Eskom	Scope of Work	Generation

Title:	**Kriel Power Station scope of work for the installation of additional drains at the Ash Dam Complex**	Unique Identifier:	**240-161264492**
		Alternative Reference Number:	**NA**
		Area of Applicability:	**Kriel Power Station**
		Documentation Type:	**Scope**
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		Total Pages:	**15**
		Next Review Date:	**NA**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	Functional Responsibility	Authorized by
……..	……..	……..
J Bennett	**N Muthavhine**	**Z Nkosi**
Civil Engineer	**Auxiliary Plant Manager**	**Engineering Manager**
Date: 22/01/2021	Date: 2021/01/22	Date: 22/01/2021

CONTENTS

1. INTRODUCTION

Kriel Power Station is located approximately 8m west of Kriel in Mpumalanga Province, South Africa. The location is shown in Figure 1 below.

Figure 1: Kriel Power Station location

The Ash Dam complex consists of three compartments namely Dam1, Dam 2 and Dam3 which has an approximate footprint of 300Ha.The Dams are shown on the figure below

Figure 2: Layout of Ash Dams

Eskom is required to take drain flow readings in order to monitor the amount of water draining from the Ash Dam. From investigations a number of existing drains are damaged or have failed and are not working efficiently or at all. This has been caused by the increase in height of the dams creating increased weight on the drains which has caused the drains to fail. The installations of additional drains on Kriel Ash Dam Complex has been recommended by the Approved Professional Person (APP). It is believed that installing new drains at the Ash Dam would alleviate pressure in the dam by draining water out the body of the dam which will reduce its phreatic line (water table). Reducing the phreatic line through the dam will in turn increase the stability of the slopes of the dam complex.

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope comprises of, but not limited to:

- • The contractor is requested to install pilot drains within Kriel Ash Dam facility. . The Pilot test will consist of the installation of 12 drains.
- After monitoring of the pilot test drains for a period of a Month, the APP will advise on continuing with the rest of the 817 Drains
- If the pilot test is successful, the contractor is requested to supply and install the remaining 805 drains (817 drains minus the 12 test pilot drains) in pre-determined areas by the APP of the Ash Dam
- Locations of drains will be advised by the APP
- In the event that not all 817 drains are to be installed (advised by the APP or the Employer) , the contractor will be paid for the drains that have been completed
- Dispose of any waste materials from drain installations in a predetermined area (location to be advised by the Employer).

2.1.1 Purpose

1. The purpose of the document is to outline the scope of work required by the Contractor for the installation of additional drains (817) around the Kriel Ash Dam facility.

2.1.2 Applicability

This document shall apply to Kriel Power Station, Specifically the Ash Dams

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

1. CSRA: Standard Specification for Sub-surface Investigations, 2010
2. All work is conducted in accordance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) as amended
3. The successful tenderer is required to conform to all relevant legislation, whether natural, social, cultural or technical, and shall liaise with the appropriate authorities if required.
4. Risk Management Plans for Weathered Ash as approved by the Department of Environmental, Forestry and Fisheries.
5. 40-86973501: Engineering Drawing Standard- Common Requirements
6. SANS 1200 series

2.2.2 Informative

7. TN061/16/F912-01 (January 2017): Kriel Power Station: Ash Dam Complex Geotechnical Stability Review

8. 2007310/R03R - Kriel power station ash dams slope stability assessment report October 2020
9. Kriel Power Station Ash Dam Complex Drainage System Conceptual Design Report
10. W129/15/F015 (April 2016): Kriel Ash Dam Step-In & Go Higher Geotechnical Investigation And Stability Assessment – Final Report
11. Drainable Pavement Systems – Demonstration 87 (FHWA, 1992)

2.3 DEFINITIONS

2.3.1 Classification

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

2.3.2 Abbreviations

Abbreviation	Description
APP	Approved professional person
mamsl	Metres above sea level
O.S.H.	Occupational Health & Safety
VWP	Vibrating wire piezometer
S.A.N.S.	South African National Standards

