose of this contract the **Contractor** will, in terms of OHSA 1993, be the mandatory, without derogating from his status as an employer in his own right.

- (c) **"Engineer" where used in this specification, means the Engineer as defined in the General Conditions of Contract. In terms of the Construction Regulations the Engineer may act as agent on behalf of the Employer (the client as defined in the Construction Regulations).**

3: APPLICATION FOR CONSTRUCTION WORK PERMIT

The Employer shall at least 30 days before work is to be carried out apply to the Provincial Director of the Department in writing for a construction work permit if the intended works:

- (a) Exceeds 180 days;
- (b) Involves more than 1800 person days;
- (c) The value of the works equals to or exceeding thirteen million rands of CIDB grade level 6.

The application shall be done using form Annexure 1.

4: TENDERS

The Contractor shall submit the following with his tender:

- (a) a documented Health and Safety Plan as stipulated in Regulation 7 of the Construction Regulations. The Safety Plan must be based on the Construction Regulations 2014 and will be subject to approval by the Employer;
- (b) a declaration to the effect that he has the competence and necessary resources to carry out the work safely in compliance with the Construction Regulations 2014;
- (c) a declaration to the effect that he made provision in his tender for the cost of the health and safety measures envisaged in the Construction Regulations.
- (d) Failure to submit the foregoing with his tender, will lead to the conclusion that the Contractor will not be able to carry out the work under the contract safely in accordance with the Construction Regulations.

5: NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION WORK

After award of the contract, but before commencement of construction work, the Contractor shall, in terms of Regulation 3, notify the Provincial Director of the Department of Labour in writing if the following work is involved:

- (a) the demolition of structures and dismantling of fixed plant of height of 3,0 m or more;
- (b) the use of explosives;
- (c) excavation work deeper than 1,0 m; or
- (d) working at a height where there is a risk of falling.

The notification must be done in the form of the Annexure 2 included in the tender document.

A copy of the notification form must be kept on site, available for inspection by inspectors, Employer, Engineer, employees and persons on site.

6: RISK ASSESSMENT

The Employer shall prepare a baseline risk assessment for the construction project and prepare a site specification Health & Safety specification.

Before commencement of any construction work during the construction period, the Contractor shall have a risk assessment performed and recorded in writing by a competent person. (Refer Regulation 7 of the Construction Regulations 2014).

The risk assessment shall identify and evaluate the risks and hazards that may be expected during the execution of the work under the contract, and it shall include a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards identified.

The risk assessment shall be available on site for inspection by inspectors, Employer, Engineer, subcontractors, employees, trade unions and health and safety committee members, and must be monitored and reviewed periodically by the Contractor.

7: APPOINTMENT OF EMPLOYEES AND SUBCONTRACTORS

7.1 Health and Safety plan

The Contractor shall appoint his employees and any subcontractors to be employed on the contract, in writing, and he shall provide them with a copy of his documented Health and Safety Plan, or relevant sections thereof. The Contractor shall ensure that all subcontractors and employees are committed to the implementation of his Safety Plan.

7.2 Health and safety induction training

The Contractor shall ensure that all employees under his control, including subcontractors and their employees, undergo a health and safety induction training course by a competent person before commencement of construction work. No visitor or other person shall be allowed or permitted to enter the site of the works unless such person has undergone health and safety training pertaining to hazards prevalent on site.

The Contractor shall ensure that every employee on site shall at all times be in possession of proof of the health and safety induction training issued by a competent person prior to commencement of construction work.

8: APPOINTMENT OF SAFETY PERSONNEL

8.1: Construction Supervisor

The Contractor shall appoint a full-time **Construction Supervisor** with the duty of supervising the performance of the construction work.

He may also have to appoint one or more competent employees to assist the construction supervisor where justified by the scope and complexity of the works.

8.2: Construction safety officer

Taking into consideration the size of the project and the hazards or dangers that can be expected, the Contractor shall appoint in writing a full-time or part-time **Construction Safety Officer** if so decided by the Inspector of the Department of Labour. The Safety Officer shall have the necessary competence and resources to perform his duties diligently.

Provision shall be made by the Contractor in his rates, to cover the cost of this dedicated construction safety officer appointed after award of the contract.

8.3: Health and safety representatives

In terms of **Sections 17 and 18 of the Act (OHSA 1993)** the Contractor, being the employer in terms of the Act for the execution of the contract, shall appoint a **health and safety representative** whenever he has more than 20 employees in his employment on the site of the works. The health and safety representative must be selected from employees who are employed in a full-time capacity at a specific workplace.

The number of health and safety representatives for a workplace shall be at least one for every 100 employees.

The function of the health and safety representative(s) will be to review the effectiveness of health and safety measures, to identify potential hazards and major incidents, to examine causes of incidents (in collaboration with his employer, the Contractor), to investigate complaints by employees relating to health and safety at work, to make representations to the employer (Contractor) or inspector on general matters affecting the health and safety of employees, to inspect the workplace, plant, machinery etc. on a regular base, to participate in consultations with inspectors and to attend meetings of the health and safety committee.

8.4: **Health and safety committee**

In terms of **Sections 17 and 18 of the Act (OHSA 1993)** the Contractor (as employer), shall establish one or more **health and safety committee(s)** where there are two or more health and safety representatives at a workplace. The persons selected by the Contractor to serve on the committee shall be designated in writing.

The function of the health and safety committee shall be to hold meetings at regular intervals, but at least once every three months, to review the health and safety measures on the contract, to discuss incidents related to health and safety with the Contractor and the inspector, and to make recommendations regarding health and safety to the Contractor and to keep record of recommendations and reports made by the committee.

8.5: **Competent persons**

In accordance with the Construction Regulations the Contractor has to appoint in writing **competent persons** responsible for supervising construction work on each of the following work situations that may be expected on the site of the works.

- (a) Risk assessment and induction training as described in Regulation 9 of the Construction Regulations;
- (b) Fall protection as described in Regulation 10;
- (c) Structures work as described in Regulation 11;
- (d) Temporary works as described in Regulation 12;
- (e) Excavation work as described in Regulation 13;
- (f) Demolition work as described in Regulation 14;
- (g) Scaffolding work as described in Regulation 16;
- (h) Suspended platform operations as described in Regulation 17;
- (i) Rope access work as described in Regulation 18;
- (j) Material hoist as described in Regulation 19;
- (k) Bulk Mixing Plant as described in Regulation 20;
- (l) Explosive activated fixing device as described in Regulation 21;
- (m) Cranes as described in Regulation 22;
- (n) Construction vehicle and mobile plant inspections on a daily basis by a competent person as described in Regulation 23;
- (o) Electrical installations and mechanisms on construction site as described in Regulation 24;
- (p) Use and storage of flammable liquids on construction site as described in Regulation 25;
- (q) Water Environments as described as Regulation 26;
- (r) Housekeeping and general safeguarding on construction sites as described in Regulation 27;
- (s) Stacking and storage on construction site as described in Regulation 28;
- (t) Fire Precautions as described in Regulation 29; and
- (u) Construction employer facilities as described in Regulation 30.

A competent person may be appointed for more than one part of the construction work with the understanding that the person must be suitably qualified and able to supervise at the same time the construction work on all the work situations for which he has been appointed.

The appointment of competent persons to supervise parts of the construction work does not relieve the Contractor from any of his responsibilities to comply with **all** requirements of the Construction Regulations.

9: RECORDS AND REGISTERS

In accordance with the Construction Regulations the Contractor is bound to keep records and registers related to health and safety on site for periodic inspection by inspectors, the Engineer, the Employer, trade union officials and subcontractors and employees. The following records and registers must be kept on site and shall be available for inspection at all times.

- (a) A copy of the OSHA 1993 Construction Regulations 2014;
- (b) A copy of this Health and Safety Specification;
- (c) A copy of the Contractor's Health and Safety Plan (Regulation 7);
- (d) A copy of the Notification of Construction Work (Regulation 3);
- (e) A health and safety file in terms of Regulation 5(7) with inputs by the Construction Safety Officer [Regulation 6(7)];
- (f) A copy of the risk assessment described in Regulation 7;
- (g) A full protection plan and the corresponding records of evaluation and training of employees working from elevated positions as described in Regulation 8;
- (h) Drawings pertaining to the design of structures [Regulation 9(3)] and formwork and support work structures [Regulation 10(d)] must be kept on site;
- (i) Pronouncement of the safety of excavations must be recorded in a register to be kept on site [Regulation 11(3)(h)];
- (j) A copy of the certificate of the system design for suspended platforms [Regulation 15(3)];
- (k) A notice must be affixed around the base towers of material hoists to indicate the maximum mass load, which may be carried at any one time by material hoists [Regulation 7(5)].
- (l) Maintenance records of material hoists and inspection results must be kept in a record book to be kept on site [Regulation 17(8)];
- (m) A record of any repairs to or maintenance of a batch plant must be kept on site [Regulation 18(9)];
- (n) A warning notice must be displayed in a conspicuous manner when and wherever an explosive powered tool is used [Regulation 19(2)];
- (o) A register for recording of findings by the competent person appointed to inspect construction vehicles and mobile plant [Regulation 21(1)(j)].

10: CONTRACTOR'S RESPONSIBILITIES

The Contractor's duties and responsibilities are clearly set out in the Construction Regulations 2003, and are not repeated in detail but some important aspects are highlighted hereafter, without relieving the Contractor of any of his duties and responsibilities in terms of the Construction Regulations.

- (a) Contractor's position in relation to the Employer (Client) (Regulation 4)

In accordance with Section 4 of the Regulations, the Contractor shall liaise closely with the Employer or the Engineer on behalf of the Employer, to ensure that all requirements of the Act and the Regulations are met and complied with.

- (b) The Principal Contractor and Contractor (Regulation 5)

The Contractor is in terms of the definition in Regulation 2(b) the equivalent of Principal Contractor as defined in the Construction Regulations, and he shall comply with all the provisions of Regulation 5.

Any subcontractors employed by the Contractor must be appointed in writing, setting out the terms of the appointment in respect of health and safety. An independent subcontractor shall however provide and demonstrate to the Contractor a suitable, acceptable and sufficiently documented health and safety plan before commencement of the subcontract. In the absence of such a health and safety plan the subcontractor shall undertake in writing that he will comply with the Contractor's safety plan, the health and safety specifications of the Employer and the Construction Regulations 2003.

(c) Supervision of construction work (Regulation 6)

The Contractor shall appoint the safety and other personnel and employees as required in terms of Regulation 6 and as set out in paragraph 7 above. Appointment of those personnel and employees does not relieve the Contractor from any of the obligations under Regulation 6.

(d) Risk assessment (Regulation 7)

The Contractor shall have the risk assessment made as set out in paragraph 7 above before commencement of the work, and it must be available on site for inspection at all times. The Contractor shall consult with the health and safety committee or health and safety representative(s) etc. on a regular basis to ensure that all employees, including subcontractors under his control, are informed and trained by a competent person regarding health hazards and related work procedures.

No subcontractor, employee or visitor shall be allowed to enter the site of works without prior health and safety induction training, all as specified in Regulation 7.

(e) Fall protection (Regulation 10)

Fall protection, if applicable to this contract shall comply in all respects with Regulation 10 of the Construction Regulations.

(f) Structures (Regulation 11)

The Contractor will be liable for all claims arising from collapse or failure of structures if he failed to comply with all the specifications, project specifications and drawings related to the structures, unless it can be proved that such collapse or failure can be attributed to faulty design or insufficient design standards on which the specifications and the drawings are based.

In addition the Contractor shall comply with all aspects of Regulation 11 of the Construction Regulations.

(g) Formwork and support work (Regulation 11)

The Contractor will be responsible for the adequate design of all formwork and support structures by a competent person.

All drawings pertaining to formwork shall be kept on site and all equipment and materials used in formwork, shall be carefully examined and checked for suitability by a competent person.

The provisions of Regulation 11 of the Construction Regulations shall be followed in every detail.

(h) Excavation work (Regulation 13)

It is essential that the Contractor shall follow the instructions and precautions in the Standard Specifications and Project Specifications as well as the provisions of the Construction Regulations to the letter as unsafe excavations can be a major hazard on any construction site. The Contractor shall therefore ensure that all excavation work is carried out under the supervision of a competent person, that inspections are carried out by a Professional Engineer or Technologist, and that all work is done in such a manner that no hazards are created by unsafe excavations and working conditions.

Supervision by a competent person will not relieve the Contractor from any of his duties and responsibilities under Regulation 13 of the Construction Regulations.

(i) Demolition work (Regulation 14)

Whenever demolition work is included in a contract, the Contractor shall comply with all the requirements of Regulation 14 of the Construction Regulations. The fact that a competent person has to be appointed by the Contractor, does not relieve the Contractor from any of his responsibilities in respect of safety of demolition work.

(j) Scaffolding (Regulation 16)

The Contractor shall ensure that all the provisions of Regulation 16 of the Construction Regulations are complied with. [Note : Reference in the Regulations to “Section 44 of the Act” should read “Section 43 of the Act”]

(k) Suspended platforms (Regulation 17)

Wherever suspended platforms will be necessary on any contract, the Contractor shall ensure that copies of the system design issued by a Professional Engineer are submitted to the Engineer for inspection and approval. The Contractor shall appoint competent persons as supervisors and competent scaffold erectors, operators and inspectors and ensure that all work related to suspended platforms are done in accordance with Regulation 17 of the Construction Regulations.

(l) Boatswain's chairs (Regulation 18)

Where boatswain's chairs are required on the construction site, the Contractor shall comply with Regulation 18.

(m) Material Hoists (Regulation 19)

Wherever applicable, the Contractor shall comply with the provisions of Regulation 19 to the letter.

(n) Batch plants (Regulation 20)

Wherever applicable, the Contractor shall ensure that all lifting machines, lifting tackle, conveyors, etc. used in the operation of a batch plant shall comply with, and that all operators, supervisors and employees are strictly held to the provisions of Regulation 20. The Contractor shall ensure that the General Safety Regulations (Government Notice R1031 of 30 May 1986), the Driven Machinery Regulations (Government Notice R295 of 26/2/1988) and the Electrical Installation Regulations (Government Notice R2271 of 11/10/1995) are adhered to by all involved.

In terms of the Regulations, records of repairs and maintenance shall be kept on site.

(o) Explosive powered tools (Regulation 21)

The Contractor shall ensure that, wherever explosive-powered tools are required to be used, all safety provisions of Regulation 21 are complied with.

It is especially important that warning notices are displayed and that the issue and return of cartridges and spent cartridges be recorded in a register to be kept on site.

(p) Cranes (Regulation 22)

Wherever the use of tower cranes becomes necessary, the provisions of Regulation 20 shall be complied with.

(q) Construction vehicles and mobile plant (Regulation 23)

The Contractor shall ensure that all construction vehicles and plant are in good working condition and safe for use, and that they are used in accordance with their design and intended use. The vehicles and plant shall only be operated by workers or operators who have received appropriate training, all in accordance with all the requirements of Regulation 23.

All vehicles and plant must be inspected on a daily basis, prior to use, by a competent person and the findings must be recorded in a register to be kept on site.

(r) Electrical installation and machinery on construction sites (Regulation 24)

The Contractor shall comply with the Electrical Installation Regulations (Government Notice R2920 of 23 October 1992) and the Electrical Machinery Regulations (Government Notice R1953 of 12 August 1993). Before commencement of construction, the Contractor shall take adequate steps to ascertain the presence of, and guard against dangers and hazards due to electrical cables and apparatus under, over or on the site.

All temporary electrical installations on the site shall be under the control of a competent person, without relieving the Contractor of his responsibility for the health and safety of all workers and persons on site in terms of Regulation 24.

(s) Use of temporary storage of flammable liquids on construction sites (Regulation 25)

The Contractor shall comply with the provisions of the General Safety Regulations (Government Notice R1031 of 30 May 1986) and all the provisions of Regulation 25 of the Construction Regulations to ensure a safe and hazard-free environment to all workers and other persons on site.

(t) Water environments (Regulation 26)

Where construction work is done over or in close proximity to water, the provisions of Regulation 26 shall apply.

(u) Housekeeping on Construction sites (Regulation 27)

Housekeeping on all construction sites shall be in accordance with the provisions of the environmental Regulations for workplaces (Government Notice R2281 of 16 October 1987) and all the provisions of Regulation 27 of the Construction Regulations.

(v) Stacking and storage on construction sites (Regulation 28)

The provisions for the stacking of articles contained in the General Safety Regulations (Government Notice R1031 of 30 May 1986) as well as all the provisions of Regulation 28 of the Construction Regulations shall apply.

(w) Fire precautions on construction sites (Regulation 29)

The provisions of the Environmental Regulations for Workplaces (Government Notice R2281 of 16 October 1987) shall apply.

In addition the necessary precautions shall be taken to prevent the incidence of fires, to provide adequate and sufficient fire protection equipment, sirens, escape routes etc. all in accordance with Regulation 29 of the Construction Regulations.

(x) Construction Employer facilities (Regulation 30)

The Contractor shall comply with the construction site provisions as in the Facilities Regulations (Government Notice R1593 of 12 August 1988) and the provisions of Regulation 30 of the Construction Regulations.

(y) Non-compliance with the Construction Regulations 2014

The foregoing is a summary of parts of the Construction Regulations applicable to all construction projects.

The Contractor, as employer for the execution of the contract, shall ensure that all provisions of the Construction Regulations applicable to the contract under consideration are complied with to the letter.

Should the Contractor fail to comply with the provisions of the Regulations 3 to 32 as listed in Regulation 33, he will be guilty of an offence and will be liable, upon conviction, to the fines or imprisonment as set out in Regulation 33.

The Contractor is advised in his own interest to make a careful study of the Act and the Construction Regulations as ignorance of the Act and the Regulations will not be accepted in any proceedings related to non-conformance to the Act and the Regulations.

C3.4.2 ENVIRONMENTAL MANAGEMENT SPECIFICATION

CONTENTS

- 1: PURPOSE**
- 2: RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT**
- 3: TRAINING AND INDUCTION OF EMPLOYEES**
- 4: COMPLAINTS REGISTER AND ENVIRONMENTAL INCIDENT BOOK**
- 5: ENVIRONMENTAL SAFETY**
- 6: MEASUREMENT AND PAYMENT**

ENVIRONMENTAL MANAGEMENT SPECIFICATION

1. PURPOSE

The purpose of the EMP is to encourage good management practices through planning and commitment with respect to environmental issues, and to provide rational and practical environmental guidelines to minimise disturbance of the natural environment.

2. RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT

The contractor will be responsible for environmental control on site during construction and the maintenance period. The construction activities will be monitored by an independent environmental specialist and audited against the EMP.

3. TRAINING AND INDUCTION OF EMPLOYEES

The contractor has a responsibility to ensure that all those people involved in the project are aware of and familiar with the environmental requirements for the project (this includes sub-contractors, casual labour, etc.).

4. COMPLAINTS REGISTER AND ENVIRONMENTAL INCIDENT BOOK

Any complaints received by the project team from the community will be recorded. The complaint will be brought to the attention of the site manager.

All complaints received will be investigated and a response given to the complainant within 28 days.

All environmental incidents occurring on the site will also be recorded.

5. ENVIRONMENTAL SAFETY

The management of impacts associated with various categories of concern is discussed as separate topics, indicated below.

5.1 Soil

- (a) Topsoil should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost.
- (b) Stockpiled topsoil should not be compacted and should be replaced as the final soil layer. No vehicles are allowed access onto the stockpiles after they have been placed.
- (c) Stockpiled soil should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season. The need for such measures will be indicated in the site-specific report.
- (d) Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. Topsoil obtained from sites with different soil types must not be mixed.

- (e) Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and micro-organisms in the soil.
- (f) Soil must not be stockpiled on drainage lines or near watercourses without prior consent from the Project Manager.
- (g) Soil should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be co-ordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds.
- (h) Limited vehicular access is allowed across rocky outcrops and ridges.
- (i) All cut and fill surfaces need to be stabilized with appropriate material or measures when major civil works are complete.
- (j) Erosion and donga crossings must be dealt with as river crossings. Appropriate soil erosion and control procedures must be applied to all embankments that are disturbed and destabilized.
- (k) All equipment must be inspected regularly for oil or fuel leaks before it is operated. Leakages must be repaired on mobile equipment or containment trays placed underneath immobile equipment until such leakage has been repaired.
- (l) Soil contaminated with oil must be appropriately treated and disposed of at a permitted landfill site or the soil can be regenerated using bio-remediation methods.
- (m) Runoff must be reduced by channelling water into existing surface drainage system.

5.2 Water

- (a) Adequate sedimentation control measures must be instituted at any river crossings when excavations or disturbance of a riverbanks or riverbeds takes place.
- (b) Adequate sedimentation control measures must be implemented where excavations or disturbance of drainage lines of a wetland may take place.
- (c) All fuel, chemical, oil, etc. spills must be confined to areas where the drainage of water can be controlled. Use appropriate structures and methods to confine spillages such as the construction of berms and pans, or through the application of surface treatments that neutralise the toxic effects prior to the entry into a water course.
- (d) Oil absorbent fibres must be used to contain oil spilt in water.
- (e) During construction through a wetland, the majority of the flow of the wetland should be allowed to pass downstream.
- (f) Vehicular traffic across wetland areas must be avoided.
- (g) No dumping of foreign material in streams, rivers and/or wetland areas is allowed.

- (h) The wetland area and/or river must not be drained, filled or altered in any way including alteration of a bed and/or, banks, without prior consent from the DWAF. The necessary licenses must be obtained in terms of Section 21 and 22 of the National Water Act, 36 of 1998 from DWAF.
- (i) No fires or open flames are allowed in the vicinity of the wetland, especially during the dry season.
- (j) No swimming, washing (including vehicles and equipment), fishing or related activity is permitted in a wetland or river without written permission from the Project Manager.
- (k) Disturbances to nesting, breeding and roaming sites of animals in or adjacent to wetland areas must be minimized.

5.3 Air

Speed limits must be implemented in all areas, including public roads and private property to limit the levels of dust pollution.

