

ToR

Civil engineering and construction works for 6 X Kestrel e400nb (3.5 kW) small scale wind turbine tower foundations, container foundation and connecting cable trenches (wind turbine(6)/container, container/1st post) with piping for Upper Blinkwater: RMLM: Eastern Cape, South Africa, Minigrid project.

1. Background and Introduction

The Eastern Cape (EC) Province of South Africa (SA) and the Lower Saxony State of Germany have been engaged in a longstanding twinning partnership arrangement resulting in a mini-grid pilot that was initiated to electrify the small village of Upper Blinkwater (UB) in the Raymond Mhlaba Local Municipality (RMLM). The village is comprised of approximately 70 households, a school and a church and surrounded by mountains (-32°34'37.59"S, 26°33'26.14"E). The project represents a model for supplying high quality energy to deep rural villages which are not due to be connected to the national electricity grid in the foreseeable future, providing improved living conditions and economic opportunities for inhabitants. It seeks to demonstrate that even in the absence of a comprehensive power grid, communities can be provided with electricity by relying predominantly on renewable energies. This represents a first of its kind technical and institutional model for rural electrification which, if successful, can be implemented in other rural villages in the region. This holistic village development concept aims to provide much needed socio-economic development opportunities for inhabitants, slowing down rural-urban migration.

With careful attention to the demand requirements of the village, the mini-grid power system was developed and includes a 75 kWp photovoltaic (PV) system, 130kWh battery storage, and a 55 kVA backup diesel generator (3000 l diesel storage – all with an integrated vending system, smart meters and demand side management interface.

The EC Government, through the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT), expressed an interest in collaborating with South Africa Wind Energy Project (SAWEP) Phase 2 to add the wind component into the UB mini-grid project. The PV and diesel genset components of the UB project are already at an advanced stage which makes it a win-win situation for SAWEP and the UB project.

SAWEP is supported by the United Nations Development Programme (UNDP) with resources from the Global Environment Facility (GEF), and implemented by the Department of Minerals Resources and Energy (DMRE) and the South African National Energy Development Institute (SANEDI) with a variety of partners: <https://sawep.co.za>

The addition of preferred locally manufactured small scale wind turbines is a cost-effective and robust manner in support of local industries, which will complement this project with small-scale wind turbines that operate at lower heights than large turbines and where wind speed is not optimal, since the area is mountainous. The Council for Scientific and Industrial Research (CSIR) Energy Centre by virtue of its accumulated technical expertise acquired through the institutionalisation of the Wind Atlas for South Africa (WASA), undertook a six months LIDAR (April to September 2019) wind measurement campaign that was augmented

with data of a wind mast installed. Using the closest proximity nodes from the CSIR wind & PV aggregation study annual wind time series to allow an annual view of the wind resource and in turn using the measure, correlate and predict (MCP) method, facilitated modelling and analysis for the wind turbine installation site wind climate (-32°34'34.88"S, 26°33'7.08"E). Using the derived wind climate and applying a Feasibility Analysis Matrix informed the specification for this bid.

A contract was entered into with Eveready, Kestrel for the supply, installation and the connection of 6 X Kestrel e400nb (3.5 kW) small scale wind turbines at Upper Blinkwater Community.

This ToR is for the:

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The work shall include all labour, materials and equipment necessary to design, install and commission the Works, as well as the maintenance component. All work not expressly called for in this document, but necessary for the complete and proper construction and maintenance of the wind turbine tower foundations, container foundation and wind turbine/container connecting cable trenches with piping shall be performed and furnished by the Contractor at no additional cost.

This ToR includes maintenance services for the defects period which is twelve (12) months from the Practical completion date. The 6 small scale wind turbine tower foundations, container foundation and connecting cable trenches (wind turbine(6)/container, container/1st post) with piping shall be ready for installation of the 6 small scale wind turbines and connected with the minigrid by no later than **1.5 months** from contract signing. The Contractor will be required to include a detailed project schedule with their submission, to demonstrate how they intend to meet the milestones, hold-points and the COD deadline.