2.3.3 Roles and Responsibilities

The *Contractor* is required to:

- Review all relevant existing site information inclusive of existing geological and geotechnical data;
- Supply and install additional drains on Kriel Ash Dam Facilities
- Work with the existing Kriel Ash Dam APP to determine locations of installations
- Produce drawings for the locations
- Engage relevant authorities and/or assist with engagement with necessary authorities (where needed).
- Use approved installation methods to install drains specified by the design
- Provide adequate resources including provision of equipment for required works,
- Manage cost and a scheduled, time frame of work,
- Ensure that the scope is carried out in full,
- Provide regular feedback
- Ensure that all site work is conducted by a competent person,

- Ensure that prior to any fieldwork, all parties working on site have familiarized themselves with the Employers safety requirements and the Occupational Health and Safety (OSH)Regulations act (85 of 1993) and,
- The Contractor is to submit method statements and Quality Control Procedures (QCP's) to the *Employer* for approval

2.4 PROCESS FOR MONITORING

Not Applicable

2.5 RELATED/SUPPORTING DOCUMENTS

12. 2007310/R03R - Kriel power station ash dams slope stability assessment report October 2020

13. Kriel Power Station Ash Dam Complex Drainage System Conceptual Design Report

3. SCOPE OF WORKS

The scope of work includes the supply and installation of new drains on Kriel Ash Dams,

3.1 DRAINAGE SYSTEM DESIGN

The Drainage system design is explained below and drawings can be seen in the appendix at the end of this document.

3.1.1 Drainage Pipe Details:

The drainage system will comprise perforated 110mm diameter HDPE pipes with a factory installed geotextile filter surround. The pipes are to be inserted into the ash dam to varying depths and at various elevations along the perimeter of the Ash Dam Complex

Each 110mm diameter perforated HDPE pipe will be inserted into the ash dam at a minimum slope of 3 degrees to enable gravity flow.

Drainage pipes inserted at the toe of the facility discharge directly into the existing solution trench via a 110mm diameter unperforated HDPE outlet pipe. Drainage pipes inserted along the benches will discharge into a drainage collection system.

Rodding eyes are provided to allow for cleaning of the drainage system when required. The rodding eyes comprise 110mm diameter Y-junctions located at the end of each drainage outlet pipe. A rodding eye is also provided at the end of each drainage collector pipe

3.1.2 Drainage Collection system

Drainage collection system is required to convey drain water from the ash dam benches to the existing solution trench located at the toe of the facility without recharging the phreatic surface.

The drainage collector system comprises a 160mm diameter unperforated HDPE collector pipe which collects drain water discharging from each drain located on the ash dam bench. Downpipes covey the drain water from the collector pipes to the existing solution trench.

3.1.3 Drainage pipe geotextile

Each perforated pipe is to have a geotextile filter surround. Geotextiles are commonly used as a filter material due to the ease of installation and the effectiveness in providing filtration.

The geotextile filter allows for water to flow into the drainage pipes whilst preventing the ash material from being eroded. Selection of an appropriate geotextile requires careful analysis to ensure that the geotextile is compatible with the surrounding material.

A suitable geotextile filter was selected based on the criteria specified in the Drainable Pavement Systems – Demonstration 87 (FHWA, 1992). Geotextile filter design requires consideration of the geotextile's:

- Soil-retention characteristics
- Permeability
- Susceptibility to clogging
- Durability

The particle size distribution of the ash material was obtained from the Step-in and Go Higher Geotechnical Investigation and Stability Assessment (Report No: JW129/15/F015 – Rev 1) submitted by Jones & Wagner in December 2015. The particle size distribution of the two ash samples KBH01/01 and KBH02/01are indicated in Figure 3 (9).