Dust must be suppressed on access roads and construction sites during dry periods by the regular application of water or a biodegradable soil stabilisation agent. Water used for this purpose must be used in quantities that must not result in the generation of run-off.

The site-specific investigation will quantify the impact of dust on nearby wetlands, rivers and dams in terms of sedimentation. Mitigation measures identified during the site specific study must be implemented.

The Contractor must notify the Principal of all schools within 50m of the site of proposed activities. The Principal must in turn ensure that children with allergies and respiratory ailments take the necessary precautionary measures during the construction period. The Contractor must ensure that construction activities do not disturb school activities e.g. dust clouds may reduce visibility affecting sports activities.

Waste must be disposed of, as soon as possible at a municipal transfer station, skip or on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours.

Noise control measures must be implemented. All noise levels must be controlled at the source. All employees must be given the necessary ear protection gear. IAP's must be informed of the excessive noise factors.

The Contractor must inform all adjacent landowners of any after-hour construction activities and any other activity that could cause a nuisance e.g. the application of chemicals to the work surface. Normal working hours must be clearly indicated to adjacent land owners.

No loud music is allowed on site and in construction camps.

No fires are allowed if smoke from such fires will cause a nuisance to IAP's.

5.4 Social and Cultural

- (a) Access by non-construction people onto any construction sites must be restricted. The Contractors activities and movement of staff must be restricted to designated construction areas only.
- (b) The Contractors crew must be easily identifiable due to clothing, identification cards or other methods.
- (c) Rapid migration of job seekers could lead to squatting and social conflict with resident communities and increase in social pathologies if not properly addressed. The Contractor must ensure that signs indicating the availability of jobs are installed.
- (d) Criteria for selection and appointment (by the Contractor) of construction labour must be established to allow for preferential employment of local communities. The Local Authority must be actively involved in the process of appointing temporary labourers.
- (e) Sub-Contractors and their employees must comply with all the requirements of this document and supporting documents e.g. the Contract document that applies to the Contractor. Absence of specific reference to the sub-contractor in any specification does not imply that the sub-contractor is not bound by this document.
- (f) No member of the construction workforce is allowed to wander around private property, except within the immediate surroundings of the site.
- (g) The Contractor must provide suitable sanitation facilities for site staff. Sanitation provided during the construction phase should be managed so that it does not cause environmental health problems. The use of the surrounding veld for toilet purposes is not permitted under any circumstance.
- (h) The Contractor must arrange for all his employees and those of his sub-contractors to be informed of the findings of the environmental report before the commencement of construction to ensure:
 - A basic understanding of the key environmental features of the work site and environments, and
 - Familiarity with the requirements of this document and the site specific report.
- (i) Supervisory staff of the Contractor or his sub-contractors must not direct any person to undertake any activities which would place such person in contravention of the specifications of this document, endanger his/her life or cause him/her to damage the environment.
- (j) The demand for construction materials and supplies will have an effect on the local economy. This impact can be optimised by sourcing and purchasing materials locally and regionally wherever possible, insofar as the material complies with the design specification.
- (k) The Contractor must maintain a detailed complaints register. This must be forwarded, together with solutions, to the authorities when requested.

5.5 Aesthetics

(a) Scenic Quality

Damage to the natural environment must be minimized.

Trees and tall woody shrubs must be protected from damage to provide a natural visual shield. Excavated material must not be placed on such plants and movement across them must not be allowed, as far as practical.

The clearing of all sites must be kept to a minimum and surrounding vegetation must, as far as possible, be left intact as a natural shield.

No painting or marking of natural features must be allowed.

- (b) All above ground structures could be treated or painted to blend in with the natural environment.
- (c) Cut and fill areas, river and stream crossings and other soil stabilisation works must be constructed to blend in with the natural environment.
- (d) Natural outcrops, rocky ridges and other natural linear features, must not be bisected. Vegetation on such features must, as far as possible, not be cut unless absolutely necessary for construction.
- (e) Excavated material must be flattened (not compacted) or removed from site. No heaps of spoil material must be left on site once the Contractor has moved to a new construction site.
- (f) Any complaints from interest groups regarding the appearance of the construction site must be recorded and addressed promptly by the Contractor.

5.6 Archaeology and Cultural Sites

- (a) All finds of human remains must be reported to the nearest police station.
- (b) Human remains from the graves of victims of conflict, or any burial ground or part thereof which contains such graves and any other graves that are deemed to be of cultural significance may not be destroyed, damaged, altered, exhumed or removed from their original positions without a permit from the South African Heritage and Resource Agency (SAHRA).
- (c) Work in areas where artifacts are found must cease immediately.
- (d) Under no circumstances must the Contractor, his/her employees, his/her sub-contractors or his/her sub-contractors' employees remove, destroy or interfere with archaeological artifacts. Any person who causes intentional damage to archaeological or historical sites and/or artifacts could be penalised or legally prosecuted in terms of the National Heritage Resources Act, 25 of 1999.
- (e) A fence at least 2 m outside the extremities of the site must be erected to protect archaeological sites.
- (f) All known and identified archaeological and historical sites must be left untouched.

- (g) Work in the area can only be resumed once the site has been completely investigated. The Project Manager will inform the Contractor when work can resume.

5.7 Flora

- (a) All suitable and rare flora and seeds must be rescued and removed from the site. They must be suitably stored, for future use in rehabilitation.
- (b) The felling and/or cutting of trees and clearing of bush must be minimised.
- (c) Bush must only be cleared to provide essential access for construction purposes.
- (d) The spread of alien vegetation must be minimized.
- (e) Any incident of unauthorised removal of plant material, as well as accidental damage to priority plants, must be documented by the Contractor.
- (f) Woody vegetative matter stripped during construction must either be spread randomly throughout the surrounding veld so as to provide biomass for other micro-organisms and habitats for small mammals and birds, or it may be stockpiled for later redistribution over the reinstated topsoiled surface. No vegetative matter must be burnt or removed for firewood other than those removed during the grubbing and clearing phase. Such vegetation can be made available to the local inhabitants to be used as firewood.
- (g) No tree outside the footprint of the Works area must be damaged.

5.8 Fauna

- (a) No species of animal may be poached, snared, hunted, captured or wilfully damaged or destroyed.
- (b) Snakes and other reptiles that may be encountered on the construction site must not be killed unless the animal endangers the life of an employee.
- (c) Anthills and/or termite nests that occur must not be disturbed unless it is unavoidable for construction purposes.
- (d) Disturbances to nesting sites of birds must be minimized.
- (e) The Contractor must ensure that the work site is kept clean and free from rubbish, which could attract pests.

5.9 Infrastructure

- (a) The relevant authorities must be notified of any interruptions of services, especially the Local Municipality, National Road Agency, Spoornet, TELKOM and ESKOM. In addition, care must be taken to avoid damaging major and minor pipelines and other services.
- (b) The integrity of property fences must be maintained.
- (c) No telephone lines must be dropped during the construction operations, except where prior agreement by relevant parties is obtained. All crossings must be protected, raised or relocated as necessary.
- (d) All complaints and/or problems related to impacts on man-made facilities and activities must be promptly addressed by the Contractor and documented.
- (e) Storage Facilities
 - Proper storage facilities should be provided for the storage of oils, grease, fuels, chemicals and hazardous materials.
 - The Contractor must ensure that accidental spillage does not pollute soil and water resources.
 - Fuel stock reconciliation must be done on all underground tanks to ensure no loss of oil, which could pollute groundwater resources.
 - Cement must be stored and mixed on an impermeable substratum.

(f) Traffic Control

All reasonable precautions must be taken during construction to avoid severely interrupting the traffic flow on existing roads, especially during peak periods.

Before any work can start the Local Traffic Department must be consulted about measures to be taken regarding pedestrian and vehicular traffic control.

(g) Access Roads

The Contractor and the affected landowner must collaborate on the planning and construction of new access routes and the repair or upgrading of existing routes.

Access to the site must be controlled such that only vehicles and persons directly associated with the work gains access to the site.

Temporary access roads must not be opened until required and must be restored to its former state as soon as the road is no longer needed.

(h) Batching Plants

Concrete must be mixed only in an area demarcated for this purpose. All concrete spilled outside this area, must be promptly removed by the Contractor and taken to a permitted waste disposal site. After all concrete mixing is complete, all waste concrete must be removed from the batching area and disposed of at an approved dumpsite. Stormwater must not be allowed to flow through the batching area. Water laden with cement must be collected in a retention area for evaporation and not allowed to escape the batching area. Operators must wear suitable safety clothing.

- (i) Chemical toilet facilities should be managed and serviced by a qualified company. No disposal or leakage of sewerage should occur on or near the site.

(j) Blasting

Blasting must not endanger public or private property.

Noise mufflers and/or soft explosives must be used to minimize the impact on animals.

All the provisions of the Explosives Act, 26 of 1956 and the Minerals Act, 50 of 1991 must be complied with.

The Contractor must take measures to limit flyrock.

5.10 Safety

- (a) Measures must be taken to prevent any interference that could result in flashover of power lines due to breaching of clearances or the collapse of power lines due to collisions by vehicles and equipment.
- (b) Measures must be taken during thunderstorms to protect workers and equipment from lightning strikes.
- (c) All tall structures must be properly earthed and protected against lightning strikes.
- (d) The process of excavation and back filling must be carried out as a sequential process following one another as quickly as possible. Excavations must only remain open for a minimum period of time and during this time they must be clearly demarcated. If excavations place the public at risk these sites must be fenced.
- (e) The residents directly affected by open trenches must be notified of the dangers. This will be done during the site-specific phase.

5.11 Waste

Solid Waste

- (a) Littering on site and the surrounding areas is prohibited.
- (b) Clearly marked litterbins must be provided on site. The Contractor must monitor the presence of litter on the work sites as well as the construction campsite.
- (c) All bins must be cleaned of litter regularly.
- (d) All waste removed from site must be disposed at a municipal/permitted waste disposal site.
- (e) Excess concrete, building rubble or other material must be disposed of in areas designated specifically for this purpose and not indiscriminately over the construction site.
- (f) The entire works area and all construction sites must be swept of all pieces of wire, metal, wood or other material foreign to the natural environment.
- (g) Contaminated soil must be treated and disposed of at a permitted waste disposal site, or be removed and the area rehabilitated immediately.
- (h) Waste must be recycled wherever possible.

Liquid Waste

- (a) The Contractor must maintain mobile toilets on site.
- (b) The Contractor must provide adequate and approved facilities for the storage and recycling of used oil and contaminated hydrocarbons. Such facilities must be designed and sited with the intention of preventing pollution of the surrounding area and environment.
- (c) All vehicles must be regularly serviced in designated area within the Contractors camp such that they do not drip oil.
- (d) All chemical spills must be contained and cleaned up by the supplier or professional pollution control personnel. Run-off from wash bays must be intercepted.

Hazardous Waste

- (a) No hazardous materials must be disposed of in the veld or anyplace other than a registered landfill for hazardous material. Hazardous waste must be stored in containers with tight lids that must be sealed and must be disposed at an appropriately permitted hazardous waste disposal site. Such containers must not be used for purposes other than those originally designed for.
- (b) The Contractor must maintain a hazardous material register.

5.12 Rehabilitation and Site clearance

- (a) When all major construction activities are completed, the site must be inspected to determine site-specific rehabilitation measures. This may be considered as unplanned work e.g. soil rehabilitation due to oil spills.
- (b) All temporary buildings and foundations, equipment, lumber, refuse, surplus materials, waste, construction rubble fencing and other materials foreign to the area must be removed.
- (c) If waste products cannot be recycled they must be disposed of at a permitted landfill site.
- (d) All drainage deficiencies including abandoned pit latrines and waste pits must be corrected.
- (e) Cut and fill areas must be restored and re-shaped.
- (f) The area must be restored to its natural vegetation condition using indigenous trees, shrubs and grasses as directed by a grassland and/or rehabilitation expert.
- (g) Borrow pits must be re-shaped into even slopes and surfaces to blend with the natural terrain and topsoil must be replaced.
- (h) The grass mix, shrubs and trees used for rehabilitation must be compatible with the species identified in the site-specific investigation.
- (i) Areas compacted by vehicles during construction must be scarified to allow penetration of plant roots and the regrowth of natural vegetation.

6. MEASUREMENT AND PAYMENT

No additional payment will be made to the Contractor to comply with the above actions as it will be deemed to be included in the rates tendered.

C3.4.3 PART LGM : GEOMEMBRANE LINER**CONTENTS****Clause**

LGM.1	SCOPE
LGM.2	DEFINITIONS
LGM.3	MATERIALS
LGM.3.1	General
LGM.3.2	Slopes
LGM.4	PLANT
LGM.5	CONSTRUCTION
LGM.5.1	Manufacturing Quality Control and Manufacturing Quality Assurance
LGM.5.2	Construction Quality Control
LGM.5.3	Material Delivery
LGM.5.4	Geomembrane Installation
LGM.6	TOLERANCES
LGM.7	TESTING
LGM.7.1	Seam Testing
LGM.7.2	Vacuum Testing
LGM.7.3	Destructive Testing
LGM.7.4	Specified Testing of Destructive Seam Samples
LGM.7.5	Defects and Repairs
LGM.8	MEASUREMENT AND PAYMENT
LGM.8.1	Supply of Geomembrane
LGM.8.2	Installation of Geomembrane
LGM.8.3	Electronic Leak Location

LGM GEOMEMBRANE LINER**LGM.1 SCOPE**

This Specification covers the supply and installation of a Geomembrane Liner for a Municipal Waste Landfill. It does not include earthworks and protection layers or drainage systems which are covered separately.

LGM.2 DEFINITIONS

For the purposes of this Specification, the following definitions shall apply:

Any reference to the “liner”, “lining” or “geomembrane” shall be deemed to refer to the **Geomembrane Liner** to the base and side slopes of the Landfill.

- **Manufacturing Quality Control (MQC)** : A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and Contract Specifications.
- **Manufacturing Quality Assurance (MQA)** : A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and Contract Specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organisation to determine if the manufacturer is in compliance with the product certification and Contract Specifications for a project.
- **Manufacturing Quality Control (CQC)** : A planned system of inspections that is used to directly monitor and control the quality of a construction project. Construction quality control should be performed by the Lining Subcontractor or for soil and treated soil materials by the Main Contractor, and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the installer or Contractor to determine compliance with the requirements for materials and workmanship as stated in the Drawings and Specifications for the Project.
- **Construction Quality Assurance (CQA)** : A planned system of activities that provides the Employer, Engineer and Permitting Authorities assurance that the facility was constructed as specified in the design. Construction quality assurance includes inspections, verifications, audits and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the Engineer to assess if the Lining Subcontractor is in compliance with the Drawing and Specifications for the Project.

LGM.3 MATERIALS**LGM.3.1 General**

The Geomembrane Liner to the Leachate Collection System shall generally comply with the requirements of the Minimum Requirements for Waste Disposal by Landfill (Second Edition 1998) or shall meet with the approval of the Department of Water and Sanitation (DWS).

Although a 1.5mm HDPE lining material is specified, alternatives acceptable to DWAF may be considered provided it has well established and successful performance record in this application. The results of successful test programmes to establish the durability of the liner material should be available confirming its resistance to leachate generated by Municipal solid waste should be provided. It is noted that the minimum thickness of the membrane shall be that specified.

It may be that the Contractor employs a specialist lining subcontractor to supply and install the approved geomembrane lining. Notwithstanding this the Contractor shall remain responsible for all aspects of the geomembrane lining.

It is recognised that due to the differences in the chemical constituents of materials making up the geomembrane, as well as the variations in manufacturing processes by which geomembrane liners may be made, the physical and chemical properties of the various types of liner may be quite distinct.

The Tenderer shall submit at least the following data and the relevant test method, as well as all other pertinent details, to enable the Engineer to evaluate the material from a technical aspect. The provision of the details below shall not necessarily be sufficient for the material to be evaluated and other testing and test results may be requested by the Engineer, at his discretion, before the material proposed by any Tenderer can be considered for this project.

Thickness	-	Average value
	-	Minimum value
Density		
Melt Flow Index (Max)		
Carbon Black	-	Content
	-	Dispersion
Tensile Properties	-	Stress at yield
	-	Stress at break
	-	Strain at yield
	-	Strain at break
Tear Resistance		
Puncture Resistance		
ESCR		
Dimensional Stability (Max)		
Seaming	-	Shear strength
	-	Peel adhesion (Fusion)
	-	Peel adhesion (Extrusion)

The geomembrane supplied shall be textured on both sides. The texturing shall be embossed or co extruded.

The geomembrane shall provide an interface friction between its surface (both sides) and a non-woven geofabric of

Peak Shear Strength (kPa)	Normal Load (kPa)
22 – 25	50
50 – 100	100
100 – 150	200
145 – 180	300

The residual friction angle between the geomembrane and the non-woven geofabric shall be greater than 17°.

Tenderers should also note that the geomembrane liner selected should be resistant to degradation by sunlight, ultra-violet rays, ozone, airborne pollution, weathering and leachate generated by Municipal Solid Waste.

It is expected that leachate composition will vary with time over and beyond the life of the landfill but will contain a range of contaminants, including simple organic acids and alcohols, ammonia, humic and fulvic acids as well as inorganic salts high in sodium, calcium, chloride, sulphate and iron.

LGM.4 PLANT

The appropriate specialist plant as required for the installation of the geomembrane shall be provided.

LGM.5 CONSTRUCTION

LGM.5.1 Manufacturing Quality Control and Manufacturing Quality Assurance

Tenderers shall submit with their Tenders details of the Manufacturing Quality Control (MQC) and Manufacturing Quality Assurance (MQA) procedures that are utilised by the manufacturer and supplier respectively of the offered products.

Non-compliance with this part of the Specification may be considered sufficient grounds to reject the Tender.

Details of typical Construction Quality Control procedures that should be adopted by the Contractor are given hereafter, notwithstanding that he may employ a specialist lining subcontractor to undertake the work.

LGM.5.2 Construction Quality Control

This Specification addresses the minimum measures that should be incorporated by the Contractor in his Construction Quality Control Programme to ensure the quality of workmanship and the installation integrity generally, of a geomembrane liner. **A suitably modified but similar Construction Quality Control Programme is required for any alternative liner type proposed.**

It is recognised that careful and specific documentation of the installation procedure is required to substantiate this Construction Quality Control Programme. The onus shall be on the Contractor to ensure that his Quality Control Co-ordinators carries out his task to the satisfaction of the Engineer.

LGM.5.3 Material Delivery

The Engineer or his representative should be present, whenever possible, to observe the material delivery and unloading on Site. The Engineer or his representative is to note any material received in a damaged state and to remove any necessary conformance samples.

Upon mobilisation to Site, the Contractor shall :

- verify the equipment used on Site is adequate and does not risk damage to the geomembrane or other material,
- mark rolls or portions of rolls which appear damaged,
- verify that storage of materials ensure adequate protection against dirt, theft, vandalism and passage of vehicles,
- ensure that rolls are properly labelled and that labelling corresponds with Quality Control documentation,
- complete roll numbers, date, roll size and any damage will be logged on the material delivery checklist (Annexure E).

LGM.5.4 Geomembrane Installation

LGM.5.4.1 Preparation for Geomembrane Liner Deployment

Panel Layout

Prior to commencement of a liner deployment, layout drawings shall be produced to indicate the panel configuration and general location of field seams for the project.

Identification

Each panel used for the installation will be given a number which will be correlated with a batch or roll number. This panel identification number shall be related on the panel placement form, which will be used when required.

LGM.5.4.2 Field Panel Placement***Weather Conditions***

Geomembrane deployment will generally not be done during any precipitation, in the presence of excessive moisture, in an area of standing water, or during high winds.

Location

The Contractor will attempt to install field panels as indicated on the layout drawing. If the panels are deployed in a location other than that indicated on the layout drawings, the revised location will be noted in the field.

These notations will be maintained and submitted by the Contractor as determined on a site specific basis.

Documentation of Panel Placement

Information relating to geomembrane panel placement including date, time, panel number, and panel dimensions may be maintained on a site specific basis on the panel placement as presented in **Annexure E**.

If a portion of a roll is set aside to be used at another time, the roll number will be written on the remainder of the roll in several places.

Method of Deployment

The method and equipment used to deploy the panels must not damage the geomembrane or the supporting base material.

No personnel working on the geomembrane will wear shoes that can damage the liner or engage in actions which could result in damage to the geomembrane.

Adequate temporary loading and/or anchoring (i.e. sand bags, tyres) which will not damage the geomembrane, should be placed by the Contractor to prevent uplift of the liner by wind.

The geomembrane will be deployed with slack to allow for typical thermal expansion.

Any area of a panel seriously damaged (torn, twisted or crimped) will be marked and repaired in accordance with Clause LGM.1.7.5 of this Specification.

LGM.5.4.5 Geomembrane Field Seaming

General Requirements

Layout

In general, seams shall be oriented parallel to the slope, i.e. oriented along, not across the slope. Whenever possible, horizontal seams should be located on the base of the cell, not less than two metres from the toe of the slope. Each seam made in the field shall be numbered. Seaming information to include seam number, welder ID, machine number, temperature setting and weather conditions may be maintained on the Panel Seaming Form as presented in **Annexure E**.

Personnel

All personnel performing seaming operations shall be trained in the operation of the specific seaming equipment being used and will qualify by successfully welding a test seam as described in the Specifications.

Equipment

Fusion Welding

Fusion welding consists of placing a heated wedge, mounted on a self propelled vehicular unit, between two (2) overlapped sheets such that the surface of both sheets are heated above the geomembrane material's melting point. After being heated by the wedge, the overlapped panels pass through a set of preset pressure wheels which compress the two (2) panels together to form the weld. The fusion welder is equipped with a device which continuously monitors the temperature of the wedge.

Extrusion Fillet Welding

Extrusion fillet welding consists of introducing a ribbon of molten resin along the edge of the overlap of the two (2) geomembrane sheets to be welded. A hot air preheat and the addition of molten polymer causes some of the material of each sheet to be liquefied resulting in a homogeneous bond between the molten weld bead and the surfaces of the overlapped sheets. The extrusion welder is equipped with gauges giving the temperature in the apparatus and a numerical setting for the pre-heating unit.

