Eskom	Scope of Work	GCD

Title: **Scope of Work: Electric Leak Location Survey at Kendal Power Station Continuous Ash Disposal Extension Facility Project**

Unique Identifier:	**KADF-Electric Leak Location Survey-004**
Alternative Reference Number:	**N/A**
Area of Applicability:	**GCD**
Documentation Type:	**Scope**
Revision:	**1.0**
Total Pages:	**17**
Next Review Date:	**N/A**
Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	Functional Responsibility	Authorised by
.....	.....	.....
Mokotedi Mokoena	**Denvor Fielies**	**Vusi Mlandu**
Site Supervisor	**Contracts Manager**	**Project Manager**
GCD	**GCD**	**GCD**
Date: 28 April 2022	Date: 28/04/2022	Date: 28/04/2022
.....	.....	.....

CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

Kendal Power Station (Kendal) is a 4 116 MW installed capacity base load coal fired power station, consisting of six (6) units. Eskom commenced construction of Kendal in 1982, which was completed in 1993. The ash disposal facility is approximately 2km south-west of the Kendal Power Station terrace, and to the west of the R686 road.

Ash is generated as a by-product due to the combustion of coal from the power station. As a result of this process Kendal produces about 5.5 million tons of ash per annum. The ash is transported from the boilers to the dry ash dump by means of dual overland conveyors. The ash dump is constructed by the main stacker and standby spreader in a progressive nature by placing a front stack of ash in front of the conveyors down to ground level and a 12m back stack behind. This ash is currently being disposed of within the premises of the Kendal Power Station, on Eskom owned land in terms of the current power station Water Use Licence.

The original design of the ash dump was done by Jones & Wagener consulting civil engineers in the mid 1980's. The ash dump was designed for a 40 year station life, plus an eight (8) year contingency area, by diverting the western clean water stream into the next valley and ashing over the western stream valley. As only 60 % of the land for the ash dump was purchased at the start of the power station, Kendal did not secure its ashing rights for the total design life and uncontrolled private surface coal mining took place on the remaining area. This resulted in the original ash dump design no longer being feasible to construct as the required western clean water stream diversion dam could no longer be built on the disturbed coal mine area. The remaining properties required for the ash dump construction were purchased in 2008.

Due to this situation, the footprint of the ash dump was constrained within the original design footprint on the current dump site, to the area between the northern and western clean water streams, which resulted in a loss of about 20 % of the original design area. This loss of dump capacity, together with a higher ash volume due to poorer quality coal, higher generating loads and a lower ash dump density than assumed in the original design, together with the recent increase in the required station life to sixty (60) years, resulted in the current ash dump site not being able to provide ashing capacity for Kendal's remaining life.

.

1.2 PROJECT OVERVIEW

Due to the need to obtain an Integrated Environmental Authorisation (including Waste) and a Water Use Licences (WUL) for the ashing operations for the remaining area of the continuous ash dump on the new properties and the new 30 year ash disposal facility, Zitholele Consulting were appointed to carry out an EIA study to assess the environmental risks and determine the optimum dump construction and required mitigation works, in order to provide continuous ashing capability for Kendal's sixty (60) year life. The Integrated Environmental Authorization (IEA) was issued on 28 July 2015 for a period of five (5) years and WUL was issued on 18 December 2015.

Current environmental legislations require that the construction and operation of an ash disposal facility, must comply with all relevant environmental legislation such as the National Environmental Management Act, Act No. 107 of 1998, National Environmental Management Waste Act, Act No. 59 of 2008 and the National Water Act, Act No. 36 of 1998. Therefore, the ash disposal facility was required to obtain the Environmental Authorisation, Waste Management Licence and the Water use Licence in order to comply with environmental legislation.

The Kendal ADF is currently an unlined dry stack ash dump. The extended ADF is designed to have one unlined phase and four lined phases. Ash reporting to the Kendal ADF is classified as a Type 3 waste which requires a Class C landfill barrier.