The ash material particle size distribution was used to select a suitable geotextile filter which adheres to the requirements indicated in the Drainable Pavement Systems – Demonstration 87 (FHWA, 1992).

A4 Bidim or similar approved geotextile filter adheres to the soil retention, permeability, clogging and durability criteria indicted in the Drainable Pavement Systems –Demonstration 87 (FHWA, 1992).

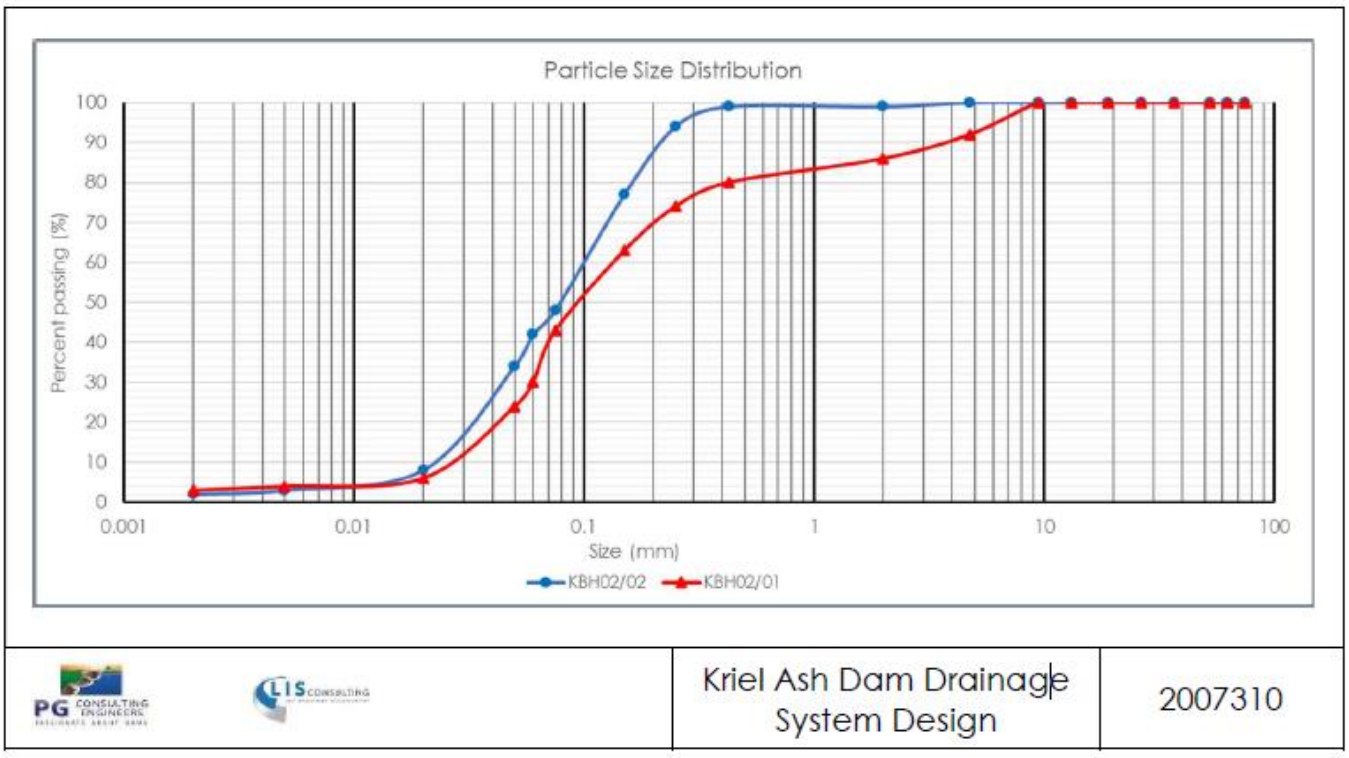


Figure 3: Kriel Ash Dam Drainage System Design (9)

3.2 PROPOSED METHODOLOGY

Proposed methodology for installations:

- Directional drill the hole into the ash dam to the required length.
- Insert a temporary casing into the hole as drilling progresses to prevent the hole from collapsing.
- Withdraw the drill head.
- Insert the drainage pipe with a factory installed geotextile filter surround.
- Withdraw the casing.
- Plug the drainage pipe outlet end.
- Install the drainage collection system to collect the water discharging from the drainage pipe.

