

## **Appendix D**

### **Specialist Reports**

- Fauna and Flora Assessment - HydroScience
- Geotechnical survey – Africa Exposed
- Specialist declarations on interest
  - Louise van Wyk – Fauna & Flora
  - Jan Arkert - Geotechnical

**FLORA, FAUNA AND AESTHETIC REPORT**

**FOR**

**THE PROPOSED TOWNSHIP**  
**ESTABLISHMENT ON PORTION 385 OF THE**  
**FARM WATERKLOOF 305 JQ, RUSTENBURG,**  
**NORTH WEST PROVINCE**

**OCTOBER 2012**



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## LIST OF DEFINITIONS, ABBREVIATIONS AND ACRONYMS

BAR .....	Basic Assessment Report
CARA .....	Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983)
CBA .....	Critical Biodiversity Area
CBD .....	Central Business District
EAP .....	Environmental Assessment Practitioner
EIA .....	Environmental Impact Assessment
EIR .....	Environmental Impact Report
EMF .....	Environmental Management Framework
GPS .....	Global Positioning System
IUCN .....	International Union for Conservation of Nature
NEMA .....	National Environmental Management Act, 1998 (Act 107 of 1998) as amended
NEMBA .....	National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004)
NW SoER .....	North West State of the Environment Report, 2002
PRECIS .....	National Herbarium Pretoria (PRE) Computerised Information System
RLM .....	Rustenburg Local Municipality
SANBI .....	South African National Biodiversity Institute

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## 1 INTRODUCTION

HydroScience cc, an independent Environmental Assessment Practitioner (EAP), has been appointed by Mr Ben van der Walt from Esimio Investments (Pty) Ltd, to undertake an Environmental Impact Basic Assessment and to submit the Basic Assessment Report (BAR) to the relevant authority to apply for environmental authorisation for the proposed township establishment on Portion 385 of the farm Waterkloof 305 JQ, Rustenburg, in the North West Province.

As part of the process, a flora and fauna specialist study is required to indicate what the impacts of the proposed development will be on the current biodiversity. This is also relevant to the visual/aesthetic impacts, as vegetation will be removed and the project area is located on a sloped topography. From the identified impacts, mitigation can be suggested to reduce the significance of potentially negative impacts.

### 1.1 Aim and objectives

The aim of the flora and fauna study was to determine the current flora composition and fauna. Furthermore to establish what impact the removal of the flora of a sloped project area will have on the aesthetic value. From the survey findings, the severity of impacts exerted onto the site ecology and aesthetic value by the proposed development can be determined. To achieve this aim, the following objectives were set out:

- To conduct a site investigation of the proposed project area based on the flora, fauna and visual aspects;
- To identify on site and confirm by means of a desktop study (if necessary) the following:
  - Dominant indigenous species and vegetation communities;
  - Dominant exotic species;
  - Rare and endangered species (if present) or the probability of occurrence if not recorded on site; and
  - Site topography/slope and land use.
- To communicate any additional relevant issues that may be of significance to the project; and
- To suggest mitigation for the issues identified.

Based on the above objectives, a report is compiled which meets these requirements and objectives.

### 1.2 Limitations

Historical data obtained through official websites is assumed to be correct. No review or correction of the historical data was undertaken. Furthermore, the flora and fauna site survey comprised of a one day survey during the wet season (October 2012). For this reason, seasonal variation in species composition is not taken into account. However, due to the level of disturbance already exerted onto the site, seasonal variation is estimated to be limited and therefore does not compromise the findings of this study.

## 2 STUDY AREA

The proposed township establishment will be on Portion 385 of the farm Waterkloof 305 JQ, Rustenburg, North West Province. The proposed portion of land is situated approximately 6.5km south from the Rustenburg Central Business District (CBD) on the R24 (P16-1) just before the Waterfall Mall driving into Rustenburg from Magaliesburg/Johannesburg. Global Positioning System (GPS) coordinates are 25° 42' 51.25" South and 27° 15' 07.33" East (please refer to the locality map – Figure 1). The farm portion is bordered by agricultural homesteads, natural areas and commercial businesses.

### 2.1 Vegetation composition

This region falls within the Savannah biome. The Savannah biome is found within the north and eastern parts of South Africa. It is also known as Bushveld and comprises of dominating woody vegetation such as trees and shrubs with a grassy understorey. The two layers of the Bushveld (tree and grass layer) can differ in their densities from open to dense depending on environmental conditions and human instigated impacts. Specific to the study area, it was found that the area has been disturbed by human activities (caravan park, hotel, roadhouse, other businesses) resulting in a less dense and transformed bushveld community.

The biome is then further classified into vegetation types. Two vegetation types are identified to occur on the proposed project area including Gold Reef Mountain Bushveld and Moot Plains Bushveld (Mucina and Rutherford, 2006). Gold Reef Mountain Bushveld (SVcb9) covers approximately a third of the project area, whereas Moot Plains Bushveld (SVcb8) covers approximately two thirds of the project area.

The Gold Reef Mountain Bushveld is Least Threatened. Whilst the conservation target is 24%, 22% is currently protected and 15% is considered to be transformed. It is a dense to open woody vegetation occurring on the west-east trending rocky hills and ridges of the North-West and Gauteng. Typical species include: *Acacia caffra*, *Combretum molle*, *Protea caffra*, and *Cheilanthes hirta*, etc. (Mucina and Rutherford, 2006).

The Moot Plains Bushveld forming the southern plains of the Magaliesberg consists of open to closed woodlands dominated by *Acacia caffra* and *Acacia karroo*. The threatened status of this vegetation type is Vulnerable and the conservation target is 19% (Mucina and Rutherford, 2006).

Gold Reef Mountain Bushveld is characteristic of ridge vegetation, which is a sensitive system although the vegetation type specifically is not of conservation concern as it is already adequately protected. Moot Plains Bushveld, however, is identified to be of conservation value as it is not adequately protected. The site survey indicated that the vegetation on the site was predominantly transformed due to existing development (buildings etc) and other anthropogenic impacts (littering, chopping of trees). When approaching the ridge area and mountain bushveld, the vegetation was found to be less disturbed, however anthropogenic impacts were still identified, only reduced compared to the remainder of the site.

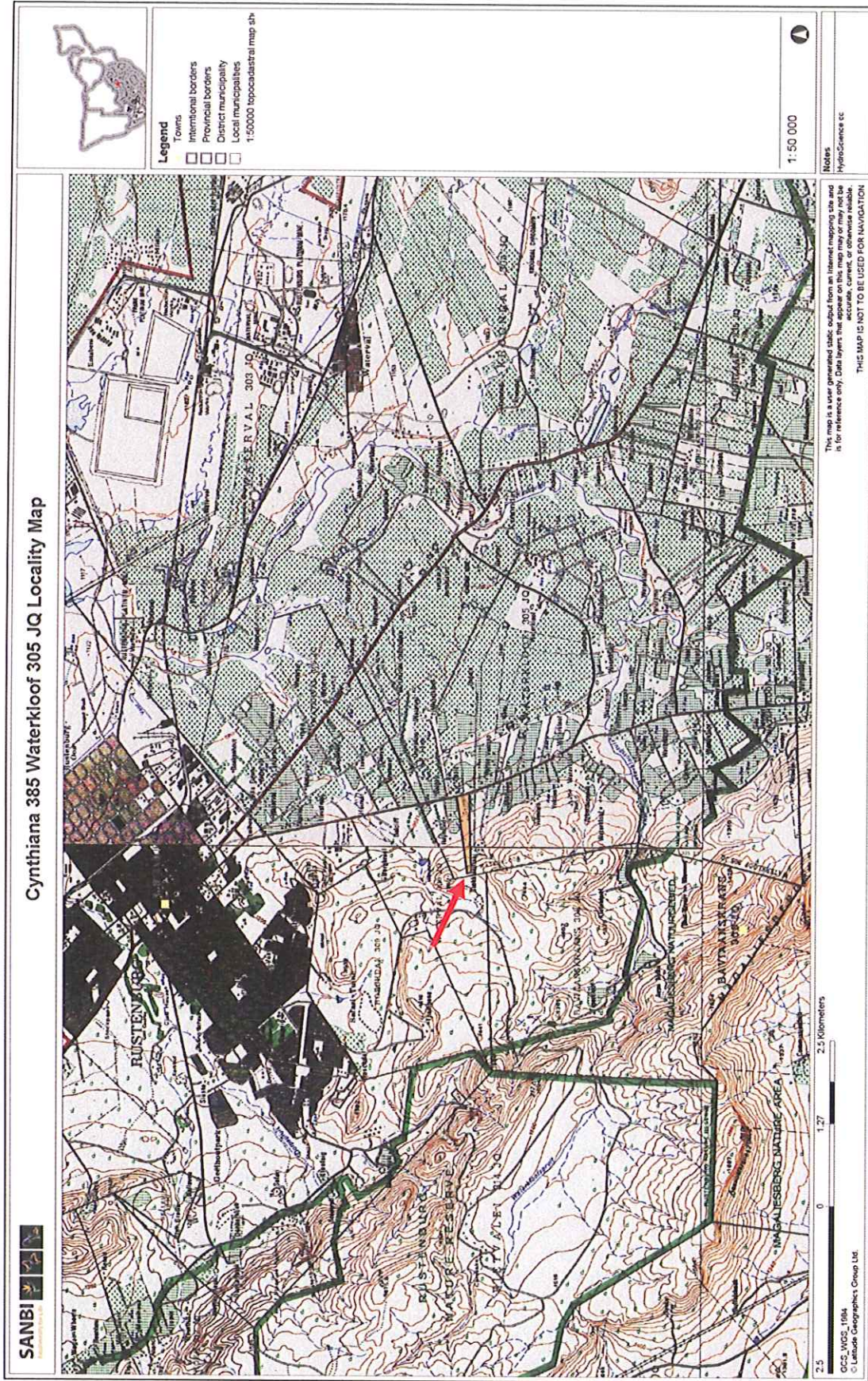
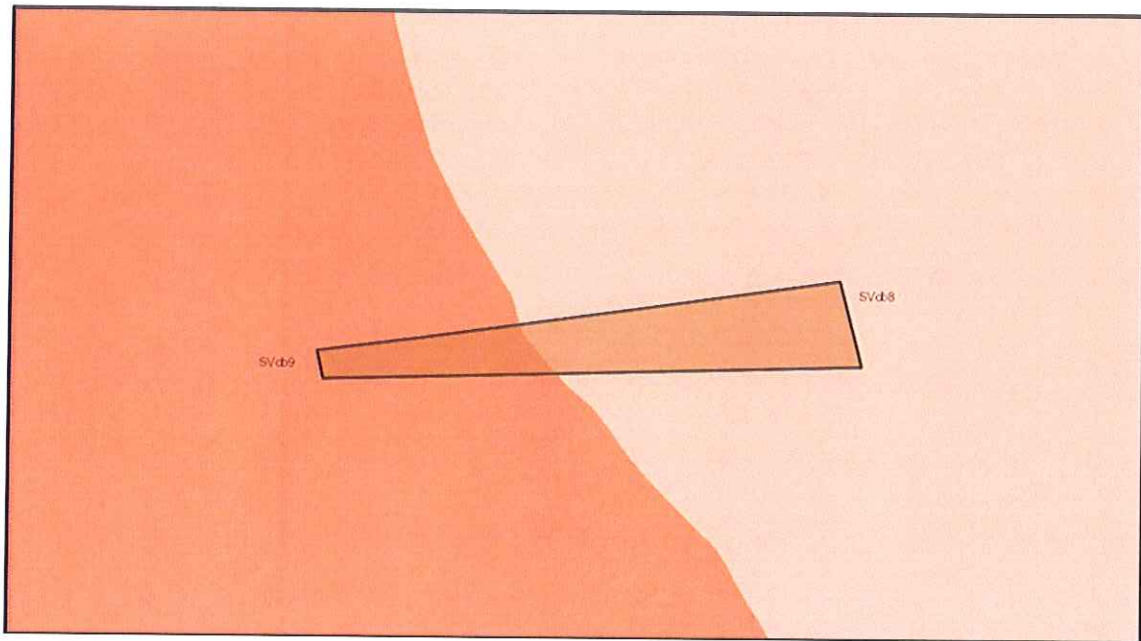


Figure 1: Locality map of the project area within Rustenburg, North West Province





**Figure 2: The vegetation types identified for the project area – Gold Reef Mountain Bushveld (SVcb 9) and Moot Plains Bushveld (SVcb 8) (Mucina and Rutherford, 2006)**

## 2.2 Topography and slope

The project area slopes from the west to east from 1 315 mamsl to 1 211 mamsl (104 metres vertical drop over a horizontal distance of 1.2 km) reaching the R24. This can be explained by the mountainous ridge that forms part of the western section of the proposed project area.

Although the ridge area will not be developed, the sloped project area might still have a visual impact on the surrounding environment where the topography is lower than the proposed developed area. Plate 1 indicates the topography on the project area based on a topography map (A) and the contours (B) throughout the project area.