In April 2021, the Department Forestry, Fisheries and Environmental approved the design drawings of Eskom Kendal Power Station Continuous Ash Disposal Facility with the condition that an Electric Leak Location Survey (ELLS) or similar be undertaken by an independent person to confirm the competence of the geomembrane installation after placement of the above liner protection layers and/or sacrificial layers to a depth of 300mm. The standard to be complied with for the ELLS on the single composite liner is ASTM D8265.

2. SUPPORTING CLAUSES

The Kendal Ash Facility Extension project is split into 5 phases:

- Phase 1: Initial works, exemption area works Unlined up to May 2020, Ash Buttress
- Phase 2: Lined up to January 2023
- Phase 3: Lined up to January 2026
- Phase 4: Lined up to January 2029
- Phase 5: Lined up to end of life June 2031

The initial works, exemption area works and initial lined area works were subdivided into design and construction phases. The purpose of this subdivision was to compartmentalise the various works into smaller packages with the potential for construction to be handled independently of one another. This proposal is for the Independent CQA to cover the construction and commissioning monitoring of Phase 2 and 3, and all associated infrastructure (PCDs, Stream Diversion, lowering farm dam wall) provide project readiness for Phase 4.

2.1 SCOPE

2.1.1 Purpose

The purpose of this document it to give a high level scope of work for the sourcing of services from a Subject Matter Expert (SME), for the undertaking of the ELLS Scope of Work within the Kendal Continuous Ash Dump Extension Project.

2.1.2 Applicability

This document applies to GCD and Generation Kendal Power Station.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs:

2.2.1 Normative References

1. Concept Design Report for Kendal's Continuous and Emergency Ash Disposal Facilities Ref: 12810, 5 May 2014.

2. Kendal Power Station Existing Area Water Use Licence dated 24 June 2011.
3. Waste and Water Use Licence for new properties (awaiting issue).
4. DWS approval in principal letter dated 23 January 2015.
5. Kendal Extension of Ashing Infrastructure, User Requirement Specification.
6. Kendal Emergency Dump Extension, User Requirement Specification.
7. SANS 10286, Mine Residue.
8. SANS 1200 series, Standardized specification for Civil Engineering Construction.
9. The National Water Act & Regulation GN704.
10. Environmental Protection Acts NEMA & NEMWA and regulations.
11. Kusile and Kendal Power Stations Ash Disposal Facilities Waste Classification Report, Ref: JW030/13/D121 - Rev 3, January 2014.
12. Kendal Power Stations Ash Disposal Facility Extension Ash-Bentonite Tests, Ref: JW002/14/E353 – Rev 1, January 2014.
13. 240-53113685, Design Review Procedure.
14. All work shall be conducted in accordance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) as amended.
15. Kendal Continuous Ash Disposal Facility Project – Detailed Design Report
16. Kendal Continuous Ash Disposal Facility Project – Works Information Phase 2
17. Kendal Continuous Ash Disposal Facility Project – Works Information Phase 3

2.2.2 Informative References

1. Kendal Power Station Ash Disposal Facility Project: Environmental Impact Assessment Report.
2. ENV13-R019 Water management policy.
3. 240-4332798, Engineering policy.

2.3 DEFINITIONS

2.3.1 Classification

Controlled Disclosure: means controlled disclosure to external parties (either enforce by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
BMH	Bulk Materials Handling
CoE	Centre of Excellence
C&I	Control and Instrumentation
DWS	Department of Water and Sanitary
EIA	Environmental Impact Assessment
GTE	Group Technology Engineering
LPS	Low Pressure Services
N/A	Not Applicable
PCD	Pollution Control Dam
SME	Subject Matter Expert
SoW	Scope of Work
SRD	Stakeholders Requirements Document

2.5 RELATED/SUPPORTING DOCUMENTS

1. Geotechnical Report on the Ash Disposal Site for Kendal Power Station. Jones & Wagener Inc. 16 May 1986. Report No: ESC 3/86/1911.
2. Kendal Power Station, Dry Ash Disposal Facility, Operating Manual, Revision 4, April 1999. Compiled by: A Oliver, Revision by: A Kreuiter, Date: 31 April 1999. Doc Ref: Kendop4.Doc. Civil & Building Division, Generation Eng. Dept.
3. Kendal Ash Dump - Time to Reach Existing Fence & Piggyback inside Fence Concept (Rev 2) Power Point Presentation, dated December 2013 by Andre Kreuiter, Eskom GTE Civil & Structural department.