3.3 TEST PILOT

Pilot testing is recommended to determine the practicality and efficacy of the drainage system, and to determine the best way to install the drains.

The pilot testing will confirm the overall cost to install the drainage system as well as the technical ability to install the proposed drainage system.

It is recommended that four (4) 50m long pilot drains be installed at the toe, first bench (1595 mamsl) and third bench (1610 mamsl) on the eastern flank of Dam 3. Two pilot drains are to be installed on either side of the existing piezometer line M1 at the required elevations. This will allow the operators to measure the phreatic surface near the newly installed drainage system and assess the effectiveness of the drainage system.

Exact locations will be advised by the APP

3.4 PHASED DRAINAGE SYSTEM INSTALLATION

If the test pilot set of drains is declared successful by the APP, the remaining of the total 817 drains must phased o be installed

The installation of the proposed new drainage system should be completed in phases with the most critical areas given preference. This will allow better project economics and time-distributed expenditure.

If the drainage system proceeds, then the installation should first commence along the eastern and northern flank of Dam 3 as well as the southern flank of Dam 2. The installation of the drainage system can then continue in the remaining areas of the Ash Dam Complex to ensure that the best project economics are achieved.

Exact locations and phasing will be advised by the APP

3.5 LABOUR, PLANT AND EQUIPMENT

- Labour will be supplied by the contractor with all the required PPE and safety equipment.
    - Working hours – normal dayshift working hours is required (Overtime work up to contractor discretion)
    - Supervision – Supervisor to supervise all work activities and required. (with safety training (HIRA) to conduct risk assessments) must be full time on site

- Operators and/or General workers will be supplied by the contractor to execute the work activities.

- Plant and Equipment will be supplied and maintained by the contractor.
  - It is expected that the drilling and all other equipment is in a good and safe condition.
  - All plant or equipment operators must be found competent and certified to operate equipment.

3.6 RESPONSIBILITY FOR DESIGN

- The Contractor is responsible for the design of all temporary works required for the execution of the works.
- All designs, design reports and Construction drawings prepared by the Contractor are signed off by an ECSA Professionally registered Technologist or Engineer who takes full professional accountability for the designs.
- The Contractor is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) a - j and 6(2) a – d, to fulfil the duties described therein for the detailed and temporary works designs done by the Contractor.
- Any risk associated with the Contractor's design is highlighted to the Employer together with mitigation measures. The Contractor's is responsible for construction monitoring at the level required to certify that the works have been constructed in accordance with the Contractor's design.

3.7 DRAWINGS FORMAT AND LAYOUT

- The creation, issue and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 Engineering drawing Standard
- Drawing numbers will be issued to the contractor
- Drawings issued will be a minimum of one hardcopy and an electronic copy in native CAD and/or DWG/DGN format.
- No drawings in TIFF or any other electronic format will be accepted.
- Issued drawings will not be "Right Protected" or encrypted

3.8 PRODUCTION OF AS-BUILT INFORMATION

The Contractor is required to produce as-built drawings of the works

As-built drawings indicate, as a minimum, layer works, widths including shoulder, diameters of culverts, as well as details of associated structures.

3.9 SURVEY CONTROL AND SETTING OUT OF THE WORKS

It is the responsibility of the contractor to verify and rectify the survey information where provided. It is the responsibility of the contractor for the setting out of the works.