Weather Conditions

Factors such as the geomembrane temperature, humidity, wind, precipitation, etc., can affect the integrity of field seams and must be taken into account when deciding whether or not seaming should proceed. Test seams, are required prior to daily production seaming to determine if the weather conditions will affect the Contractor's ability to produce quality seams. Additional non-destructive and destructive testing of production seams should be done to substantiate the decision made by the Contractor to seam on any given day.

Seam Preparation

Fusion Welding

The panels of the geomembrane should be overlapped by approximately 100mm to 150mm prior to welding.

The seam area should be cleaned prior to seaming to ensure the area is clean and free of moisture, dust, dirt, or debris of any kind.

The panels should be adjusted so that seams are aligned with the fewest possible number of wrinkles and "fishmouths".

A movable protective layer may be used, at the discretion of the Contractor, directly below the overlap of geomembrane that is to be seamed to prevent build-up of dirt or moisture between the panels.

Extrusion Fillet Welding

Whenever possible, the sheet should be bevelled prior to heat tacking into place.

The panels of geomembrane should be overlapped a minimum of 75mm.

Using a hot air device, the panels of geomembrane to be welded should be temporarily tacked taking care not to damage the liner.

The seam area should be cleaned prior to seaming to assure the area is clean and free of moisture, dust, dirt, and debris of any kind.

The seam overlap should be ground prior to welding within one (1) hour of the welding operation in a manner that does not damage the geomembrane. Grind marks should be covered with extrudate whenever possible. In all cases grinding should not extend more than 5mm past the edge of the area covered by the extrudate during welding.

The extruder should be purged prior to beginning the seam to remove all heat degraded extrudate from the barrel.

The welding rod should be kept clean and dry.

Trial Welds

Trial welds shall be conducted by welding technicians prior to each seaming period, every five (5) hours, as weather conditions dictate, or as requested by personnel if welding problems are suspected, or if requested by the engineer or his representative. All trial welds will be conducted under the same conditions as will be encountered during actual seaming. Once qualified by a passing trial weld, welding technicians will not change parameters without performing another trial weld.

Trial Weld Lengths

The trial weld shall be made by joining two (2) pieces of geomembrane, each piece at least 150mm in width. Trial welds for fusion welds will be approximately 5m long and extrusion trial welds will be a minimum of 1.5m long.

Sample Procedure

The seam should be visually inspected for squeeze out, footprint, pressure and general appearance.

Three (3) 25mm wide specimens should be cut, one (1) from the middle of the seam and one each 300mm from each end of the test seam using a 25mm die cutter. The specimens shall then be tested in peel using a field tensiometer.

In order for a trial weld to be considered acceptable, all three specimens must meet the following criteria :

Exhibit Film Tearing Bond (FTB)

If any specimen is non-conforming the entire procedure shall be repeated. In the case of double track fusion welded seams, both welds must pass in order to be considered acceptable.

If repeat tests utilising reasonable sets of welding parameters also fail, the seaming apparatus shall not be accepted and shall not be used for seaming until the deficiencies are corrected and a passing test seam is achieved.

Trial Weld Documentation

The CQC co-ordinator and the Engineer or his representative will be present during peel testing and will record date, time, operator, machine number, ambient and operating temperatures, speed setting, peel values, and pass/ fail designation.

All trial weld records shall be maintained on the Trial Weld Form as exhibited in Annexure E.

The CQC co-ordinator will give final approval to proceed with welding once the Engineer or his representative has verified that he too is satisfied that all procedures have been correctly completed.

General Seaming Procedures

Seaming shall extend into the anchor trench.

While welding a seam the proper overlap should be monitored and maintained.

The seam area should be inspected to ensure that it is clean and free of moisture, dust, dirt or debris of any kind.

Welding technicians should periodically check machine operating temperatures and speed, and mark this information on the geomembrane.

Wrinkles at the seam overlap should be aligned to allow welding through the wrinkle.

"Fishmouths" or wrinkles at seam overlaps that cannot be welded through should be cut along the ridge in order to achieve a flat overlap. The cut "fishmouth" or wrinkle should be heat tacked flat and extruded or patched with an oval or round patch of the same geomembrane extending a minimum 75mm beyond the cut in all directions.

All cross/butt seams between two (2) rows of seamed panels should be welded during the coolest time of the day when practical, to allow for typical thermal expansion of the geomembrane.

Prior to welding cross/butt seams, the top and bottom overlap of intersecting fusion welded seams should be trimmed to 150mm. Intersecting extrusion fillet welded seams should be ground to flatten the extrusion bead prior to welding butt seams.

All "T" joints produced as a result of cross/butt seams should be extrusion fillet welded. Overlap on each "leg" of the "T" joint should be trimmed back 150mm. Then a distance of 75mm minimum on each of the three (3) legs of the "T" should be ground and all of the area prepared by grinding should be extrusion welded.

Whenever possible welding technicians should cut a 25mm peel specimen at the end of every seam. Prior to welding the next seam, the specimen will be tested for peel.

In the event non-complying seam test strips are encountered the welding machine will be taken out of service until a passing trial weld is obtained, and additional peel specimens will be taken to localise the flaw.

The Engineer or his representative may order the CQC co-ordinator to take destructive samples from any seam, if defects are suspected.

Seaming Documentation

Welding technicians should mark on the liner with permanent markers at the start of all seams information regarding date, time, welding technician ID, machine number and set temperature. The CQC co-ordinator should record date, time, seam number, welding technician ID, machine ID, set temperature, speed and weather conditions on the Panel Seaming Form (**Appendix F**).

Welding technicians should periodically check operating temperature and speed and mark the information along the seam.

The CQC co-ordinator should make periodic checks on welding operations to verify overlap, cleanliness etc.

LGM.6 TOLERANCES

Tolerances applicable are covered under Section 7 : Testing.

LGM.7 TESTING**LGM.7.1 Seam Testing*****Air Pressure Testing******Equipment for Air Testing***

An air pump (manual or motor driven) capable of generating and sustaining a pressure between 138 kPa to 414 kPa.

A rubber hose with fittings and connections.

A sharp hollow needle, or other approved pressure feed device with a pressure gauge capable of reading and sustaining a pressure between 0 kPa to 414 kPa.

Procedure for Air Testing

Both ends of the seam to be tested should be sealed.

A needle or other approved pressure feed device should be inserted into the sealed channel created by the fusion weld.

The test channel should be inflated to a pressure of approximately 207 kPa and the pressure maintained within the range listed in the initial pressure schedule. With the valve closed the initial pressure should be observed and recorded.

Initial Pressure Schedule *

Material (mm)	Minimum kPa	Maximum kPa
1.0	166	207
1.5	186	241
2.0	207	241
2.5	207	241

- * Initial pressure settings should be recorded after an optional two (2) minute stabilisation period. The purpose of this "relaxing period" is to permit the air temperature and pressure to stabilise. The initial pressure reading may be recorded once stabilisation has taken place.

The air pressure should be observed and recorded five (5) minutes after the initial pressure setting is recorded. If loss of pressure exceeds the following or if the pressure does not stabilise, the suspect area should be located and repaired in accordance with Clause LGM.1.7.5.

Maximum Permissible Pressure Differential After 5 minutes - HDPE/VLDPE

Material (mm)	Pressure Differential
1.0	28 kPa
1.5	21 kPa
2.0	14 kPa
2.5	14 kPa

At the conclusion of all pressure tests, the end of the air channel opposite the pressure gauge should be cut. A decrease in gauge pressure must be observed or the air channel will be considered "blocked" and the test will have to be repeated from the point of blockage. If the point of blockage cannot be found the air channel in the middle of the seam should be cut and each half treated as a separate test.

The pressure feed needle should be removed and the resulting hole sealed by extrusion welding.

Procedure for Non-Complying Air Pressure Test

In the event of a non-complying air pressure test the following procedure should be followed:

The seam end seals should be checked and seams re-tested

If a seam will not maintain the specified pressure the seam should be visually inspected to localise the flaw.

If the seam passes the visual inspection the overlap left by the wedge welder should be removed and the entire length of seam should be vacuum tested in accordance with this Clause.

- If a leak is located by the vacuum test, it should be repaired by extrusion fillet welding. The repair should be tested by vacuum testing.
- If no leak is discovered by vacuum testing, the seam will be considered to have passed non-destructive testing.
- If one or more peel specimens are in non-compliance, additional samples should be taken as described below.

- When two (2) passing samples are located, the length of seam bounded by the two (2) passing test locations will be considered non-complying. The overlap left by the wedge welder should be heat tacked in place along the entire length of seam and the non-complying portion of seam should be extrusion fillet welded.
- The entire length of the repaired seam should be tested by vacuum testing.

General Air Testing Procedures

The opposite end of the air channel should in all cases be pierced to ensure that no blockages of the air channel have occurred.

Whenever possible, seams should be air tested prior to completing butt seams to avoid having to cut into the liner.

All cuts through the liner, as a result of testing, should be repaired by extrusion welding.

All needle holes in air channels, within the boundaries of the active cell should be repaired with an extrusion bead.

Air Pressure Testing Documentation

All information regarding air pressure testing (date, initial time and pressure, final time and pressure, pass/fail designation, and technician's number) should be written on one end of the seam, or portion of seam tested. All of the above information will also be logged on the Non-destructive Testing Form as exhibited in **Annexure E**.

LGM.7.2

Vacuum Testing

This test is to be used on extrusion welds, or when the geometry of a fusion weld makes air pressure testing impossible or impractical, or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

Equipment for Vacuum Testing

Vacuum box assembly consisting of a rigid housing with a soft neoprene gasket attached to the open bottom, a transparent viewing window, port hole or valve assembly, and a vacuum gauge.

Vacuum pump or Venturi assembly equipped with a pressure controller and pipe connection.

A rubber pressure/vacuum hose with fittings and connections.

A bucket and means to apply a soapy solution.

A soapy solution.

Procedure for Vacuum Testing

Any excess overlap should be trimmed from the seam.

The vacuum pump/compressor should be turned on to reduce the vacuum box to approximately 34 kPa gauge pressure.

A generous amount of a strong solution of liquid detergent and water should be applied to the area to be tested.

The vacuum box should be placed over the area to be tested and sufficient downward pressure applied to "seat" the seal strip against the liner.

The bleed valve should be closed and the vacuum valve opened.

A minimum of 34 kPa vacuum should be applied to the area as indicated by the gauge on the vacuum box. It should be ensured that a leak tight seal is created.

For a period of approximately 10 seconds the geomembrane should be examined through the viewing window for the presence of soap bubbles.

After this period the vacuum valve should be closed and the bleed valve opened, and the box should be moved over the adjoining next area with a minimum 75mm overlap and the process repeated.

Procedure for Non-Complying Test

All areas where soap bubbles appear should be marked and such areas repaired in accordance with Clause LGM.1.4.5.

Repaired areas should be re-tested.

General Vacuum Testing Procedures

Vacuum box testing should be performed only by qualified construction personnel.

Overlap must be trimmed prior to vacuum boxing all seams.

Special attention shall be exercised when vacuum testing "T" seams or patch intersections with seams.

Vacuum Testing Documentation

Vacuum testing crew should use permanent markers to write on liner indicating tester's ID number, date, and pass/fail designation on all areas tested.

Records of vacuum testing should be maintained by the CQC co-ordinator or testing crew on the Non-Destructive Testing Form as exhibited in **Annexure E**.

LGM.7.3 Destructive Testing

Concept

The purpose of destructive testing is to determine and evaluate seam strength. These tests require direct sampling and thus subsequent patching. Therefore, destructive testing should be held to a minimum to reduce the amount of repairs to the Flexible Membrane Liner.

Procedure for Destructive Testing

Destructive test samples should be marked by the engineer or his representative and cut out randomly at a minimum average frequency of one (1) test location every 150m of seam length, unless otherwise specified or agreed.

Location of destructive samples will be selected by the Engineer or his representative with samples being cut by the staff of the Contractor.

Destructive samples should be taken and tested as soon as possible after the seams are welded (the same day), in order to receive test results in a timely manner.

Qualified personnel should observe all field destructive testing and record date, time, seam number, location and test results on the Destructive Testing Form contained in **Annexure E**.

All destructive test locations with pass/fail designation will be marked on the liner with permanent markers.

Sample Size

The sample should be 300mm wide with a seam 400mm long centred lengthwise in the sample. The sample may be increased in size to accommodate independent laboratory testing by the Engineer or by specific Project Specifications.

A 25mm specimen shall be cut from each end of the test seam for field testing.

The two (2) 25mm wide specimens should be tested on a field tensiometer for peel strength. If either field specimen does not pass, it should be assumed the sample would also not pass specified destructive testing.

The procedure outlined above should be followed to locate passing samples for specified testing.

Procedure for Non-complying Destructive Test

Additional field samples should be cut out for peel testing. In the case of a field production seam, the samples should lie a minimum of 3m in each direction from the location of the initial non-complying sample. Perform a field test for peel strength. If these field samples pass, then full samples can be cut for specified testing.

If the full samples pass, then the seam between the two (2) passing sample locations should be repaired according to procedures detailed in Clause LGM.1.7.5.

If either of the samples are still in non-compliance then additional samples should be taken in accordance with the above procedure until two (2) passing samples are found to establish the zone in which the seam should be reconstructed.

All passing seams must be bounded by two (2) locations from which full samples passing specified destructive tests have been taken.

In cases of repaired seams exceeding 50m, a sample must be taken and pass destructive testing from within the zone in which the seam has been reconstructed. Each destructive test must be considered a seam.

All destructive seam samples should be numbered and recorded on the Destructive Test Form as exhibited in **Annexure E**.

LGM.7.4 Specified Testing of Destructive Seam Samples***Full Destructive Seam Testing***

Full destructive samples should be tested by the Contractor in the event that testing is not being performed by the Engineer. Full samples should be tested under appropriate condition on Site, unless the Engineer requests laboratory testing.

Destructive samples should be tested for "Shear Strength" and "Peel Adhesion". Five (5) specimen should be tested for each test method. Four (4) out of the five (5) specimens must exhibit FTB for each round of peel and shear testing.

LGM.7.5 Defects and Repairs

The CQC co-ordinator should conduct a detailed walk through and visually check all seams and non-seam areas of the geomembrane for defects, holes, blisters and signs of damage during installation.

All other installation personnel shall, at all times be on the lookout for any damaged areas. Damaged areas shall be marked and repaired.

LGM.7.5.1 Repair Procedures

Any portions of the geomembrane, or geomembrane seam, showing a flaw, or having a destructive test in non-compliance should be repaired. Several procedures exist for repair and the decision as to the appropriate repair procedure should be made by the Contractor in conjunction with the Engineer.

Procedures available for repair are to include the following :

Patching - used to repair large holes, tears, and destructive sample locations. All patches shall extend at least 75mm beyond the edges of the defect and all corners of patches shall be rounded.

Grounding and welding - used to repair sections of extruded fillet seams.

Spot Welding or Seaming - used to repair small tears, pinholes or other minor localised flaws.

Capping - used to repair lengths of extrusion or fusion welded seams.

Extrude overlap along the length of fusion welded seams.

Removal of a seam and replacement with a strip of new material seamed into place.

LGM.7.5.2 Verification of Repairs

Every repair should be non-destructively tested. Repairs which pass the non-destructive test shall be deemed acceptable. Repairs in excess of 50m will require a destructive test. Non-destructive testing of repair shall be logged on Repair Report Form when specified, as exhibited in **Annexure E**.

LGM.7.5.3 Construction Quality Assurance

The Engineer, or his representative, shall have full access to all test results carried out by the Supplier. In addition, he shall be entitled to be present whenever such test is carried out.

Should it be deemed necessary, additional tests may be called for by the Engineer and the Contractor shall give full co-operation in obtaining samples for such tests.

LGM.7.5.4 Electronic Leak Location (ELL)

On completion of the liner and the overlying protection and drainage layers the Contractor shall arrange for the integrity of the geomembrane to be verified by ELL. The Contractor will be required to appoint an independent specialist company with experience in ELL testing. The company must be registered with the appropriate regulatory authorities. A comprehensive report covering the extent of the testing, details of perforations identified and the repairs undertaken.

LGM.8 MEASUREMENT AND PAYMENT**LGM.8.1 Supply of Geomembrane**

The unit of measurement shall be the square metre geomembrane (m²) delivered on site. The quantity measured for payment will be the nett area placed as measured in LGM.8.2.

The Tendered Rate for the supply of the Geosynthetic Membrane shall include full compensation for all materials, plant labour and other incidentals required to manufacture, purchase, transport, delivery, store the material on and off site, test or comply with all Quality Assurance and Control requirements, in full accordance with the relevant specifications, irrespective of the source or point of manufacture. Waste allowance, overlap, etc. shall be deemed to be included in the tendered rate.

The costs of Freight, Duty, Landing charges and Rates of exchange shall be included in the Tendered Rate as well as an allowance for waste and overlap. Variations in these costs are dealt with under special materials.

LGM.8.2 Installation of Geomembrane

The unit of measurement shall be the square metre area (m²) of Geomembrane installed.

The Tendered Rate for the installation of the Geomembrane shall include full compensation for all materials, plant labour and other incidentals required to install the Geosynthetic Membrane and connection with pipes in accordance with the relevant specifications. No additional payment will be made for any transport, handling, cutting, waste, placing, joining, overlapping temporary anchoring/securing, testing or compliance with all Quality Assurance and Control requirements, and Construction Quality Assurance Plans.

LGM.8.3 Electronic Leak Location (ELL)

The unit of measurement shall be the square metre area (m²) of Geomembrane tested.

The Rate for the ELL testing shall for all preparatory work including isolating the liner in areas to be tested, the testing, report preparation and reinstatement on completion.

C.3.4.4 EM GENERAL MEICA SPECIFICATION**CONTENTS**

Clause	Description
EM.1	GENERAL
EM.2	MECHANICAL SPECIFICATION
EM.3	ELECTRICAL SPECIFICATION
EM.4	INSTRUMENT SPECIFICATION
EM.5	CONTROL & AUTOMATION SPECIFICATION
EM.6	MEASUREMEN & PAYMENT

EM.1 GENERAL

EM.1.1 General

EM.1.1.1 General MEICA Specification

The General MEICA (Mechanical, Electrical, Instrumentation and Control) Specification shall apply to the whole of the Works unless otherwise stated, and shall be read in conjunction with the parts of Specification relevant to the Particular Specifications for Mechanical and Electrical Equipment, as follows below. In the event of discrepancies between the General Specification and the Particular Specifications then the Particular Specifications shall apply.

The Contractor shall design, supply all labour and materials, manufacture, install, wire, commission in full and efficient working order, test and demonstrate the Works detailed in the Contract and shall provide all necessary tackle, equipment, materials and labour and the loading and unloading of same.

The MEICA Specification is intended to be a **Performance Specification** and should be read in conjunction with Section 2, the Process Specification. The Contractor shall be responsible for the preparation of shops drawings and provision of all mechanical and electrical equipment to satisfy the performance requirements. The approval by the Engineer of the Contractor's design shall not relieve the Contractor of any of the duties or responsibilities under the Contract and the Contractor shall ensure that the Performance Specification and all statutory requirements are satisfied.

The Contractor shall deliver the MEICA equipment in a fully complete state to site in accordance with the Contract Programme. The Contractor shall commence the installation and commissioning of the mechanical and electrical equipment immediately following delivery, and arrange for the provision of such water as is necessary for works commissioning.

EM.1.1.2 Scope of Works

The Mechanical and Electrical work includes for the preparation of workshop drawings, manufacture, supply, erection, including all labour and materials, commissioning and defects correction for 12 months thereafter of mechanical equipment and electrical services associated with the leachate treatment, storage and disposal.

The original works were constructed and commissioned in 2006 and this further module forms part of an extension of those works, as does the refurbishment/replacement of equipment on the original works.

The scope of works pertaining to this enquiry is generally as follows:

- Pumping plant
- Venturi aerators
- Actuated valves
- Pipework
- Motor control gear and cabling
- Instrumentation and control
- Ancillary equipment

EM.1.1.3 Nature of Influent

The plant treats the leachate from the landfill site, this is stored in a lined dam before being transferred to the plant.

A typical analysis of the raw leachate is as follows:

Table 1

10/5/21	Raw
Ammonia	1571 mg/l
Chloride	3724 mg/l
COD	5470 mg/l
Conductivity	2460 mg/l
Total Solids	14187 mg/l

The specific attention of tenderers is drawn to the fact that this effluent is extremely corrosive and that all item in contact with the effluent shall be manufactured from grade 316L stainless steel or better.

EM.1.1.4 Design and Construction Responsibilities

The following design responsibilities are allocated for this project:

Civil design	Engineer
Civil construction	Contractor
Builders work details for equipment	M&E Contractor
Process design	Engineer
M&E Specification	Engineer
M&E Equipment Selection and integration	M&E contractor
M&E Preparation of shop drawings	M&E contractor
M&E Construction	M&E contractor
M&E Commissioning	M&E contractor

EM.1.1.5 Process Selection

The process selected for this works is a duplication of the existing plant and has the following unit processes:

- Leachate storage tanks (existing)
- Leachate transfer pumps (existing)
- Raw leachate feed tank (existing)
- Raw leachate feed pumps (existing)
- Existing SBR
- New SBR
- Treated leachate balancing tank (existing)
- 2 no existing reed beds
- 2 no new reed beds.
- Interconnecting pipework

A P&ID depicting the combined plants is shown on Drawing No. 51248/9-59.

EM.1.2 Scope of Works for the Combined Plant**EM.1.2.1 Mechanical****EM.1.2.2 Existing Leachate Storage Tanks**

The existing leachate storage dam will be retained in its current guise. No implications for this contract.

EM.1.2.3 Existing Leachate Transfer Pumps

The existing leachate transfer pumps will be retained in their current guise. No implications for this contract.

