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CIVIL DESIGN 2.2 GEOTECHNICAL REPORT				
Project Description:	MAKHATHINI 132/22-kV SUBSTATION: 2 x 3MVar 22kV CAPACITOR BANK C-TYPE FILTER ESTABLISH			
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List of Abbreviations

Abbreviation	Meaning
CBR	California Bearing Ratio
DCP	Dynamic Cone Penetrometer
KZN	KwaZulu Natal

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		Authorisation Date	October 2019		
		Review Date	October 2024		

TABLE OF CONTENTS

List of Abbreviations.....	ii
TABLE OF CONTENTS.....	iii
FOREWARD	iv
DOCUMENT REVISION HISTORY	iv
1. INTRODUCTION	5
2. SITE DESCRIPTION	5
3. METHODS OF INVESTIGATION.....	5
4. GENERAL SITE GEOLOGY	6
5. ESKOM CLASSIFICATION	6
6. MATERIAL EVALUATION.....	9
7. GEOTECHNICAL RECOMMENDATIONS	9
7.1. Excavation Requirements and Stability of Excavations.....	9
7.2. Excavations.....	10
7.3. Foundations	10

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		Template Identifier	240-130399981	Rev	0
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FOREWARD

This document is the Geotechnical Report for the **Makhathini 22-kV Cap Bank Establish**

TEMPLATE REVISION HISTORY

REV	Date	Compiler	Comment
0	2016	P Chetty	Original document
1	2017	P Chetty	Revised the header to include the correct format.
2	2019	P.A Moabi	Change to the latest date of Authorisation and review

DOCUMENT REVISION HISTORY

REV	Date	Compiler	Comment

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1. INTRODUCTION

This report, documents findings from a geotechnical investigation conducted on the 13th July and 13 August 2017 at the Existing Makhathini Substation site under Jozini Municipality. The geological features have an influence on the design and construction of the foundations and earthworks for this work.

This report is based on the findings which were obtained using the visual investigation method.

2. SITE DESCRIPTION

Makhathini 132/22kV Substation is situated in the Empangeni Sector and is maintained by Jozini Customer Network Centre. The substation is located north of KZN 5km from the centre of Jozini town. Substation is not accessible using the newly constructed main tarred road as the two levels between Eskom access road and P499 Road are at least 500mm different in terms of height. therefore, low bed or any vehicle will not be able to access. The site may be accessed through the back tarred road (D9) from Jozini to Makhathini and Eskom Access Road will tee off from this tarred road (D9), this new access road may need to be upgraded to meet the requirements of the Lowbed should it be necessary however it is fairly in good condition for normal trucks and vehicle, not for low bed or Abnormal vehicles or trucks.

3. METHODS OF INVESTIGATION

4.1 FIELDWORK

The fieldwork for the investigation was carried out on the 13th July 2017 and as well as 13 August and the following temperature conditions were encountered:

- Hot winter's day with min 10 and max 27 degrees Celsius

And Comprised the following:-

- Checking dongas, cut and fill sections and any excavations in an around the substation site
- DCP testing

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		Authorisation Date	October 2019		
		Review Date	October 2024		

- TLB Testing

4. GENERAL SITE GEOLOGY

Geological mapping of South Africa confirmed that there may be two types of rocks in the area surrounding the substation, namely;

- Dywka and Eccca Group shale
- Cape supergroup and Natal Group
- Beaufort Group

5. ESKOM CLASSIFICATION

According to Eskom classification the soil discovered on site is type 1 & 2, up to a depth of 2000mm below natural ground level. This is per the observations made on site and as well as the test pits and DCP test. This site has medium to dense loam soils based on the stratum of the test pits undertaken and also cuts of dongas and cut to fills.

Description of soil type 1 & 2as outlined below:

Type "1 & 2" soils

SOIL TYPE	DESCRIPTION
SOIL TYPE 1	Consistency (degree of density): Competent soil with equal or better consistency (strength or toughness) than would be encountered in stiff cohesive soils or medium dense cohesionless soils above the water table. Firm of stiff cohesive soils: Moulding of soil with the fingers is difficult to impossible. Excavation with a spade is difficult and picking is required.

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		Review Date	October 2024		

	Medium dense non-cohesive soils: Considerable resistance to shoveling or penetration by hand bar. Texture: Cohesive soils: Very stiff, sandy clay, silty clay, sandy silts and silty sands Cohesiveless soils: Compact, well graded gravels, sands and gravel sand mixtures, permanently above all water tables The DCP will have a low penetration rate with a DCP value of 7-8 The maximum bearing at foundation depth shall be 300 kpa
SOIL TYPE	DESCRIPTION
SOIL TYPE 2	Consistency (degree of density): A less competent soil than soil type 1 with equal or better consistency than would be encountered in firm to stiff swelling cohesive soils or dry, poor graded loose to medium dense soils above the water table. Firm of stiff swelling cohesive soils: Soils can be moulded with fingers with strong to very strong pressure. Freshly exposed surface shows faint heel mark when stood upon. Excavation with shovel is difficult Medium dense to loose soils: Having little to considerable resistance to shoveling or penetration with hand bar.

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	Texture: Cohesive soils: Firm to stiff clay, sandy clay, sandy silt and silty sands. Clayey soil will have a smooth texture and will tend to stick to the DCP rod when removed Cohesiveless soils: Poor to well graded sands, gravels and gravel-sand mix, permanently above all water tables. Dry sand will have a coarse texture The DCP will have a visible penetration rate with a DCP value of 5-6 The maximum bearing at foundation depth shall be 150 kpa
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Cohesive Soils		Non-Cohesive Soils		Eskom Soil Nom. Type
DCP Blow Count Blows/100mm	Subsoil Consistency	DCP Blow Count Blows/100mm	Subsoil Consistency	
0-1	Very soft	1-2	Very loose	4
1-2	Soft	3-4	Loose	3
2-3	Firm	5-6	Medium	2
3-6	Stiff	7-8	Dense	1
6-14	Very Stiff	> or = 9	Very dense	Rock

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6. MATERIAL EVALUATION

7. GEOTECHNICAL RECOMMENDATIONS

7.1. Excavation Requirements and Stability of Excavations

The terrain is relatively steep at about 5% slope and therefore medium to deep excavations may be required. Excavations will be soft from 0-600mm to from 600mm-1000mm hard excavations. 1000mm below ground is expected to be bed rock and 2000mm below is expected to be hard bed rock

As a general guideline of the likely excavation requirements in terms of SABS1200: D (current version) for the creation of cut to spoil excavations, the following is provided:

Type 1 to Type 3 Soil materials: Soft Excavation

Type Soft Rock materials: Intermediate Excavation

Type Hard Rock materials: Hard Excavation, with possible blasting or heavy equipment excavation

In terms of excavation stability during the construction term, provided the excavations are not affected by groundwater seepage or rainfall events, the following recommendations for the foundation excavation will apply:

Loose/soft materials in upper 0.5 to 1 metres of the soil profile 1V:1.5H

Medium dense/ firm materials below about 1 metre depth 1V:1H

Dense/Stiff and very dense/ very stiff materials Vertical

We must take into consideration the health and safety regulations governing the formation of excavations and their requirements for shoring below a certain depth

Extra care should be exercised when dealing with the excavation of this nature.

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7.2. Excavations

It is anticipated that cuts required to construct foundations and terrace will not be more than 1 metres in height,.

7.3. Foundations

Foundations for type 1 and 2 soil may be used for all these equipment.

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