3.10 SPECIFICATIONS FOR THE WORKS

Number	Title
240-56364545	Structural Design and Engineering Standard
240-53113685	Design Review Procedure
240-84418186	Road Specification Manual
240-85549846	Standard for Design of Drainage and Sewerage Infrastructure
240-86973501	Engineering drawing Standard – Common Requirements
240-53114026	Project Engineering Change Management
240-66920003	Documentation Management Review and Handover Procedure for Gx Coal Projects
240-56227443	Requirements for Control and Power Cables for Power Stations Standard
240-56356396	Earthing and Lightning Protection Standard
240-143485806	Generation Auxiliary Plant Medium Voltage Protection Standard (Rev 1)
240-76992014	Project / Plant Specific Technical Documents and Records Management Work Instruction
240-105658000	Supplier Quality Management Specification
32-136	Contractor Health and Safety Requirements
32-245	Eskom Waste Management
240-100069100	SHE Specification
SANS 1200 A	Standardized specification for civil engineering construction Section A: General
SANS 2001-DP1	Construction works Part DP1: Earthworks for buried pipelines and prefabricated culverts
SANS 2001-DP2	Construction works Part DP2: Medium pressure pipelines
SANS 2001-DP3	Construction works Part DP3: Cable ducts
SANS 1200 DK	Standardized specification for civil engineering construction Section DK: Gabions and pitching
SANS 1200 DM	Standardized specification for civil engineering construction Section DM: Earthworks (roads, subgrade)
SANS 1200 GE	Standardized specification for civil engineering construction Section GE: Precast concrete (structural)
SANS 1200 HA	Standardized specification for civil engineering

Number	Title
	construction Section HA: Structural steelwork (sundry items)
SANS 2001-CS1	Construction works Part CS1: Structural steelwork
SANS 1200 M	Standardized specification for civil engineering construction Section M: Roads (general)
SANS 1200 ME	Standardized specification for civil engineering construction Section ME: Subbase
SANS 1200 MF	Standardized specification for civil engineering construction Section MF: Base
BS 8007: 1987	Design of Concrete Structures for retaining aqueous liquids
SANS 2001-CC1	Construction works Part CC1: Concrete works (structural)
SANS 2001-BE	Construction works Part BE1: Earthworks (general)
SANS 2001-BS1	Construction works Part BS1: Site clearance
SANS 2001-CC2	Construction works Part CC2: Concrete works (minor works)
SANS 10313	Protection against lightning - Physical damage to structures and life hazard
SANS Methods 5856	Bulking of fine aggregates

3.11 EXCAVATIONS AND ASSOCIATED WATER CONTROL

A pumping system may be required to pump excess water in wet areas. The pump is to operate via diesel and to pump water into its natural flow path.

3.12 GENERAL

The *Contractor* is responsible for the analysis and verification of any existing infrastructure impacted by the works as well as any modifications required taking full accountability for any changes made to existing infrastructure.

All work activities will be conducted during normal 9 hour dayshift working day and 5 day work week (Overtime and extended hours to contractor discretion).

3.13 AUTHORIZATION

This document has been seen and accepted by the development team and the Kriel Engineering Manager.

- Jason Bennett – Civil Engineer
- Santhesh Naicker – Civil Engineer

- Neo Muthavhine – Auxiliary Plant Engineering Manger
- Zakhele Nkosi – Kriel Engineering Manager
- Andre Kruiter – Ash Dam Specialist – Asset Management

4. REVISIONS

Date	Rev.	Compiler	Remarks
January 2021	0.1	J Bennett	Draft document for review
January 2021	1.0	J Bennett	Final document for signature