3. SCOPE OF WORK

Scope of Works will be applicable in the following areas at the Kendal New Ash Dam Project:

- Ash Disposal Facility Phase 2.
- Ash Disposal Facility Phase 3.
- Pollution Control Dam (Dam No.1).
- Clean Water Dam (Dam No.2).

The Scope of Works consist of the General Electric Leak Location Survey (ELLS) on the abovementioned facilities to confirm the competence of the geomembrane installation after placement of the above liner protection layer and/or sacrificial layer to a depth of 300mm. The standard to be complied with or the ELLS on the single composite liner is ASTM D8265. The facility layouts and lining systems can be viewed in the attached Issue for Construction (IFC) Drawings. The ELLS Specialist (Contractor) is advised to familiarize themselves with all the details of the lining system, including drainage, outlets, concrete works, etc., to identify where isolation will be required and to include for this in their rates. The Contractor my have discussions with the Earthworks Contractor (Concor Lubocon JV) to assist with the isolation requirements, however payment for these services should be included in the rate schedule.

The Contractor will be required to do an Electric Leak Location Survey using, Arc Testing (ASTM D7953-14) or Water Puddle (ASTM D7002-16) and Dipole Testing (ASTM D7007) or a combination thereof, to confirm and certify that the Installer has met the Specification Requirements as stated in SANS 10409:2020 on the above-mentioned facilities.

The following sections will from part of the SOW for the ELLS Specialist:-

3.1 SUPPORTING REFERENCE

The publications below form part of this specification to the extent referenced. Where a particular publication is referred to, that publication shall, unless otherwise stated, be the edition in effect 30 (thirty) days prior to the date of issue of this specification. Any contradictions between publications shall be submitted to the Engineer for decision.

- Project Technical Specifications related to the construction of the Kendal Ash Disposal Facility.
- Project Construction Drawings.
- Project Construction Quality Assurance Plan.
- Regulatory Compliance Requirements such as issued by Department of Water and Sanitation.

- South African National Standards (SANS):
    - SANS 10409:2020: Design, selection, and instillation of geomembrane.
- American Society for Testing and Materials (ASTM).
    - ASTM D4439: Terminology for Geosynthetics.
    - ASTM D6747-15: Standard Guide for Selection of Techniques for Electrical Detection of Leaks in Geomembranes.
    - ASTM D7953-14: Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Arc Testing Method.
    - ASTM D7002-16: Standard Practice for Leak Location on Exposed Geomembranes Using the Water Puddle System.
    - ASTM D7007: Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials.
    - ASTM D4439-18: Terminology for Geosynthetics.
    - D8265 – 19: Standard Practices for Electrical Methods for Mapping Leaks in Installed Geomembranes.

3.2 DEFINITIONS

For the purposes of this specification, the definitions given in the Contract and the following definitions shall apply:

"Electrical leak location" – a method which uses electrical current or electrical potential to locate leaks in a geomembrane.

"Leak" – a leak is any unintended opening, perforation, breach, slit, tear, puncture, crack, or seam breach. Significant amounts of liquids or solids may or may not flow through a leak. Scratches, gouges, dents, or other aberrations that do not completely penetrate the geomembrane are not considered to be leaks.

"Geomembrane" – an essentially impermeable membrane used with foundation, soil, rock, earth, or any other geotechnical engineering related material as an integral part of a man-made project, structure, or system.

"Conductive-backed geomembrane" – a specialty geomembrane manufactured using the coextrusion process with an insulating layer in intimate contact with a conductive layer.

"Leak detection sensitivity" – the smallest leak that the leak location equipment and survey methodology are capable of detecting under a given set of conditions. The leak detection sensitivity specification is usually stated as a diameter of the smallest leak that can be likely detected.

