
**AUGRABIES**

**PROPOSED NEW CEMETERY**

**REPORT ON**

# STORM WATER DRAINAGE & GEOTECHNICAL CONDITIONS

PREPARED FOR:

Kai !Garib Municipality
Private Bag X6
**Kakamas**
8870

Telephone 054 – 461 6400
Fax No 054 - 516 9066
Email wellsp@kaigarib.gov.za

PREPARED BY:

Stabilis Development (Pty) Ltd
P.O. Box 861
**Kimberley**
8300

053 – 833 1654
053 – 831 3786
info@stabilis.co.za

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## TABLE OF CONTENTS

## 1. BACKGROUND

Kai !Garib Municipality appointed Stabilis Development (Pty) Ltd to conduct a feasibility study for the development of a new cemetery for the town of Augrabies.

MIG funding was approved to conduct the feasibility study. The feasibility study also includes the subdivision and rezoning and the required EIA requirements of the portion of land required for a new cemetery.

An application for the funding of the capital costs involved for the development of the proposed new cemetery will be lodged at the Department of Corporate Governance, Human Settlements and Traditional Affairs on the MIG program.

## 2. INTRODUCTION

The town of Augrabies is located approximately 35 Kilometres to the north of Kakamas, the main centre of Kai !Garib Municipality.

The existing cemetery at Augrabies is situated in the town of Augrabies and adjacent to a natural major storm water drainage channel and therefore prone to flooding during heavy rains in the catchment area.

The existing cemetery is also approximately 95 % full and reaching its capacity. Therefore a new cemetery is required to meet the needs of the Augrabies Community.

This report addresses the storm water drainage, external and internal, and the geotechnical conditions at the portion of land identified for the new proposed cemetery at Augrabies.

## 3. GENERAL INFORMATION

The portion of land identified for the development of the prosed new cemetery is located within the town. This land belongs to Kai !Garib Municipality and will be part of the new town extension. A total of 400 new plots are planned for the extension of the town to meet the housing shortage in this area. The new identified site is near the existing cemetery, with a natural storm water channel between the new and existing sites.

The site identified is indicated in the attached Annexure A, drawing SK 2278/1. This portion of land is approximately 1,50 Hectares and can accommodate an estimated total number of 2 050 graves – 1 310 adult and 740 children graves respectively.

Water will be supplied from the Augrabies town and a new access road will form part of the development of the new proposed cemetery.

## 4. STORM WATER AND GEOTECHNICAL

The prevailing storm water and geotechnical conditions at the site identified for a new cemetery at Augrabies are described in the following paragraphs.

## 4.1 Storm Water Drainage

### 4.1.1 Climatic Conditions

The mean annual rainfall in this area is approximately 169 mm per year according to the rainfall statistics of the weather station, station number 0317/447AX, at Upinton.

This area falls within the summer rainfall region of South Africa with approximately 80% of the annual rainfall that occurs normally from January to April. Thunderstorms are typical of the rainfall pattern in this area.

### 4.1.2 Catchment Characteristics

The percentage run-off in this area is expected to be relatively high due to the scarce vegetation and the semi-permeable soil.

Normally the run-off from rain storms is concentrated in natural storm water drains or channels that flow down to the Orange River. The existing natural storm water channel on the eastern side of the new site is in operation and can drain the external storm water from the site.

The natural gradient of the land where the site is located is approximately 1:1000. The run-off from this land, and the identified site, can thus be accommodated by the natural gradient and be accommodated in the natural drainage channels in the area.

### 4.1.3 Suitability of Site

The identified site is suitable for the development of a new cemetery as far as the external storm water drainage is concerned. The natural storm water channel adjacent to the site can be utilised to drain the run-off from external storm water. The new identified site is situated on a higher level than the existing natural storm water channel and flooding of the proposed new cemetery is not likely to occur..

The drainage of the internal storm water will be addressed at the design and the development of the new proposed cemetery. An earth embankment can be constructed on the eastern side of the new cemetery to prevent storm water from flowing into the cemetery and to drain any run-off that originates from the new cemetery site.