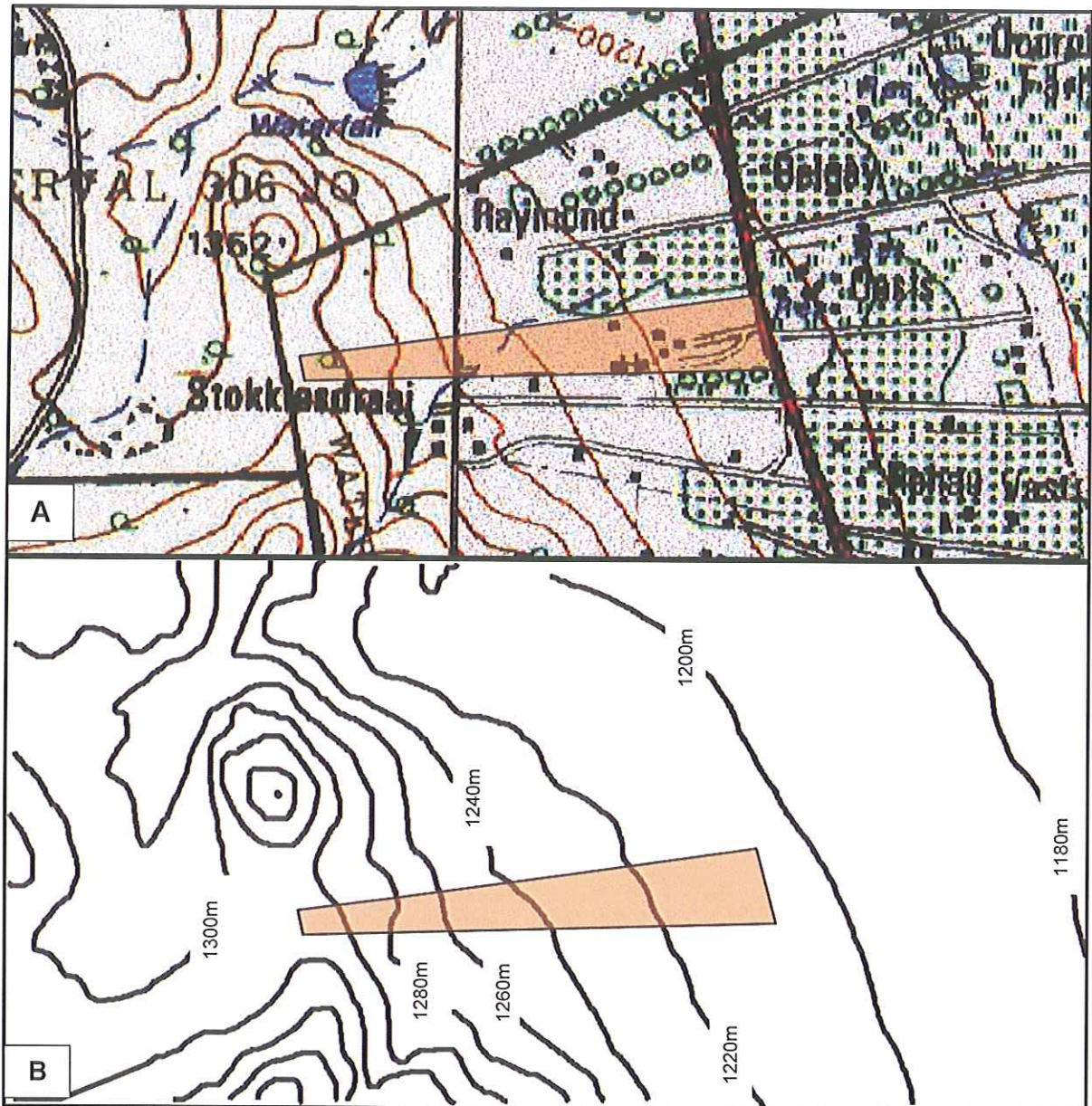


Plate 1: The topography (A) of the project area and the contours (B) indicating the meters above mean sea level

### 3 METHODOLOGY

#### 3.1 Flora

A floristic survey was conducted during the growing season (the rainy season when most plants are in flower or seeding), October 2012. This provided an indication of the actual species present on the site and these are discussed in context of plant communities within the ecosystem present in the area. A GPS instrument (Garmin e-trex) was used to mark vegetation community change or species of concern. The protected, endemic, exotic and alien invasive species are also discussed as separate issues and related back to relevant legal requirements. A desktop study was done by retrieving data per grid square from the South African National Biodiversity Institute (SANBI) National Herbarium Pretoria (PRE) Computerised Information System (PRECIS) data. The Braun-Blanquet sampling method was used during vegetation surveys, whereby vegetation is stratified by means of aerial/satellite imagery with physiognomic characteristics as a first approximation. Representative areas within these stratifications are then surveyed by means of line-point transects for grasses, sedges and forbs, as well as belt transects for shrubs and trees. The Braun-Blanquet method allows for the following to be compiled:

- Vegetation classification regarding plant communities within the area and sub communities and variations of these;
- Species list for each plant community, including diagnostic and dominant species;
- Invasive/exotic species (if present) for each plant community; and
- Protected/endemic species for each plant community.

#### 3.2 Fauna

Along with the vegetation survey, pertinent notes were made on ecological indications of fauna species and desktop studies were also conducted for mammals, birds, reptiles, frogs and insects. Species encountered on site were identified and recorded. The following methods were used during the survey:

##### 3.2.1 Mammalia

Visual sightings and ecological indicators were used to identify the mammal inhabitants of the study area; this includes scats, tracks and habitat such as burrows and dens. Scats found were collected (if required), photographed on scale along with any tracks found and identified. For identification purposes, a field guide, *Mammals of Southern Africa* (Smithers, 2000) was used. The following was recorded:

- All mammals encountered or noted during the survey; and
- A list of rare and endangered species encountered during the survey.

Species of conservation concern and listed by the International Union for Conservation of Nature (IUCN) or within the North West State of the Environment Report (NW SoER) (Mangold *et al*, 2002) as protected or threatened, took priority and the Red Data status was identified and recorded.

##### 3.2.2 Avifauna

The principal ornithological field survey technique used was transect counts. Footpaths, trails and other access ways on the site are usually used but in this case the same transects as for the vegetation surveys were utilised. Transect count procedures involve slow attentive walks along transects during which any bird seen or heard is identified and recorded.

The following was recorded:

- All birds encountered or noted during the survey;
- A list of rare and endangered species encountered.

Because the primary purpose of this work was to establish the presence of species, no distance or time limit was set, and hence any species seen or heard anywhere was recorded for the site. Where possible, visual identification was used to confirm calls. Bird species were confirmed using Sinclair *et al*, 1997. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN) and birds listed by the NW SoER (Mangold *et al*, 2002).

### 3.2.3 Herpetofauna

Herpetofauna include reptile and amphibian species. Direct/opportunistic observation was done along transects within the project area. Any herpetofauna species seen or heard along such paths or trails within the project area was identified and recorded. Another method used was refuge examinations using visual scanning of terrains to record smaller herpetofaunal species which often conceal themselves under rocks and in fallen logs, rotten tree stumps, in leaf litter, rodent burrows, ponds, old termite mounds, etc. Branch (1996) and Carruthers (2001) were used to confirm identification where necessary.

### 3.2.4 Arthropoda

No active arthropod identification was done, except the identification of the presence of any Red Data species or arthropods of concern on the project area, specifically butterfly species. If no species of concern were identified, the habitat of Red Data species was evaluated to determine the probability of occurrence.

### 3.2.5 Red Data Probability Assessment

The following parameters were used to assess the Probability of Occurrence of each Red Data species:

- Habitat requirements (HR) – Most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics in the study area was evaluated.
- Habitat status (HS) – The status or ecological condition of available habitat in the area is assessed. Often a high level of habitat degradation prevalent in a specific habitat will negate the potential presence of Red Data species (this is especially evident in wetland habitats).
- Habitat linkage (HL) – Movement between areas for breeding and feeding forms an essential part of the existence of many species. Connectivity of the study area to surrounding habitat and the adequacy of these linkages are evaluated for the ecological functioning of Red Data species habitat within the study area.

Probability of occurrence is presented in four categories, namely:

- Low (will not occur);
- Medium (could possibly occur);
- High (most likely could occur); or
- Recorded (does occur on site).

## 3.3 Visual

Visual/Aesthetic Assessment refers to a systematic analysis of potential impacts to scenery and views (positive and negative impacts) resulting from a proposed development. It also

includes an investigation of the means available to mitigate the effects of such proposals prior to implementation. There is no single precise methodology for visual assessments, but Geographic Information System (GIS) data (maps and contours) are most commonly used to determine visual impacts. While most environmental concerns such as flora and fauna are measured in quantitative terms, visual impact is assessed largely by qualitative judgements, as it is concerned with the human appreciation of, and interaction with, the landscape.

The visual character of the study area has been assessed by means of two processes:

- An analysis of GIS data, in particular the following:
  - Land cover data captured from aerial photography and satellite imagery; and
  - Topographic data derived from contours.
- Representing the data in a visual model.

The general character of the study area is shaped firstly by the topographical features of the ridge area and then secondly by the land use consisting of agricultural homesteads and commercial businesses.

A scenic preference model was used to quantify each land use category in terms of the visual quality thereof. This model is based on a study conducted in Australia which involved a community participation project with regards to people's perception of different landscapes with different "disturbing" factors. A set of parameters for visual impact assessment was developed from the findings of the study. These parameters are regarded as representative for this purpose of this study and have therefore been applied (Table 1).

In terms of the scenic model, the visual character is classified as Low, Medium, High and Very High. The model provides for a visual quality rating of 1 to 4 for different land cover types.

**Table 1: Visual quality classifications of land cover types in the study area**

Land Cover/Use	Visual Quality Value/Rating	Visual Quality
Thicket and Bushveld	4	Very High
Natural bare rock and soil	4	Very High
Grassland	4	Very High
Degraded Grassland	3	High
Subsistence Dry land	2	Medium
Agricultural, irrigated	2	Medium
Commercial Dry Land	2	Medium
Residential, Formal Township	1	Low
Erosion, Dongas	1	Low

## **4 LEGISLATIVE REQUIREMENTS**

### **4.1 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA)**

Although South Africa became a signatory to the Convention of Biological Diversity in 1998, the more recent enactment of national legislation has affirmed our country's commitment to biodiversity and conservation. NEMBA has been assessed by the South African President and was published in the Government Gazette in June 2004 (Volume 467; No. 26426). One of the objectives of this Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and to ensure the sustainable use of indigenous biological resources.

### **4.2 NEMBA 2004 (Act 10 of 2004) Threatened and Protected Species Regulations, Chapter 4**

Part 2 of NEMBA, 2004 (Act 10 of 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival. In February 2007, this was achieved as the Minister of Environmental Affairs and Tourism published a list of Critically Rare, Endangered, Vulnerable and Protected Species, according to Section 56(1) of the Act.

### **4.3 National Forest Act, 1998 (Act 84 of 1998)**

Natural forests and woodlands form an important part of the environment and need to be conserved and developed according to the principles of sustainable management. They also have an impact on the environment and need to be managed appropriately, this includes invaders like Eucalyptus or Pinus species encroaching the riparian vegetation that impact on indigenous flora and river flows. The purpose of this Act is to:

- Promote the sustainable management and development of forests for the benefit of all;
- Create the conditions necessary to restructure forestry;
- Provide special measures for the protection of certain forests and trees;
- Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- Promote community forestry; and
- Promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged or by unfair discrimination.

Although specific to the project area, forest stands do not occur; protected forest species may still occur and the protection and management of these species must be ensured.

### **4.4 Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)**

In 1984, regulations were passed in terms of the CARA, 1983 (Act 43 of 1983), regulations declaring about 50 species "weeds" or "invader plants". On 30 March 2001, the Minister of Agriculture promulgated an amendment to these regulations. This amendment now contains a comprehensive list of species that are declared weeds and invader plants dividing them into three categories. These categories are as follows:

- Category 1: Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible.
- Category 2: Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year floodline of any watercourse or wetland.

- Category 3: Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

In terms of the amendments to the regulations under the CARA, 1983 (Act 43 of 1983), landowners are legally responsible for the control of alien species on their properties.

## 5 FINDINGS

The Bojanala District falls within a high biodiversity area of the Province and some significant faunal and floral species may be present in and around the project area. Flora and fauna species identified during the survey are listed below. The site is mainly disturbed by existing developments and on-going anthropogenic impacts from the residence of the hotel/caravan park, which limits the occurrence of natural flora and fauna species. However, species that are characteristic of the bushveld in this region were still found.

### 5.1 Flora

#### 5.1.1 Vegetation communities

Vegetation communities are identified based on the change in the dominant species. As described above, the majority of the project area (> 70%) has been severely altered from its natural state due to anthropogenic impacts. Based on this, only two vegetation communities were identified (Figure 3).



**Figure 3: Vegetation communities identified for the project area**

**Park vegetation:** As part of the hotel garden area and Caravan Park, the vegetation is maintained/gardened. Furthermore, the permanent residents of the Caravan Park have established their own gardens around their stands also comprising of garden species. Species in this community therefore include mostly garden plant species, a few bushveld trees still remaining from the bushveld vegetation found here and exotic/invasive species. Dominant species include:

Trees: *Jacaranda mimosifolia*; *Eucalyptus ssp.*; *Pinus sp.*; *Acacia caffra* and *Ficus ingens*.

Grasses: *Pennisetum clandestinum*

Due to the fact that the gardened areas are not natural, there are no dominant species but it consists of a variety of garden species such as *Agave sp.*; *Strelitzia nicolai*; *Philodendron selloum*; flowering horticulture species and different fern species.

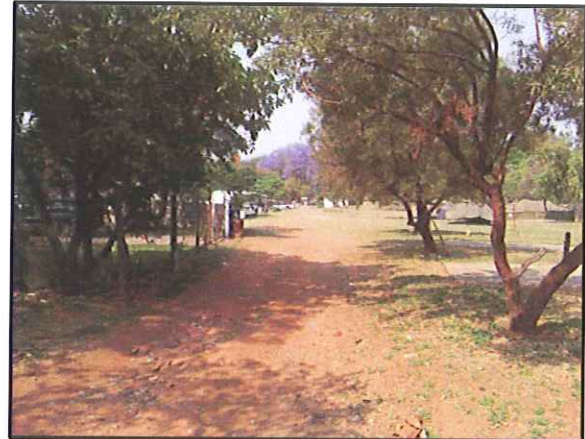


**Transformed Bushveld** – The remaining surface area extending from the end of the Caravan Park to the ridge area can be described as Transformed Bushveld. This is bushveld that has been degraded by illegal waste dumping, burning of waste and the encroachment of exotic/invasive species. The further the vegetation extends to the ridge, the less disturbed it becomes. A full species list can be seen in Appendix A.

Dominating species include:

Shrubs and Trees: *Acacia karroo*; *Acacia caffra*, *Ziziphus mucronata*; *Searsia lancea*; *Dombeya rotundifolia*; *Burkea Africana*; *Dichrostachys cinerea* and *Combretum zeyheri*.