"Poor contact condition" – for the purposes of this specification, a poor contact condition means that a leak is not in intimate contact with the sufficiently conductive layer above or underneath the geomembrane to be tested. This occurs on a wrinkle or wave, under the overlap flap of a fusion weld, in an area of liner bridging and, in an area, where there is a subgrade depression or rut.

4 SPECIFICATIONS

This specification covers the test methods applicable for locating leaks in installed covered geomembranes using electrical methods. This specification shall use the term "leak" to mean holes, punctures, tears, knife cuts, seam defects, cracks, and similar breaches in an installed primary layer HDPE geomembrane at the Kendal Ash Disposal Facility.

ELECTRICAL LEAK SURVEY PROJECT REQUIREMENTS

4.1.1 Applicable ASTM Test Methods

The electrical leak survey on the Kendal Ash disposal facility (ADF), Pollution Control Dams (PCD's) and Clean Water Dams (CWD's) will be performed on the primary geomembrane (non-conductive) or cover material in accordance with:

- ASTM D4439-18: Terminology for Geosynthetics.
- ASTM D6747-15: Standard Guide for Selection of Techniques for Electrical Detection of Leaks in Geomembranes.
- ASTM D7953-14: Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Arc Testing Method.
- ASTM D7002-16: Standard Practice for Leak Location on Exposed Geomembranes Using the Water Puddle System.
- ASTM D7007: Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials.
- D8265 – 19: Standard Practices for Electrical Methods for Mapping Leaks in Installed Geomembranes

The ASTM test methods are further applicable, where deemed necessary.

It is the responsibility of the ELLS specialist (Contractor) to ensure any site design changes (such as material that may have changed that will be placed above or below the testing geomembrane, site geometry, penetrations) that may occur during construction that are different to tender drawings on which initial testing assumptions and costing were made on conducting the electrical leak survey are accordingly addressed to the Project Engineer, in no less than four (4) weeks prior to the commencement of the leak survey. The Contractor shall communicate these changes and implications in a detailed method statement for submission and approval by the Project Engineer.

As a minimum requirement the Contractor shall adjust and address any revisions and changes to the test methods of the electrical leak survey by quoting the applicable ASTM test method for execution of the electrical leak survey, in particular and not limited to the following:

- ASTM D7703-16: Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Lance System.
- ASTM D7240-18: Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test).
- ASTM D7909-14: Standard Guide for Placement of Blind Actual Leaks during Electrical Leak Location Surveys of Geomembranes.
- ASTM D6747-15: Standard Guide for Selection of Techniques for Electrical Detection of Leaks in Geomembranes.
- D8265-19: Standard Practices for Electrical Methods for Mapping Leaks in Installed Geomembranes.
- ASTM D7007: Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials.

4.1.2 Qualification of Specialist Contractor

The Contractor shall be approved by the Project Engineer and the Employer and the following information is to be submitted:

- Corporate background and information.
- Contractor capabilities and qualification requirements:
    - Contractor must have tested a minimum of 50,000 sqm.
    - Contractor shall provide curriculum vitae's (CV's) of key personnel – professional competence/experience.

- Proof of certification of personnel to conduct the electrical leak surveys as issued by an independent certification body such as Geosynthetic Research Institute or any other approved institution that can certify the technicians are qualified to carry out the tests as per applicable ASTM test methods.
- Contractor shall provide a list of equipment and their calibrations certificates must be provided with the bid submission.
- A copy of Contractor's quality control plan and data capturing templates to be submitted with bid submission.
- Health and Safety plan.

- A list of at least five (5) completed projects in the last twenty-four (24) months. For each project, the following information shall be provided:
  - Purpose of testing, its location, and start/finish dates.
  - Name of facility owner, project manager and engineer and contact details.
  - Two reference letters from previous clients to be provided as part of the bid submission.
  - Type, thickness, and surface area of the installed geomembrane.
- The Contractor conducting the electrical leak survey shall be independent from the owner, earthworks Contractor, liner installer and design engineering firm of the project.

4.1.3 Site Preparation Requirements

The electrical leak survey is required to be performed on the primary geomembrane liner (non-conductive) or cover material at the project site as described above.