EM.1.2.4 Existing Raw Leachate Feed Tank

The existing raw leachate feed tank will be retained in its current guise. No implications for this contract. **Other than level sensing and control equipment.**

EM.1.2.5 Raw Leachate Flow Meter

The existing raw leachate flow meter will be replaced in the current position. Details of the new meter to be supplied are:

Type	electro-magnetic
Diameter	100mm
Range	0-20 l/s

EM.1.2.6 Raw Leachate Feed Pumps

The existing raw leachate feed pumps will be replaced in their current position and a new pump provided.. Details are:

Type	Centrifugal
Number	2 (1 x duty 1 x standby)
Delivery	12 l/s
Diameter	80 mm

The existing pipework is to be retained. The manually operated valves are to be serviced. In addition, a tee piece shall be inserted into this line to allow for the connection to the new SBR 2. A new electrically driven actuated valve and a manual gate valve shall be installed on the new line to SBR 2. A new electrically actuated valve shall be installed in the existing line to SBR 1.

EM.1.2.7 Existing Sodium Hydroxide Storage

The existing sodium hydroxide storage tank shall be **retained and reused.**

Details are:

Working capacity	1 000l
Material	GPR

EM.1.2.8 Antifoam Storage

Anti- foam agent is supplied and used from 25 l containers.

EM.1.2.9 Phosphoric Acid Storage

The existing phosphoric acid storage tank shall be replaced with an installation utilizing a 1000l flow bins
Details are:

EM.1.2.10 Sodium Hydroxide Dosing Pumps

The existing sodium hydroxide dosing pumps and fittings shall be replaced with new pumps and fittings.
Details are:

No off	2 (1 x duty 1x standby)
Duty	0-500 l/h

EM.1.2.11 Antifoam Dosing Pump

The existing antifoam dosing pump and fittings shall be replaced with new pumps and fittings.

A standby pump will also be installed. Details are:

Number	2 (1 x duty and 1 x standby)
Duty	0-200 l/h

EM.1.2.12 Phosphoric Dosing Pump

The existing phosphoric dosing pump system shall be replaced with new pumps and fittings.

A standby pump will also be installed. Details are:

Number	2 (1 x duty and 1 x standby)
Duty	0-200 l/h

EM.1.2.13 Existing SBR No 1

The existing SBR will be retained in its present duty. Details are:

Materials of construction	Reinforced concrete
Diameter	15m
Wall height	6.25m
Water depth	5.75m

The existing aerator (3 No.) are submersible venturi (15kW) and are to be replaced with 3 No. **externally mounted centrifugal pump and aerator injector systems**. Existing lifting davits **and submersible aerators are to be removed**. Existing bell mouth actuated stopper to be removed and replaced with a fixed bell mouth.

EM.1.2.14 Existing Treated Leachate Pump for SBR No 1

The existing pump is to be replaced with a new pump. The existing pipework is to be retained. Details are:

Type	centrifugal
Number	1
Duty	12 l/s
Diameter	100 mm

The existing manually operated valves are to be serviced.

EM.1.2.15 Existing Treated Leachate Flow Meter

The existing treated leachate flow meter shall be replaced with a new flow meter. Details are:

Type	Electro-magnetic
Diameter	100mm
Range	0-20 l/s

EM.1.2.16 New SBR No 2

A new SBR will be constructed and equipped. Details are:

Materials of construction	Reinforced concrete
Diameter	15m
Wall height	6.25m
Water depth	5.75m

Three (3 No.) **externally mounted 15kW venturi aerators are to be provided**.

A complete spare pump and motor shall be provided as a standby, for installation on one of the existing base plates as required.

EM.1.2.17 New Treated Leachate Pump No 2 and 3

Two treated Leachate Pumps are to be supplied and commissioned and the other kept in store as a standby. Details are:

Type	centrifugal
Number	1 installed, 1 standby in store
Duty	12 l/s
Size	100 dia

EM.1.2.18 New Treated Leachate Flow meter

One flow meter is to be supplied and installed. Details are:

Type	Electro-magnetic
Diameter	100mm
Range	0-20 l/s

EM.1.2.19 Existing Treated Leachate Balancing Tank

The existing treated leachate balancing tank will be retained in its current duty.

The existing flow recorder to be replaced.

EM.1.2.20 Actuated Valves

All actuated valves shall be electrically operated.

In order to enable the second module to utilise certain of the existing equipment, some additional actuated valves will be required. These are shown on the P&ID (Drawing No. 51248-9/59) and will be positioned on the following pipelines

- Leachate feed lines
- Sodium hydroxide feed line
- Phosphoric acid feed line
- Antifoam feed line

EM.1.2.21 Existing Reed Beds

The existing reed beds will be retained in their current guise.

No implications on this contract.

Level sensors to be replaced.

EM.1.2.22 New Reed Beds

New reed beds will be constructed to augment the existing reed beds.

New level sensors to be installed.

EM.1.3 Electrical**EM.1.3.1 Existing Cables**

As far as possible, the existing cables shall be retained for use. These shall be tested and only replaced if necessary.

EM.1.3.2 Motor Control Centre and Field Equipment

An entirely new MCC for the combined plant shall be designed, supplied and installed.

EM.1.4 Instrumentation

All existing instrumentation shall be replaced with new instruments, all designed and installed to be compatible with the additional instrumentation supplied.

EM.1.5 Commissioning

The entire works shall be commissioned.

The commissioning process shall consist of:

- a) Dry commissioning – carry out checks on all equipment as far as possible, without water or leachate in the plant.
- b) Wet commissioning – carry out checks on all equipment, with water in the plant.
- c) Process commissioning – decant the water in the plant (both SBR units) to decant levels and then fill to operational level with an approved activated sludge (minimum MLSS concentration to be 8 000 mg/l)
- d) Operate the aeration system for a full aeration cycle and then decant 25% of the normal decant volume and replace with leachate.
- e) Repeat for four consecutive days to acclimatize the process before operating per normal programme.

EM.1.6 General Workmanship and Design Requirements

The Plant design, workmanship and general finish shall be of sound quality in accordance with good engineering practice and design shall be robust and suitable for heavy use.

The general mechanical and electrical design of the Plant and particularly that of the bearings, contacts and other wearing parts, shall be governed by the need for long periods of service without the need for frequent maintenance and attention. The service period for each item of plant supplied shall be specified in the information returned with the tender.

Unless otherwise specified, all items of Plant shall be rated for continuous service at the specified duties under the prevailing atmospheric and operational conditions on site.

All parts subject to wear shall be readily accessible for maintenance.

EM.1.7 Use of Dangerous Substances

No explosive or other dangerous substance shall be brought on to the Site or used for any purpose unless the Contractor has previously obtained the written approval of the Engineer.

In the event that such substances are permitted to be brought to site, the Contractor shall be responsible for the off-loading, storage, handling and **usage** of any dangerous substances or materials to be used in the construction of the leachate treatment plant. He shall ensure that safe working practices are followed for the storage, handling and usage of any dangerous substances or materials in order to ensure the health and safety of all personnel and property.

EM.1.8 Materials

All materials incorporated in the Plant shall be the most suitable for the duty specified and shall be new and of the best commercial quality of their respective kinds free from any flaws defects and imperfections.

All welding spatter shall be removed.

All Plant shall be constructed so as to reduce the **danger of corrosion** to a minimum. The anticipated life of the plant is in excess of 20 years.

Particular attention shall be paid to the prevention of corrosion due to the close proximity of dissimilar metals.

Where it is necessary to use dissimilar metals in contact, these shall, if possible, be so selected that the potential difference between them in the electro-chemical series is not greater than 0.5 mV. If this is not possible, the contact surfaces of one or both of the metals shall be electroplated or otherwise finished in such a manner that the potential difference is reduced to within the required limits. Alternatively, the two metals shall be insulated from each other by an approved method. Notwithstanding this clause, the current requirements of the IEE Wiring Regulations with respect to Earthing and Bonding shall be observed.

Aluminium materials are not considered suitable for contact with leachate.

EM.1.9 Storage of Materials

Materials and components shall be stored in such a manner as to preserve their quality and condition to the standards required by the Contract.

Where the Contractor is required to store materials and equipment on site, including materials and equipment for his sub-contractors, secure storage accommodation shall be provided in accordance with the recommendations of the manufacturer and to the entire satisfaction of the Engineer. Particular care shall be taken to protect electrical and rotating equipment from damage due to damp and dirt.

EM.1.10 Handling and Use of Materials

Materials and components shall be handled in such a manner as to avoid any damage or contamination, and in accordance with all applicable recommendations of the manufacturers.

Unless otherwise described in the Contract, the use, installation, application or fixing of materials and components shall be in accordance with all applicable recommendations of the manufacturer. Where appropriate, the Contractor shall make use of any technical advisory services offered by manufacturer.

EM.1.11 Lifting Equipment and Lifting

The Contractor shall be responsible for obtaining all lifting equipment requirements for all aspects of the MEICA Works.

Where a mobile crane or lifting device is to be used on site the Contractor shall ensure that:

- a) The F91 Register for the lifting device and up-to-date certificates for the lifting gear are available for inspection by the Engineer when the lifting device is first brought onto the site.
- b) The crane operator shall be a fully trained and competent operator of the lifting device that he is operating.
- c) Where loads exceed 1.0 tonne, the lifting device must have visual and audible alarms.

All machinery shall be fitted with lifting facilities, by bolts or other suitable fittings. Large structures shall be provided with jacking points, suitably identified, to aid replacement of drive components.

Tapped holes or other provisions must be made in all main casting, impellers, casings, etc. for the insertion of jacking screws or fixing other such drawing gear as necessary to facilitate dismantling for maintenance purposes. On items of machinery subject to frequent dismantling, bolts or studs shall be employed in preference to set screws.

EM.1.12 Guards

The necessary guards to afford protection from electrical apparatus and moving parts of machinery shall be provided. The guards shall be of approved design in accordance with the relevant SABS standards and meet all statutory requirements. The Contractor must ensure that stationary points requiring access, such as lubricating and oil inspection points, are safe and outside the guards, which shall also be so designed that they are secure but can be moved without disturbing other parts of the Plant.

Large guards shall be equipped with small removable panels for inspection/checking of enclosed components.

EM.1.13 Building Attachments, Foundations, Supports & Fixings

Where attachment of any Plant or Equipment included in the Works in and around the treatment plant housing and the MCC housing is necessary, the magnitude of the loading must be stated by the Contractor on his drawings. In no circumstances will the cutting of steelwork or other structural members be allowed. The drilling of, welding to, or stud firing into, tension flanges or other steelwork subjected to tensile loads, will not be permitted on plate girders and/or any principal steelwork member. Where attachments are allowed proper clamps or straps will be preferred. Each proposed attachment shall require the approval of the Engineer.

The drilling through steel reinforcement will not be permitted without the prior approval of the Engineer.

The Contractor shall supply all foundation bolts, packers, frames and grillages necessary for the Works. Where these items are required to be built-in, the Contractor shall ensure that the details and materials are made available in time to avoid delay to any part of the works. In default, any alterations or additions found necessary subsequently will be at the expense of the Contractor.

The Contractor shall satisfy himself, before installing the Plant, that the foundation levels, dimensions and alignment are correct. The Contractor shall level and adjust the plant on its foundations prior to bedding the bases with a suitable mortar.

Where expansion type fixings and the like are used the Contractor shall drill the holes and provide and fix all parts. Such drillings shall be to the Engineer's approval.

The Contractor shall bear the expense of rectifying any such work that is done wrongly or omitted as a result of wrong information given by the Contractor or of the absence of the necessary information.

Where expansion bolts are used, they shall be Hilti, GKN Leibig or similar approved. They shall not be used within 75 mm of the edge of concrete, and the Contractor shall make good any damage to concrete, brickwork etc arising out of the fixing of such bolts.

The plugging of walls, floors or ceilings for small fixtures lighting fixtures, cables, conduits and small pipe clips, etc shall be carried out by the Contractor at his own expense.

EM.1.14 Noise and Vibration

All plant must be capable of being operated without excessive vibration and the minimum amount of noise.

Should the overall sound level of any one item exceed 65dB(A) when an approved sound level meter is sited 10 metres from the noise source, the Contractor must include for suitable sound insulation material, resilient mountings or the appropriate devices, to achieve this level.

The foregoing will apply in the audible frequencies range 20 Hz – 20k Hz. Above 20k Hz, the Contractor must state whether any fundamental frequencies are generated in the ultrasonic region.

EM.1.15 Lubrication**General**

Provision shall be made for suitable lubrication to ensure smooth operation, heat removal and freedom from undue wear. Plant selected shall require minimum lubrication attendance and down time for lubricant change.

Sealed for life units are acceptable subject to a minimum design life of 50 000 hours operation at maximum loading.

Bearings equipped with forced fed oil lubrication shall be automatically charged prior to machinery starting up, and pressure monitored from the bearing distribution or oil return bath, with automatic shutdown of machinery and alarm on low oil pressure.

Lubrication shall be possible without removal of guarding, or the use of portable ladders.

Access to lubrication systems shall be such as to permit maintenance, draining and refilling, without contamination of the charged lubricant.

The design of breathers shall take into account the humidity and atmospheric contamination at the vent point, and measures shall be incorporated to prevent contamination of the lubricant.

Grease Lubrication

Unless otherwise specified grease application shall be by steel lubrication nipples manufactured in accordance with the relevant SABS requirements (same as BS 1486).

Anti-friction bearings requiring infrequent charging shall be fitted with hydraulic type nipples. Plant bearings requiring frequent charging shall be fitted with button head pattern nipples.

A separate nipple shall be provided to serve each lubrication point and all greased nipples or oil cups and dip stocks shall be readily accessible. On below water bearings and on above water bearings when necessary for accessibility, nipples shall be remotely mounted at a point as near as is practicable to the lubrication point. Where a number of nipples supplying remote lubricating points are in use they are to be grouped together on a conveniently placed battery plate, the spacing of the nipples being in accordance with the recommendations of BS1486 (or relevant SABS requirements). Part I, Tables 9 and 10.

Provision of Lubricants

The Contractor shall supply the first fill of oil and grease which shall be obtained from the approved lubricant supplier.

The Contractor shall list sufficient grease and oil for 2 years operation of the equipment supplied.

EM.1.16 Gear Boxes

Gear boxes, where installed, shall be rated for a life of 100 000 hours and be selected in accordance with AGMA recommendations for power calculation (in kW) and service factor application.

A standard reduction ratio shall be used with the manufacturer complying with relevant BS specifications.

EM.1.17 Inspection, Testing and Commissioning

The Contractor will carry out all testing and commissioning of the works.

All testing and commissioning activities will be documented in a commissioning plan for the works which will be provided in accordance with the DSW guideline for the production of commissioning plans.

Inspection

All electrical installations provided by this contract will be inspected and tested in accordance with the requirements of BS7671 (or relevant SABS requirements) IEE Wiring Regulations 16th Edition, Requirement for Electrical Installations. Inspection certificates will be submitted to the Engineer for approval and will be included in the Operating and Maintenance Manuals.

All equipment, systems and software will be made available to the Engineer for inspection upon request at various stages of construction and development either at the factory or at site. The Engineer will give five days' notice that he intends to make such an inspection at the Contractors works. The Engineer will expect to give no notice should he intend to inspect equipment, systems and software at site.

EM.1.18 Testing

Testing will be presented to the Engineer in two main phases. These will be Factory Acceptance Tests (FATs) and Site Acceptance Tests (SATs).

Prior to both these acceptance test procedures, the Contractor will carry out and document his own detailed tests on the systems and software development. The test documentation will be made available to the Engineer at any time of request.

The Contractor will provide, and install where necessary, all test equipment, software and personnel required to carry out testing in full and in accordance with his commissioning plan. He will provide detailed method statements for approval by the Engineer where testing interfaces or effects in some way the systems or plant provided by other contractors or existing plant owned by DSW.

Testing will be carried out in a logical and structured manner.

EM.1.19 Factory Acceptance Testing (FAT)

The Contractor will carry out a full programme of tests on the complete and fully connected system at the Contractors or Manufacturers works. The Tests will demonstrate to the Engineer that the system will provide the full functionality and operation specified and that the system meets the performance requirements of the specification.

The factory acceptance tests will be fully documented in a FAT plan which will be submitted to the Engineer for approval four weeks before the intended commencement of the factory acceptance tests. The document will form the first section of the commissioning plan and will fully detail each stage of intended witness tests.

Where it is not possible to test certain operations directly, e.g. where the operation crosses a contract interference to another contractors system, then a method of simulation will be used to match the operation of the unconnected element. Where simulation is proposed, the Contractor will provide method statements detailing the method of simulation intended and will provide all necessary simulation equipment and software. The Contractor will account for time and resources to program any simulation packages. The Contractor will provide details of proposed simulation software packages.

Re-tests required as a result of an abortive FAT will be carried out at the expense of the Contractor, including all reasonable expenses incurred by the Engineer to attend the second test.

EM.1.20 Site Acceptance Tests (SAT)

The site acceptance tests will be carried out following the completion of installation works at site and following the inspection of the installed works by the Engineer or his representative.

The site acceptance tests will be carried out on all equipment systems and software supplied under the Contract and with all third party systems to which the Contractors system interfaces.

The Contractor will provide all necessary liaison with the Engineer and with the third party contractors to ensure all required functional and operational tests are carried out to the satisfaction of the Engineer.

The site acceptance tests will be fully documented and submitted to the Engineer for approval at least four weeks before commencement of the tests. The documentation will include details of the tests to be carried out including details of tests with third party systems. The documentation will include a detailed plan showing dates and times of each stage of the test. The documentation will also provide details of the resource requirements from the Engineer and from the Third party Contractors for the purpose of carrying out the tests of interfaces with third party systems.

Plant Labelling and Nameplates

The labelling shall comply with the requirements of the British and European Standards Safety Signs including compulsory signs covered by British Standard 5378 parts 1, 2 and 3.

All labels are, where possible, to be mechanically fixed to plant, adhesive backed labels and wiring of labels to items of plant will not be acceptable unless otherwise approved by the Engineer in writing.

Each main and auxiliary item of plant shall have permanently attached to it in a conspicuous position a nameplate and rating plate, each of weather-resistant material. Upon these shall be engraved or stamped the Manufacturer's name, type and serial number of Plant, details of the loading and duty at which the item of plant has been designed to operate and sufficient detail to allow the assembly to be readily identified in correspondence and when ordering spare parts.

The Contractor shall provide and fix all necessary instruction notices for special systems adjacent to the various items of plant.

The Contractor may attach the names of the manufacturers to various items of plant by means of suitable nameplates approved by the Engineer.

Flooring, Stairways, Ladders and Hand railing

Where the Contractor is required to provide platforms, flooring, stairways, ladders and hand railing, as necessary for the convenient operation inspection and maintenance of the plant, they shall be safe and generally comply with Handbook No 7, "Factory Stairways, Ladders and Handrails", as published by the Engineering Equipment Materials Users Association (EEMUA), 14 Belgrave Square, London SW1X8PS or the applicable South African design and construction standards.

Unless otherwise specified in the particular specification all steelwork shall be hot-dipped galvanized to BS729 after manufacture. All damage to the galvanising shall be made good to the satisfaction of the Engineer.

EM.1.21 Requested Variations

Variations from the Specification and design proposed and requested by the Contractor will not be permitted unless, and until, the approval of the Engineer has been obtained in writing.

The Engineer will require firm evidence in writing that such variation will have no adverse or nullifying effect on the original Specification and design, but will tend to improve them, or benefit the execution of the work, or reduce the cost. Notwithstanding the prior approval of the Engineer, if the variation initiated by the Contractor proves to be detrimental, the full cost of restitution shall be borne by the Contractor.

EM.1.22 Painting

General

The protective coating system shall have a 20 year life to first maintenance.

All coatings used for any part of the plant which comes in contact with water shall be non-toxic, non-carcinogenic and shall impart no taste, odour, colour or turbidity to the water and must not foster microbial growth.

Lead based paints shall not be used.

Painting and surface treatment shall be in accordance with Table 3.1, unless otherwise approved in writing by the Engineer (Refer Annexure 4.5).

Application of Paint

Paint shall not be applied under adverse conditions.

Each coat of paint shall be applied to produce a continuous film of paint of uniform and even thickness.

No manufacturer's name plate identification or grease nipples shall be painted over. Vented filler plugs in gearboxes shall not be painted over.

Unless otherwise agreed by the Engineer, the paint system shall be applied under cover in controlled conditions at the fabricator's works except for the finishing coat specified following installation.

Preparation of Surfaces

Galvanised Surfaces

Galvanised steel shall be adequately degreased before the application of any coatings. The surface shall be pre-treated with a brush application of etch primer, or T Wash.

The first coat of the specified system shall be applied within 4 hours of etch priming.

Non-Galvanised Surfaces

All iron and steelwork to be painted shall be blast cleaned to BS4232 : 1967 Second Quality SA 2 to achieve a surface profile with a minimum amplitude of 0.025 mm and a maximum of 0.100 mm.

Following blast cleaning, steel surfaces shall be pure zinc metal sprayed and etch primed and must be protected within 4 hours with the coating processes detailed.

Steel Parts

Unless otherwise stated all steel parts shall be galvanized.

Where galvanising is to be employed as a protective finish it must be applied by the hot dip process. The thickness and quantity of which shall conform to BS729: Part 1. All drilling, stamping, welding, cutting, machining or bending is to be carried out prior to galvanising and all erection markings shall be clearly legible after galvanising.

Steel subject to hydrogen embrittlement when galvanized shall not be used where galvanising is to be employed.

Aluminium Structures

Aluminium structures and fittings will require no painting but wherever dissimilar metals (e.g. steel/ aluminium) are in contact, the Contractor shall provide Paxolin insulated strips or washers (minimum thickness 6 mm) to prevent electrochemical corrosion.

Stove Enamel Finish

Where a stove enamel finish is specified, preparation of the surface shall be carried out at follows: the surface shall be rubbed down, degreased, etch-primed and one coat of undercoat shall be applied prior to the application of three top coats.

Each top coat shall be individual stoved on.

GRP Covers and Guards

GRP Covers and Guards will require no painting. The GRP will require pigmentation to give the finished colour.

Defects

The Contractor shall ensure that all coatings are free from defects and adequate in all respects for the purpose intended, including satisfactory application at the specified thickness and by the specified methods.

Defects are defined in BS 2015 “Glossary of Paint Terms”.