## 4.2 Geotechnical

### 4.2.1 General Geological Information

The area is mainly characterised by intrusive rock that mainly entails Vaalputs Granite and Quarts-feldspar gneiss. The granite is normally a hard rock in the un-weathered state.

### 4.2.1 Site Conditions

A test hole was excavated by means of a TLB excavator hired from Mega Construction during the week of 13 June 2011. The TLB is a relative small plant with limited excavation capacity.

The test hole was excavated up to a depth of approximately 1,1 meter below natural ground level without any difficulty. The upper 350 mm was identified as stiff red soil and the next 650 mm in the profile weathered granite with some calcrete gravel. The excavated test hole indicated stable soil conditions with stiff red sandy soil at the upper zone of the test hole.

Intermediate material or hard rock may be encountered below a level of 1,2m.

The profile of this test hole is shown in Annexure B.

### 4.2.3 Suitability of Site

As far as the geotechnical conditions are concerned, the site is suitable for the development of a new cemetery, but it is recommended that the graves be pre-excavated to the required depth of 1,8 meter. The pre-excavation of the graves are normally done where hard materials are encountered and the cost thereof is then part of the development costs of the cemetery.

## 5. REMARKS AND RECOMMENDATIONS

The following remarks recommendations regarding the storm water and geotechnical conditions are relevant;

### 5.1 Storm Water Drainage

The identified site can be regarded as suitable for a cemetery as far as the external and internal storm water drainage is concerned.

It is recommended that a small earth embankment or berm, of approximately 300mm in height, be constructed on the eastern side of the site to prevent external storm water flowing onto the site from the adjacent natural storm channel.

The internal storm water drainage can be accommodated by shaping the roads on the site.