2. Specifications

2.1 Scope of Work

The *Contractor* will be fully responsible for:

- developing the detail civil engineering and civil construction design for the 6 small scale wind turbine tower foundations, container foundation and cable trenches (wind turbine(6)/container, container/1st post) with piping in accordance with the wind turbine site and minigrid connection layout plans signed off by the Owners Engineer and requirements and specifications as set out by the wind turbine supplier and in this document and will assume liability for the design.
- **Note: The Address of Delivery/Construction location in section 2.17**
Wind farm and container position in section 2.18
The wind turbine tower-, container foundations, cable trenches with piping layout drawings and specifications in section 2.19
- design, supply of all materials and labour, manufacture, delivery to site, offloading, construction, erection, installation, off-site testing on-site testing, commissioning, performance testing, preparation of all drawings, details and design, as-built drawings, maintenance manuals and instructions, in accordance with the requirements detailed in this document.

- Service and maintenance of the civil engineering works during the one year defects period after construction in accordance with the requirements described in this document.

2.1.1 Works Information

The supply and works shall include but are not limited to the following:

Table 1, **Specifications, Drawings** see **2.19**

Item #	Description	Unit	Quantity
1	Inverted T- foundation for 18m high wind turbine tower (6) (Kestrel e400nb (3.5 kW)	each	6
2	Foundation (6 x piers) for 6060 x 2440mm Dry Container to support container a minimum 200, maximum 400 mm above ground, Concrete 25 MPA	each	6
3	Wind turbine/container connecting cable trenches 1000mm deep from wind turbine (6) base to common point under Container	each	6
4	DN75 Kabelflex pipe, placed in Wind turbine/container connecting cable trenches 1000mm below ground level from wind turbine (6) base to common point under Container	each	6
5	Container/1 st post connecting cable trench 1000mm deep from container base to 1 st post of overhead wind farm, minigrid low voltage line (separate tender)		1
6	DN75 Kabelflex pipe, placed in Container/1st post connecting cable trench 1000mm below ground level from container base to 1 st post of overhead wind farm, minigrid low voltage line (separate tender)		1
All goods and fixtures secured with appropriate enclosures as per supplier guidelines and warranty requirements and applicable SABS standards			

The Eastern Cape Dept. of Economic Development, Environmental Affairs and Tourism (DEDEAT) wishes to maximize on local content, and preference will be given to local construction companies that qualify.

It is the *Contractor's* responsibility to ensure that the final design fully complies with the specifications referenced in this document, as well as South African legislation and regulations.

Due consideration must be given to the prevailing environmental and service conditions and the *Contractor* shall ensure that warranties are suited to the site and service conditions. The *Contractor* shall follow manufacturers' instructions on the use of materials and products.

All components supplied shall be designed, manufactured and tested in accordance with the latest applicable SANS standards.

If there is a conflict of method, or level of provision, the *Contractor* shall adopt the specification, recommendation or regulation with the most stringent conditions. The *Contractor* shall submit details of any such conflicts and the provisions adopted.

The *Contractor* shall:

- Ensure appropriate certification in accordance with the appropriate Standards or Code of Practice.
- Ensure that all designs for civil works are signed off by ECSA registered Professional

Engineers.

- Design will be provided to Owners Engineer for approval

2.2 Procurement

The *Contractor* shall:

- Ensure that all works, materials, parts, components etc. supplied shall be new, both in the construction of the 6 X Kestrel e400nb (3.5 kW) small scale wind turbine tower foundations, container foundation and connecting cable trenches with piping and for the service and maintenance of the civil works during the Defects Period.
- Ensure materials and products delivered to site bear the manufacturer's name, brand name and any other data required to verify that their performance and specification complies with the requirements of this document.
- Ensure materials and products are appropriately marked or SABS approved. The *Contractor* shall select materials & products with regard to standardization and availability and for ease of maintenance.
- Ensure the same manufacturer is used for materials or products of a similar type and that identical parts of similar products are interchangeable.
- Ensure that materials and components are transported and stored in accordance with manufacturer's guidelines.

2.3 Site Establishment (Site offices and ablutions on site)

The *Contractor* shall be responsible for all site establishment works required to enable the completion of The Works in compliance with the Performance Requirements detailed in this document including but not limited to:

- Electricity to the site
- Chemical Ablutions for staff.
- Safety and Security

2.4 Installation and Construction

The *Contractor* shall:

- Construct the 6 X Kestrel e400nb (3.5 kW) small scale wind turbine tower foundations, container foundation and connecting cable trenches (wind turbine(6)/container, container/1st post) with piping, all equipment, infrastructure and staff resources required for the construction of the Works in accordance with the wind turbine supplier and Performance Specifications detailed in this document including ancillary equipment required for construction. A minimum of one concrete cube test per foundation is required at 7 days and 28 days to ensure that the concrete exceeds the specified compressive strength.
- The *Contractor* shall include suitable concrete foundations and ensure that storm water drainage for the wind turbines and container are sufficiently implemented.
- Follow manufacturers' instructions on the use of materials and products.
- Not use plant and equipment prior to Handover other than for testing, commissioning and demonstration.
- Ensure that the Works are provided in accordance with appropriate South African Standards and Codes of Practice.
- Employ only operatives who are skilled and responsible craftsmen, fully experienced in their respective trades and who have gained qualifications appropriate for the work being carried out.
- Take all necessary steps to safeguard the Works during construction to ensure that damage or deterioration has not occurred.
- Provide suitable packaging for the protection of all materials and equipment during delivery, storage, and where exposed to damage on site. The *Contractor* shall return reusable packaging

to the supplier. The *Contractor* shall take particular care to protect and maintain plant and equipment delivered early, or provided under separate contracts.

- Examine materials and products supplied when delivered to site and immediately prior to installation. The *Contractor* shall replace any damaged or faulty materials or products.
- Store all materials on raised boarded platforms under weatherproof covers and/or according to manufacturers' specifications.
- Protect all materials and equipment which may be exposed to damage, inclement weather, or ultra violet light.
- Ensure that sensitive plant and equipment items are not exposed to dirt or dust at any time, to maintain manufacturers' warranties and long term reliability.

2.5 Commissioning

The *Contractor* shall:

- Carry out and supply all equipment and documentation in order to carry out the commissioning of the works in accordance with the specifications detailed in this document.
- Repair any damage to finished materials and equipment prior to handover of the Works.

2.6 Guarantees, Warranties and Certification

The *Contractor* shall:

Provide valid manufacturers guarantees and warranties for all materials and products supplied according to the required warranty periods defined in the table below.

Table 2

Description	Years Warranty
Workmanship	1
DN75 Kabelflex pipe	Manufacturer

The *Contractor* shall provide valid manufacturers' guarantees and warranties for all materials and products supplied according to the required warranty periods defined in Table 2.

The *Contractor* shall ensure that the conditions of delivery, storage, installation and use of materials and products are such that they remain under guarantee for the maximum period as specified by the manufacturers.

The *Contractor* shall ensure any maintenance required is provided and that full records are kept before Practical completion.

The risks as well as the expenses of conditioning and shipping back of the defective parts or products will be borne by the *Contractor* during the Defects Period.

All warranties and guarantees shall be passed on to the Owners Engineer transfer of ownership of the civil works. Furthermore, all documents necessary to ensure the enforcement of the warranties and guarantees are to be supplied by The *Contractor* to the Owners Engineer on Final Completion.

2.7 Insurance

The *Contractor* shall ensure that adequate insurance is in place to cover the value and consequential losses due to accident, theft or fire of the materials and equipment stored onsite and that no materials or equipment in excess of this limit are stored on site at any given time.

2.8 Health and Safety

All construction for this project must be completed in accordance with the occupational Health and Safety Act 85 of 1993.

2.9 Civils

The *Contractor* shall:

- provide valid manufacturers' guarantees and warranties for all materials and products supplied.
- take the utmost care to minimise the impact of his establishment and other construction activities on the environment.
- submit a Method Statement to the employer detailing his construction activities and what measures will be implemented to prevent the pollution.
- contact the employer as early as possible, and program for the execution of the works.
- only dump excess or unsuitable materials at sites, which have been authorized for that purpose by the *Client*.
- include full compensation in costing for all work necessary for the clearing of the surface in preparation for the construction of the Works.

2.10 Applicable Standards

All equipment and services supplied shall comply with the standards listed below.

2.10.1 General

- SANS 10142-1:2009: The wiring of premises Part 1: Low-voltage installations
- SANS 10142-2:2009: The wiring of premises Part 2: Medium- voltage installations above 1kV ac not exceeding 22kV ac and up to and including 3000kW installed capacity
- SANS 10142-3:2018: National Standard for Small Scale Embedded Generation installations
- IEC 60364-4-41: Low-voltage plants installation. Part 4-41 - Protection for safety — protection against shock
- IEC 60364-7-712: Electrical installations of buildings Part 7-712 - Requirements for special installations or locations Solar photovoltaic (PV) power supply systems

2.10.2 Electrical Cabling

- SANS 1507 Part 1: General, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- SANS 1507 Part 2: Wiring Cables, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- SANS 1507 Part 3: PVC Distribution, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- SANS 1507 Part 4: XLPE Distribution Cables, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- SANS 1507 Part 5: halogen-free Distribution Cables, „Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
- SANS 10198 Parts 1-14: 2004 The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 1 to 14