Grasses: *Eragrostis cilianensis*; *Eragrostis rigidior* and *Hyparrhenia hirta*



Park vegetation – consisting of caravan stands on *Pennisetum clandestinum*, garden areas and some remaining bushveld trees



Transformed Bushveld – bushveld trees and grasses

### Plate 2: Photographs indicating the different vegetation communities

#### 5.1.2 Red Data and endemic species

Red Data that might occur within the project grid squares 2527CA and 2527CB as listed by SANBI can be seen in Table 2. Endemic species, meaning species that only occur within South Africa or specific regions of South Africa were also taken into account. Endemic species listed to possibly occur within the project area, as listed by SANBI, can be seen in Table 3. No species of concern listed by SANBI or by the National Forest Act, 1998 were found during the site survey.

**Table 2: Red Data species with a possibility of occurring within the project area (SANBI, 2012)**

Family	Scientific Name	Red Data Status
AQUIFOLIACEAE	<i>Ilex mitis</i>	Declining
ASPHODELACEAE	<i>Aloe peglerae</i>	Endangered
ASPHODELACEAE	<i>Aloe peglerae</i>	Endangered
CRASSULACEAE	<i>Adromischus umbraticola</i>	Near Threatened
EUPHORBIACEAE	<i>Acalypha caperonioides</i>	Data Deficient
GUNNERACEAE	<i>Gunnera perpensa</i>	Declining
HYACINTHACEAE	<i>Drimia elata</i>	Data Deficient
HYACINTHACEAE	<i>Drimia sanguinea</i>	Near Threatened
MESEMBRYANTHEMACEAE	<i>Frithia pulchra</i>	Rare
MYROTHAMNACEAE	<i>Myrothamnus flabellifolius</i>	Data Deficient
ROSACEAE	<i>Prunus africana</i>	Vulnerable

**Table 3: Endemic species with a possibility of occurring within the project area (SANBI, 2012)**

Family	Species Name
ACANTHACEAE	<i>Blepharis angusta</i>
ACANTHACEAE	<i>Chaetacanthus costatus</i>
ANACARDIACEAE	<i>Searsia rigida</i> var. <i>margaretae</i>
ANACARDIACEAE	<i>Searsia rigida</i> var. <i>rigida</i>
APOCYNACEAE	<i>Asclepias brevipes</i>
APOCYNACEAE	<i>Aspidoglossum glabrescens</i>
APOCYNACEAE	<i>Brachystelma nanum</i>
APOCYNACEAE	<i>Aspidoglossum glabrescens</i>
ARALIACEAE	<i>Cussonia transvaalensis</i>
ASPHODELACEAE	<i>Aloe peglerae</i>
ASPHODELACEAE	<i>Bulbine favosa</i>
ASPHODELACEAE	<i>Aloe peglerae</i>
ASTERACEAE	<i>Berkheya carlinopsis</i> subsp. <i>magalismontana</i>
ASTERACEAE	<i>Cineraria parvifolia</i>
ASTERACEAE	<i>Dimorphotheca spectabilis</i>
ASTERACEAE	<i>Geigeria burkei</i> subsp. <i>burkei</i> var. <i>intermedia</i>
ASTERACEAE	<i>Nolletia rarifolia</i>
ASTERACEAE	<i>Senecio pentactinus</i>
ASTERACEAE	<i>Vernonia staehelinoides</i>
ASTERACEAE	<i>Senecio lydenburgensis</i>
ASTERACEAE	<i>Vernonia staehelinoides</i>
BUDDLEJACEAE	<i>Nuxia glomerulata</i>
CARYOPHYLLACEAE	<i>Dianthus mooiensis</i>
CONVOLVULACEAE	<i>Ipomoea bathycolpos</i>
EUPHORBIACEAE	<i>Euphorbia clavarioides</i> var. <i>truncata</i>
FABACEAE	<i>Indigofera pongolana</i>

Family	Species Name
HYACINTHACEAE	<i>Ledebouria ovatifolia</i>
HYACINTHACEAE	<i>Ornithogalum juncifolium</i>
LAMIACEAE	<i>Tetradenia brevispicata</i>
LOBELIACEAE	<i>Cyphia assimilis</i>
MALPIGHIACEAE	<i>Triaspis glaucophylla</i>
MALVACEAE	<i>Abutilon piloso-cinereum</i>
MALVACEAE	<i>Pavonia transvaalensis</i>
MALVACEAE	<i>Triumfetta sonderi</i>
MALVACEAE	<i>Hermannia grisea</i>
MALVACEAE	<i>Hibiscus marlothianus</i>
MESEMBRYANTHEMACEAE	<i>Frithia pulchra</i>
MESEMBRYANTHEMACEAE	<i>Khadia acutipetala</i>
OROBANCHACEAE	<i>Sopubia cana var. glabrescens</i>
POACEAE	<i>Tristachya biseriata</i>
POLYGALACEAE	<i>Polygala krumanina</i>
RHAMNACEAE	<i>Phyllica paniculata</i>
RUBIACEAE	<i>Otiophora calycophylla</i>
SANTALACEAE	<i>Thesium magalismontanum</i>
SANTALACEAE	<i>Thesium transvaalense</i>
SCROPHULARIACEAE	<i>Craterostigma wilmsii</i>
SCROPHULARIACEAE	<i>Selago mixta</i>
VAHLIACEAE	<i>Vahlia capensis</i>
VITACEAE	<i>Cyphostemma sulcatum</i>

### 5.1.3 Exotic/Invasive species

Due to the disturbed nature of the project area, exotic/invasive species were prevalent, excluding private gardened areas of permanent residents. Some exotic garden species were also found but were limited to a few common garden species. Exotic/invasive species that occur on site can be seen in Table 4.

The alien plants of Category 1 Declared Weeds require compulsory removal in terms of the regulations under CARA (Act 43 of 1983), as amended. Category 2 and 3 Declared Invaders should likewise be controlled.

**Table 4: Exotic/invasive species identified to occur within the project area**

Family	Scientific Name	Common Name	Category (CARA)
AGAVACEAE	<i>Agave sp.</i>		
AMARANTHACEAE	<i>Alternanthera pungens</i>	Khaki Weed	
ARACEAE	<i>Philodendron selloum</i>	Lacy Tree Philodendron	
ASTERACEAE	<i>Conyza albida</i>	Tall Fleabane	
ASTERACEAE	<i>Flaveria bidentis</i>	Smelter's Bush	
ASTERACEAE	<i>Tagetes minuta</i>	Tall Khaki Weed	
BIGNONIACEAE	<i>Jacaranda mimosifolia</i>	Jacaranda	3

Family	Scientific Name	Common Name	Category (CARA)
MELIACEAE	<i>Melia azedarach</i>	Syringa	3
MYRTACEAE	<i>Eucalyptus ssp.</i>	Gum Tree	2
PINACEAE	<i>Pinus sp.</i>	Pine tree	2
SOLANACEAE	<i>Nicotiana glauca</i>	Tree Tobacco	
SOLANACEAE	<i>Solanum mauritianum</i>	Bugtree	1
SOLANACEAE	<i>Solanum panduriforme</i>	Bitter Apple	
VERBENACEAE	<i>Lantana camara</i>	Spanish Flag	1



*Jacaranda mimosifolia* (Jacaranda)



*Melia azedarach* (Syringa)



*Pinus sp.* (Pine tree)



*Eucalyptus ssp.* (Gum tree)



*Solanum mauritianum* (Bugtree)



*Lantana camara* (Spanish Flag)

Plate 3: Invader species found within the project area

## 5.2 Fauna

### 5.2.1 Mammalia

No active capture of small mammals was conducted, however, ecological indicators, indicating small mammal activity, were actively searched for. Fresh diggings were found indicating a mole species that occur on site, the GPS coordinate was 25° 42.853' South and 27° 15.161' East. Unfortunately, no positive identification of the mole species was possible. Other species that are likely to occur on site include small mammals such as *Lemniscomys rosalia* (Striped Mouse); *Aethomys chrysophilus* (Red Veld Rat) and *Lepus saxatili* (Scrub Hare).

Red Data mammals considered to possibly occur on site can be seen in Table 5. No Red Data or protected mammals were found during the field survey.

**Table 5: Red Data mammals that are likely to occur within the Rustenburg region**

Scientific Name	Common Name	Status	Probability
<i>Atelerix frontalis</i>	Hedgehog	Rare	High
<i>Civettictis civetta</i>	African Civet	Rare	Low
<i>Cleotis percivali</i>	Short-eared Trident Bat	Indeterminate	Low
<i>Crocidura maquassiensis</i>	Maquassi Musk Shrew	Indeterminate	Low
<i>Graphiurus ocellatus</i>	Spectacled Dormouse	Rare	Low
<i>Manis temminckii</i>	Pangolin	Vulnerable	Low
<i>Mellivora capensis</i>	Honey Badger	Vulnerable	Low
<i>Myodomys albicaudatus</i>	White-tailed Mouse	Vulnerable	Moderate
<i>Orycteropus afer</i>	Aardvark	Vulnerable	Low
<i>Pipistrellus kuhlii</i>	Kuhl's Bat	Indeterminate	Moderate
<i>Poecilogale a. albinucha</i>	African Striped Weasel	Rare	Low
<i>Proteles cristatus</i>	Aardwolf	Rare	Low
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat	Indeterminate	Low
<i>Suncus infinitesimus</i>	Lesser Dwarf Shrew	Indeterminate	Moderate
<i>Suncus lixus</i>	Greater Dwarf Shrew	Indeterminate	Low
<i>Zelotomys woosnami</i>	Woosnam's Desert Rat	Rare	Low

### 5.2.2 Avifauna

Bird species observed during the field survey can be seen in Table 6. No Red Data, protected species or species of concern were identified. Red Data species that have a probability of occurring in the area can be seen in Table 7 and were taken into account during the field survey.

**Table 6: Bird species observed during the field survey**

Scientific Name	Common Name
<i>Bostrychia hagedash</i>	Hadeda
<i>Cuculus solitarius</i>	Redchested Cuckoo
<i>Lanius collaris</i>	Fishcal Shrike
<i>Lybius torquatus</i>	Blackcollared Barbet
<i>Passer domesticus</i>	House Sparrow
<i>Pycnonotus barbatus</i>	Bulbul
<i>Streptopelia senegalensis</i>	Laughing Dove
<i>Turdus olivaceus</i>	Olive Thrush

**Table 7: Bird species that are likely to occur within the Rustenburg region**

Scientific Name	Common Name	Status	Probability
<i>Anthus brachyurus</i>	Short-tailed Pipit	Rare	Low
<i>Apus bradfieldi</i>	Bradfield's Swift	Indeterminate	Low
<i>Ardeotis kori</i>	Kori Bustard	Vulnerable	Low
<i>Botaurus stellaris</i>	Bittern	Vulnerable	Low
<i>Falco peregrinus</i>	Peregrine Falcon	Rare	Low
<i>Glareola pratincola</i>	Red-winged Pratincole	Rare	Low
<i>Gypaetus barbatus</i>	Bearded Vulture	Rare	Low
<i>Gypohierax angolensis</i>	Palmnut Vulture	Rare	Low
<i>Gyps coprotheres</i>	Cape Vulture	Vulnerable	Low
<i>Ixobrychus sturmii</i>	Dwarf Bittern	Indeterminate	Low
<i>Mirafra chuana</i>	Short-clawed Lark	Indeterminate	Moderate
<i>Neophron percnopterus</i>	Egyptian Vulture	Endangered	Low
<i>Neotis ludwigii</i>	Ludwig's Bustard	Vulnerable	Low
<i>Polemaetus bellicosus</i>	Martial Eagle	Vulnerable	Low
<i>Porzana pusilla</i>	Baillon's Crake	Indeterminate	Low
<i>Pterocles gutturalis</i>	Yellow-throated Sandgrouse	Indeterminate	Moderate
<i>Terathopius ecaudatus</i>	Bateleur	Vulnerable	Low
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	Vulnerable	Low
<i>Tyto capensis</i>	Grass Owl	Vulnerable	Low

### 5.2.3 Herpetofauna

The herpetofauna species identified during the field survey include *Hemachatus haemachatus* (Rinkhals) and *Mabuya varia* (Variable Skink). No other species were observed including Red Data or protected species. This does not, however, eliminate the possible occurrence of other reptile species such as *Serpentes* (snakes). Snakes are likely to occur on site, but are less active in the heat of the day. Any amphibian species are less likely to occur as there are no natural aquatic habitats for them.

Red Data species considered and the probability of occurrence of these species can be seen in Table 8.

**Table 8: Herpetofauna species likely to occur within the Rustenburg region**

Scientific Name	Common Name	Status	Probability
<i>Dalophia pistillum</i>	Blunt-tailed Worm-lizard	Peripheral	Moderate
<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	Rare	Low
<i>Python sebae natalensis</i>	African Rock Python	Vulnerable	Moderate

### 5.2.4 Arthropoda

As mentioned before, no active arthropod sampling/collection was conducted. However, Red Data species (Butterflies) and their probability of occurrence were considered and can be seen in Table 9. All species were considered to have a low probability of occurrence based on habitat specifications and species distribution. *Burkea africana* (Wild Seringa) found on site is known to be utilised by butterflies for breeding. Several *Charaxes*, *Deudorix* and *Aphnaeus* butterflies breed on the tree. Caterpillars of the moth *Cirina forda* may also occur in large numbers on the tree. This tree is not easily cultivated and plays an important role in the lifecycle of many Lepidoptera species. Therefore, it should be considered to not remove these trees if possible during construction.

**Table 9: Arthropod species likely to occur within the Rustenburg region**

Scientific Name	Habitat	Status	Probability
<i>Acraea machequena</i>	Bushveld	Red Data	Low
<i>Andronymus neander neander</i>	Wetlands/forests	Red Data	Low
<i>Metisella meninx</i>	Wet areas/wetlands	Red Data	Low
<i>Neita neita</i>	Bushveld/Hillsides	Red Data	Low
<i>Spialia paula</i>	Bushveld	Red Data	Low

### 5.3 Sensitive areas

Sensitive areas are identified as a sensitive species habitat or a unique ecological system that it supports. This usually includes ridges, aquatic habitats such as rivers and wetlands as well as the habitat of Red Data, protected or endemic species. A ridge system does occur on the project area and is regarded as sensitive despite the surrounding environment being impacted. A ridge can function as an ecological system separate from the surrounding environment and has its own unique ecological system and species, which contributes to its sensitive nature. The development, however, will not impact the ridge area as it will be avoided during construction.