5. DEVELOPMENT TEAM

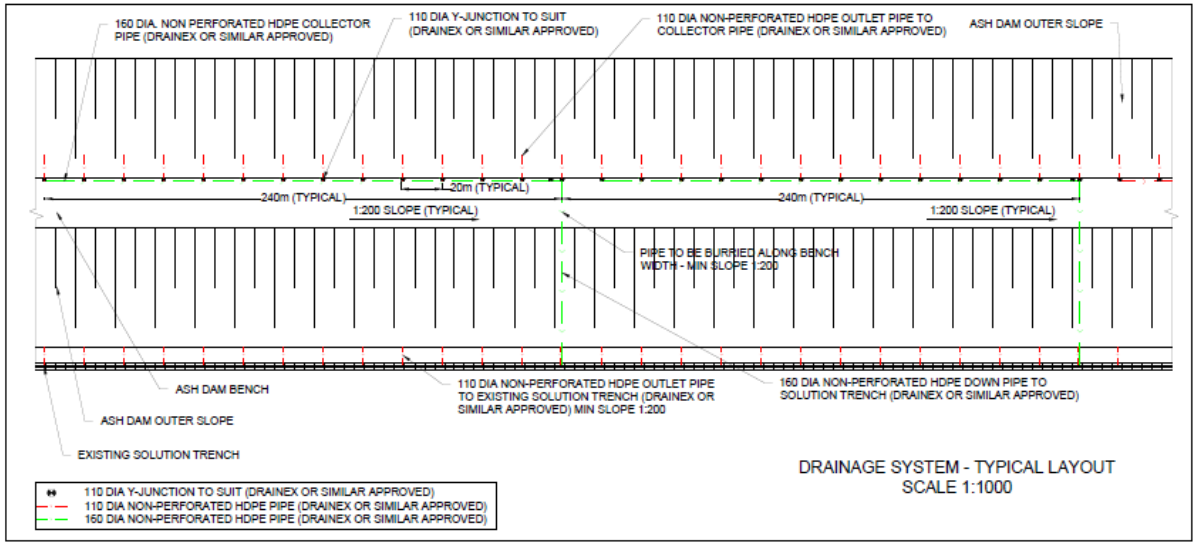
The following people were involved in the development of this document:

J Bennett

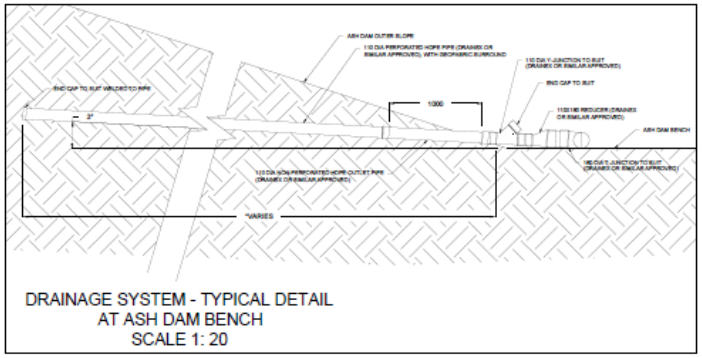
APPENDIX A: DESIGN DRAWINGS

NOTES

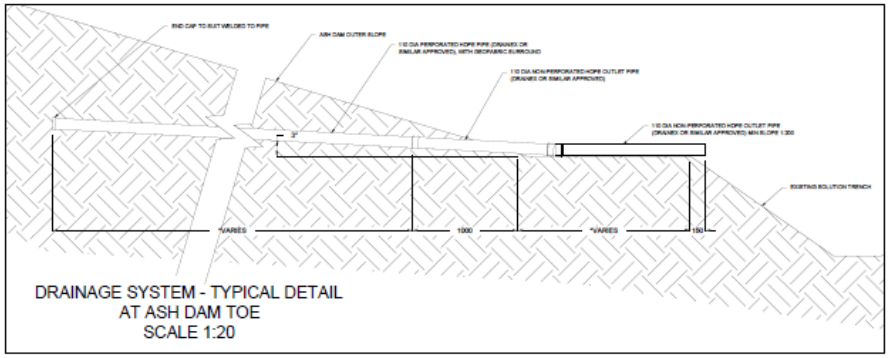
- DRAINAGE COLLECTOR PIPES TO BE LAID AT A SLOPE OF MIN 1:200 ALONG ASH DAM BENCHES. ASH DAM BENCHES TO BE GRADED AT A SLOPE OF MIN 1:200 IN DIRECTION OF DRAINAGE COLLECTOR PIPE FLOW.
- DRAINAGE OUTLET PIPES TO BE BURIED ALONG THE WIDTH OF THE ASH DAM BENCH. MINIMUM COVER TO BE 300MM FROM BENCH SURFACE. PIPE EXCAVATION TO BE BACKFILLED WITH EXCAVATED ASH MATERIAL AND NOMINALLY COMPACTED AND MADE GOOD.
- ALL PIPE FITTINGS TO BE WATERTIGHT.