2.10.3. Test Procedure for Weather Resistance

IEC 60068-2-78 Environmental testing. Test methods

IEC 60811 Insulating and sheathing materials of electric cables

2.10.4 Earthing

- NRS 097-2-1:2017 Section 4.2.6
- NRS 097-2-1:2017 ANNEX B
- SANS 10292:2001 Earthing of low-voltage (LV) distribution systems

2.10.5 Construction

- ISO 14713:1999 Protection against corrosion of iron and steel structures — Zinc and aluminum coatings — Guidelines
- SANS 1200 — Standardized specifications for civil engineering construction
- SANS 1200 HC — Corrosion Protection of Structural Steelwork (Standard Specification)
- SANS 1200 H — Structural Steelwork (Standard Specifications)
- SANS 2001 — Construction Works — PART CC1 — Concrete Works (Structural)
- SANS 10100 — The structural use of concrete
- SANS 10160 — Basis of structural design and actions for buildings and industrial standards
- SANS 10162-1 — The structural use of steel Part 1: Limit states design of hot-rolled steelwork
- SANS 10162-2 — The structural use of steel Part 2: Limit states design of cold-formed steelwork
- SANS 10162-4 — The structural use of steel Part 4: The design of cold-formed stainless steel structural members
- SANS 10400 - Code of Practice — The Application of the National Building Regulations
- SANS 12944 — Corrosion Protection of Steel Structures

2.11 Environmental

The *Contractor* shall be responsible for identifying and complying with all environmental legal and other requirements applicable to the design, construction and operation of the Works.

2.12 Testing and Acceptance General Requirements

Contractor should inspect, test, commission and execute a performance test of the Works on site to demonstrate compliance with the Contract documents.

Provide facilities necessary to enable the inspection, testing, commissioning and performance testing of the Works to be satisfactorily completed including labour, equipment, materials, instruments, consumable materials, electrical power, fuel, lubricants, water, and suchlike.

Provide staff with the relevant skills and competence for the inspection, testing, commissioning, performance testing and witnessing required.

2.13 Instruments

Provide any instruments or other equipment for the Owners Engineer to review the accuracy, quality and performance of the Works. Provide any assistance required by the Owners Engineer in the use of instruments and measuring equipment.

Ensure that instruments used for survey work, checking, inspection, testing, commissioning and performance monitoring are correctly calibrated. Submit calibration certificates with test method statements and test records.

2.14 Defects

Where the performance of the Works fails to meet the requirements of the Contract Documents, submit a method statement for the proposed remedial works including measures to be taken to prevent any delay to the program for the Works.

Rectify any defects that become apparent during inspection, testing, commissioning and

performance testing. Retest defective parts of the Works, and any associated interdependent systems, and demonstrate that the Works operates in accordance with the Contract Documents.

Submit without delay any record that indicates that any part of the Works inspected or tested does not comply with the Contract Documents along with a proposal for rectification.

2.15 Records

Maintain records and certificates of inspections, testing, commissioning and performance testing undertaken demonstrating compliance with the Contract Documents and other recognized standards including those carried out by third party testing agencies, and manufacturers.

Retain records on site and make the records available to the Owners Engineer on request.

Ensure inspection, testing, commissioning, and performance testing records are dated, and are clearly and uniquely referenced with the agreed equipment identification codes. Ensure equipment identification codes are permanently marked and clearly visible after installation.

Certify that the Works has been tested to recognized standards and the requirements of the Statutory Authorities, the Statutory Undertakings/Utility Suppliers, and service providers.

Testing and Acceptance includes the following Acceptance Tests:

- Civil engineering works Completion Test
- Practical Completion Test
- Final Completion Test

The *Contractor* shall:

- Ensure that he employs suitably qualified professionals with appropriate accreditation to carry out The Acceptance Tests with an appropriate grade for the work.
- Ensure the supervising commissioning engineer has a minimum of 3 years' experience in the commissioning and performance testing of similar installations.
- Supply regime of tests 1 month prior to construction including pre-requisites, methodology, stopping and restarting procedure and instrumentation.

2.16 Civil completion test

When the *Contractor* has completed the Civil Completion Test of the Works successfully, then the Owners Engineer will issue the Civil Completion Certificate in which case civil completion will have occurred.