Critical Biodiversity Areas (CBAs) for the project area were also taken into account. CBAs are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. The primary purpose of CBAs is to inform land-use planning and the land-use guidelines to CBAs aim to promote sustainable development by avoiding loss or degradation of important natural habitat and landscapes in these areas and the landscape as a whole. CBAs can also be used to inform protected area expansion and development plans. As can be seen in Figure 4, the project area falls outside of CBA 1 and consists entirely of CBA 2. CBA 1 and CBA 2 explanations can be seen below, however only CBA 2 is relevant to the project area.



**CBA 1 - Natural landscapes**

- Ecosystems and species fully intact and undisturbed.
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met.
- These are landscapes that are at or past their limits of acceptable change.

**CBA 2 - Near-natural landscapes:**

- Ecosystems and species largely intact and undisturbed.
- Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets.
- These are landscapes that are approaching but have not passed their limits of acceptable change.

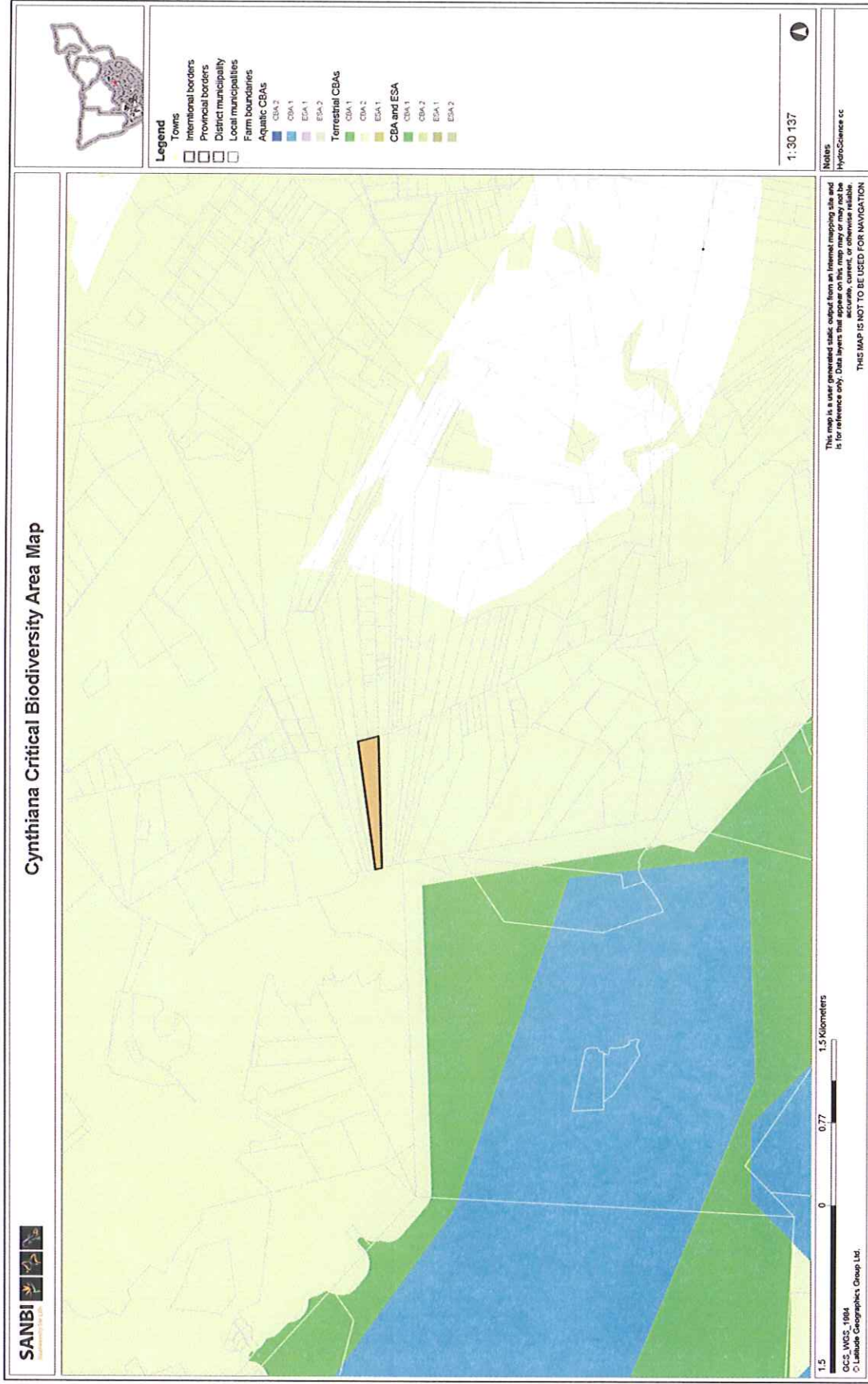
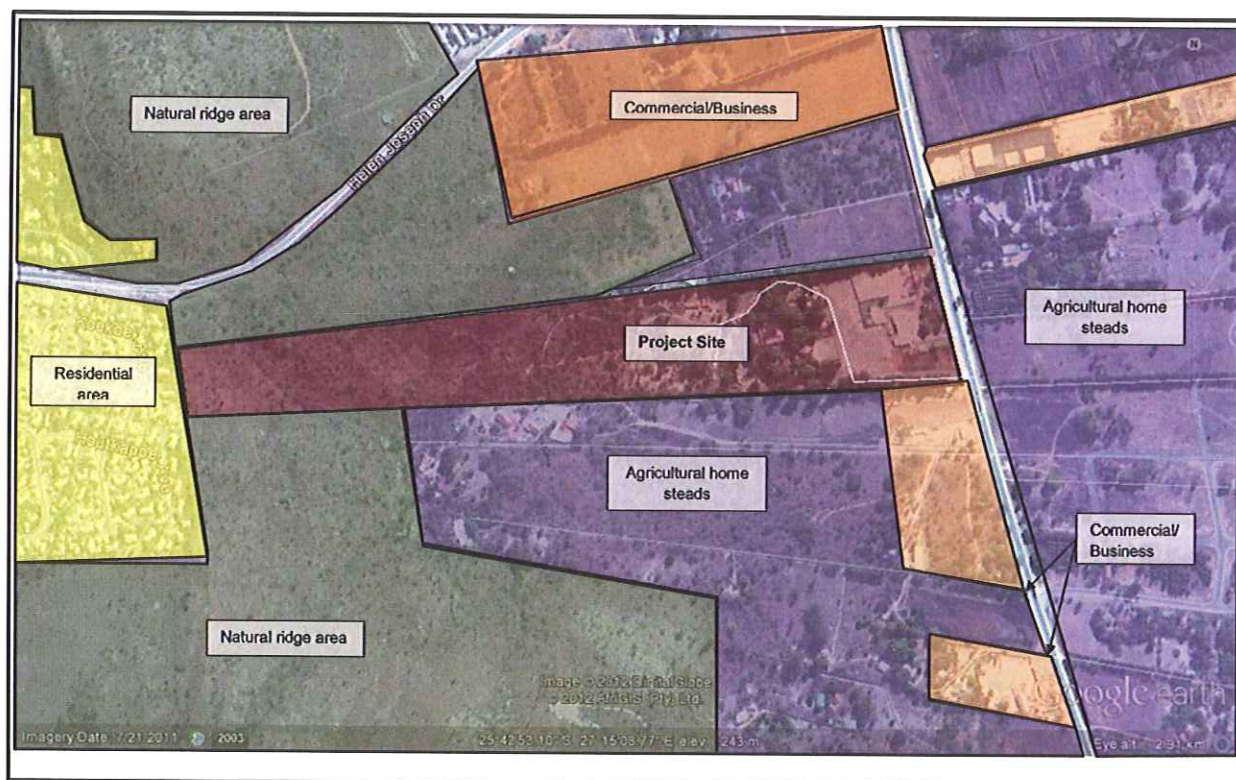


Figure 4: The Terrestrial and Aquatic CBA map for the project area

## 5.4 Visual/Aesthetic

When considering the visual impacts that the proposed development might have; both the topography and land use needs to be considered as mentioned in the methodology. The surrounding land use was investigated during the field survey and was found to consist of agricultural home steads, commercial businesses and a natural ridge area (Figure 5). A residential area occurs on the other side of the ridge area but will not be affected by the development.

Based on the scenic preference model, the visual quality of most of the area is regarded as Low as most of the site has already been disturbed by the existing development (hotel, shops, caravan park) and other anthropogenic impacts. The ridge area however has a Very High visual quality. Figures 6 and 7 indicate the visual quality before and after the development. The visual quality changed only slightly on the project area. This is the small section transgressing from the caravan park to the ridge area.



**Figure 5: The surrounding land use of the proposed project area**

Photographs were also taken to indicate the exposure of the project area's slope to the surrounding environment (Plate 4).

From the photographs, it can be seen that only the upper most part of the ridge area (which will not be disturbed during construction/development) was visible from the road (R24/P16-1) located east of the site (which the topography slopes down to). The caravan park (which will be removed and developed) was however, not visible from the road. This was also found on the project area. When taking photographs facing the east from the most westerly point of the development, the road was not visible.