The recommendation for the remedial treatment of defects given in BS5493 are to be regarded as a minimum in the Specification.

Inspection

All of the work and/or materials covered by the Specification shall be subject to inspection by the Engineer. Any work or materials found to be defective or not conforming to the specification shall be made good by the Contractor at no additional cost to the Employer.

Colour

The finishing coats shall be carried out to the colour schedule where instructed by the Engineer, and in accordance with the relevant requirements of BS 1710, BS 4800, BS 5252 and BS 5378.

EM.1.23 Functional Design Specification

1.1 Treatment Cycle

A single treatment cycle takes place over a 24-hour period. Figure 1 presents atypical treatment cycle.

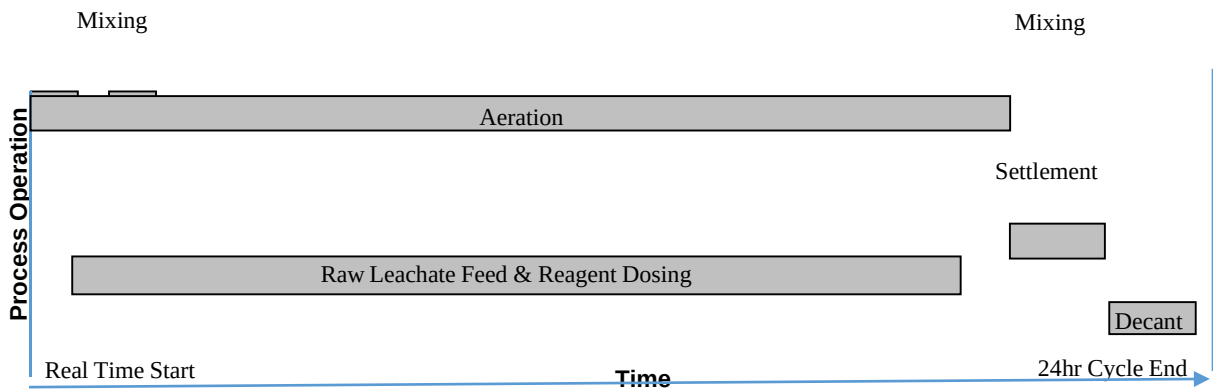


Figure 1 Typical Treatment Cycle

The treatment cycle generally comprises:

Pre-Aeration Period

The pre-aeration period starts at the operator-adjustable set 'real-time' datum. It always marks the start of a new treatment cycle. The aerators are started in a staggered sequence, thereby ensuring that the total starting current does not overload the supply to the treatment plant or affect other MEICA equipment operating in the plant. The operator may adjust the start time under 'MAINTENANCE' section on SCADA.

The first mixing period starts at the beginning of the aeration period and continues for an operator-adjustable set time. The function of this mixing period is to resuspend and mix the biomass in the SBR, using the venturi aerators, after the previous cycle's settlement and decant period. During this period, raw leachate is **not** fed into the SBR. If for any reason the aerators were still on at the end of the previous cycle, this mixing period will not be activated as the biomass will already be suspended and mixed in the SBR.

The second mixing period starts one hour before the end of the aeration period and continues up to the end of the aeration period. During this period, raw leachate is **not** fed into the SBR. This mixing period is not operator-adjustable and is required to oxidize any excess ammonia or organic compounds that remain from the last feed period.

Raw Leachate Feed Period

The raw leachate feed period starts at the end of the first mixing period, or at the beginning of the aeration period if the aerators were still active at the end of the previous cycle. Raw leachate is dosed intermittently into the SBR over the feed period. If the operator selects only the 'real-time' hour, then there will be 18 'real-time' points where the feed pumps will be activated to dose raw leachate into the SBR.

Raw leachate may be fed into the SBR during the set dosing periods using one of two operator-selectable and adjustable methods. It may be fed by operator-adjustable set time periods or by operator-adjustable set volumes.

The raw leachate feed period ends one hour before the end of the aeration cycle and this feature is operator-adjustable, however not advised, refer to mixing period above.

Post-Aeration Period

The post-aeration period starts at the end of the Raw Leachate Feed Period. During the post-aeration period the aerators remain operational, raw leachate is **not** fed into the SBR.

The second mixing period starts one hour before the end of the aeration period and continues up to the end of the aeration period.

Settlement Period

The settlement period starts at the end of the aeration period. During the settlement period the biomass is allowed to settle, leaving supernatant at the top of the liquid body. The settlement period is operator-adjustable under the 'Cycle Options' on SCADA but may not be set a duration less than 1 hour. The recommended settlement time is two hours.

Decant Period

The decant period starts at the end of the settlement period. During the decant period the clear supernatant is decanted into the TLBT via the bell mouth in the SBR, this is controlled by a pneumatic valve at the outlet of the SBR. The decant period is operator-adjustable under the 'Cycle Options' on SCADA.

Quiet Period

The quiet period starts at the end of the decant period. During the quiet period all equipment is shut down and the plant is not operational.

EM.2 MECHANICAL SPECIFICATION

EM.2.1 Mechanical Equipment

EM.2.1.1 Pumps (general)

All pumps shall comply with the performance requirements given in the following clauses.

Each pump shall consist of an integral pump and motor. It shall be of the vertical, single or multiple stage, centrifugal type or positive displacement, driven by a direct coupled squirrel cage induction motor sealed for a duty to IP65 minimum for outdoor applications, and IP 54 when used within the Control Building.

The pump shall be of robust design, suitable for prolonged operation without attendance or maintenance.

The pump shall be capable of running dry without damage for short periods during maintenance, inspection or rotation tests.

The pump shall have a stable flow characteristic over the operating head range. The power curve shall be non-overloading. Pumps need to have an agent in South Africa unless otherwise approved.

The casing sections shall be fitted with guide-vanes to minimize turbulence within the hydraulic passages. Replaceable wear rings shall be fitted to each casing inlet and discharge.

Impellers shall be keyed to the shaft. Each impeller shall be individually dynamically balanced prior to assembly on to the shaft, and the complete shaft assembly shall be balanced prior to pump assembly. Impellers shall be hydraulically balanced to reduce end thrust.

Radial bearings and axial thrust bearings within the pump shall be lubricated by the pumped medium. Bearing bushes within the casing shall be replaceable. The shaft shall be fitted with renewable sleeves at bearing points. Bearings shall be rated and sized to ensure a life of at least 50 000 hours at pump speed.

The pump body and discharge pipework shall be capable of withstanding one and a half times the working pressure.

EM.2.1.2 Pump motors (general)

Pump motors shall be totally enclosed to BS 4999 with Class F insulation of the stator windings and squirrel cage motors, suitable for 3 phase, 400v, 50 Hz electrical supply, and protected to IP 65 or IP 68 as BS 5420: 1977, as appropriate to the installation. The maximum pump speed shall be 1500 rpm.

The motors shall be from an approved manufacturer and the maximum continuously rated output shall be at least 10% greater than the maximum power required by each pump when operating in the conditions which require the greatest power input in the pumps.

The motor shall incorporate high temperature cut-outs. All motors (and pumps) shall be flame and explosion proof in accordance with the Hazardous area classification stated in Section 2.5.

The motor shall be protected from the pumped medium by mechanical seal(s). The design shall ensure that the external flow around the motor provides adequate cooling in all operating conditions.

Unless otherwise stated, or otherwise agreed, all motors above 3kW shall be fitted with soft-start starters. The starter shall incorporate voltage release and overload protection, with the overload current adjusted to trip the motor at full load current. Motors drawing 3kW or lower may have direct-on-line-starting.

A length of flexible electrical cable shall be fitted to the pump-set. The cable shall comply with BS 6883 or BS 6887 (IEC 245(66)). The number of cores shall be sufficient for operating the pump and any protection devices fitted.

Suitable identification plates shall be fitted to the motor and shall be made of hard metal deeply engraved or stamped. They shall be permanently fixed to the frame of the motor and shall not be fitted to removable covers, mounting plates or skirts or fan cowls. Thin aluminium plates or lightly stamped plates shall not be accepted. The plate shall be manufactured from and permanently fixed with corrosion resistant materials.

The pump rating plate shall contain the following information:

Table 2.1: Data Template

Manufacturer	
Model	
Serial number	
Rated head	
Rated flow	
Shaft power	
Pump speed	
Weight	
Voltage/Phases/Frequency	
Mechanical seal type & manufacturer.	

A second identical plate shall be supplied for fixing to the control panel for information. Pump motors need to have an agent in South Africa unless otherwise approved.

EM.2.1.3 Pump Performance

The Contractor is reminded that he is responsible for the design of the system in its entirety.

EM.2.1.4 Aerators

General

The aerators shall be externally mounted, single nozzle venturi jet aerators, suitable for use on the Aeration Tank in this Contract, and installed at the locations shown on the drawings. Typically, these are to be **Landia 15 Kw – 1500rpm** or equal approved aerators.

The aerators shall be identical so that they can be interchangeable within the aeration zone of the Aeration Tank.

The configuration of the aerators shall be such that they will fully re-suspend and maintain the solids in suspension within the aeration zone of the Aeration Tank within 30 minutes of start up. The Contractor shall submit to the Engineer design calculations showing the calculated flow pattern and velocities in the tank to provide complete re-suspension within 30 minutes of commencement of operation. Performance will be assessed on achieving a minimum of 80% of the design re-suspension velocities throughout the tank.

The Contractor shall, if requested by the Engineer, provide an approved independent inspector's written report on the preparation and painting of the aerators. The report shall be submitted to the Engineer for approval. The inspection organization will be a nationally recognized inspection organization and BS 5750 accredited.

Each aerator assembly shall be supported and bolted down onto a concrete slab so that, while in operation there is no movement of the aerator. The Contractor shall be responsible for setting the aerators on their respective bases and orientating them so as to provide the optimum mixing pattern within the aeration zone. Installation shall be as detailed by the manufacturer.

The materials used in the aerator, including pump and motor nozzles, (and gearbox if fitted) shall be constructed of materials that will resist corrosion by landfill leachate of the chemical composition described elsewhere in this document such that the replacement of components is required, for a minimum period of 10 years. Stainless steel (Grade 316) is preferred but all material shall be subject to approval by the Engineer.

Aerators need to have an agent in South Africa unless otherwise approved.

Aerator Performance Requirements

The aerators will operate under the conditions set out in Table 2.2 below.

Table 2.2: Aerator Performance Requirements

Nominal Tank Capacity	460 m ³
Nominal Liquor Depth	5.75 m
Tank Annulus	n/a
Minimum Total Oxygen transfer capacity required	Contractor to provide details for the approval of the Engineer
Aerator Specification	3 No. at 15 kW per aerator; externally mounted
Special Requirements	Aerator fixings, installation and removal as shown in text

Aerator Gearbox (if required)

A gearbox if fitted shall be suitable for continuously immersed installation (IP 68) and be rated for continuous operation at a service factor of twice the motor rating. The whole assembly shall have a high resistance to shock loading.

All gears shall be manufactured from hardened alloy steel, designed and cut to ensure strength and surface durability. Gears shall be carried on solid forged shafts mounted on tapered roller bearings or double row self-aligning spherical roller bearings, as recommended by the gearbox manufacturer, capable of handling all radial and thrust loads simultaneously. Bearings shall be rated for a life of 100 000 hours at full torque rating.

The gearbox housing shall be manufactured from high strength close grained cast iron. All sealing faces shall be perfectly oil-tight. Both the input and output shaft shall be sealed with heavy duty lip oil seals.

The gears and bearings shall be splash lubricated. The first fill of lubricant for the gearbox shall be provided by the Contractor with the aerator. The lubricant shall be as recommended by the gearbox manufacturer. Provision for oil drainage shall be included. The size of the oil reservoir shall be such as to minimize the frequency of inspections. Oil level detectors shall be fitted to the gearboxes and arranged to stop the aerator in the event of low oil level.

Aerator Motors

Aerator motors shall be suitable for operation from a 400 volt, 3 phase, 50 Hz supply, and shall have a continuously rated output to BS 5000: Part 99. The maximum frequency of starting shall be 4 starts per hour, unless specifically stated otherwise. The motor output shall be rated 25% above the KW input to the aerator. Unless otherwise stated, or otherwise agreed, the aerator motors shall be fitted with soft-start starters. The starter shall incorporate voltage release and overload protection, with the overload current adjusted to trip the motor at full load current. Aerators should be programmed to start sequentially to minimize start up current draw.

The motor enclosure shall be weatherproof with IP68 protection. All items of the motor including end covers, terminal boxes shall be constructed from metal. The motor shall be flange mounted to the gearbox.

The insulation of the motor windings shall be to Class “F” in accordance with BS 2757: 1956 but shall be designed for a Class “B” temperature rise.

In the automatic mode, the aerators will operate continuously for 24 hours per day.

Bearing shall either be lubricated for life or provided with grease nipples for grease lubrication. Indication of the type of grease required shall be fitted adjacent to the nipples.

EM.2.1.5 Pipeline Construction

The types of pipe to be used in this Contract for conveying treated and untreated leachate, and dosing chemicals, are set out in Table 2.3 below:

Table 2.3: Permitted materials for pipeline construction

Pipe Material	Usage	Standard	Particular Requirements
1. Ductile iron pipe and fittings	In chambers, under lagoons and for use in connecting to fittings around pump sets	BS4772 BS EN545	K9. Sulphate Resisting Cement Mortar lined
2. MDPE pipes and fittings	Untreated and treated leachate pipelines	BS6730	Pressure rating 10 bar (SDR 17.6)
3. 316 stainless steel pipe and fittings	Dosing pipelines (but see below) and process pipelines		

Where ductile iron is used, the pipework system shall be earth-bonded using braided copper straps with a maximum resistance of 10 Ohm. The pipework shall also be electrically connected to a suitable earthing point using a similar earth bonding strip.

The types of pipe to be used in this contract for conveying sodium hydroxide shall be 316 stainless steel or other metallic or non-metallic material, chemically compatible with up to 50% sodium hydroxide. The pipes shall be laid in 100 diameter uPVC. The maximum delivery temperature of the sodium hydroxide will be 45°C.

The types of pipe to be used in this contract for conveying phosphoric acid shall be 316 stainless steel or other metallic or non-metallic material, chemically compatible with up to 81% phosphoric acid at specific gravity 1.65. The pipes shall be laid in 100 diameter uPVC ducts.

EM.2.1.6 Permissible Joint Types

The types of jointing arrangement permissible in this Contract are set out in Table 2.4 below.

Table 2.4: Permitted Joint Types

Pipeline Material	Type of Joint
Ductile Iron and Carbon Steel	Flanged, in pump stations and on all valves
MDPE	Butt welds or electrofusion couplings only
316 stainless steel (in chemical closing)	Compression fittings welded joints (See Dosing Pump Section for particular requirements for NaOH)

EM.2.1.7 Valves

Valves for pipeline installation in this Contract shall comply with the relevant provisions of the appropriate British Standard, as set out in Table 2.5 below.

Table 2.5: Permitted Valve Types

Type	BS
Cast iron gate (parallel slide) valves	5151
Cast iron swing check valves	5153
Stainless steel knife gate valves	
Diaphragm valves	5156
Predominantly key-operated cast iron gate valves for waterworks purposes	5163

EM.2.2 Electrically Actuated Valves (EAV)

The Contractor shall provide and install all necessary equipment, including cabling, required to complete and connect the installation of electrically actuated valves, (EAVs), where required in the Contract. Unless otherwise indicated in the Contract, the actuators shall only operate knife type gate valves.

Electrically actuated valves shall be certified for the Hazardous Zone classification as stated in Section 2.5. The actuators shall be set to operate under automatic control from the main control panel however, they shall incorporate facilities for both automatic and manual operation, the latter being a manual override at the actuator unit. The valves shall be fitted with emergency stop buttons within the casings. The actuator shall be required with end of travel limit switches to signal to the control system open/closed or failed to close/open. Signal cables shall be separated from power cables.

Control systems shall be arranged so that valves will make three attempts to close/open in the event of failure to close/open on the first attempt. After a third failure, an alarm event will be raised at the PLC.

EM.2.3 Solenoid Valve

Where required in the Contract the Contractor shall provide and install all necessary equipment including cables required to complete and connect the installation of electrically operated solenoid valves. Each valve should have local means of isolation and shall be controlled from the PLC. The whole of the valve body shall be suitable for use with leachate both untreated and pre-treated. The valve shall be fitted with auxiliary switches to confirm the status of the valve, open or closed. The solenoid shall be rated IP 65.

The valve shall be installed with the fail-safe as closed.

EM.3 ELECTRICAL SPECIFICATION

EM.3.1 Design Responsibility

The Contractor shall be responsible for the design, installation and testing of the complete electrical system for the pumping and treatment plant as detailed.

The Contractor shall include for the provision and laying of all cabling and wiring, including marker tape.

EM.3.2 General Requirements

All electrical installation works shall be carried out by a qualified electrical Contractor who shall be approved by the Engineer.

All electrical installation works shall be completed to the requirements of this Specification and shall comply with OHS Act No. 85 of 1993 or current relevant regulations. Equipment shall be supplied and installed to the requirements of the relevant national and international standards.

The completed installations shall be tested and commissioned to the requirements of the specification, the local supply authority, DSW, and to the satisfaction of the Engineer.

All overall power factor of 0.96 lagging or better, must be maintained during normal operating conditions.

The Contractor shall provide power factor correction equipment as necessary to meet this requirement.

The Contract includes for the design, manufacture, supply, installation, erection, testing, commissioning and servicing and maintenance for 12 months thereafter, of the following features:

- i) Pump and compressor controls.
- ii) Flowmeters, pressure gauges, level monitoring instruments and other instrumentation,
- iii) Power, control and instrumentation cabling.
- iv) Main control panel including starters,
- v) PLC software, auto-dialler facility
- vi) Earthing and surge protection and lightning protection system
- vii) Meter cubicle, and connection to the site three phase supply and cabling from the drop point to the Works
- viii) Auxiliary equipment necessary to achieve the Contractor's design proposals
- ix) As-fitted documentation/manuals package.

The Contractor will be required to maintain an interface and liaison with the local Electricity Company/supply authority (eThekweni Electricity).

The Contractor shall provide all equipment required to achieve the safe, efficient and reliable operation of the plant in achieving the required process performance.

EM.3.2.1 Units of Measurement

The Contractor is to comply, as far as is economic and practicable, with the Systems International d'Unites (SI Units), in accordance with BSI/PD 5686, BS 5555 and the Units of Measurements Regulation 1976, SI 1976 No 1674. All information shall be provided in SI Units.

EM.3.2.2 Standards

All plant provided shall be in accordance with the latest revisions, at the time of tender, of such SABS ISO, IEC Standard or British Standards as are applicable, and in that order of precedence.

All plant and practices not covered by standards and documents shall conform with sound engineering practice and shall be subject to the approval of the Engineer.

Where a relevant standard provides for the furnishing of a certificate to the Employer, at his request, stating that the materials comply in all respects with the standard, the Contractor shall obtain the certificate and forward it to the Engineer.

All equipment, materials, supplies and installations shall also comply with the latest edition of the following:-

BS7671 The Institution of Electrical Engineers Wiring Regulations 16th Edition Requirements for Electrical Installations; (hereafter referred to as IEE Wiring Regulations)

Any regulations covering the use of electricity at work.

Any regulations governing health and safety generally, in the work place.

National electricity supply regulations.

The Requirements of eThekweni Electricity.

Any national and local construction safety regulations.

Any bylaws governing the use of potable water supplies.

Any regulations governing the design and use of temporary electrical installations.

Where multiple instances of similar devices are to be supplied these shall be, wherever possible, manufactured by the same manufacturers, to ensure compatibility, consistent high quality and supported by simplified spares ordering for ease of maintenance.

EM.3.3 Cabling

EM.3.3.1 Scope

This specification covers the provision of cabling, earthing and bonding for the interconnection of all electrical plant and instrumentation at all voltage levels up to 1000V. The Contractor shall be responsible for the design, supply and installation of all power control, instrumentation and communication cables necessary to effect his design and make the installation complete in every way.

The Contractor shall produce a cable schedule to include all LV and control cable information necessary for the contract. This shall include as installed cable lengths core ferrule identification, route identification and gland information. The completed cable schedule shall be returned to DSW's Engineer for acceptance.

In addition to the mechanical equipment already identified, the Contractor shall provide all necessary cabling and wiring between the control panel and the following equipment to provide a complete operational installation:

- a) All level control switches
- b) All flow meters
- c) Any and all pumps and actuated valves used as part of the Contractor's design
- d) Stop locks, motor heaters, moisture detectors, anti-condensation heaters, etc.
- e) Instrumentation cables
- f) General alarm to external flashing lamp
- g) Building services and external floodlights
- h) Trace heating (if required)
- i) Power Factor Correction Equipment

Cables supplied for use under this contract shall be from a BASEC approved manufacturer.

Control, extra low voltage and instrument cables shall be spaced from each other and/or shielded, particularly from heavy current power cables, at a distance that will ensure resultant electrical "noise" is insufficient to cause any form of malfunction of associated equipment.

All external field wiring shall be completed in PVC/SWA/PVC or XLPE cable. Such cables shall be installed/laid direct in the ground or in PVC ducts where detailed.

The cable size shall be calculated and colour coded in accordance with the requirements of the IEE Wiring Regulations to suit the operational conditions and environment.

The Contractor shall however, allow in his tender for laying cables in the service trenches for electrical mains cables and backfilling those trenches.

EM.3.3.2 Cable Ducts

Cable ducts with draw cords and draw pits will be laid and constructed by the Contractor, as required to complete the installation of his designed electrical system. All cable ducts shall be left after installation with a spare draw cord in position ready for future use.

EM.3.3.3 Earthing and Lightning Protection

A satisfactory earthing system shall be achieved for all installations, earth circuits and bonding being provided and tested in compliance with the 16th Edition of the IEE Wiring Regulations for Electrical Installation with current amendments and British Standard Code of Practice CP1013: 1965.

All non-current carrying metal work and metal components within the control panel or associated with the cabling installation shall be suitably bonded to earth in accordance with the requirements of the IEE Regulations.