The *Contractor* shall undertake the following:

2.16.1 General

- Verify all parts of the Works are in line with approved Final Design
- Verify the Works is according to provisions of the Contract
- Verify all equipment and parts have been installed according to their manufacturer's Installation Manuals
- Verify all Safety Labels have been erected according to the Contract

2.16.2 Practical Completion Test

The Practical completion Test shall take place once Civil Completion Tests have occurred and the 28 day concrete compressive tests have passed. Practical completion will be finalized by the issuance of a Practical completion Certificate in which case Practical completion will have occurred.

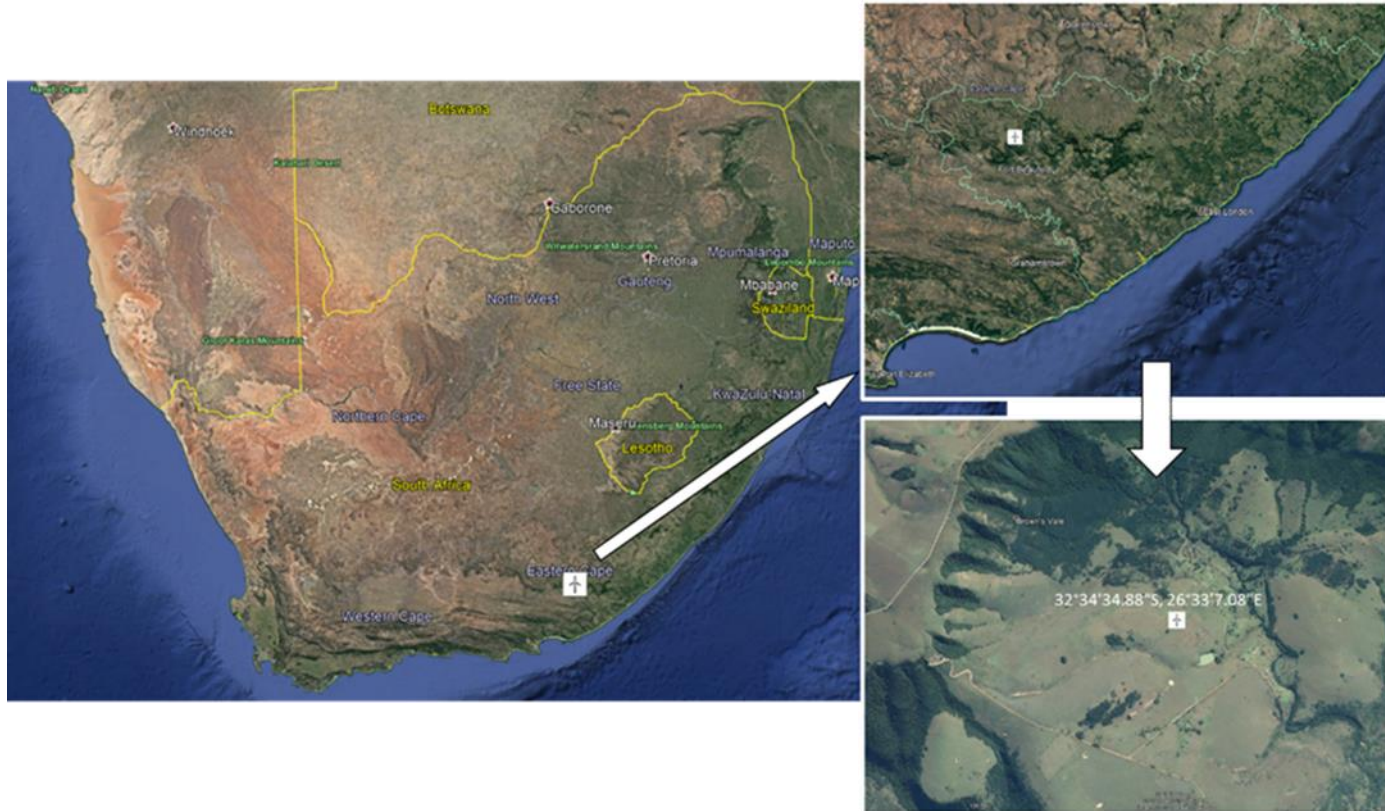
In the event of disruption of the Test due to Force Majeure, such as theft, vandalism or Grid failure, the test will be suspended and restarted.