DRAINAGE SYSTEM - TYPICAL LAYOUT
SCALE 1:1000



DRAINAGE SYSTEM - TYPICAL DETAIL
AT ASH DAM BENCH
SCALE 1: 20



DRAINAGE SYSTEM - TYPICAL DETAIL
AT ASH DAM TOE
SCALE 1:20

FOR APPROVAL
ORIGINAL SIZE A1

AMENDMENTS

NR	DATE	APPROVED	DESCRIPTION	PAR

GENERAL NOTES:

1. ALL WORK MUST COMPLY WITH THE BY-LAWS AND "SPECIFICATIONS" OF THE LOCAL AUTHORITY, "NATIONAL" BUILDING REGULATIONS AND SABS 1200.
2. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE BEFORE WORK COMMENCES AND ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IN WRITING.
3. THE ENGINEER WILL ASSIST THE CONTRACTOR IN "STAKING LINES, WHERE AFTER THE CONTRACTOR" SHALL TAKE OVER ALL SETTING OUT PEGS AND SURVEY BEACONS AND MAINTAIN THEM DURING THE CONSTRUCTION PERIOD.

Eskom

CONSULTANT:
PG CONSULTING ENGINEERS
LIS CONSULTING

DESIGNED: GEOTHETA	DRAWING CHECKED: PJ GOUWS
CHECKED: I HAMMOND	DRAWN: M MULDER
APPROVED: ESKOM	OTHER CONSULTANTS

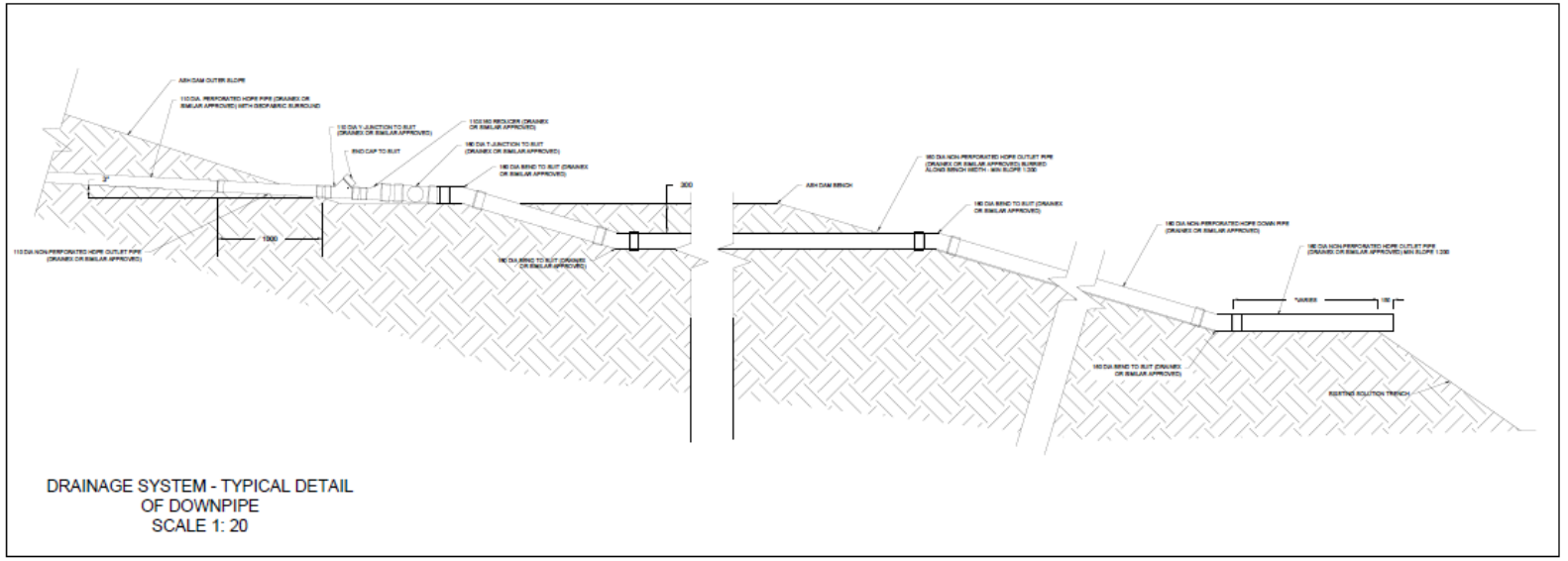
KRIEL POWER STATION

WICK DRAINS - SECTIONS & DETAILS
1 OF 2

DATE	2020-11-10
SCALE	AS SHOWN
DRAWING NUMBER	104-W-002
REVISION NO.	A
PROJECT NUMBER	104

NOTES

- DRAINAGE COLLECTOR PIPES TO BE LAID AT A SLOPE OF MIN 1:200 ALONG ASH DAM BENCHES. ASH DAM BENCHES TO BE GRADED AT A SLOPE OF MIN 1:200 IN DIRECTION OF DRAINAGE COLLECTOR PIPE FLOW.