The Contractor shall determine if structures require lightning protection and install a suitable system in accordance with the relevant SANS specifications and BS6651.

The Contractor shall provide devices to protect the electrical system from damage due to electro-magnetic discharges, such as:

- Furze Ltd. ESP 415M1 or equal on the mains incomer.
- Furze Ltd. ESP 06E or equal for twisted pair data signal lines.
- Furze Ltd. 120-5A low current, in-line protection for 250 volt RMS supplies.

The list is not exhaustive. The Contractor shall provide these and other devices as necessary to protect the installation, all as manufactured by Furse Ltd, or equal, to the Engineer's approval.

EM.3.3.4 Cable Armour Earthing

The cable armour earthing shall be earthed via the cable gland to the nearest Earthing Terminal. A brass earthing tag shall be included in the cable gland assembly for this purpose.

EM.3.3.5 Instrument/Functional Earths

The Contractor shall provide for the connection of an Instrument Earth within the MCC/PLC panel.

In order to prevent the likelihood of circulating currents, conductors shall be suitably sized and shall be connected to each earthing terminal as close to each other as possible.

Only signal reference grounds, instrument cable pair screens and the like shall be connected to the Instrument Earth Terminal. The terminal shall be clearly labelled to reduce the risk of inadvertent connection of other earth conductors.

The screen of instrument cable pairs shall be insulated from earth at junction boxes, marshalling boxes and at the instrument in the field to ensure that circulating currents cannot occur.

EM.3.3.6 Cable Support Systems

Where cables are laid in the ground, they shall be laid in ducts. Where cables are installed above ground, they shall be adequately supported on approved cable support systems.

The Contractor shall be responsible for the design of the cable support systems and shall demonstrate to the satisfaction of the Engineer, that the system is adequately sized for the number of cables (including future requirements) and braced to prevent unacceptable sagging. Cable supports shall be hot dipped galvanized steel or equivalent GRP. All cutting and drilling of cable supports, shall be treated immediately afterwards with an approved sealant to prevent corrosion where applicable. The Contractor shall be responsible for taking off his own quantities and all associated costs shall be deemed to be included in the Contract Price. All cables shall be run above finished ground level. Where cables are at risk of mechanical damage, they shall be protected by inverted tray work or other suitable barrier.

The primary tray routes shall be installed in the service trench units, as indicated on the drawings. The Contractor shall fix the cable support system as shown, using steelwork and proprietary channel brackets, clamps, etc. Drilling or welding of steelwork provided by others for the support of pipework will not be permitted.

Secondary cable routes radiating from the primary routes to switchrooms and equipment locations shall generally be fixed to the sides of concrete tanks, buildings, bund walls, etc.

If Unistrut is used for cable support, the Contractor shall treat all cut ends with Galvafruid, and install end caps.

Any cables at ground level shall be arranged to avoid a trip hazard. If burial in ducts is not possible crossing points shall be provided.

EM.3.3.7 Ladder

All ladder racks used in the Contract shall be sized for the cabling to be initially accommodated.

EM.3.3.8 Tray-work

Tray-work shall be sized for the cabling to be initially accommodated.

EM.3.3.9 Joints and Connections

Joints in cables shall not be permitted.

EM.3.4 Motor Control Centre

EM.3.4.1 General

This particular specification covers the design, manufacture, supply, delivery, offloading, installation, re-assembly and testing of the Motor Control Centre required for the Contract Works.

Switchgear and control assemblies shall comply with the provisions of BS EN 60439-1:1999 (or as currently relevant) Low Voltage switchgear and control gear assemblies – Part 1: Type-tested and partially tested assemblies.

Adequate space shall be provided within all enclosures of electrical equipment, to ensure ease of access for removal of replacement of components, and maintenance purposes and for future equipment.

Adequate space shall be provided with the enclosure for the installation of dial out telemetry equipment.

Switchboards shall be sized in accordance with the requirements of the equipment supplied and with the electricity supplier's metering requirements.

EM.3.4.2 Construction

General

Switchboards may be single or multi-cubicle type, flush front and back, with front access, folded and welded construction, manufactured from mild steel of not less than 2.0 mm minimum thickness to form a rigid construction, unless a specialist equipment supplier offers equivalent protection from an alternative material/panel configuration, to the Engineer's approval. Switchboards shall be corrosion protected. The protection provided shall be adequate for the life of the board.

Vertical and horizontal bracings shall be provided where deemed necessary to produce a secure and rigid structure. The Contractor shall be responsible for ensuring that the panels comply with the load factor requirements of BS EN 60439-1:1999, and make all necessary consultations with the electricity supply company to establish same.

The Ingress Protection classification shall be IP55 for panels within the leachate treatment plant, and factory painted to the approval of the Engineer.

EM.3.4.3 Door Mounted Equipment

Any equipment with a source of supply remote from cubicle and therefore not isolated on operation of door interlocks shall be shrouded and a warning label fixed in a prominent position to indicate this.

EM.3.4.4 Panel Heaters

Panel heaters shall be shrouded to prevent inadvertent contact and be controlled by means of an appropriate thermostat (range - 15° - + 15 °C). Final connection to the heaters shall be by heat resisting flexible cable.

Panel anti-condensation heaters, and thermostats shall be fitted within each compartment.

EM.3.4.5 Labels

The Contractor shall provide and install with each item of equipment a suitably inscribed device function label, manufactured from Traffolyte, unless otherwise specified.

The proposed content of the labels shall be submitted to the Engineer for approval prior to manufacture.

The fixing of labels shall be carried out by means of nylon or stainless steel screws and nuts.

EM.3.4.6 Weatherproof Protection

Externally mounted equipment shall be minimum IP 65 rated.

Equipment and controls in wet wells and manholes shall be minimum IP and zone rated in accordance with any gas hazard zone identified in the specification or on the drawings, in which case gas hazard protection to BS EN 60079-0 – 2004 will be provided.

Cubicles and all door-mounted equipment and all local pump motor control equipment shall comply with IP65 rating. No special gas hazard protection is required to cubicles and door-mounted equipment beyond the passive measures described elsewhere.

All external fixings shall be corrosion protected. The protection provided shall be adequate for the life of the panel.

No external grommets will be permitted.

EM.3.4.7 Busbars

Where busbars are included in the control panel, the busbar system shall be rated approximately for the size of the board.

All busbars, risers and droppers shall remain fully shrouded when compartment doors are open.

EM.3.4.8 Power Distribution

Power shall be distributed using adjustable Moulded Case Circuit Breakers (MCCBs). An MCCB shall be provided at the metering cubicle.

MCCBs shall be in metal clad compartments of switchboards. Clear indication of "ON", and "OFF" and "TRIPPED" positions shall be provided, together with facilities for padlocking in the "OFF" position on all isolating switches.

EM.3.4.9 Common Control

The common control circuit voltage shall be 55 – 0 – 55V, derived from a transformer installed in the common controls compartment.

Control and alarm circuits shall be designed as fail-safe.

EM.3.4.10 Motor Starters

Motor starter equipment shall be supplied by the Contractor and suitably rated for starting conditions for all the mechanical equipment.

The starter control circuit voltage shall be 110V derived from a transformer provided within the starter compartment, having separate primary and secondary windings (the secondary with control point earthed).

A "Motor Failure Alarm" condition shall be indicated when a protection device trips or control circuit fuse blows. This shall de-energise the motor contractor under all conditions. An "Overload Tripped" condition shall be indicated on the respective starter by means of an illuminated lamp. The motor failure condition will also be relayed to a microprocessor for annunciation with other alarms.

Starters shall incorporate overload and single phase protection, suitably rated for each motor and with a manual reset facility. Overload ranges shall be adjustable 80 – 150% motor full load current.

Each leakage protection shall be provided with a variable sensitivity setting and associated test and reset buttons shall be provided on the panel door. Residual current devices (RCDs) shall be complete with core balance current transformer (CT) and trip levels to be 30 mA for general purpose final circuits and 30-300mA with adjustable time of 0.05-0.2s for motor circuit RCD's.

If motor heaters are installed they shall be arranged to operate when the motor is de-energised.

MCBs supplying motor starters shall be equipped with both magnetic and thermal trips.

Starting methods shall be determined by the requirements of the equipment manufacturer and the electricity supply company. In general, assisted starting shall be provided for all motors over 3 kW, unless by agreement with electricity supply company that motors above this size may be started direct-on-line.

EM.3.4.11 Lamps

Alarm indicator lamps shall only be illuminated when an abnormal condition occurs.

All signal lamps shall be colour coded in accordance with the following system.

Table 3.1

Colour	Duty
Red	Stop and Emergency Stop push buttons. Power supply "on" indicators
Green	Start push buttons. Motor running indicators
Blue	Forward, Raise or Open push buttons or indicators
White	Reverse, Lower or Close push buttons or indicators
Amber or Yellow	Lock-out and Alarm indicators and Reset push buttons

A lamp test facility shall be provided. 24 Volt lamps shall be used.

EM.3.4.12 Internal Wiring

Wiring cables shall be run in groups fixed:

- a) With black nylon cable ties
- b) In trunking
- c) On cable trays

Cables shall have stranded copper conductors with a minimum cross sectional area as follows:

- | | |
|--|----------------------|
| a) Motor supply cables | 2.5 mm ² |
| b) Control cable external to switchboards | 1.5 mm ² |
| c) Control cable within switchboards | 0.75 mm ² |
| d) Telemetry control/digital signal cables | 0.75 mm ² |

Control, extra low voltage cables used to transmit instrument signals likely to be affected by interference shall be screened and/or spaced from each other and particularly from heavy current power cables, at a distance that will ensure that resultant electrical “noise” is insufficient to cause any form of malfunction of associated equipment.

EM.3.4.13 Earthing and Bonding

All earth circuits and bonding shall be provided and tested in accordance with OSHALT No. 85 of 1993 and SABS 0142 of 1993 or as currently updated and relevant.

Protection shall be provided whenever necessary to ensure the continued fault-free operation of all electrical equipment during electromagnetic discharges (thunderstorms) spikes or other power surges or momentary power cuts.

EM.3.4.14 Protection Devices

Discrimination in multiple MCCB link systems shall be arranged to ensure that under fault conditions the link nearest the fault operates first. In the event of power failure (supply failure) all equipment shall be designed to restart automatically at the point in the control cycle at which it would be operating if no power failure had occurred. An alarm will be displayed. No discharge pumping sequence shall be initiated by the control system until the alarm has been cancelled by the plant operator. In the event of systems overload (overload device tripped), the equipment will be manually restarted.

The adoption of an MCB design is preferred.

EM.3.4.15 Remote indication

Facilities shall be included for voltage free contacts and all cabling on each alarm device and plant status for remote indication purposes.

EM.3.4.16 Panel Layout

General

The main control panel shall be of a multi-cubicle construction to accommodate:

- a) Incoming mains isolator
- b) A distribution and instrumentation section
- c) A motor starter control section

All external panels shall be provided with a 300 mm minimum free air gap between the ground surface (the floor of the housing unit) and the panel to avoid the risk of flammable vapour pressures being exerted on the cable glands at the base of the panel. A steel grill shall be installed to provide cable protection over the “air gap”. No ducts will cross the “air gap”.

Main Control Panel Location – Control Building

The panel will be located in a dedicated ISO “shipping” container.

Motor Control Section

The motor starter control sections shall contain the following for each of the motor applications: door-mounted isolator with facility to energise control circuits only for testing/maintenance purposes.

MCCBs and MCBs

Motor starters with overload and single phase protection,

Control sections operating at 110V AC,

Anti condensation heater,

Lamp test facility,

Suitable Klippon SAK type terminals.

Specific related control equipment,

Set of control MCBs,

(the pump motor control section shall include provision for a timer for staggered starting of the pumps).

Door mounted equipment, for each unit of mechanical equipment:

Selector switch – hand/off/auto,

Indicator lamp – green – motor running,

Indicator lamp – amber – overload device tripped,

Indicator red – power supply “on”,

An earth leakage contact breaker (ELCB),

Suitably calibrated ammeter connected to one phase only (with a suppressed scale to read motor running and starting current) and an adjustable set point indicator in red)

Integrator (hours run) non resettable (reading to 99999 hrs). The hours run meter shall only run when the pump, aerator etc. is actually running.

Any item of control equipment common to the control of more than one item of plant shall be located in the common control section. All controls (in all compartments) must be adjustable from the front of the panel without opening the cubicle doors.

Distribution Section

This section shall accommodate the following:

1 No triple pole plus neutral (TP&N) externally operated fault monitoring load breaking isolating switch interlocked with the compartment door. The isolator shall be provided with provision to padlock in the OFF position.

1 No TP&N MCB distribution board with adequate ways for the requirements of Building Services and for the various instruments all as detailed in this specification plus 2 spare 30 A ways per phase.

The MCBs shall be accessible from the front of the panel without opening the door.

The distribution board shall include residual current circuit breaker (RCB) units on all 13 A socket outlet ring mains.

The distribution board shall be provided with circuit identification labels.

Instrumentation Section

This section shall accommodate the following:

PLC and door mounted operator interface. No stand- alone computer shall be provided. All computerized functions shall take place internally to the control panel and be accessed through the HMI.

All necessary relays, timers, and other control equipment shall be provided for the automatic operation of the feed, treatment and discharge system as described in this Specification.

In general all instrumentation should be fed from the common control voltage and the presence of 240 volts in this compartment shall be avoided.

EM.4 INSTRUMENTATION SPECIFICATION

EM.4.1 Scope

This Specification covers the provision of Instrumentation systems for the treatment of the leachate at the Locu landfill.

EM.4.1.1 Design

The Contractor shall design each instrument installation taking in account local ambient conditions, measurement requirements and good instrumental engineering practice, ensuring that adverse ambient conditions do not have a detrimental effect on the instrument and its measurement.

Instrument selection shall take cognisance of routine maintenance requirements/frequencies, re-calibration intervals, consumables, specialist calibration/test equipment and the availability of technical support. The instrument supplier shall ensure that the instrument manufacturer has an adequate local based technical and logistical support organisation.

Where an instrument is installed in or likely into a hazardous area, it shall comprise components and equipment with internationally recognised certification (appropriate to the zone/gas group/surface temperature limitations) and be suitable for connection into intrinsically safe circuits.

EM.4.1.2 Instrument Ranges and Units of Measurement

Ranges of display instruments and measuring systems shall be selected so that the maximum reading under normal operating conditions corresponds approximately to the following: -

Flows and levels	90% of full scale value
Analytical	Ranges to be agreed by the Engineer

Units of measurement for use with measurement systems and displays shall be:

Flow rate	Litres per second(l/s)
Total flow volume	Cubic metres
Level	Metres (above the bottom of the tank)
Analytical	Units to be agreed by the Engineer

EM.4.1.3 Installation of Field-Mounted Instrumentation

The Contractor shall design the instrument installation to the following basic criteria:-

- i. The physical location of instruments shall be such that instrument position and orientation provide safe access for operation and maintenance and do not impede safe access to plant. Manufacturer installation, maintenance and operational recommendations and guidelines shall be followed.
- ii. Sensors shall be mounted generally either on the pipework or in dedicated stilling tubes. Where impulse lines are used, they shall be kept as short as possible.
- iii. Where the weight of a sensor is excessive for support via the pipe tapping, a separate supporting bracket shall be provided. The supporting bracket shall not be attached to the process pipeline.

- iv. Unless otherwise specified, instrument display and transmitters shall be located adjacent to the respective sensor location, for ease of calibration. The transmitter will send a signal back to the PLC for conversion to an analogue signal and for downloading through the SCADA system for display, logging and trending.
- v. When the transmitter is remote from the sensor it shall be fixed to a suitable frame positioned 1.4 metres above ground or floor level. Where the instrument must be located above 2 metres high, a separate local indication shall be provided 1.4 metres above ground or floor level. Instruments shall only be mounted between 1.4 and 2.0 metres with the Engineer's approval.
- vi. Where the instrument transmitter is integral to the sensor, a local junction box shall be provided and installed close to the transmitter for the connection of the signal cables to the local instrument tails.
- vii. Junction boxes shall be polycarbonate IP65 and be provided with DIN rail mounted non-disconnect 2.5 mm terminals to accommodate all conductors and screens. For hazardous areas the junction box shall be rated for the particular zone.
- viii. Typical hook up drawings shall be provided for each sensor type, and approved by the Engineer prior to installation (example hook ups will be provided by the Engineer)
- ix. Calibration sheets shall be supplied with each instrument showing that the instrument has been tested and calibrated on a certified test rig or instrument. The sheets shall show test results and confirm that the instrument is within the specified accuracy limit across the whole of its range. Where a test instrument is used, a verification test certificate shall be provided and reference to the certificate number shall be included on the test sheet of the instrument under test.
- x. Each 110V ac powered instrument transmitter shall be provided with a local disconnection located not more than 5 metres from the transmitter.
- xi. Local disconnection shall comply with BSEN60947 and shall be lockable, using a padlock, in the off position.
- xii. Instrument transmitters installed in outside locations shall be protected IP65 minimum. Where the manufacturer design does not allow for this, the transmitter shall be installed in an IP65 enclosure.
- xiii. Where enclosures are provided for instrument transmitters, they shall be of a double insulated GRP construction with a glass panel in the door to provide a view of the transmitter displays without having to open the door. An anti-condensation heater capable of maintaining 10°C for an ambient temperature of -20°C shall be provided.
- xiv. The enclosures shall be lockable with a key that is common to all instrument transmitter enclosures across the site. Separate locking arrangements shall be provided for analytical instrument system monitor stations.
- xv. The enclosures shall be suitably sized and mounted to allow the ease of maintenance. The enclosures shall be installed on a prefabricated galvanised steel mounting frame. The mounting frames shall be of a standard design, suitable for either ground mounting or mounting on the support structure, subject to the individual transmitter location.

- xvi. Transmitters for tanks measuring systems or other inaccessible areas shall be installed at a convenient location at ground level on a support frame, as specified above.
- xvii. Instrument and sensor materials that are in contact with the process liquor shall be suitable for the liquor.

EM.4.1.4 Process Connections, Piping & Valves

Instrument and sample point tapings to process pipework or tanks shall be provided by the Contractor. The tapings are provided for either direct instrument and manifold connection or for connection of sample or impulse lines via a primary isolating valve.

Process connections for field instrumentation shall comply with appropriate piping standards, and shall be compatible with both process and mechanical requirements. Impulse lines to field instruments shall be terminated by close-coupled proprietary isolation manifolds, which shall incorporate flushing and rodding facilities where there is any possibility of the tapping point/impulse lines blocking.

Instrument tapping points for connection of instrument or manifold/impulse line under this contract will be presented as follows:

Tanks

DN200 PN16 supported of the inside of the tank walls for ultrasonic level sensors, pressure transducer level sensors, dissolved oxygen probes, pH probes and temperature probes

Pipes

DN 100 PN16 for all connections where sludge is the measured liquor

DN13 PN 16 for pressure instrument connections

DN25 PN 16 for all other instrument connections

DN 40 PN 16 for sample line connections

The Contractor shall provide details of pipe lengths in the tender documentation for evaluation. Impulse pipework shall be kept to an absolute minimum and shall be installed only at the discretion of the Engineer.

All instrument impulse lines shall be 316 stainless steel and shall be 12 mm diameter. All pipe bends shall be produced using proprietary pipe benders and pipe fitting shall be stainless steel compression type.

Impulse and sample lines shall include all tubing, fittings and secondary isolation valves. This shall include manual isolation of each instrument fed from the impulse or sample line in a manner that allows removal of any single instrument/measuring element without disturbing any other elements.

The Contractor shall ensure that good engineering practice is adhered to when installing impulse and sample lines. This shall include ensuring adequate fall, the inclusion of blow down legs, absence of dead legs and air traps etc.

The Contractor shall design alkali dosing (NaOH) pipework in such as manner to act as fail-safe in the event of pipe blockage, or inappropriate valve settings being set while pumping. Accidents are possible in which NaOH dosing systems can fail and spray alkali from fittings, causing possible alkali skin burns to operatives. It will as a result be necessary to include a pressure relief system within the pipework for the NaOH dosing. The layout and flow regime for the duty/standby NaOH dosing pumps shall be submitted to the Engineer for acceptance.

EM.4.1.5 Instrument Specifications

All analogue instrumentation output shall be isolated 4-20 mA, alarms and switch points shall be change over volt free contacts.

All digital instruments shall be provided with volt free contacts. Where active devices are provided an interface relay shall be provided within the control panel, common controls section.

Alarm signals shall be de-energised and open, energised and closed when true.

Status signals shall be closed when true and open when false.

Unless specified otherwise, signal conversation, display, transmission, and processing shall be carried out in areas set aside for that purpose, which shall be within buildings or enclosures wherever possible. Where field mounted sensors provide low magnitude output signals, signal conversion shall be performed locally to the sensor. Every active instrument shall provide analogue or digital indication together with discrete diagnostics and alarm information in a suitable form for transmission to a PLC/SCADA system.

Examples of signal requirements for various transmitters and discrete signal devices are given in this section. The signals shall be cabled to the relevant MCC Control and Instrumentation panel and cabling shall comply with the cable schedules. Where a cable is omitted from the cable schedule, the cable supplied for a particular signal shall comply with the general requirements for cabling for the relevant signal type.

EM.4.1.6 Flow Measurement Equipment

The flow measurement shall be achieved by the use of a electro-magnetic flow measurement equipment as set out in Table 4.1.

Table 4.1: Typical Flow Measurement Requirements

Parameter	Requirement
Location	in locations as shown on the drawings
System	Magnetic Flow meter type, as ABB-Kent Taylor or equivalent
Flow Range	0 l/s to 20 l/s at RLBT & TLBT to Gooseneck & Aeration Tank Decant Pipeline
Accuracy of Flow Measurements	+/-5% (over flow range)
Digital display/print out	Instantaneous flow, signal to be transmitted to the main panel unit for processing, totalized flow to be recorded

Digital display/print out instantaneous flow, signal to be transmitted to the main panel unit for processing, totalised flow to be recorded.

EM.4.1.7 Electromagnetic Flow Meters

Electro-magnetic flow meters shall comprise a flow-meter detector head including earthing ring(s), the converter and the interconnecting signal cable between the flow head and the converter.