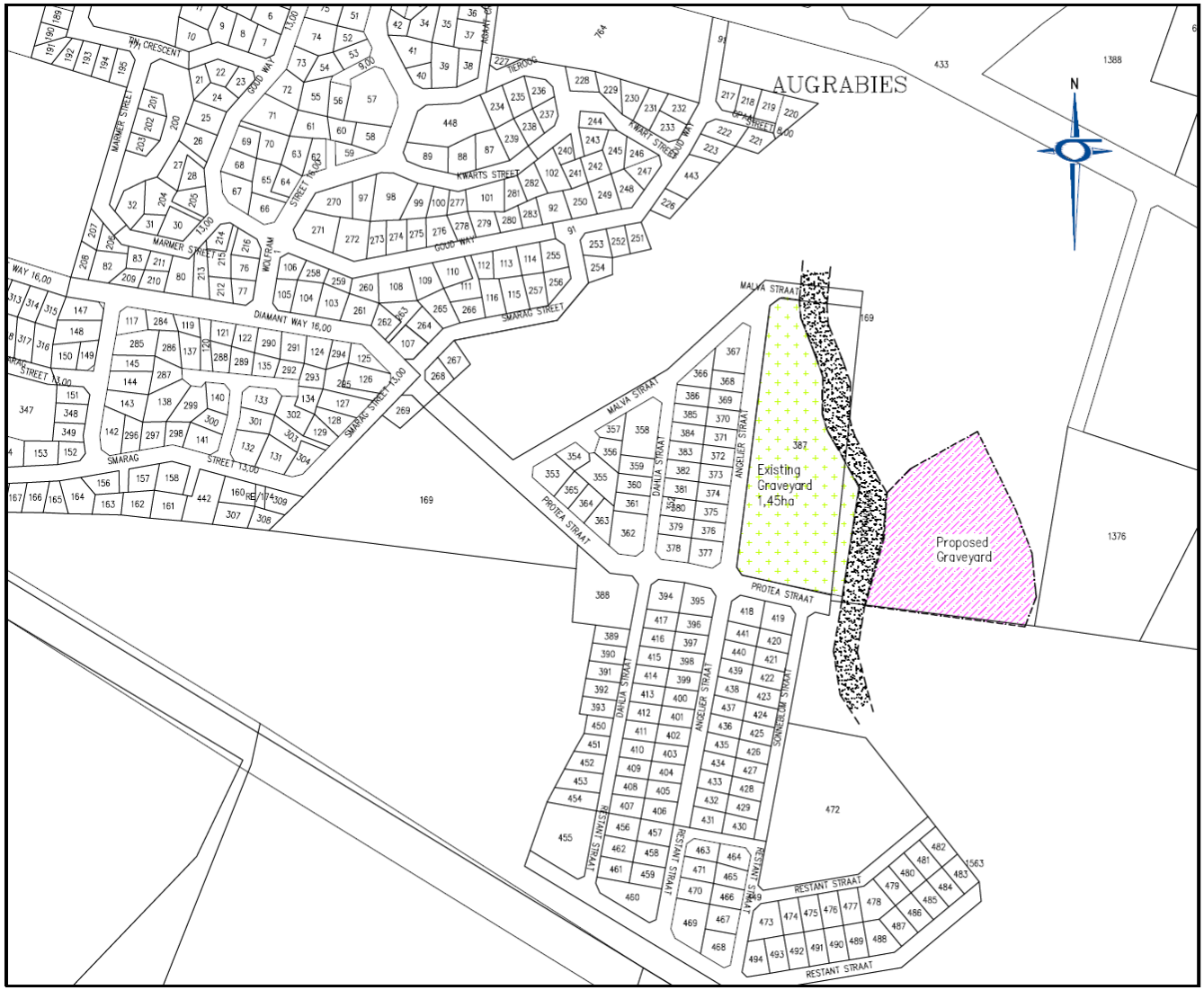
### 5.2 Geotechnical Conditions

The test hole excavated on the site indicated that hard material may be encountered at a depth of more than 1,20 meter below natural ground level. This material is typical of this area and therefore it is recommended that the graves be pre-excavated as part of the development of the new cemetery.

C.J Botha Pr.Eng
Stabilis Development (Pty) Ltd

**ANNEXURE A**

**LOCALITY PLAN**




NOTAS / NOTES

Area : existing graveyard = 14555m²
proposed graveyard = 14277m²

| DATUM DATE | NR. NO. | WYSIGING AMENDMENT | HANDT. SIGN. |
|---|---|---|---|
| AFDRUK UITGEREIK PRINT ISSUED | | | |

KLIENT / CLIENT


STABILIS Development(Pty)Ltd
Posbus / P.O. Box 861
KIMBERLEY
8300
Tel. (053) 8331658
Fax. (053) 8313786
E-mail: info@stabilis.co.za

Branch Office / Takkantoor
Posbus / P.O.Box 342
KEMPTON
1620
Tel. (054) 4610019
E-mail: allan@atlantic.net


DIENS / SERVICE

**AURGABIES**
UPGRADING OF GRAVEYARD

TITEL / TITLE

PLAN LAYOUT

TEKENING NR. / DRAWING NO.
SK2278/1

| SKAAL / SCALE | 1:3000 | GETEKEN DRAWN | Q. SCHEFFERS |
|---|---|---|---|
| LEER NR. / FILE NO. | | ONTWERP DESIGNED | |
| DATUM DATE | SEPTEMBER 2009 | NAGESIEN CHECKED | |

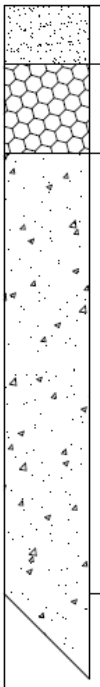
## ANNEXURE B

## TEST HOLE PROFILE

# KAI! GARIEB MUNICIPALITY: AUGRABIES

HOLE No: 1

Scale 1:10



0.00

0.10 Red loose sandy soil

0.25 Stiff red soil

1.10 Stiff red soil with intrudence of weathered granite in matrix

Excavated area = 1,2m x 1,2m

TEST HOLE PROFILE

DATE: Mar 2012

JOB NUMBER:


STABILIS Development(Pty)Ltd

Posbus / P.O. Box 861
KIMBERLEY
8300
Tel. (053) 8331659
Fax. (053) 8313786
E-mail: info@stabilis.co.za

Postnet Suite 136
Privaatsak / Private Bag X5879
UPINGTON
8800
Tel. / Fax. (054) 3311779
E-mail: edian@lantic.net

## ANNEXURE C

## Photographs of Test Hole

**Photograph 1-Test Hole Augrabies**

**Photograph 2 – Test Hole**