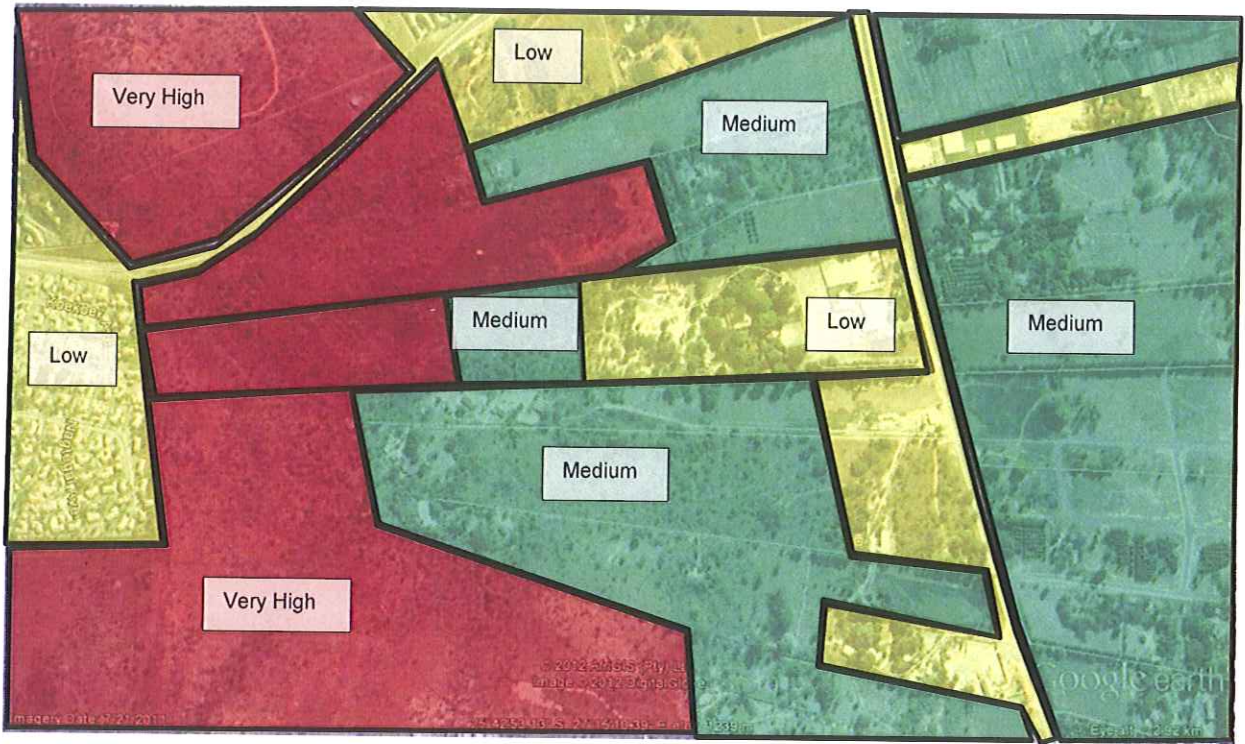


Figure 6: The visual quality prior to the development

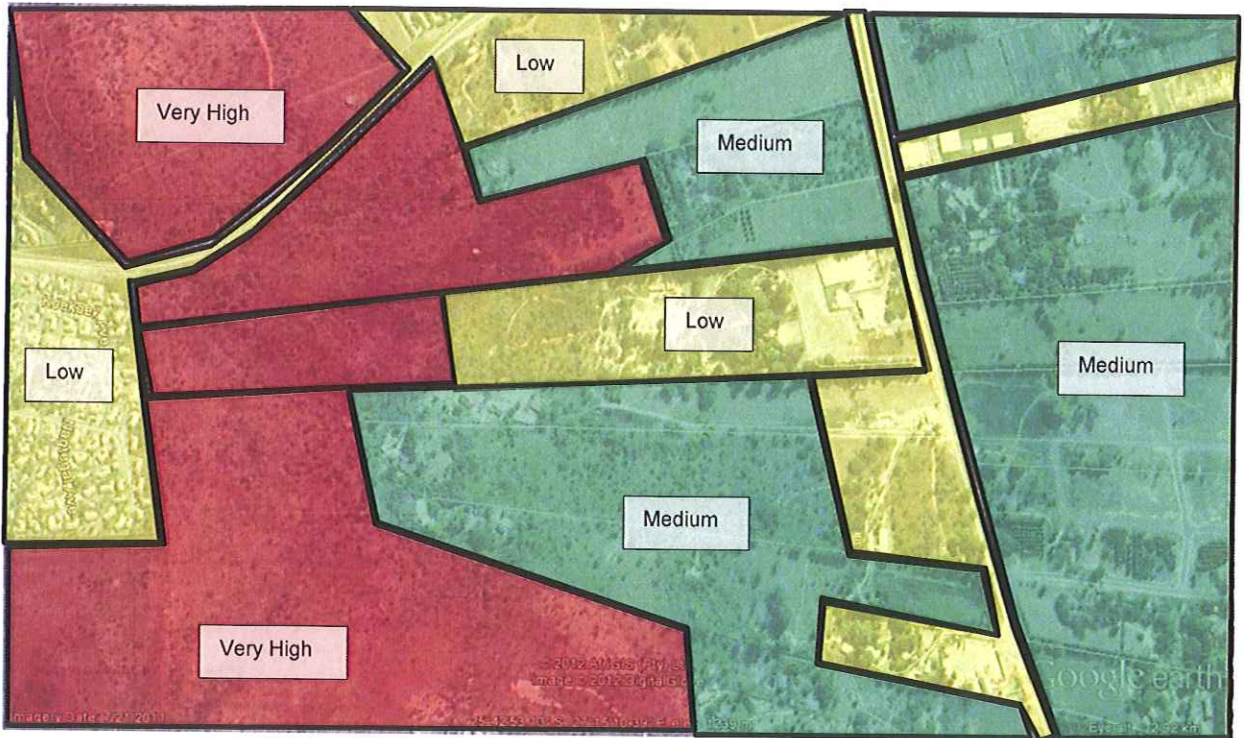
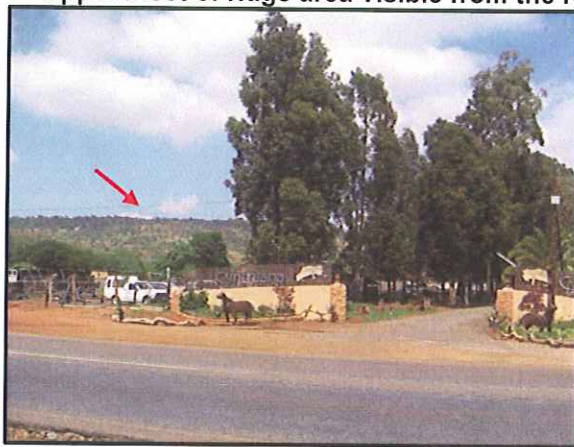
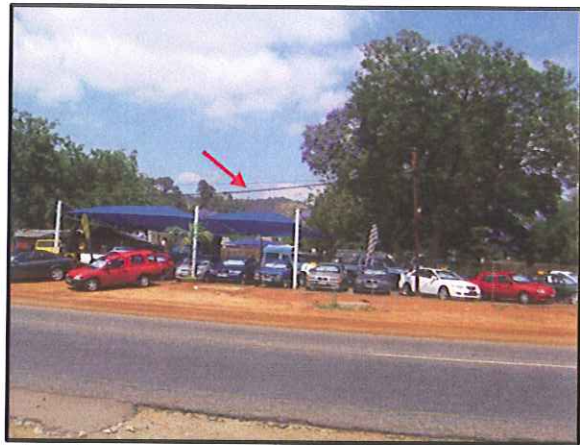


Figure 7: The visual quality after the development



Upper most of ridge area visible from the road (eastern boundary) facing the project area



Higher neighboring ridge visible from the road



Neighboring ridge visible from on site



Ridge visible facing west from on the project area



Same spot as left facing east, road is not visible from site only distant landscape features

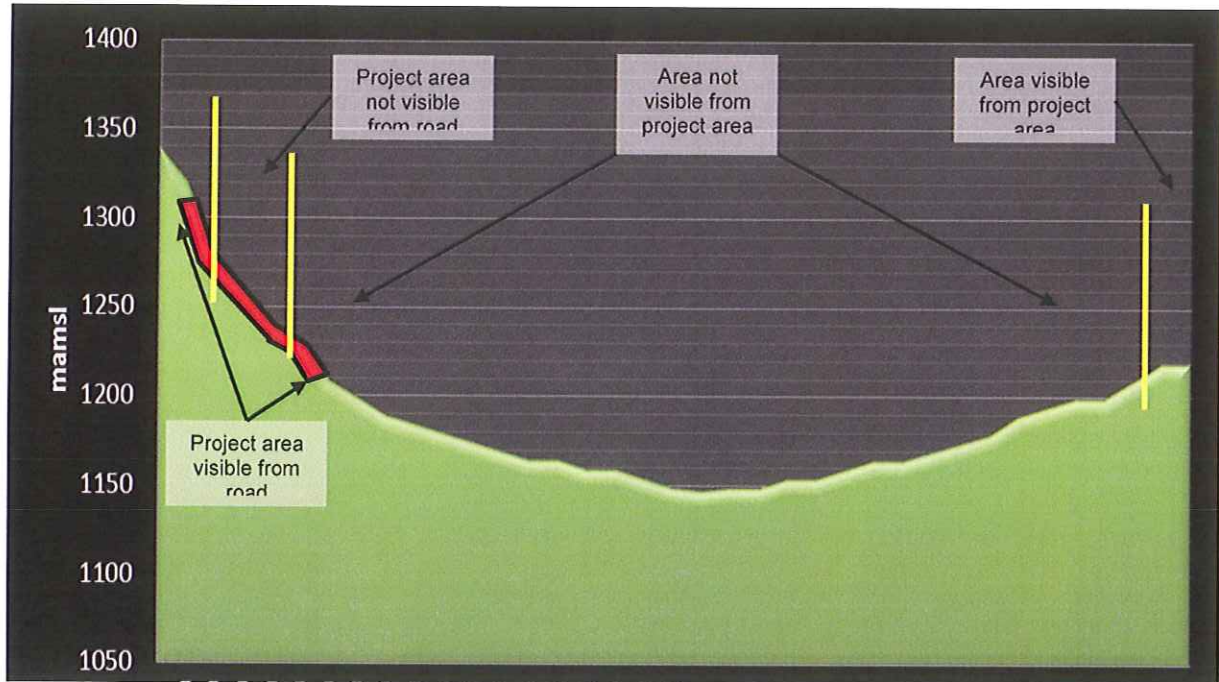
**Plate 4: Photographs indicating visibility of site from outside the project area and visibility of the surrounding landscape from on the project area**

As can be seen from the photographs, the sloped topography and ridge is evident, but where the development will take place, the visual impact will be minimal. This is due to the following aspects:

- The ridge area will be avoided during the construction of the township and remain undeveloped;

- The current land use will predominantly remain the same as the area is already disturbed/developed;
- Large trees existing on site, limit the visual effect of the current development; and
- The commercial businesses on the eastern portion of the site (adjacent to the road) also limit the visibility of the area behind it.

From the assessment above, it is established that the proposed development will be most visible from areas of a higher or the same topography range. The visibility (the visual impact) of the proposed project can be seen in Figure 8.



**Figure 8: An indication of the project site visibility to the surrounding area and the visibility of the surrounding area from the project site**

From all of the above data, it was found that although the topography indicates a possible visual impact, the current land use hinders the visibility of the site to the surrounding area and vice versa. Due to the fact that the current land use will mostly remain unchanged, the visual impact will be minimal.

## 6 DISCUSSION AND RECOMMENDATIONS

The site was found to be of a moderate to low ecological integrity, excluding the ridge area on the site that will remain unaffected by the development and has a moderate to high ecological integrity due to its habitat availability and high ecological sensitivity. The anthropogenic impacts exerted onto the site and the existing development already impacts ecological aspects and therefore as long as the development remains inside demarcated areas and away from the ridge area, the ecological impact is seen as low. This is also the case with the visual impact. Due to the fact that most of the land use will remain the same, the visual impact is also regarded as low, however it is suggested that current factors assisting in low visual impact should be maintained (large indigenous trees).

The following recommendations should be encompassed in the Environmental Management Plan (EMP):

- To remain within demarcated areas during construction to limit disturbances to surrounding areas as well as to remain off the ridge area throughout the project life;
- To erect a fence (palisade to maintain visual value to residents) between the development and the ridge to limit access and so prevent illegal waste dumping and burning that currently impacts on the ridge area as well as prevent disturbance to flora and fauna in this ridge area;
- To remove all exotic/invasive species as CARA, 1983 (Act 43 of 1983) requires;
- To limit the removal of indigenous Bushveld trees where possible (specifically *Burkea africana*) and incorporate it into the landscape features of the development which will assist in the aesthetic value of the site;
- To limit construction activities to the day time and working hours for the purpose of not disturbing activities and ecological processes of nocturnal birds, small mammal etc.;
- To avoid ground disturbance to the mole habitat found on site or remove the mole species through capture and release;
- No fauna species (snakes, small mammals etc.) may be killed if encountered during construction, but rather be relocated to the ridge area;
- To have a Waste Management Plan in place so as not to pollute the site or surrounding ecology thereby further reducing the ecological integrity; and
- To limit dust on site and the spreading thereof to surrounding vegetation.

## 7 CONCLUSION

The flora and fauna survey found that the site ecology has been transformed by anthropogenic impacts and existing developments. No Red Data, protected or endemic flora and fauna were found. However, the ridge is identified as a sensitive ecological feature which must be avoided and not impacted throughout the life of the project. The ridge area also forms part of a corridor to the remainder of the natural ridge area.

Therefore, the proposed project will have an impact of moderately-low significance, if recommendations are implemented. This is also the findings on the visual assessment due to the fact that the landuse will mostly remain unchanged despite the topography suggesting possible visual impacts. However, it is suggested that large indigenous trees must be incorporated into the landscape plan to maintain the aesthetic value.

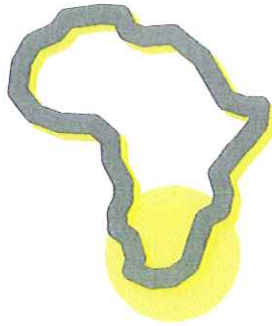


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**APPENDIX A**  
**VEGETATION IDENTIFIED TO OCCUR ON THE PROJECT**  
**AREA**

Family Name	Scientific Name	Common Name
Agavaceae	* <i>Agave sp.</i>	
Amaranthaceae	* <i>Alternanthera pungens</i>	Khaki Weed
Anacardiaceae	<i>Searsia lancea</i>	Karree
Araceae	* <i>Philodendron selloum</i>	Lacy Tree Philodendron
Asphodelaceae	<i>Aloe greatheadii</i>	Spotted Aloe
Asteraceae	* <i>Conyza albida</i>	Tall Fleabane
Asteraceae	* <i>Flaveria bidentis</i>	Smelter's Bush
Asteraceae	* <i>Tagetes minuta</i>	Tall Khaki Weed
Bignoniaceae	* <i>Jacaranda mimosifolia</i>	Jacaranda
Boraginaceae	<i>Ehretia rigida</i>	Puzzle Bush
Caesalpiaceae	<i>Burkea africana</i>	Wild Seringa
Celtidaceae	<i>Celtis africana</i>	White Stinkwood
Combretaceae	<i>Combretum zeyheri</i>	Large-fruited Bushwillow
Fabaceae	<i>Acacia karroo</i>	Sweet Thorn
Fabaceae	<i>Acacia caffra</i>	Common Hook-Thorn
Fabaceae	<i>Dichrostachys cinerea</i>	Sickle Bush
Loranthaceae	<i>Tapinanthus natalitius</i>	Parasitic Mistletoe
Malvaceae	<i>Hibiscus sp.</i>	
Meliaceae	* <i>Melia azedarach</i>	Syringa
Moraceae	<i>Ficus ingens</i>	Red-leaved Fig
Moraceae	<i>Ficus sp.</i>	
Myrtaceae	* <i>Eucalyptus ssp.</i>	Gum Tree
Pinaceae	* <i>Pinus sp.</i>	Pine tree
Poaceae	<i>Cynodon dactylon</i>	Couch Grass
Poaceae	<i>Eragrostis cilianensis</i>	Stink Love Grass
Poaceae	<i>Eragrostis rigidior</i>	Broad Curly Leaf
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu Grass
Poaceae	<i>Hyparrhenia hirta</i>	Common Thatching Grass
Poaceae	<i>Urochloa mosambicensis</i>	Bushveld Signal Grass
Poaceae	<i>Heteropogon contortus</i>	Spear Grass
Rhamnaceae	<i>Ziziphus mucronata</i>	Buffalo Thorn
Solanaceae	* <i>Nicotiana glauca</i>	Tree Tobacco
Solanaceae	* <i>Solanum mauritianum</i>	Bugtree
Solanaceae	* <i>Solanum panduriforme</i>	Bitter Apple
Sterculiaceae	<i>Dombeya rotundifolia</i>	Wild Pear
Strelitziaceae	<i>Strelitzia nicolai</i>	Natal Wild Banana
Verbenaceae	* <i>Latana camara</i>	Spanish Flag



# AFRICA EXPOSED

CONSULTING ENGINEERING GEOLOGISTS CC

ENGINEERING GEOLOGICAL INVESTIGATION  
REPORT  
OF  
PORTION 385 OF THE FARM WATERKLOOF 305-JQ  
RUSTENBURG.

Prepared for: **HydroScience**

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*Report No.4012*  
*Date: November 2012*

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## REFERENCES

## APPENDICES

1	LOCALITY AND SITE MAP
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3	LABORATORY TEST RESULTS



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**GEOTECHNICAL INVESTIGATION REPORT  
OF  
PORTION 385  
OF THE FARM WATERKLOOF 305-JQ,  
RUSTENBURG.**

## **1. INTRODUCTION**

### 1.1 Preamble

During October 2012, Ms. P. Jacobs of HydroScience invited Africa Exposed Consulting Engineering Geologists to submit a proposal for the completion of a geotechnical investigation of a site situated on Portion 385 of the farm Waterkloof 305-JQ in Rustenburg.

On 15<sup>th</sup> October 2012, emailed confirmation was received from Hydroscience, instructing Africa Exposed to proceed with the investigation.

### 1.2 Database

The following information was supplied by Hydroscience;

- The extent of the area that is proposed for development is 8ha.
- A locality plan was provided.
- A plan showing the area of proposed development was provided.
- The proposed development will include
  - thirteen (13) large residential properties;
  - two (2) areas with high density units (46 units at a density of 30 units/ha & 123 units at a density of 60 units/ha)
  - internal roads
  - extended infrastructure for bulk services (water supply and sewage).
  - a filling station bordering the main road R24.



### 1.3 Objectives

The objectives of the investigation were:

- to identify the soil and rock conditions below the site.
- to recommend suitable foundation systems, and founding depths for the proposed structures.
- to comment on any perceived geotechnical problems which may affect either the design or construction of the project.
- to classify the site in terms of the National Home Builders Registration Council (NHBRC) of 1999.