The flow meter shall be of the bipolar pulse type and shall provide the measurement of volumetric flow and integrated total flow.

The Contractor shall ensure that the flow head is installed ready for the pipeline to be pressure tested, unless otherwise specified.

The signals provided by the flow meter shall be as set out in Table 4.2.

Table 4.2: Flow Meter Signals

Parameter	Signal Type
Flow (volumetric)	Analogue
Pulse digital (totalized flow)	Digital
Reverse flow indication	Digital
Empty pipe indication	Digital
Fault	Digital

EM.4.1.8 Flow Switching/Monitoring

Flow switches/monitors shall be of the calorimetric (thermal conductivity) type. Calorimetric switches shall provide a switched output on a volt-free changeover contact and shall monitor the flow within a tolerance of + 2% of actual flow. The output shall be adjustable over the calibrated range of the sensor. Temperature compensation shall prevent variation in the set-point value over varying process and ambient temperatures. Connections to pipes shall be via BSP threads appropriately sized to the application. The flow switches shall be protected to BS5490 IP65.

EM.4.1.9 Ultrasonic Level Transmitters

Ultrasonic level transmitters shall not be provided as part of this Contract.

EM.4.1.10 Level Sensing Pressure Transducers

Primary control of pumping shall be by means of level sensing transducers.

Level sensing transducers shall be manufactured by an approved manufacturer such as the GE Druck, or equal approved, and shall be provided in each of the following locations and for the following purposes set out in Table 4.3.

Table 4.3: Location and requirements of liquid level sensors

Location	Requirement and Condition
Raw Leachate Balancing Tank	One enabling level set point to start the feed pumps
	One low level set point to stop the pumps
Aeration Tank	One high-high level set point to alarm
	One high level set point to stop the Raw Leachate feed pump
	One low level set point to close the decant actuated valve and stop the discharge pump
	One low level set point to stop the aerators
Treated Leachate Balance Tank	One high-high level set point with alarm
	One high level set point to stop the effluent decant pump, subject to daily cycle
Reed Bed/Outlet Chamber	One high-high level set point to close the reed bed feed actuated valve and alarm
NaOH storage Tank	One high level set point with alarm to alert the operator regarding overfilling the tank
	One low level set point with alarm to alert the operator that the hydroxide level is low

Location	Requirement and Condition
	One low level set point to stop the pumps
Phosphate Storage and Antifoam	Drum storage – not required

The transducers shall operate via current limiters (eg Zenner Barriers) which shall be provided for all wet well and tank applications. The Contractor is reminded that an explosion risk zone has been identified above the cover over the RLBT, and the current limiters will serve to limit the low risk potential for a spark to cause an explosion, in the event of damage to the transducer cables.

The Contractor shall provide and install suitable robust and readily adjustable stainless steel support brackets and weights for the transducers to ensure that they remain in position. The transducers will be located within a minimum 32mm ID polypropylene or stainless steel tubing. One no. spare transducer unit shall be provided to be delivered to the Employer's store, together with 10 m of cable.

EM.4.1.11 Level switches

Level switches or floats shall be provided, or transducers. Transducers are preferred and shall be by Druck, or equivalent. See previous clause.

EM.4.1.12 Dissolved Oxygen Monitoring

A Dissolved Oxygen Meter is to be provided under the contract. Details are to be provided.

EM.4.1.13 pH Monitoring

Two sets of pH probes shall be installed in each aeration zone of the Aeration Tank, in stilling tubes. The Contractor shall provide details of a suitable non-clogging stilling tube design for approval by the Engineer.

Table 4.4 Location and requirements of pH-value sensors

Location	Requirement and condition
Aerated tank	Monitor pH-value and display on local display and on PC monitor
	Activate sodium hydroxide pumps at operator adjustable low pH-value
	Deactivate sodium hydroxide pumps at operator adjustable high pH-value
	Alarm to alert operator at high-high or low-low pH value.

Sufficient length of cable shall be provided to permit adjustment of the probe length over the whole depth of the tank within the mixed liquor volume.

The pH sensor shall be of Differential Electrode Technique design, which uses two electrodes to compare the process value with a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling resistant characteristics.

The sensor shall have a hex-shaped body to facilitate mounting and shall be constructed of liquid crystal polymer for chemical resistance and mechanical strength. This material shall enable the sensor to be installed in metal fittings without leakage usually caused by heating and cooling cycles when dissimilar metals are threaded together.

The sensor's built-in electronics shall be completely encapsulated to protect them from moisture and humidity. The sensor shall have built-in preamplifier to enable the signal to be transmitted up to 914 m with standard cabling, or a built-in, two wire transmitter that provides a non-isolated and uncalibrated 4-20 mA output.

The sensor signal shall be automatically temperature compensated by an integral temperature sensor. The sensor shall include a metal ground electrode to eliminate ground loop currents in the measuring electrodes.

A separate display of the pH measurement shall be provided on the outside of the Aeration Tank outer wall immediately adjacent to the probe housing to permit the operator to clean and re-calibrate the probe readily.

The sensor shall be GLI International Inc. Model P53 pH/ORP Analyser for pH measurement or equivalent.

EM.4.1.14 Temperature Monitoring

The temperature of the mixed liquor in the aeration zone of the Aeration Tank shall be monitored continuously. Where a pH value probe is also present the temperature monitoring probe shall be this integral probe. If no integrated temperature probe is specified the Contractor shall provide 1 No sensor for liquid temperature in the range -0 deg Celsius to +45 deg Celsius; the sensor being combined with the pH sensor instrument.

EM.4.1.15 Sensor Stilling Tubes

All instrumentation sensors shall be installed in stilling tubes, which will have at least 30% by area of opening in the tube walls. The tubes shall be located on the perimeter wall of the aeration tank offset from the aerator fixing points to avoid conflict or damage, and should not be placed in areas of high turbulence close to the aerators.

The stilling tubes for pH/temperature and dissolved oxygen monitoring shall be made of plastic, of 100 mm diameter, minimum, and of length suitable to maintain the probe within it and below liquor level at all times in the tank. The tubes shall be rigidly supported off the tank wall at appropriate centres to maintain a suitable fixing for all movement of mixed liquor in the tank.

The tubes for level monitoring sensors shall be at least a 32 mm diameter, and they shall be of solid plastic. Fixing of the tubes to the tank walls shall be similar to the above.

Each tube shall house 1 No sensor only, for measuring the respective parameter. It shall be suitably fixed to the top of the tank for easy removal of the respective sensor for regular cleaning, calibration, etc, together with sufficient length of cable for direct connection without joints to the receiving units in the main control panel.

EM.4.1.16 Conductivity Monitor

The Contractor shall design, supply, deliver to site, install and calibrate in the presence of the Engineer or the Engineer's Representative, and commission a permanently installed continuous measurement conductivity monitor. This instrument will be in the Aeration Tank perimeter drain leakage detection chamber at an approved position.

A background salinity/conductivity test shall be taken before installation of the Works and used to choose a suitable alarm trigger setting for the Conductivity Monitor. The Conductivity Monitor will be provided complete with the signal cable to be laid through duct (by others) to the Control panel.

EM.4.1.17 Labelling

Instrumentation Labels

Each pump, aerator and instrument shall be provided with a stainless steel tag number label, wired to the instrument.

An additional traffolite label showing tag number and a duty shall be fixed by stainless steel screws adjacent to the instrument. Fixing to the instrument will be prohibited. The label shall be as shown in the diagram:

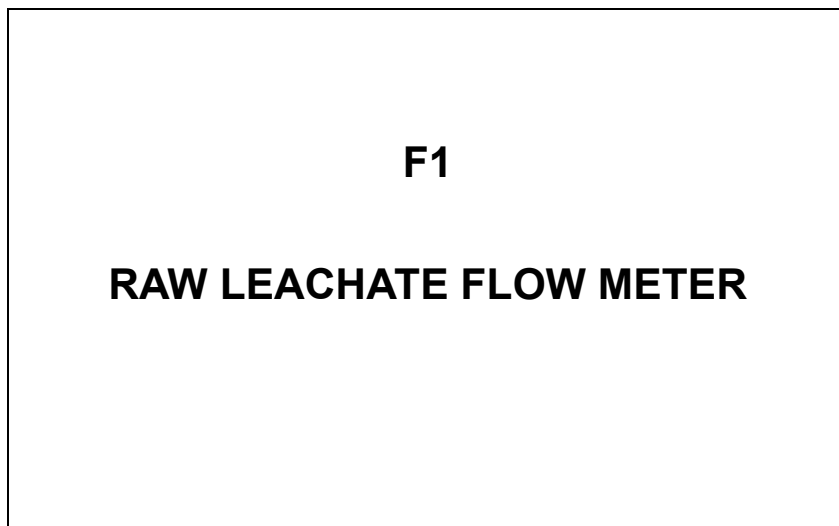


Figure 1: Traffolite Labels – Black Text on White Background

EM.4.1.18 Junction and Marshalling Box Labels

Drilling of junction box lids will not be permitted: junction and marshalling boxes shall have labels attached to the structure adjacent to the box.

EM.4.1.19 Hard-Wired Trip Systems (Hard-Wired Interlocks)

Hard-wired interlocks shall be used as protection against pump dry running:-

Low-level cut-outs in tanks, sumps and bunds.

Low flows in pipelines – positive displacement pumps shall use pressure switches. All other pumps shall use flow switches.

The signal shall trip the starter in the MCC and shall only be manually resettable.

Interlock signals are to be shown on the P&IDs as dotted lines between the trip instrument and the motor or valve actuator.

EM.4.1.20 Loop Diagrams

For each instrument a loop diagram shall be provided. Where possible the whole loop shall be incorporated on the A3 sheet (examples given). The core numbering shall follow the PLC address and shall keep this tag identification from source to destination. The cables shall be labelled PXXX for power, AXXX for analogue, DXXX for digital and MXXX for miscellaneous.

EM.5 CONTROL AND AUTOMATION SPECIFICATION

EM.5.1 Scope

The general scope of works shall include, but not be limited to the following:

Programmable Logic Controller (PLC) will be supplied to provide a stand-alone interface with all control automation and instrumentation equipment. The PLC will form the basis of the SCADA system. It will provide a user-friendly, graphically intensive, user interface for the monitoring and adjustment of all control and instrumentation inputs and outputs. The PLC will provide trend graphs of all monitored parameters and will include a database for storage and subsequent access to all plant data. The database fields shall be comma delineated such that all data can be readily output to industry standard spreadsheet packages including Microsoft Excel.

All necessary system software, loaded and set up to provide a fully operating system.

Configuration of system databases, operating screen mimics and controls and the setting up of system functions.

All necessary software licenses and all software documentation including third party supplied software.

Applications software.

All necessary communications equipment (e.g. modem) and software to interface with the Alarm and Status Printer.

Programming facilities.

The Contractor will provide all parts necessary for the performance of the plant whether or not such parts are mentioned in the specification except insofar as they are expressly excluded from the Contract.

EM.5.1.1 Control

Control of the plant shall, unless otherwise specified, be carried out by the PLC which shall be programmed to operate the plant as follows:

EM.5.1.2 General information

Definitions

“System” means the whole sum of the windows operating system, the “source code”, the “Software”, and the “Hardware” as set out below,

“Source Code” will mean the non-compiled program data created in **Windows** based programming language capable of supporting all current windows operating systems.

“Bespoke Software” means the compiled run-time version of the programme created using the standard software.

“Standard Software” means any high level language shall program utilized for the production of SCADA software by compiling a run-time application.

“Software” means the Bespoke Software the Operating System and any other software provided by the MEICA Contractor ancillary to the system.

“Hardware” means the computer and PLC microprocessor forming part of the Plant and all the equipment and operating systems as listed in the Schedule hereto.

The operating system shall be a Microsoft Windows operating system.

The parties shall meet together with such frequency as may be desirable for the purposes, inter alia, of:

Monitoring progress of that part of the Works which consists of the System,

Agreeing a delivery schedule for exchange of information between Contractors for the Hardware.

Agreeing the Acceptance tests and the services and facilities (if any) to be provided by DSW (the eThekweni Municipality).

Following approval, in writing by the Engineer, no amendment shall be made by the Contractor unless specifically requested, in writing, so to do by the Engineer who will signify his approval in writing. The Contractor will be deemed to have included for these in his price. Meetings will be in the office of the Contractor or at the offices of the Engineer.

EM.5.1.3 Software and System Acceptance

Following the successful passing of the tests and routines for the Hardware, the Contractor will provide, deliver, install and commission the Software. Each item representing part of the Standard Software and each part of the Software will be accepted when it has in conjunction with the Hardware successfully passed the Acceptance Tests specified for such part. The System will be accepted when the Standard Software and the Bespoke Software has demonstrated its capacity to fulfil the Specification functions during the Trial Period.

Title to Operating System and all Software

Title to the Software will at all times be vested in DSW including all user names, passwords, key codes, Serial Numbers etc used during installation. The Contractor will grant to DSW the non-exclusive right to use one copy of the Standard Software in the System for the purposes of use at the site or sites to which the Contract applies. DSW will be entitled to make such copies of the Standard Software as he may reasonably require for his own internal use for back-up purposes, without the payment of any royalty to the Contractor and will ensure that all such copies acknowledge the Contractor's copyright therein and, in the product, thereof.

EM.5.1.4 Title to Bespoke Software

Title to copyright in the Bespoke Software will be vested in DSW at the end of the maintenance period. DSW will at the request of the Contractor grant to the Contractor a non-exclusive world-wide license to market the Bespoke Software (and to sub-license third parties to use the same) upon such terms as may be agreed, or in the absence of agreement, upon such terms as may be fixed by Arbitration under the Conditions of Contract as being in all the circumstances reasonable.

EM.5.1.5 Source Codes

The Contractor will upon delivery of any part of the Bespoke Software:

- i. Provide for the retention on the Premises a copy of the Source Code thereof both in written form and in a magnetic or optical digital form, or
- ii. Deposit a copy of such Source Code with a third party approved by DSW upon terms that upon the Contractor going into liquidation or having a receiver appointed, or ceasing to provide service in respect thereof, the same will on the written request of DSW be released forthwith by such third party to DSW.

The Contractor will satisfy the Engineer as to the completeness of the Source Code prior to its being sealed and deposited.

The final version of the source code will be provided at the end of the maintenance period for the use by DSW to amend the software for use solely at the site or sites to which the Contract applies.

EM.5.1.6 Software Requirements

Programmable Logic Controllers (PLC)

The PLC will consist of all units or modules necessary to provide a fully integrated control system.

The PLC will be designed to monitor continuously the status of all inputs and to direct or control the status of all outputs in accordance with the program stored in memory. The operational capability will include interlocking, timing, closed loop and sequence control.

The Contractor will submit sufficient details with his tender to enable the Engineer to appraise the software system.

The PLC system will be self-checking via a watchdog relay. This relay will have a closed contact when the PLC hardware and software is normally operating, which will open in the event of a hardware or software failure. The status of the watchdog relay will be indicated on the front of the PLC/Instrument Section of the Motor Control Centre.

Memory

The memory for the PLC will be divided into two sections:

a) Program Memory

Program memory will be EPROM with sufficient capacity to store the program, data tables, data storage, etc. with 25% spare. There will be space to add further modules when more than 50% of the capacity is used. The program and data held within memory will remain error free and intact if the external power supply is removed.

b) Working Memory

Working memory will be CMOS RAM with battery back-up, of sufficient capacity with at least 25% spare. There will be space to add further modules when more than 50% of the capacity is used.

Input/Output Modules

When the installation and commissioning of the site is completed, the PLC will have at least 20% spare, unused of each of the digital/analogue types of input/output. The spare signals will be hardwired and configured.

Digital inputs will be initiated by a volt-free contact from field equipment, and will be "fail safe" in design where appropriate, i.e. contact opening upon alarm.

Digital outputs will provide a relay contact which will be selectable between normally open and normally closed and be suitable for the intended switching duty. Arc suppression devices will be fitted as necessary.

Analogue inputs will be in the range of 4-20 mA source from the field instrumentation. The loop impedance will not exceed 250 ohms. The analogue to digital converters will be a minimum of 10 bit converters.

Analogue outputs will be in the range of 4-20 mA, and must be able to drive into an impedance of 0-750 ohms.

The loop accuracy for analogue inputs and outputs will not be less than 0.5% of actual value.

EM.5.1.7 Applications Software

The Contractor will be responsible for providing fully operational applications software to implement all the necessary control, monitoring and communication functions required to operate the plant provided.

The software will have safe “power on” and “power off” sequences built in to ensure that the plant is in a safe and controlled condition at all times.

Basic layout, function and control strategy for the software will be discussed and agreed with the Engineer and DWW before work starts.

Software design will be laid out in a modular manner; i.e. it will be structured in program files, using simple ladder logic, so that similar tasks are of a similar structure and size to enable programmes to be maintained easily.

Software will be fully documented with descriptions of each section written into the program and contact/ relays given mnemonics directly related to the items of plant.

The Engineer has the right to view the software at any stage during its writing and will receive a copy and discussions about it as soon as it is written. Regular update meetings will be held to review progress.

The Contractor will provide complete software programs with all the necessary up to date documentation prior to commissioning. The Contractor will only be allowed to implement changes to the software with consent from the Engineer during the Site Commissioning period. Any changes made during this period will be formally recorded during testing and presented in a documented format before the end of the Commissioning period. The annotated software documentation will be made available to the Engineer before factory acceptance testing and before installation at site.

Any major changes of software, determined and agreed by the Engineer and the Contractor will require a complete re-test, in accordance with each step of the testing procedure.

EM.5.1.8 Signal Requirements for Plant Controls

Digital inputs will be wetted from the PLC. Each signal pair will be wired through to the input terminals.

Digital outputs will be powered from the PLC 24V dc power supply.

Analogue inputs will be powered from the instrument where the instrument is mains-powered and from the PLC 24V-dc power supply where the instrument is loop powered. All analogue signaling will be 4-20 mA.

Analogue outputs will be by direct connection to the load (i.e. the whole primary loop).

Analogue output signals will be 4-20 mA powered from the PLC 24V-dc supply via the analogue output card.

Table 5.1 shows some of the required I/O signals to and from the designated instrumentation to the PLC.

Table 5.1: Example PLC received signals

Source	Receiver	Type of Signal	Display	Comment
Motor starters	PLC	Digital	Running/stopped	Status
			Available/Not available	Condition
PLC	Motor starters	Digital	Run	24V dc run relay in starter (24V dc derived from the PLC power supply)
Actuated Valve	PLC	Digital	Open / Not Open	Status
		Digital	Closed / Not Closed	Status
PLC	Actuated Valve	Digital	Open	24V dc run relay in PLC
		Digital	Close	24V dc run relay in PLC valve actuators will require control supply from the PLC
Electromagnetic Flow meters	PLC	Digital	Available / Not Available	Condition
Electromagnetic Flow meters	PLC	Analogue	Flowrate	4-20 Ma
Pressure Transducer Level Transmitters	PLC	Digital	Available / Not Available	Condition
		Analogue	Level	4-20 mA
Pressure/Flow Switch	PLC	Digital	Normal / High Level (Pressure)	Condition
		Digital	Normal / Low Level (Flow)	Condition

Small control valves and solenoid actuators will be controlled via a 24V pilot relay installed in the MCC. The pilot relay will be operated via the PLC supply. If the control valve is operated at 24V dc it will be powered from an alternative source to the PLC power supply. Solenoid actuators will include for operating direct or pilot operated valves or operating solenoid actuated dosing pumps etc.

These I/O lists are for information purposes only. The lists are not exhaustive, but are included as a guide and an indication of the format that the I/O list should be.

The Contractor will be responsible for the production of I/O lists.

EM.5.1.9 Control Logic

General

All necessary relays, timers, electronic and microprocessor control equipment shall be provided for the automatic operation of the treatment and discharge system as described below.

The treatment system and all microprocessors, timers and sub-sequences operating within it shall be maintained by the provision of back-up power sources in the event of intermittent or extended interruptions in power supply for a minimum of 5 years, and shall be protected against the effects of electromagnetic storms in the area and power “spikes”. The Contractor shall provide protection to the PLC including filters and surge protection and include an UPS supply to prevent disruption and damage to the programme and the plant operation sequence due to transient fluctuations to the power supply. The UPS battery duration shall be a maximum of one hour. The UPS shall interface with the PLC to shut down the PLC when power down time exceeds 2 minutes or when battery condition is low. The process cycle shall restart automatically and sequentially upon return of mains power after a 30 second delay.

It shall be possible to confirm by reference to a readily accessible operator interface, so that each function of the cycle is accurately set and operating correctly.

Alarm events

Alarm events are listed in Section EM.5.1.

High Alarm Events

The pump control systems shall incorporate high and low level control using pressure transducer level devices. In the automatic mode the pumps shall start on a pre-set pump-on level, intermediate or enabling level and stop on a pre-set pump-off level.

Chemical Reagent Addition

Operation of the sodium hydroxide dosing is carried out in accordance with demand from the aeration zone by the pH sensors. Only the sensor furthest from the point of entry into the aeration zone of the Aeration Tank from the chemical storage tank shall be used for controlling the operation; the other sensor will be used as a check sensor. The check probe is to be programmed as a standby control sensor in the event of disconnection or malfunction of the “duty” probe.

The controlling sensor shall be programmed to operate between low and high operator settable set points and for a maximum, operator settable, pump run time. If the pump continues for the full pre-set run time, on completion of that run time, the pump will cease operation and re-interrogation shall not occur until the following day. An upper limit of pH value, operator settable, will when reached cause an alarm to be raised in the PLC and the operator alerted. Similarly, a low/low limit of pH value will also cause an alarm to be raised in the PLC and the operator alerted.

The level of the sodium hydroxide in the tank shall be measured by a level indicator in the storage tank.

Operation of the phosphoric acid dosing pumps shall be on an as required manual basis.

Interlocks

The interlocks and overriding controls shall be provided on these functions, are listed in Section 2.