It is the responsibility of the Contractor to familiarize themselves with the following in relation to the design of the facility and successful execution of the electrical leak survey:

- Boundary conditions that are applicable to the site conditions and facility design layout or configuration such as the sloping of the embankments, provision of berms to aid testing, provision of sufficient water to conduct the test and any limitations applicable to the applicable leak survey.
- Subgrade conductivity – the primary geomembrane will have an underlying compacted clay layer, refer to construction drawings for details. It is the responsibility of the Contractor to ensure he is familiar with the technical specifications of the compacted clay layer and where required the subgrade material must be watered before placement of the geomembrane.

- Above Geomembrane – the primary geomembrane will have a cover material that may consist of, geocells, concrete, coarse ash, etc. refer to construction drawings for details. It is the responsibility of the Contractor to ensure he is familiar with the technical specifications of the cover material, where required the cover material must be watered before testing.
- The Contractor shall ensure that the subgrade conductivity trial testing is performed as early as possible in the case of questionable site soils.
- Sensitivity test – shall be performed to consider the site-specific conditions and the basin configuration. The calibration location shall clearly be marked and repaired afterwards. Alternatively, an artificial leak may be used.
- Objects that will provide a source of electrical grounding on site should be carefully considered and addressed by the Contractor prior to construction of the facility and the electrical leak survey commencing. The Contractor shall familiarize himself with the sequence of the construction activities on site in particular relating to any metal pipe penetrations, concrete inlet or outlet structures, including metal batten strips, if they exist on construction drawings, and the consequence and impact of it in relation to electrical grounding shall be communicated to the Project Engineer prior to commencement of construction and possible mitigation measures shall be clearly addressed to the Project Engineer.
- The Contractor shall be responsible in the preparation of the areas to be tested. The surface of the geomembrane in the area to be tested shall be cleaned and shall be free of grease, moisture, dust, dirt, debris, and foreign material of any kind.
- Wrinkles in the liner can interfere with the intimate contact between the liner and the subgrade beneath it. The Contractor shall ensure the liner is relatively flat but when the wrinkles are severe the work must be performed during the early morning or late afternoon/evening.
- The geomembrane must be completely installed in the facilities prior to the electrical leak survey commencing.

4.1.4 Weather Restrictions

The Contractor shall consider that rapid weather changes are possible at the site, resulting in delays in performance of the electrical leak survey.

Electrical leak surveys shall only be undertaken under weather conditions allowing such work within the warranty limits imposed for certification by the Project Engineer or appointed CQA Engineer and which will not jeopardize the integrity of the geomembrane barrier performance function. Electrical leak surveys shall not occur under adverse environmental conditions, including, but not limited to:

- Precipitation of any kind, including condensing fog.
- Areas of ponded water due to rain, that inhibits safety to conduct the survey.
- Periods of excessive winds or dust.

The Contractor shall submit to the Project Engineer prior to commencement of surveying and upon agreement and approval of the Project Engineer what will be deemed and defined as adverse weather conditions in relation to project site weather conditions. The Contractor shall identify or provide for a weather measuring device including and not limited to a rain gauge, and a wind vane.

4.1.5 Quality Control of Surveys

The Contractor shall submit prior to commencement of the electrical leak survey the following:-

- Detailed method statement on how the electrical leak survey shall be executed; the method statement shall include:
    - Survey method according to the applicable ASTM test method as outlined in Section 3.1.1 of this specification.
    - Panel layout of area to be surveyed.
    - Equipment to be used and calibrations certificates.
    - Technicians to be used on the project and their relevant qualifications.
    - Testing schedule indicating daily production rates.

In addition, the Contractor shall ensure the following:

- The sensitivity testing procedures of the applicable ASTM test method is agreed with the Project Engineer/CQA Engineer.
- The Contractor shall ensure that the survey is performed with the same parameters as were employed during the sensitivity test. In addition, the Project Engineer/CQA Engineer shall verify that the applicable ASTM survey method was comprehensively applied to the entire survey area.
- If the Project Engineer/CQA Engineer suspects that the sensitivity test performed by the survey Contractor does not represent site conditions, then the option to create a "blind actual leak" shall be considered. If a blind leak is installed, it should be in accordance with the Standard Guide for Placement of Blind Actual Leaks during Electrical Leak Location Surveys of Geomembranes (ASTM D7909). Per the ASTM Standard Guide, a blind actual leak is "a circular hole in the geomembrane intentionally placed by the owner or owner's representative to

ensure that the site conditions are suitable for an electrical leak location survey and that a valid electrical leak location survey is performed.