## **2. FACTUAL REPORT**

### 2.1 Programme of Work

#### 2.1.1 ***Literary Review***

A literary review was conducted in order to obtain data from previous investigations carried out in the area. The 1: 250 000 geological map, No 2526 Rustenburg was consulted to determine the regional geology in the vicinity of the site.

#### 2.1.2 ***Field Work***

Between 25<sup>th</sup> and 26<sup>th</sup> October 2012, eight test pits were excavated by hand, and the positions of each test pits was determined by means of a Garmin eTrex GPS. The layout of the test pits is shown on the Site Plan in Appendix 1 and each hole was profiled by an engineering geologist according to the Jennings, Brink and Williams system, sampled as necessary and backfilled. The detailed profile logs are shown in Appendix 2.

#### 2.1.3 ***Office and Laboratory Work***

From the soil samples recovered, four were selected for Foundation Indicator Tests and two undisturbed samples were recovered to determine the collapse potential and consolidation characteristics of the soils. All the individual test results are included in Appendix 3 of this report.

### 2.2 Site Description

Portion 385 of the farm Waterkloof 305-JQ is located approximately 7 km south of Rustenburg, on the R24 road between Magaliesburg and Rustenburg. The co-ordinates of the approximate centre of the site are 25° 42' 51.25" S and 27°15' 07.33"E (see figure 1).

The site is wedge shaped and extend for approximately 1.2km along the east/west axis and is 65m wide at the western end and 200m wide in the east. The boundaries are defined by the R24 road along the eastern side, while the remaining boundaries are defined by adjacent farm portions.

The elevation of the western side of the property is approximately 1320mamsl and the eastern side is some 1210mamsl, and the property slopes at an approximate gradient of some 6 to 9% down towards the east.



The eastern portions of the site are developed, and is currently occupied by the Cynthiana hotel and caravan park, as well as a road house and other commercial enterprises.

The western portions of the site which are located on the talus slope of the Magaliesberg mountains are largely undeveloped and the vegetation consists of groves of indigenous woody vegetation that includes species such as *Sclerocarya birrea* (mopane) *Faurea saligna* (Transvaal beech), *Burkea africana* (wild syringa) and several *Acacia* species.

### 2.3 Site Geology

From the available literature as well as the observations during the site investigation, it is evident that the site is covered by a considerable thickness of transported colluvial soils that blankets the underlying bedrock.

The western portions of the site are underlain by quartzite belonging to the Magaliesburg Quartzite Formation of the Pretoria Group, Transvaal Sequence, while the lower lying eastern portions of the property are underlain by Kolobeng norite formation of the Rustenburg Layered Suite, Bushveld Igneous Complex.

### 2.4 Hydrology

The average annual rainfall in this area is approximately 750mm, most of which occurs as heavy, isolated thunder showers between October and March. Storm water runoff is primarily in the form of sheetwash towards the eastern side and no features were identified that will concentrate runoff from the site.

No groundwater seepage was recorded in any test pit, however seasonal fluctuations of the level of the perched water table must be anticipated.

### 2.5 Observations

The test pits were excavated to an average depth of 1.6m and a description of the soils that blanket the site is summarised below.

#### 2.5.1 ***Transported Soils***

The entire site is covered by a thick layer of transported soil that is on average 1.6m thick, consisting of silty sand and gravels, of colluvial (hillwash) origin. The soil varies in texture from fine silty sand to coarse (2 to 50mm diameter) gravels, clast supported with a matrix of silty sand. The consistency of the horizon is generally loose to medium dense consistency, and is rich in organic matter. In isolated places the transported soils could be seen to be slightly ferruginised.

#### 2.5.2 ***Residual Soils***

No residual soils were exposed in any of the test pits excavated on this site.

### 2.6 Laboratory and Field Test Results

#### 2.6.1 ***Indicator testing***

For more accurate identification and classification purposes, Particle Size Distribution and Atterberg Limits Tests were carried out on representative samples of the various soil





horizons present within the site. The results are shown in Appendix 3 of this report and are summarised in Table 1 below.

**TABLE 1. Summary of Indicator test results**

TP No.	Depth (m)	Material	PI	PI (ws)	LS (%)	GM	Activity
1	0.6-0.7	Silty sand and gravel. Hillwash	10	5	4	1.36	low
2	1.2-1.3	Gravels with silty sand. Colluvium	11	2	5	2.47	low
5	1.0-1.1	Silty sand and gravel. Hillwash	11	5	5	1.34	low
8	0.8-0.9	Gravels with silty sand. Colluvium	10	2	4	2	low

### 2.6.2 Collapse Potential Testing

In order to establish the consolidation characteristics and collapse potential of the soils, undisturbed samples were retrieved from TP 1 and TP 5 and were subjected to Collapse Potential tests. The results are summarised in table 2 below, and show that the residual granite retrieved is not collapsible, with a degree of severity of 12.1% and 11.4% being recorded. According to Jennings and Knight (1975), this represents "Severe Trouble".

**TABLE 2. Collapse Potential Test Results**

TP No	Depth (m)	Material	Dry Density (kg/m <sup>3</sup> )	Moisture Content (%)	Collapse Potential (%)	Jennings et.al Classification
1	0.6-0.7	Silty sand and gravel. Hillwash	1472	6.4	11.4	Severe Trouble
5	1.0-1.1	Silty sand and gravel. Hillwash	1514	8	12.1	Severe Trouble

## 3. INTERPRETIVE REPORT

### 3.1 Discussion of Results

The Collapse Potential test completed on the transported soils indicated that these soils are collapsible and are also compressible. The magnitudes of the anticipated settlements are shown in table 3 below. These values have been calculated by assuming that 800mm wide strip footings will be placed at an average depth of 0.8m below natural ground surface and the foundations would apply a bearing pressure of 100kPa.



<b>TABLE 3. Calculated Total Settlements</b> (These estimates are only applicable for the footing geometry assumed above)			
<b>Position</b>	<b>Collapse Settlement (mm)</b>	<b>Consolidation Settlement (mm)</b>	<b>Total Settlement (mm)</b>
TP 1	0	5 to 10	5 to 10
TP 2	0	5 to 10	5 to 10
TP 3	0	5 to 10	5 to 10
TP 4	5 to 10	5 to 10	10 to 20
TP 5	10 to 15	10 to 15	20 to 30
TP 6	0	5 to 10	5 to 10
TP 7	5 to 10	5 to 10	10 to 20
TP 8	0	5 to 10	5 to 10

### 3.2 Classification of Site.

In order to classify the geotechnical characteristics of the underlying soils, the geotechnical classification method proposed in the National Home Builders Registration Council (NHBR) of 1999. has been applied to this site. Table 4 shown below indicates the various geotechnical characteristics and the criteria used to evaluate the soils.

<b>TABLE 4. Residential Site Class Designations</b> National Home Builders Registration Council (NHBR) of 1999.				
<b>Typical Founding Material</b>	<b>Character of Founding Material</b>	<b>Expected Range of Total Soil Movements (mm)</b>	<b>Assumed Differential Movement (%of Total)</b>	<b>Site Class</b>
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	Compressible Soil	<10	50%	S
		10-20	50%	S1
		>20	50%	S2
Silty sands, sands, sandy and gravelly soils	Compressible and Potentially Collapsible Soils	<5,0	75%	C
		5,0-10	75%	C1
		>10	75%	C2

In terms of the National Home Builders Registration Council (NHBR) of 1999 site classification system, the site has been classified as shown below.

- S/R** Less than 10mm total consolidation settlement anticipated and rock outcrop beneath structures.
- C2** >10mm consolidation and collapse settlement anticipated

### 3.3 Design Solutions

#### 3.3.1 **Structures**

##### Site Classification S/R

(Less than 10mm total consolidation settlement anticipated and rock outcrop beneath structures)

The entire site has been classified as an **S/R** site, and is characterised by a surface horizon of transported soils which is underlain by residual quartzite bedrock within 0.5 to 1.5m of the surface. It is therefore recommended that structures built within this



zone are founded using normal strip footings placed on the very dense residual quartzite or bedrock that occurs at an average depth of 0.4m. The maximum allowable bearing pressure of the residual quartzite is 120kPa.

Negligible consolidation settlement is anticipated under assumed applied pressures of less than 120kPa and total consolidation settlements of less than 10mm are anticipated.

### 3.3.1.2

#### Site Classification C2.

(>10mm consolidation and collapse settlement anticipated)

Potential founding solutions for all of the units to be constructed within this zone are presented below.

i. *Modified Normal Strip Footings.*

It is recommended that the external and internal walls of the structure are founded on reinforced strip footings placed at an average depth of **1.2m** below current ground level. The foundations must be reinforced and construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses. Articulation joints must be included at all external and internal doors and openings. Particular attention must be placed on drainage precautions as well as ensuring the competence of all water bearing services.

For the surface bed preparation, the in-situ soils must be removed to a depth of 450mm, and replaced in 150mm thick layers with the same excavated material, compacted to a minimum density of 93% of Mod AASHTO at -1 to +2% OMC. The maximum allowable bearing pressures must not exceed 100kPa.

ii. *Soil raft.*

Remove in situ materials to 1.0m beyond perimeter of building (ie. the foot print of the structure) to a depth of 1.5 times the widest foundation, measured from the underside of the footings. Replace with the excavated material in compacted 150mm thick layers to 93% Mod AASHTO density at -1% to +2% of OMC. Bearing capacity of the soil raft will be 100kPa. Foundations must be placed at a depth of 600mm below the top of the mattress and normal construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses. The surface bed may be constructed directly on the soil raft.

iii. *Compaction of soils below individual footing.*

Remove the in-situ soils below the foundations (both internal and external walls) to a depth of 1.5 times the foundation width or to a competent horizon. Replace with the excavated material compacted to 93% Mod AASHTO density at -1% to +2% of optimum moisture content, in layers not exceeding 150mm thick. Particular attention must be paid to the compaction at the edges of the trenches and at corners. Nominally reinforced foundations must be placed at a depth of 600mm below the top of the mattress and construction may proceed with brick force included between each course in the plinth wall for a minimum of 6 courses. The maximum allowable bearing pressures must not exceed 100kPa.



For the surface bed the in-situ soils must be removed to a depth of 450mm, and replaced in 150mm thick layers with the same excavated material, compacted to a minimum density of 93% of Mod AASHTO at -1 to +2% OMC.

iv. *Concrete raft.*

A concrete raft designed by a competent structural engineer to tolerate the anticipated settlement.

Due to the risk of collapse settlement occurring in the natural soils it is imperative that good site drainage is provided around individual structures, and excess moisture should not be allowed to accumulate adjacent to foundations.

### 3.3.2 **Roads and Terraces**

The results of the Foundation Indicator Tests have been used to classify the material and to determine the suitability of soil for the construction of terraces and pavement layers. The results of the tests are presented in Appendix 3, and the samples are classified as a G 6 and G 9 materials and may therefore be used in the construction of the terraces and as in-situ sub-grade and selected layers. Suitable materials for use in the sub-base and base course layers must be imported from a commercial source.

### 3.3.3 **Excavation Classification**

Excavation conditions across the entire site will be "soft" according to SABS 1200 D: Earthworks, up to a depth of 1.5m. "Intermediate" and "hard" excavation conditions must be anticipated within zone S/R site beyond a depth of 1.0m.

The presence of boulders and bedrock must be anticipated throughout the site.

### 3.3.4 **Stormwater Management**

Due to the collapsible fabric present in the soil structure particularly within zone **C2**, it is imperative that sound stormwater management is implemented around all structures. It is suggested that the precautions presented below are considered to limit the amount of moisture reaching the foundation and thereby reducing the risk of settlement occurring.

- i. All water bearing services must be provided with flexible couplings where pipes enter the buildings.
- ii. A 1200mm wide apron paving must be provided around the perimeter of the structures. Joints between the paved areas and the walls of the buildings should be sealed with a flexible sealant to prevent moisture reaching the foundations.
- iii. Storm water management around the structures must facilitate the efficient disposal of excess water from the site.
- iv. No flower beds, garden taps, trees or down pipe discharge must be allowed adjacent to the structures, and must be placed as far away as possible.

## 3.4 **General**

### 3.4.1 **Ground Water**

No ground water seepage was encountered on the site, however it must be anticipated that shallow ground water may occur in isolated areas throughout the site after periods of sustained rainfall. Appropriate precautions should therefore be implemented beneath



all the structures and paved areas, as well as on any exposed excavated surfaces in the terraces.

3.4.2 **Trees**

It is imperative that all large root systems are properly removed and any cavities are properly back filled with suitable material compacted to 90% Mod AASHTO density at +2% to - 1% of optimum moisture content.

Where possible it would be aesthetically and environmentally pleasing to preserve the well established indigenous trees that occur on the site.

3.4.3 **Insecticides**

Termite activity was noted on the site and it is therefore recommended that a recognised, environmentally acceptable pesticide/insecticide be used to combat the threat of ants/termites and rodents to the integrity of the foundations.

3.4.4 **Buried services**

Due to the potentially mildly acidic groundwater environment, non-ferrous or plastic pipes are recommended.

3.5 Construction Problems

It must be anticipated that corestones and boulders may be encountered in the excavations.

3.6 Additional Investigations

This investigation was completed for the purposes of township proclamation, and whilst the site has been zoned and generalised foundation recommendations have been presented for typical residential structures, the results contained in this report should not be used for site specific foundation design purposes. Additional detailed geotechnical investigations would be required for structures other than single and double storey residential units.