The following interlock shall be provided to prevent gross over dosing with alkali in the event of pH probe failure, or dosing pipework rupture. The system shall provide a timer to commence at commencement of dosing. In the event that continuous dosing is demanded and takes place for more than 5 hours dosing (user adjustable). Dosing shall cease and an alarm be activated. Similarly if the pH does not vary by more than 0.5 of a pH unit over a 3 hour period relative to the pH at commencement of any continuous dosing pumping period an alarm shall be activated and pumping shall cease (user adjustable).

- i. For any alarm annunciation, a rotating or flashing red lamp mounted on the outside of the control room.

- ii. A general audible alarm will be provided at the main control panel. The audible alarm will be provided with a self-cancelling timer. Manual reset facilities shall be available for all alarms and lamps.
- iii. Time display suitable for checking purposes.
- iv. Locking access to all adjustable controls (without switching off power to section).
- v. Status to be displayed at a suitable position on the panel as follows.

The Contractor shall provide an A4 Printer, suitably shelf-mounted adjacent to the PLC enclosure to record the parameters as listed in Table 5.2.

Table 5.2: Operational Printout Requirements

Operational Parameter	Equipment Description
Flow rate (instantaneous and totalized)	All Flow meters Totalised flow over period for each flow meter
Daily running period for	All pumps Mixer
On/off times and minutes run at the end of each 24-hour period for:	Each aerator Each pump
Event logging will be via a simple message giving time and date	Each electrically actuated valve open/close operation All fault annunciations All alarm annunciations

EM.5.1.10 PLC Control and Operator Interface

The Contractor shall provide a PLC of adequate capacity to provide all the control, arrangements and alarm signals as specified. The PLC should have an internal battery to provide minimum of 72 hours protection of software in the event of power loss, and non-evaporative memory to enable instant restart of the system after more extended periods.

The operator interface shall be capable of displaying plant status and cycle time settings, pump start and stop times, alarm status etc. by a text display. The interface should include real time clock any summer/ winter changeover and outlet sockets to interface with printer and PLC.

The system shall operate a timer to ensure that under no circumstances the number of pump starts per hour shall exceed the normal pump duty (15 starts per hour max).

Although these displays shall be visible from the front of the panel, adjustment of these parameters shall only be possible via password control.

The PLC shall be an Allan Bradley or equal approved and shall be installed and provided with ancillary protection devices in accordance with the latest manufacturers installation and operation manual, or update thereof. Particular attention shall be paid to preventing corruption of the installed memory due to grounding/earthing power supply condition, communication cables, I/O signal cables, controller spacing and excessive heat prevention, etc.

The Contractor shall provide additional devices and provisions as outlined in the latest relevant Allan Bradley's publications.

The operator interface shall be via the HMI.

EM.6 MEASUREMENT AND PAYMENT

EM.6.1 General

For measurement purposes the works covered by this specification have been divided into mechanical; electrical, instrumentation control & automation, and process engineering & ancillaries components.

The mechanical components cover the aerators, pumps, connecting pressure mains, flexible couplings, valves, flow metres and other ancillary equipment that is required.

The electrical components covers the installation of a main cable from the bulk supply to the site, electrical reticulation around the treatment plant and control systems.

The instrumentation, control & automation components covers the control panels, cubicles, timers, motor starters, alarm displays, indicators, etc. It also covers the supply of hardware and software.

EM.6.2 Scheduled items

EM.6.2.1 Mechanical Plant and Equipment

The varied components required as part of the mechanical plant and equipment have been detailed separately. Individual items have been allowed to cover.

- i. *Design & Production of Shop Drawings:* The rate is to cover the design required and preparation of workshop drawings for the manufacture of the parts to be fabricated. It shall allow for the submission of drawings to the Engineer for approval and the completion of any amendments and the issuing of drawings to the manufacturer.
- ii. *Fabricated Plant & Delivery:* The rates shall cover the procurement of all materials required, fabrication of the equipment preparation for painting, painting in accordance with the specification, loading and transporting to site, offloading and storing on site until required. For aerators, it includes the anchor cables/stay wire and lifting gear for pumps.
- iii. *Installation:* The rates shall cover the installation of the equipment complete with all bolts, washers and other ancillaries. It shall also cover final touching up of the paintwork.
- iv. *Testing and Commissioning:* The rates shall cover the testing of the equipment to verify it is capable of operating in terms of the specification. This testing will only be considered complete when the Engineer is entirely satisfied with the test results.

The commission shall cover the integration of the equipment into the overall system.

EM.6.2.2 Electrical

The various items have been scheduled separately with items allowed to cover:

- i. *Power Supply:* The rates shall allow for the supply of all cables, material and incidentals to extend the power feed to the point required. It shall cover the trenching, bedding and backfilling of cables where necessary.

- ii. *Control Systems:* The rates shall cover the supply and installation of all cabling and incidentals required for the control system specified.
- iii. *Bulk Electrical Connection:* This item covers the connection of the leachate plant and leachate storage area to the existing site bulk supply. The rate shall cover the supply and installation of the required cabling, trench, bedding and backfilling and connection to the existing live supply.

EM.6.2.3 Instrumentation, Control & Automation

The unit of measure shall be sum. The amount tendered shall cover all plant/equipment, labour and materials for the design, manufacture, delivery to site and installation of the control panel cubicles, timers, motor starters, ammeters, kwh meters, hours run meter, alarm displays and status indicator, etc.

EM.6.2.4 Training & Manuals

The rate shall cover the training of DSW staff and the provision of the necessary operating manuals.

EM.6.2.5 Operation and Maintenance

The rate shall cover a transition period where the plant is handed over to the Employer (DSW) over a period of six (6) calendar months from the successful completion of Part 2 of the Take Over Tests. The period shall provide an initial transition to DSW to ensure a suitable level of competence can be achieved with the plant.

During this period, DSW staff members need to be trained in plant operation and the basis of reporting in terms of monitoring plant performance and efficiency need to be established.

The following shall be deliverable on a monthly basis:

- LTP performance
- Treatment efficiency
- Chemical usage
- Service and Maintenance required
- Training/competence sign offs

During the 6 months period, the Contractor shall ensure that DSW receives the relevant information to formulate a preventative maintenance plan and obtain full operational documentation adequate to train further plant operators.

The rate shall include for all operations, personnel, transport, tools, accommodation as needed, protective clothing, sampling equipment and ancillaries to operate and maintain the plant. Chemicals and parts for plant operation will be supplied by DSW.

DSW personnel may be present during this period and allowance for addressing their needs as regards their training to take over the operation and maintenance is to be allowed for.

Payment shall be made pro rata on a monthly basis from the Lump Sum tendered.

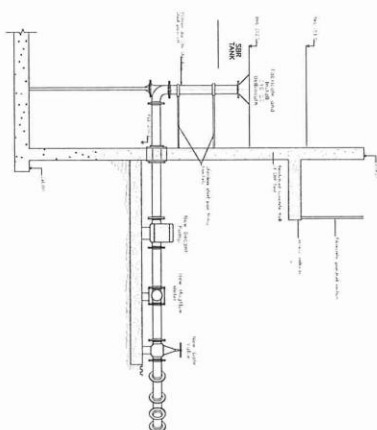
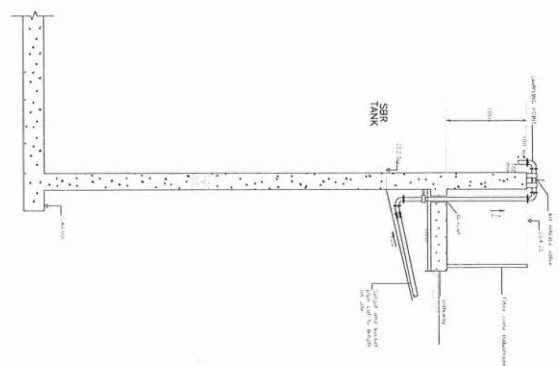
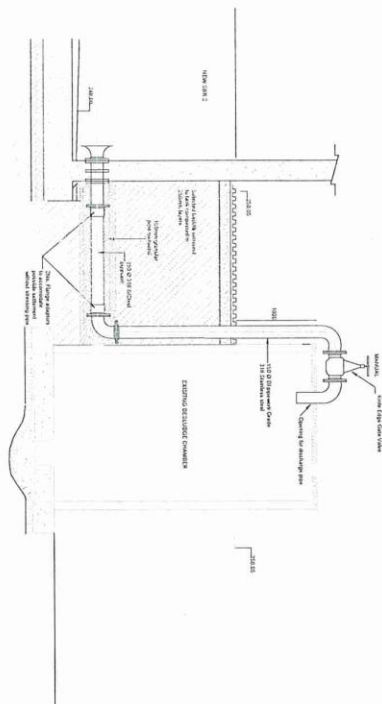
C3.5: CONTRACT AND STANDARD DRAWINGS**C3.5.1 CONTRACT DRAWINGS / DETAILS**

51248-9/51	General Layout
51248-9/53	SBR 2 New Aeration Tank General Arrangement
51248-9/54-1	SBR 1 Refurbishment
51248-9/54-2	SBR 1 Refurbishment – Detail 2
51248-9/55	Desludging, Flowmeter and Underground Detection Chamber Details
51248-9/56	RLBT and TLBT Details
51248-9/58	Reed Bed Chambers and Details
51248-9/59	Process Flow Diagram
51248-9/60	Hydraulic Profile
51248-9/61	General Layout Plan (Mechanical)
51248-9/62	Electric Schematic

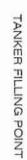
C3.5.2 STANDARD DRAWINGS

The Standard Drawings to which these Standard Engineering Specifications refer are listed below.

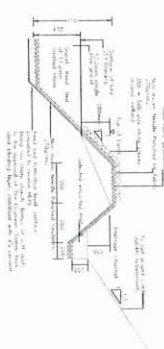
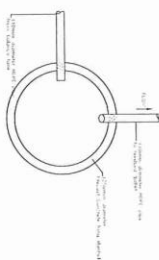
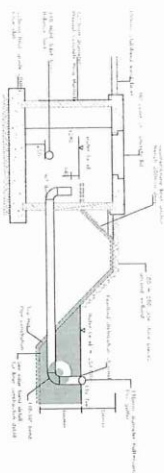
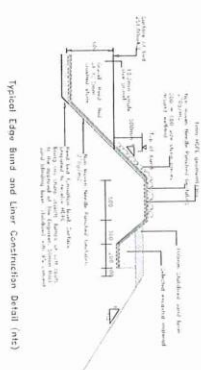
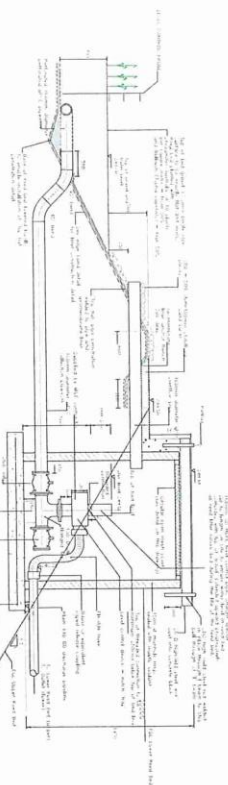
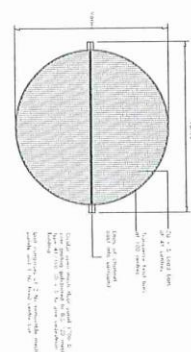
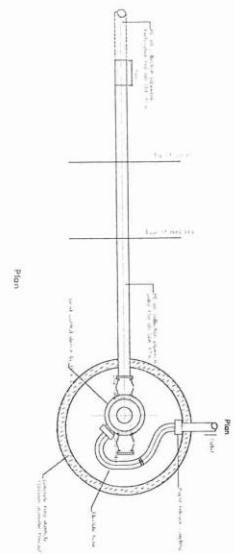
TGC/01	Concrete Ring Manholes
TGC/02	Sewer Manholes



TREATED EFFLUENT DECANT PIPEWORK

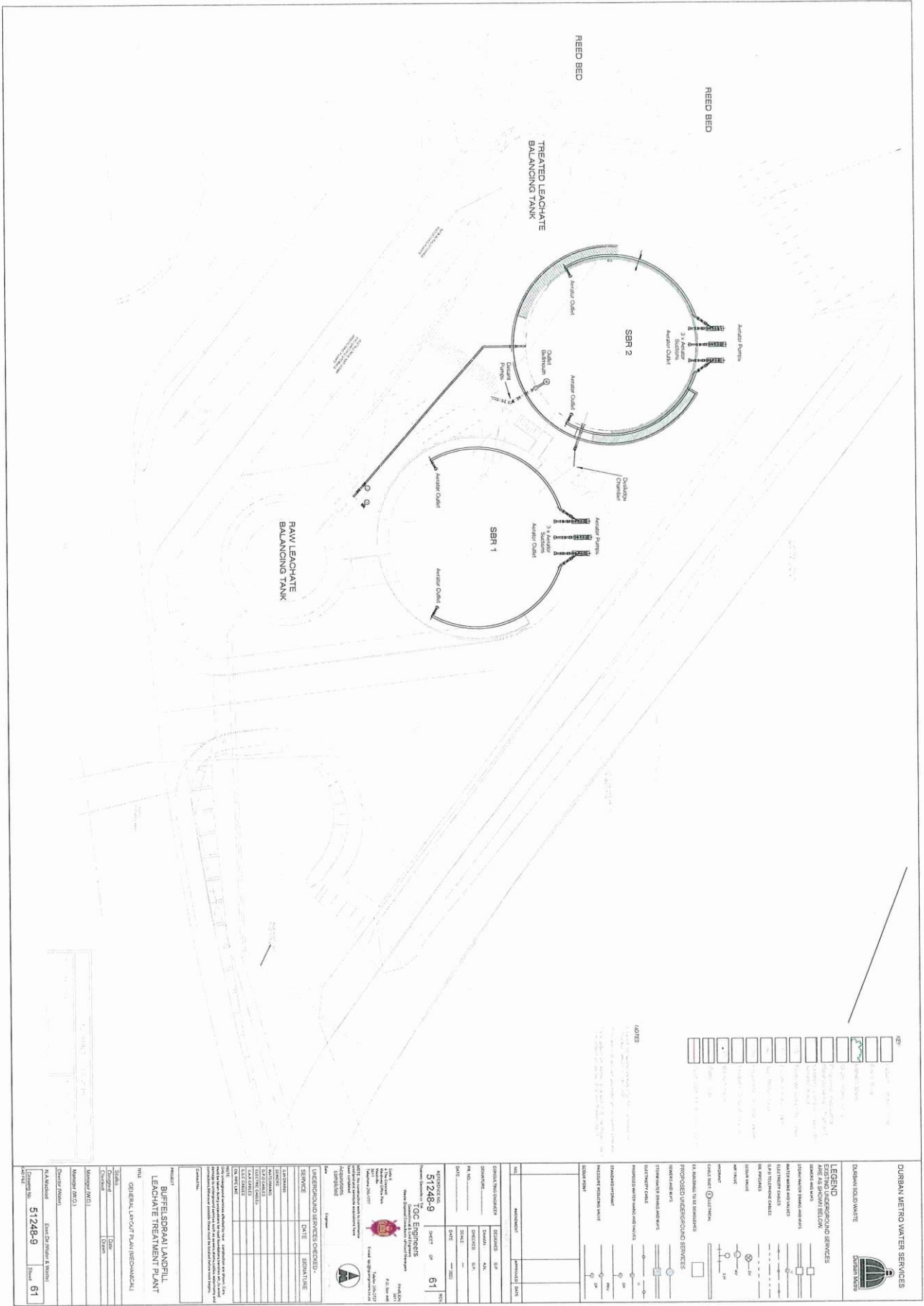
[illegible]

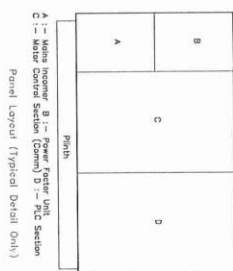
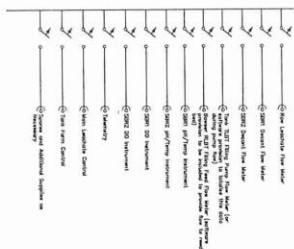
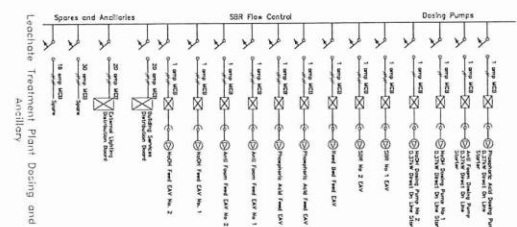
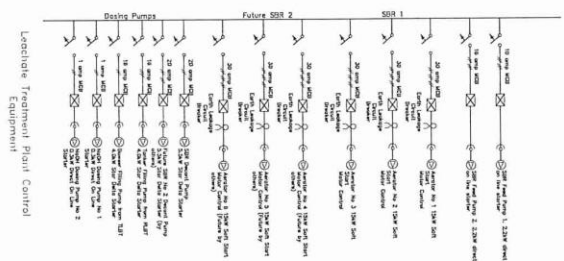
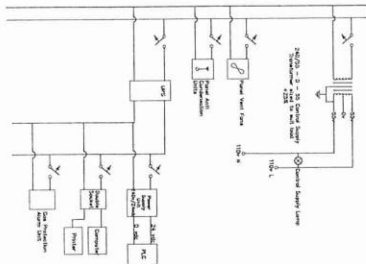
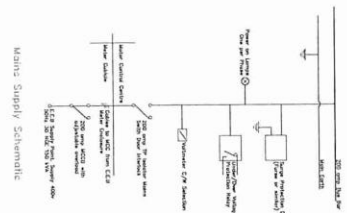




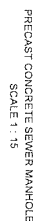
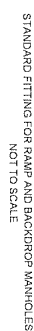
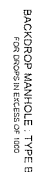
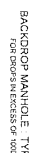
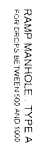
AS BUILT DRAWING	
FOR RECORD PURPOSES OF AS BUILT RECORD	FOR RECORD DATE: 06-21-11
DATE: 06-21-11	BY: [Signature]

[illegible]



[illegible]

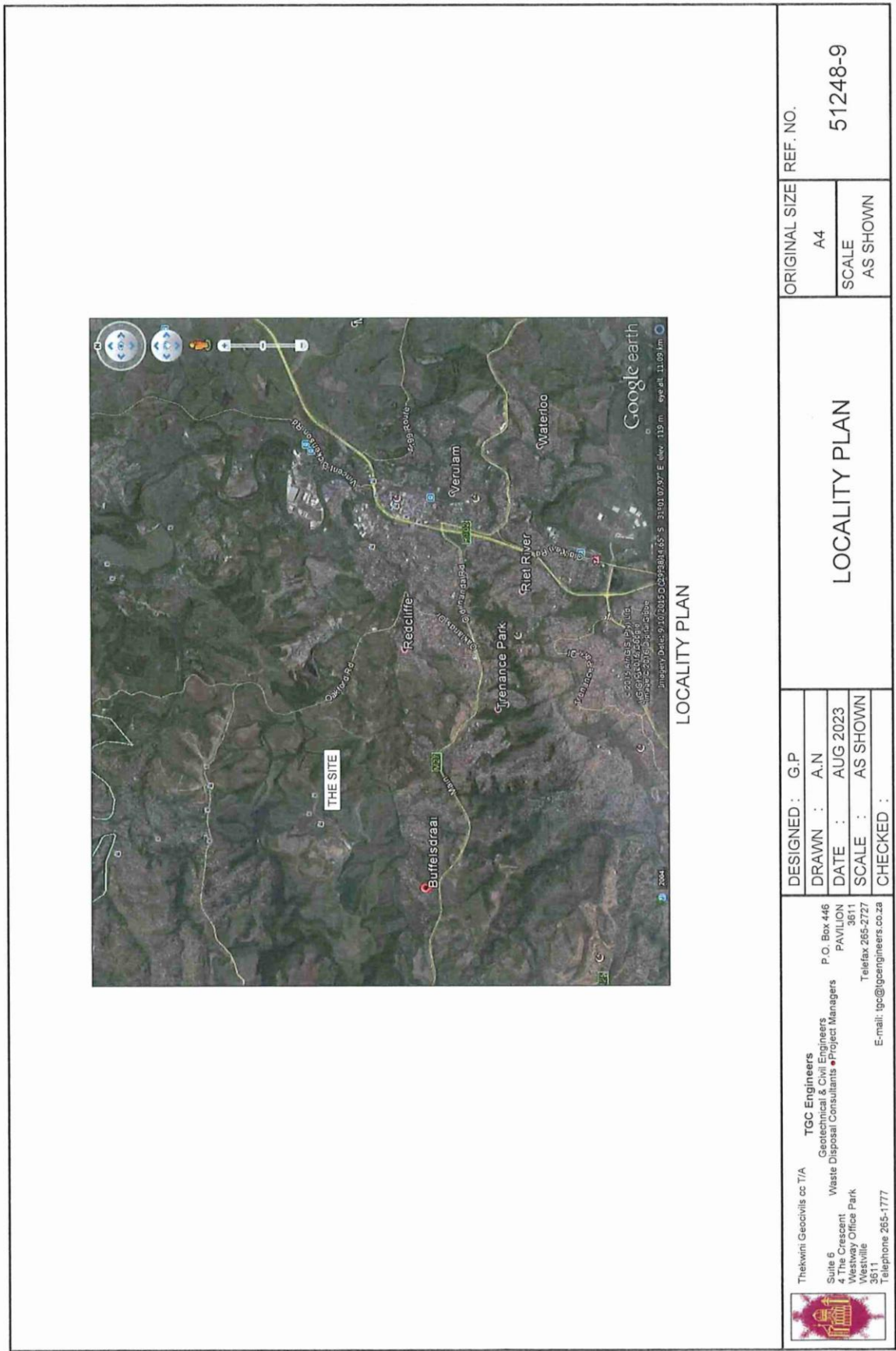




C3: Scope of Work Page 228 Document Version 24/02/2023(c)

PART C4: SITE INFORMATION

C4.1 LOCALITY PLAN



C4.2 CONDITIONS ON SITE

1. Geotechnical Investigation Report of Cell № 1 at the Buffelsdraai Landfill. (Feb 2007)

C4.3 CONTRACT NOTICE BOARD