- DRAINAGE OUTLET PIPES TO BE BURIED ALONG THE WIDTH OF THE ASH DAM BENCH. MINIMUM COVER TO BE 300MM FROM BENCH SURFACE. PIPE EXCAVATION TO BE BACKFILLED WITH EXCAVATED ASH MATERIAL AND NOMINALLY COMPACTED AND MADE GOOD.
- ALL PIPE FITTINGS TO BE WATERTIGHT.



DRAINAGE SYSTEM - TYPICAL DETAIL
OF DOWNPIPE
SCALE 1: 20

FOR APPROVAL

ORIGINAL SIZE A1

AMENDMENTS				
NR	DATE	APPROVED	DESCRIPTION	PAR

GENERAL NOTES:

1. ALL WORK MUST COMPLY WITH THE BY-LAWS AND "SPECIFICATIONS" OF THE LOCAL AUTHORITY, NATIONAL BUILDING REGULATIONS AND SABS 1200.
2. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE BEFORE WORK COMMENCES AND ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IN WRITING.
3. THE ENGINEER WILL ASSIST THE CONTRACTOR IN "SETTING LINES" WHERE AFTER THE CONTRACTOR SHALL TAKE OVER ALL SETTING OUT PEGS AND SURVEY BEACONS AND MAINTAIN THEM DURING THE CONSTRUCTION PERIOD.

Eskom

CONSULTANT:

PG CONSULTING ENGINEERS
PASSIONATE ABOUT SAND

LIS CONSULTING

DESIGNED: GEOTHETA	DRAWING CHECKED: PJ GOUWS
CHECKED: I HAMMOND	DRAWN: M MULDER
APPROVED: ESKOM	OTHER CONSULTANTS

KRIEL POWER STATION

WICK DRAINS - SECTIONS & DETAILS
2 OF 2

DATE	2020-11-10
SCALE	AS SHOWN
DRAWING NUMBER	104-W-003
REVISION NO:	A
PROJECT NUMBER	104