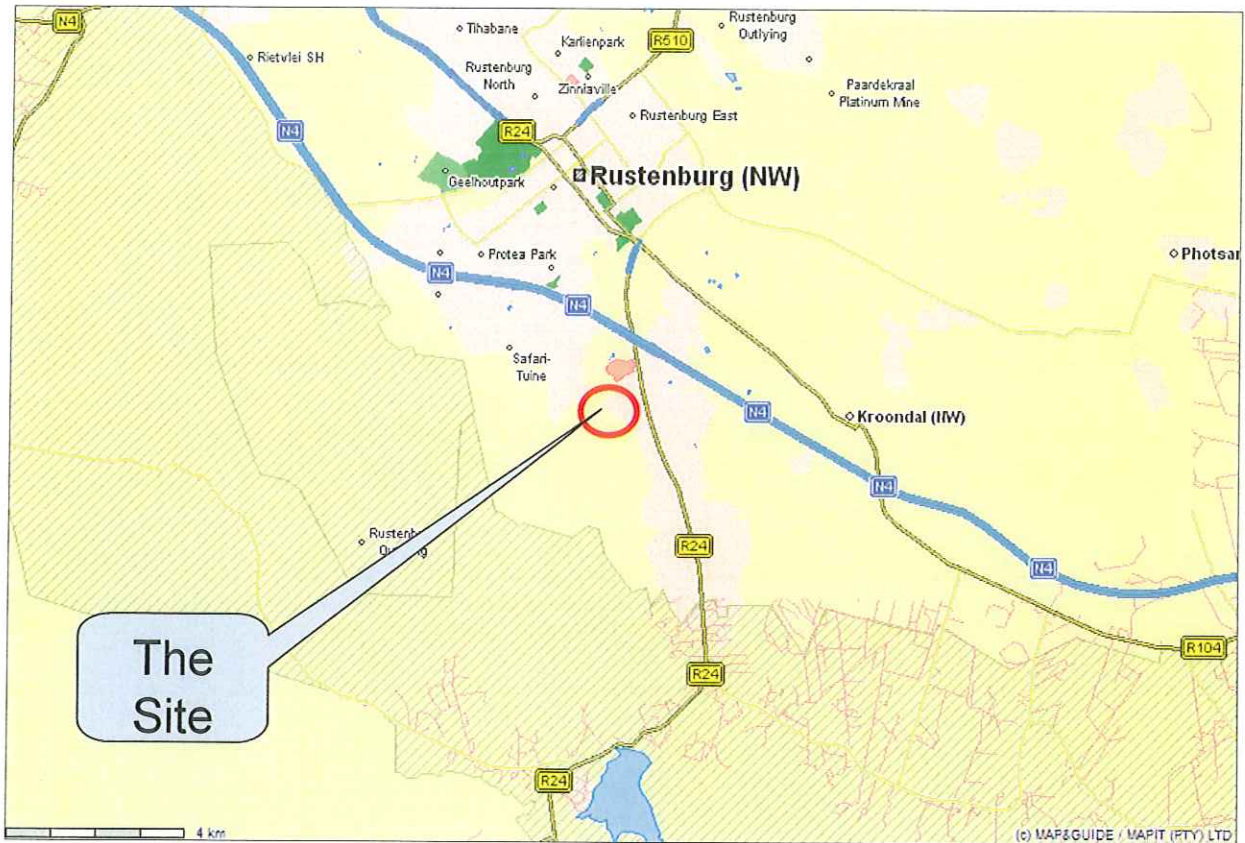
## REFERENCES

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APPENDIX 1  
LOCALITY AND SITE MAP



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**HYDROSCIENCE**  
PORTION 385 WATERKLOOF 305-JQ  
RUSTENBURG

**LOCALITY MAP**

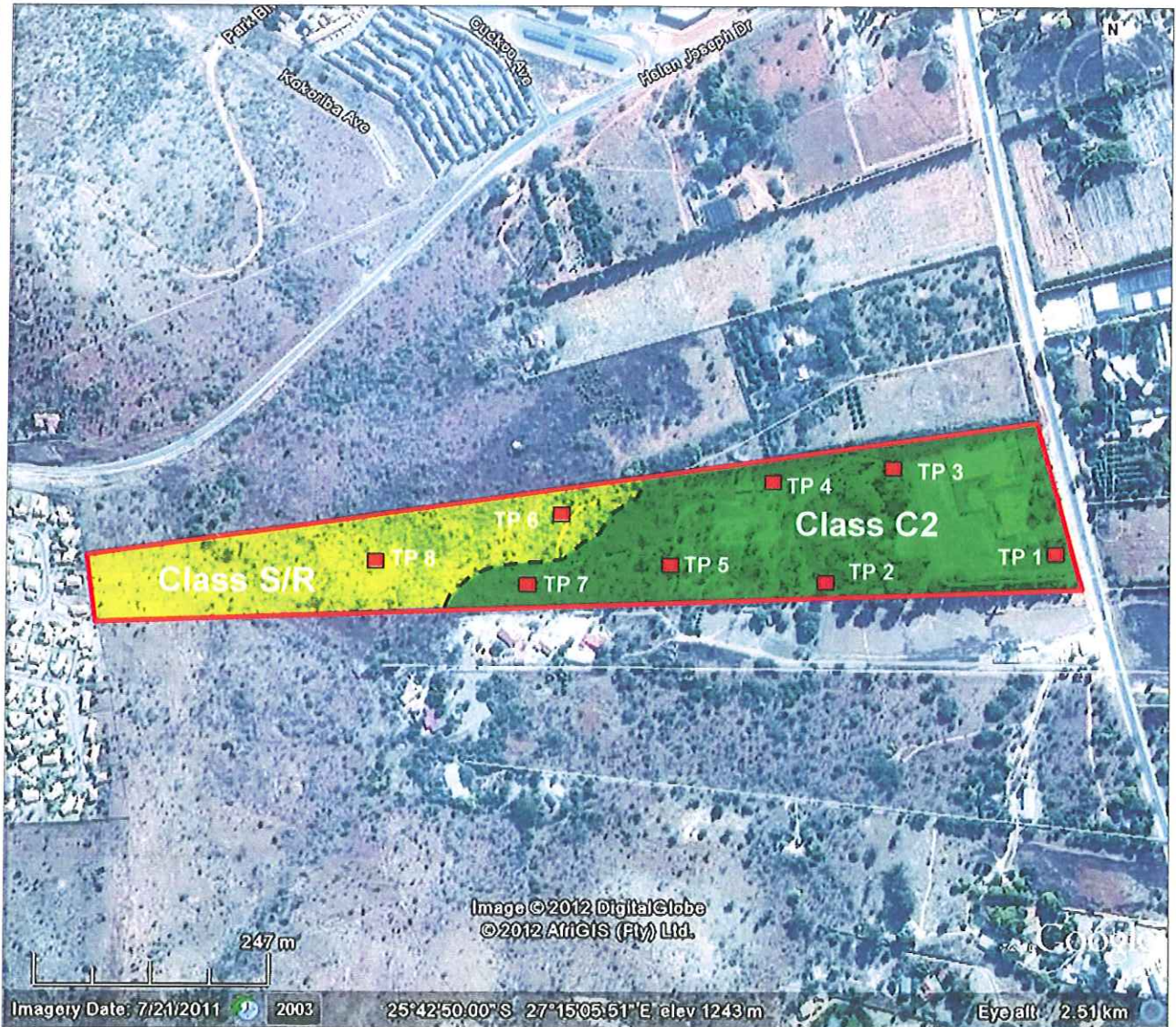
Job No. 4012

November 2012

Figure No. 1







- Site Class S/R** Less than 10mm total consolidation settlement anticipated and underlain by shallow bedrock
  
- Site Class C2** Greater than 10mm total collapse and consolidation settlement anticipated.
  
- TP 2** Approximate Test Pit Position
  
- Limit of site investigated



**HYDROSCIENCE.**  
 PORTION 385 WATERKLOOF 305-JQ  
 RUSTENBURG.  
**SITE PLAN**

Job No. 4012
November 2012
Figure No. 3



APPENDIX 2  
TEST PIT PROFILES



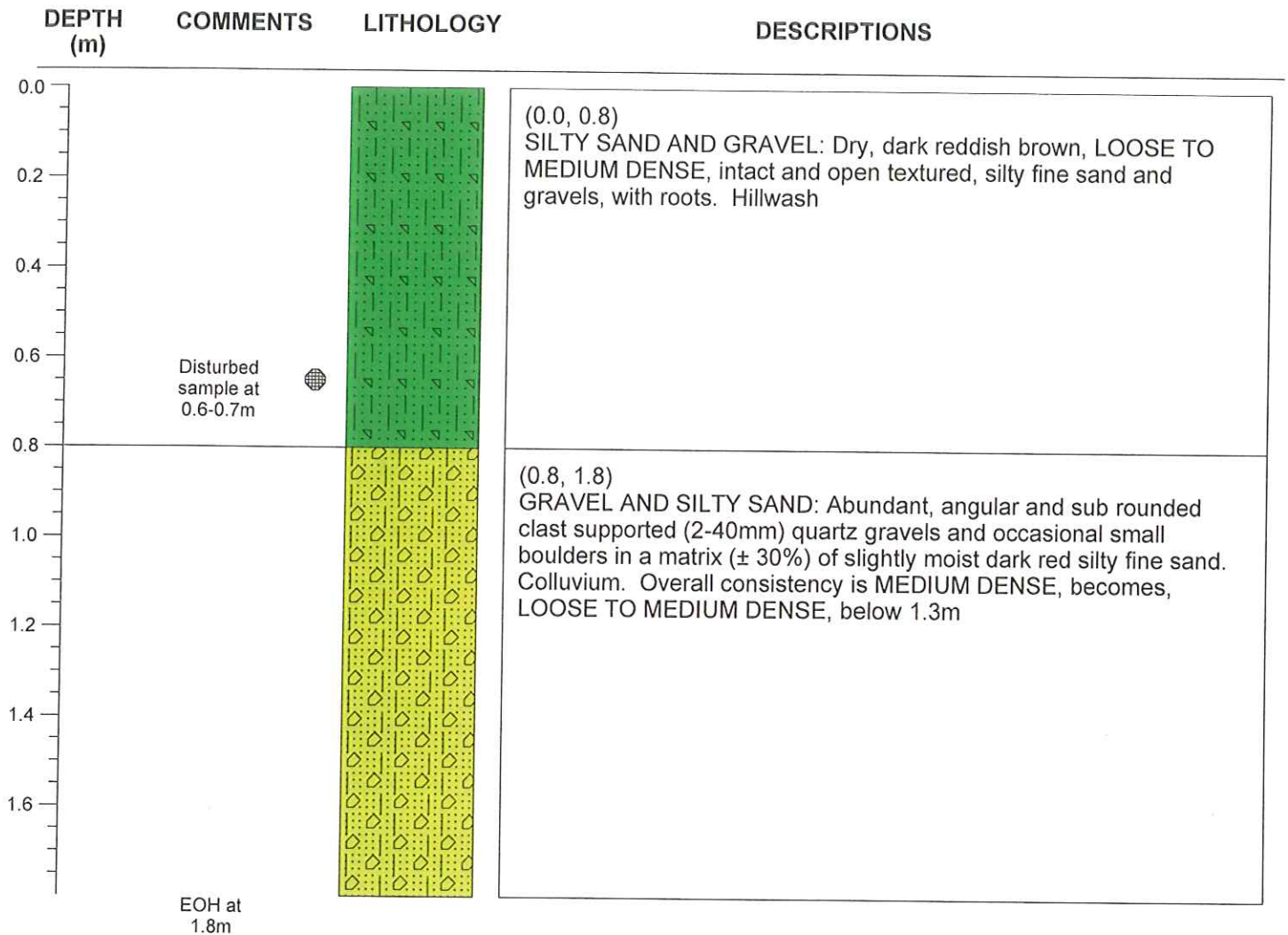
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CONSULTING ENGINEERING GEOLOGISTS C.C.

P.O. Box 68 Honeydew 2040  
Tel: (083) 656-0900  
Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ, Rustenburg

**HOLE No.:** TP 1



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. Disturbed sample taken at 0.6 to 0.7 m

**HOLE No.: TP 1**

**JOB No.:** 4012

**DATE:** 25 October 2012

**PROFILED BY:** J A

**MACHINE:** Auger

**CONTRACTOR:** Africa Exposed

**DIAMETER:** 50mm



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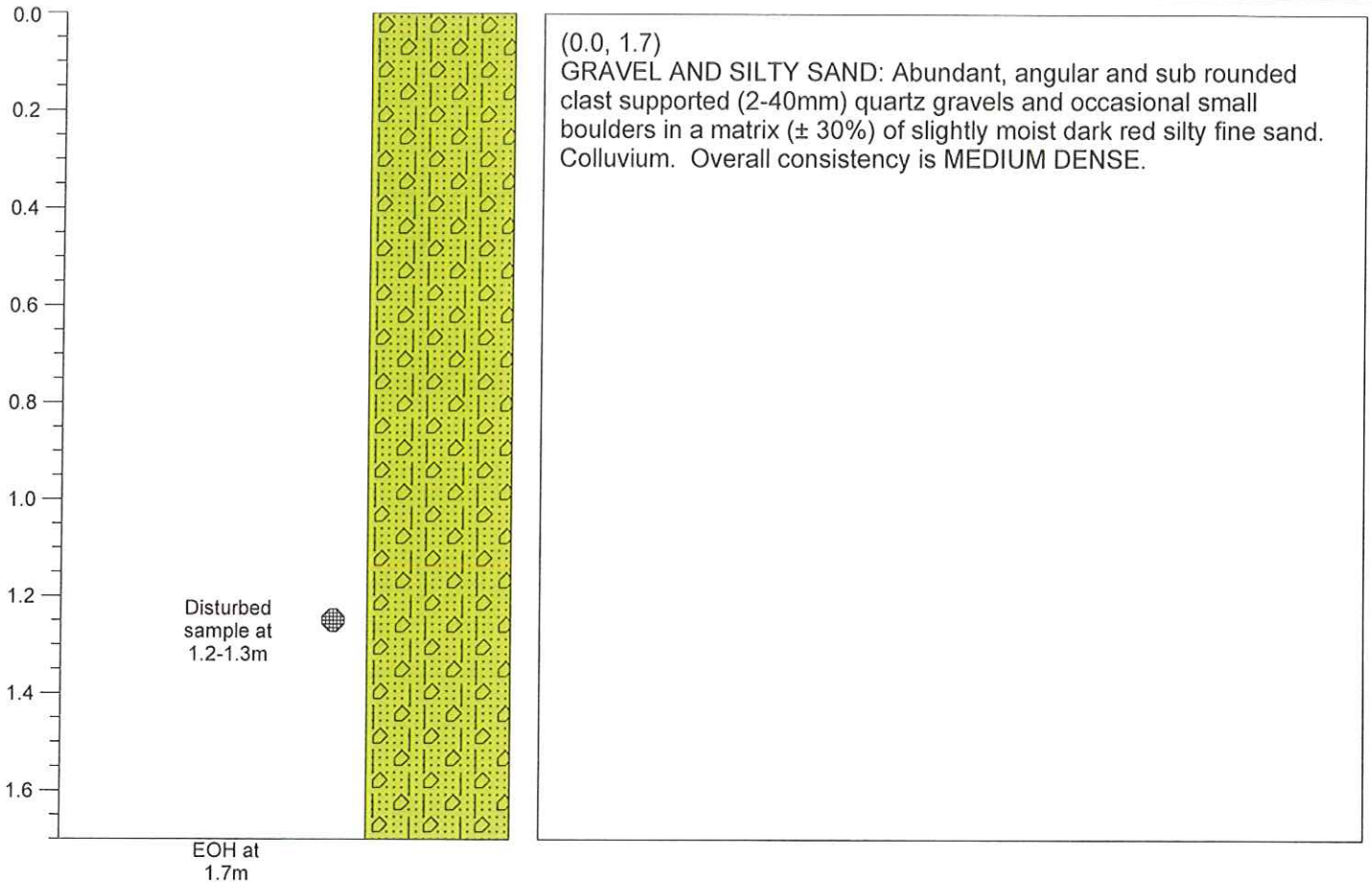
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Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ, Rustenburg