4.1.6 Identified Leak Repairs

4.1.6.1 General

Any identified leaks found during the electrical leak survey shall be repaired immediately before proceeding to other areas to be tested. Reasons for requiring repairs to the geomembrane survey may include, but are not limited to:

- Seam intersections.
- A hole, tear, or penetration, including holes in the seam for air pressure testing device.
- A scratch, gouge, or nick that penetrates more than 10 percent of the material thickness.
- A hard object underneath the geomembrane.
- A fish mouth or wrinkle at seam overlaps.
- Bridging.
- Excessive scuffing.
- Geomembrane material defects.
- Large wrinkles.

Panels that require more than one repair per 25m² shall be reported to the Project Manager and must be reported on to the Installer (Geomembrane Installer) to be removed and replaced with new geomembrane panel at the Installers expense.

All repairs shall be labelled by the Technician, who shall record pertinent details relative to the repairs, such as a photography plus date and time repaired. All information shall be captured in applicable SANS 104090:2020 log sheets.

4.1.7 Survey Schedule

The Contractor shall provide adequate manpower as required to meet the project completion schedule. One technician shall achieve no less than 6000m²/day on the electrical leak survey.

5 REPORTING REQUIREMENTS OF THE ELECTRICAL LEAK SURVEY

5.1 DAILY REPORTS

The Contractor shall provide daily reports on the electrical leak surveyed areas and shall contain the following information as a minimum:

- Description of the area of survey.
- Survey methodology.
- Description of test apparatus.
- Climatic conditions.
- Field notes, including memoranda of meetings and/or discussions with the Project Engineer and liner installer.
- Identification of any site conditions that do not conform to Section 6 of ASTM D8265-19.
- Results of system functionality and calibration test (sensitivity test).
- Location (GPS coordinates) photographed type and size of leaks.
- Repairs on detected leaks and photographed proof of repairs.
- Signatures of witness personnel not associated with Contractor such as client representative or Resident Engineer or CQA Engineer.
- Reporting requirements as per Section 9 of ASTM D8265-19, where applicable.

5.2 FINAL SURVEY COMPLETION REPORT

The Contractor shall further produce a final completion report for submission to the Project Manager and CQA monitor within fourteen (14) days of completion of survey that summarises the activities documented in the daily reports. The final completion report shall also include:

- An outline of the survey method.
- Panel layout of survey areas and where leaks were identified, and repairs conducted.
- Discussion of problems and solutions.
- "As-Built" drawings (with GPS coordinates) showing all the locations where the leaks where found. Contractor will also request the assistance of the Geomembrane Installer to identify these locations on his overall panel layout drawing.
- Letter of Certification – the letter indicating that the facility has been surveyed to applicable ASTM test methods as per project specifications and all leaks were identified and repaired accordingly.

6 PAY ITEMS

6.1 LINER INTEGRITY SURVEY LISTED ITEMS

Site Mobilization and Demobilization (Lump Sum) Qty = 1

This rate shall include:

- All mobilization and demobilization of personnel and equipment to site including:
  - Generators for power supply.
  - Necessary accessories to conduct the survey.
  - Supervision.
  - Labourers to assist with, watering, isolation, and location of anomalies.
- Site medicals and inductions for all Contractors' personnel during the duration for the survey period.
- Any applicable equipment permits.
- Transport costs and associated accommodation.
- Provision of a water cart for supply of water where required.