2.16.3 Final Completion Test

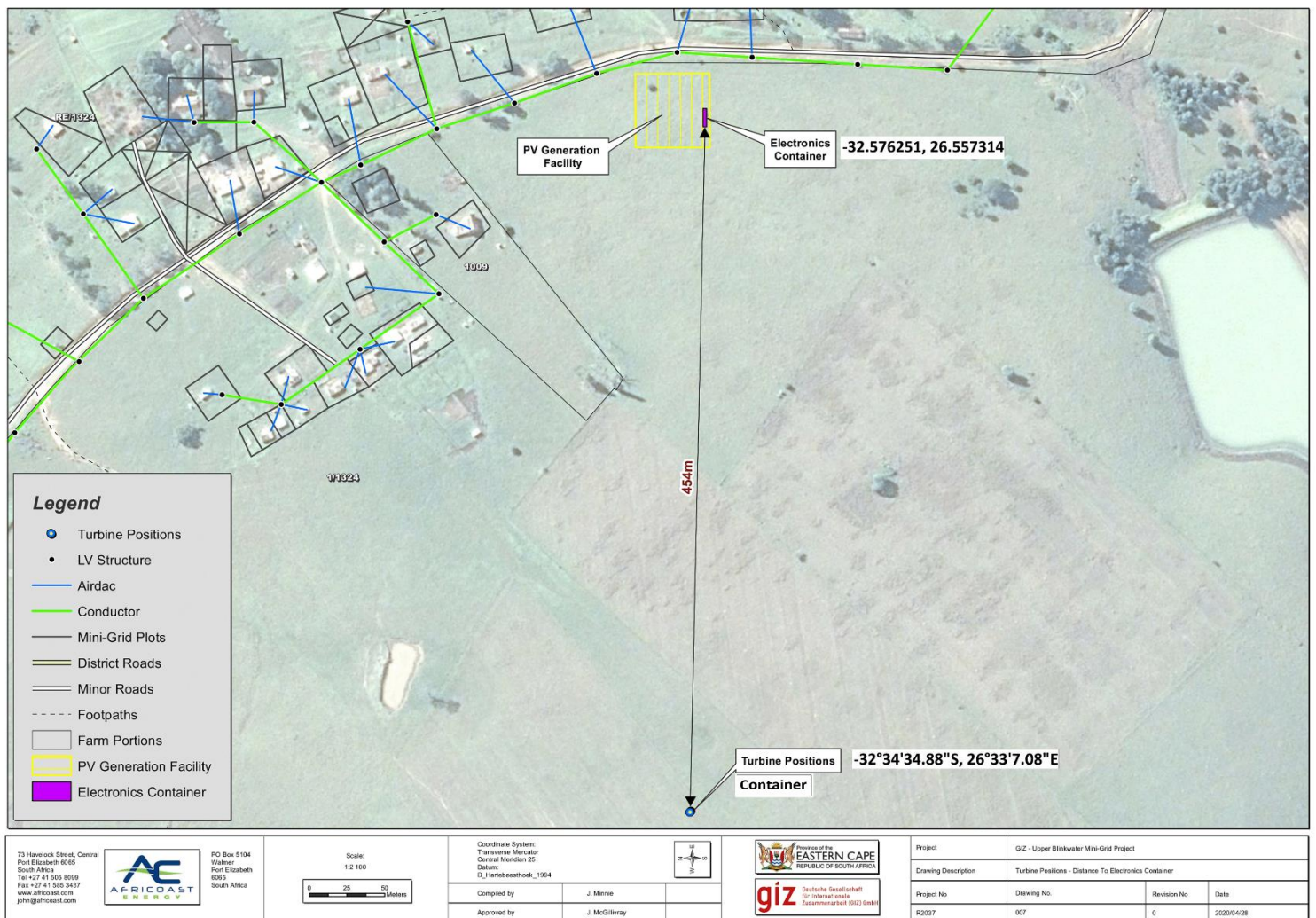
A site inspection will be held at the end of the one-year defects liability period and the Contractor will be responsible to remedy any defects resulting during that period to the satisfaction of the Owners Engineer. The Owners Engineer will issue the final completion certificate, after which Final Completion will be deemed to have occurred.

2.17 Address of Delivery/Construction location

Upper Blinkwater: -32°34'34.88"S, 26°33'7.08"E



2.18 Wind Turbine and container position



2.19 The wind turbine tower-, container foundations, cable trenches with piping layout drawings and specifications

[https://www.sawep.co.za/temp/Wind Turbine foundation %20container etc drawings specification s](https://www.sawep.co.za/temp/Wind%20Turbine%20foundation%20container%20etc%20drawings%20specification%20s)