Liner integrity survey on cover geomembrane as per ASTM D7007 (Dipole Testing) (m^2)

The rate shall include the following:

- Liner integrity survey on the installed primary geomembrane (non-conductive) as per construction drawings and in accordance with ASTM D7007: Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials. The rate shall cover all site preparations related to the testing procedures and shall include sensitivity tests or trial tests,performance of the leak survey, identification of leaks and repairs; data processing and capturing, as well as preparational work to conduct testing, repairs, closure, and retesting.
- Where necessary additional requirements as stipulated in ASTM D7007.
- All site preparations related to the testing procedures.
- Sensitivity tests or trial tests, performance of the leak survey, identification of leaks and repairs.
- Data processing and capturing.
- Preparation of daily reports as per Section 4.1 of the specification.
- Attendance of project site meetings when required.

Liner Integrity Survey on exposed Geomembrane (m^2)

As per ASTM D7953-14 (Arc Testing)

The rate shall include the following:

- Liner integrity survey on the installed primary geomembrane (non-conductive) as per construction drawings and in accordance with ASTM D7953-14: Standard Practice for Electrical Leak Location on Exposed Geomembranes using the Arc Testing Method.
- Where necessary additional requirements as stipulated in ASTM D7909-14.
- All site preparations related to the testing procedures.
- Sensitivity tests or trial tests, performance of the leak survey, identification of leaks and repairs.
- Data processing and capturing.
- Preparation of daily reports as per Section 4.1 of this specification.
- Attendance of project site meetings when required.

Liner Integrity Survey on exposed Geomembrane (m^2)

As per ASTM D7002-16 (Water Puddle)

The rate shall include the following:

- Liner integrity survey on the installed primary geomembrane (non-conductive) as per construction drawings and in accordance with ASTM D7002-16: Standard Practice for Leak Location on Exposed Geomembranes using the Water Puddle System.
- Where necessary additional requirements as stipulated in ASTM D7909-14 and ASTM D8265-19.
- All site preparations related to the testing procedures.
- Sensitivity tests or trial tests, performance of the leak survey, identification of leaks and repairs.
- Data processing and capturing.
- Preparation of daily reports as per Section 4.1 of the specification and ASTM D8265-19 reporting requirements.
- Attendance of project site meetings when required.

Incremental Weather Standby Rate RATE ONLY (R/hr)

The rate only charges for any standby time related to incremental weather conditions as prohibits the Contractor to proceed with works as per conditions outlined in Section 3.1.4 of the project specifications.

Preparation of Final Completion Electrical Leak Survey Report (Lump Sum) **Qty**

Preparation of Final electrical leak survey report on the installed primary geomembrane (non-conductive) as per requirements listed in Section 4.2 of the technical specifications. The Final Completion Report will be submitted within fourteen (14) days from completion of surveys.

7. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
Saihen Govindasami	Auxiliary Engineering – Civil Engineer
Denvor Fielies	Auxiliary Engineering – Project Manager
Mokotedi Mokoena	GCD – Site Supervisor
Sinazo Mazwi	GCD – Contracts Manager
Marike Landman	GCD – SHE Manager
Delisiwe Nkosi	GCD – Environmental Practitioner
Mbekezeli Ndaba	GCD – Environmental Practitioner
Vusi Mlandu	GCD – Site Manager

7 REVISIONS

Date	Rev	Compiler	Remarks
April 2022	1.0	M Mokoena	Final

8 DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Mokotedi Mokoena
- Saihen Govindasami

9. PROGRAMME AND PLANNING

9.1 GENERAL

The Contractor submits a single programme that incorporates the programmes of all of his sub-contractors. The interface points between his different sub-contractors as well as the interface points between the individual sub-contractors and the Contractor are to be clearly identified.

9.2 DETAILS OF THE EMPLOYER AND OTHERS WHO WILL BE OCCUPYING THE WORKING AREAS AT THE SAME TIME

Other Contractors are working in the same area as the work of this contract. In this regard, the Contractor co-ordinates his work with the Project Manager to maintain harmonious working conditions on Site.

During the progress of the works the Contractor provides access to Others who also execute work in the same area, on an as and when required basis.

The Contractor makes his own assessment of the problems and difficulties which may be encountered for providing access to and interfacing with Others (this includes access difficulties experienced during construction or commissioning phase).

No extra payment or claim of any kind on account of providing reasonable access is allowed.

9.3 COMPUTERISED PLANNING AND REPORTING

The Project Manager does not intend duplicating the Contractor's programming and planning, however, portions or high level extractions of the Accepted Programme may be used in the Employer's internal master project programme for control purposes.

The Contractor submits updated computer files on a monthly basis, or at any other time as required by the Contractor or as instructed by the Project Manager.

The updated computer file shows the logic and all filters and layouts used in the programme. MS Project has been adopted by the Employer for all planning, progress monitoring and reporting on the Kendal Power Station continuous Ash Disposal Extension Facility Project.

The Contractor obtains this software and applies it for the planning and control of the works in line with the accepted Work Breakdown Structure.

9.4 ADDITIONAL PROGRAMME REQUIREMENTS

The Contractor uses the Critical Path Method (CPM) technique for programme and planning.

The programme shows the actual critical path clearly. The preparation of the programme contains a programme basis document. This basis document describes the programme and planning methodology, format, project execution philosophy, resource assumptions, qualifications and any other items that may have a substantive impact on the schedule.

The programme layout takes into account the accepted WBS, reflecting the manner in that the works are to be performed and how control data are summarised, reported and monitored.

The following levels of programme are to be used for this project for dynamic integrated project control:

- Management level programme (Level 1)
- Project level programme (Level 2)
- Control level programme (Level 3)
- Discipline speciality programme (Level 4)

The Contractor submits the level 2 programme with the tender documentation. The level 3 programme is to be submitted within one month following design freeze of the unit

9.4.1 MANAGEMENT LEVEL PROGRAM (LEVEL 1)

The management level programme is used to establish work goals and overall time Frames for the works.

It is a statement of project objectives recorded in graphic form. The management level programme defines:

- Established goals or major milestones key dates,
- The duration of major operations and their relationship to one another,
- Identified Long Lead material items,
- Responsibility assignments for accomplishing project objectives.

9.4.2 PROJECT LEVEL PROGRAM (LEVEL 2)

A "rolled up" programme from the control level programme is produced. It is separated by Work packages areas and by Phase (Engineering, Procurement, Execution and Commissioning).

9.4.3 CONTROL LEVEL PROGRAM (LEVEL 3)

The project level programme is prepared representing the significant work activities and deliverables associated with the works. The end product is a time scaled bar-chart schedule developed through use of a logic network. This programme is separated by sections of the work package, by WBS.

The work within each work package area is broken down by engineering discipline, procurement of tagged equipment and bulks, execution by contractor, and commissioning & start-up. The control level programme is resource-loaded.

9.4.4 DISCIPLINE SPECIALITY PROGRAM (LEVEL 4)

The need for supplemental or discipline speciality programme is dependent upon the requirements and/or circumstances of the contract.

The discipline speciality programme developed and maintained by the Contractor is generated for tracking and control of various activities and deliverables for all phases of the contract. This programme is usually formatted in MS Project report utilising the WBS structure.

This programme typically represents day-to-day tasks which are work package based and become summarised in the Level 3 activities. Resource information for manpower, Plant, Material and Equipment and reflected in the resource histograms is to be provided by the *Contractor*. The *Contractor's* programme is to align to the *Contractor's* Method Statement. The programme to show where the Electric Leak Location Survey (ELLS) will be performed (Ash damp Phase 2, Ash damp Phase 3, PCD 1, PCD 2, CWD1, CWD 2) and the type of ELLS which will be performed at a particular section and at what point of executing the scope.

9.5 SUBMISSION OF REVISED PROGRAMMES AND PROGRESS REPORTING

The Contractor submits two hard copies and one electronic copy in MS Project, of each revised programme and progress report to the Project Manager for acceptance. All formally issued reports are to follow the progress reporting requirements as stated below.

9.5.1 STATUS REPORTS

A status report is submitted by the Contractor to the Project Manager. This
Report should align to section 5 of the document requirement. Contents of a weekly report should include the following
items:

- The updated MS Project programme
- Programme summary narrative
- Progress and performance summaries

10.ACKNOWLEDGEMENTS

N/A