**HOLE No.:** TP 2

**DEPTH (m)**      **COMMENTS**      **LITHOLOGY**      **DESCRIPTIONS**



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. Disturbed sample taken at 1.2 to 1.3m

**HOLE No.:** TP 2

**JOB No.:** 4012

**MACHINE:** Auger

**DATE:** 25 October 2012

**CONTRACTOR:** Africa Exposed

**PROFILED BY:** J A

**DIAMETER:** 50mm



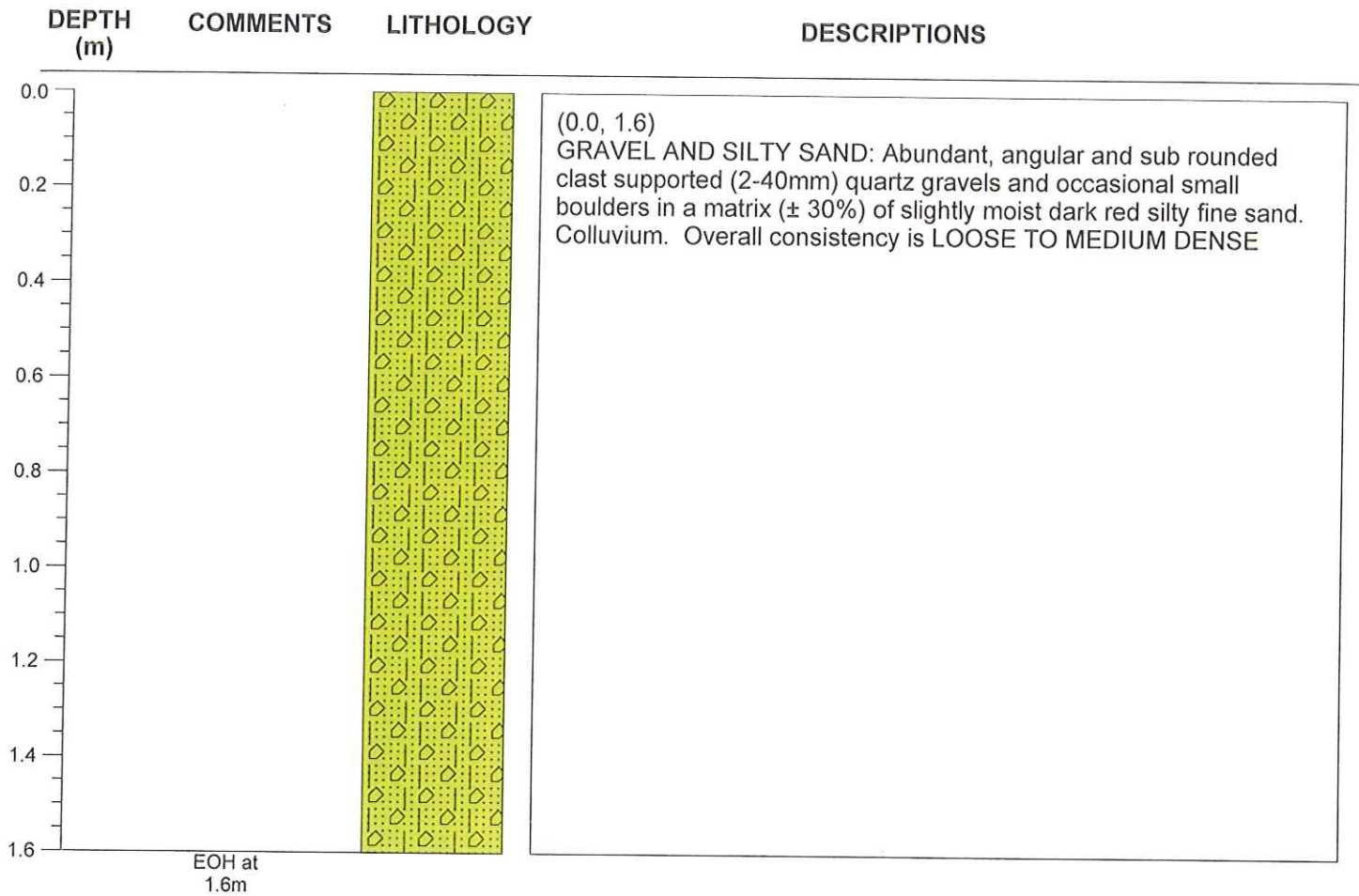
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Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 3



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. No samples taken

**HOLE No.: TP 3**

**JOB No.:** 4012

**DATE:** 25 October 2012

**PROFILED BY:** J A

**MACHINE:** Auger

**CONTRACTOR:** Africa Exposed

**DIAMETER:** 50mm



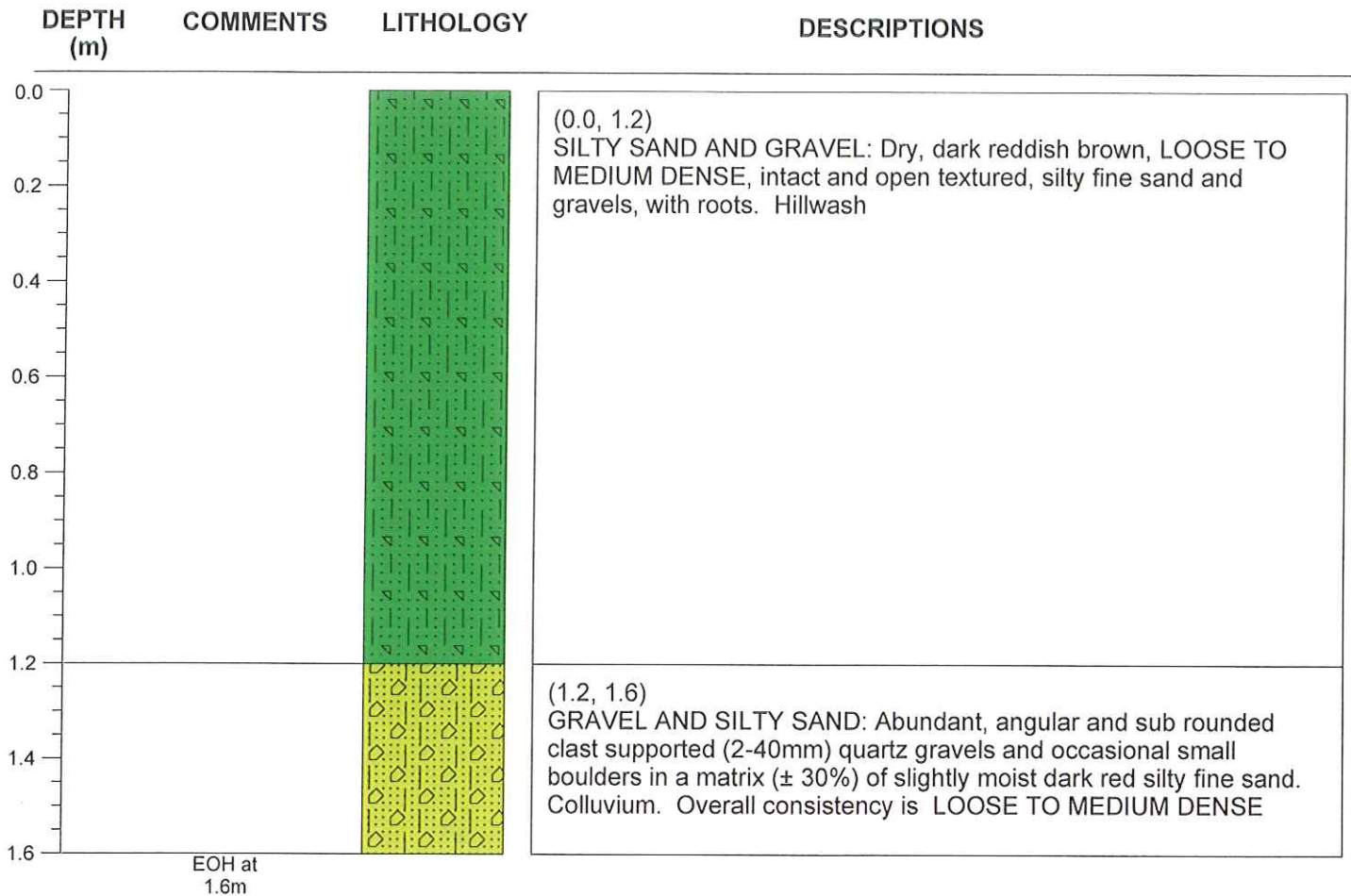
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Tel: (083) 656-0900  
Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 4



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. No samples taken

**HOLE No.: TP 4**

**JOB No.:** 4012

**MACHINE:** Auger

**DATE:** 25 October 2012

**CONTRACTOR:** Africa Exposed

**PROFILED BY:** J A

**DIAMETER:** 50mm



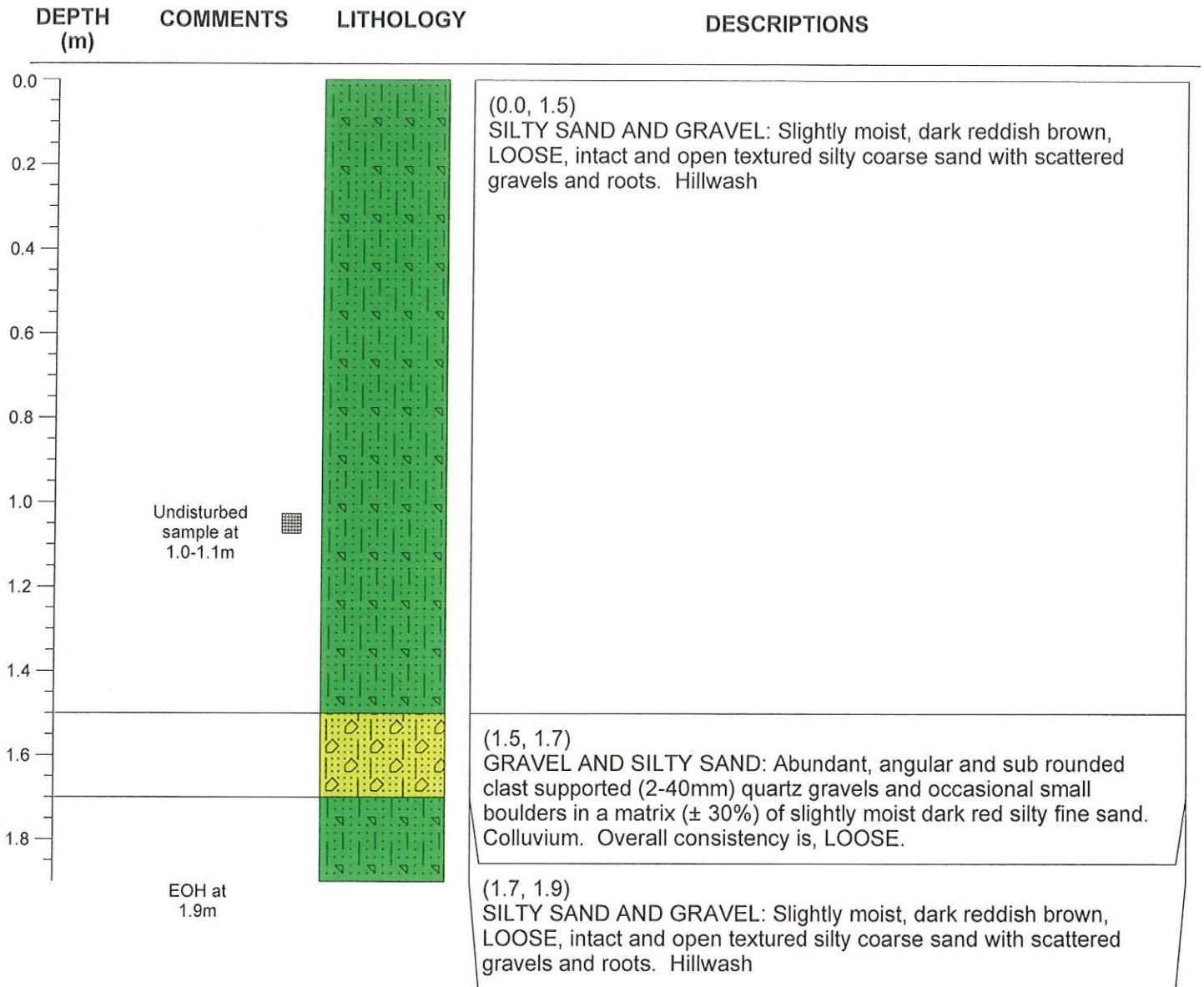
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Tel: (083) 656-0900  
Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 5



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. Undisturbed sample taken at 1.0 to 1.1m

**HOLE No.: TP 5**

**JOB No.:** 4012

**MACHINE:** Auger

**DATE:** 25 October 2012

**CONTRACTOR:** Africa Exposed

**PROFILED BY:** J A

**DIAMETER:** 50mm





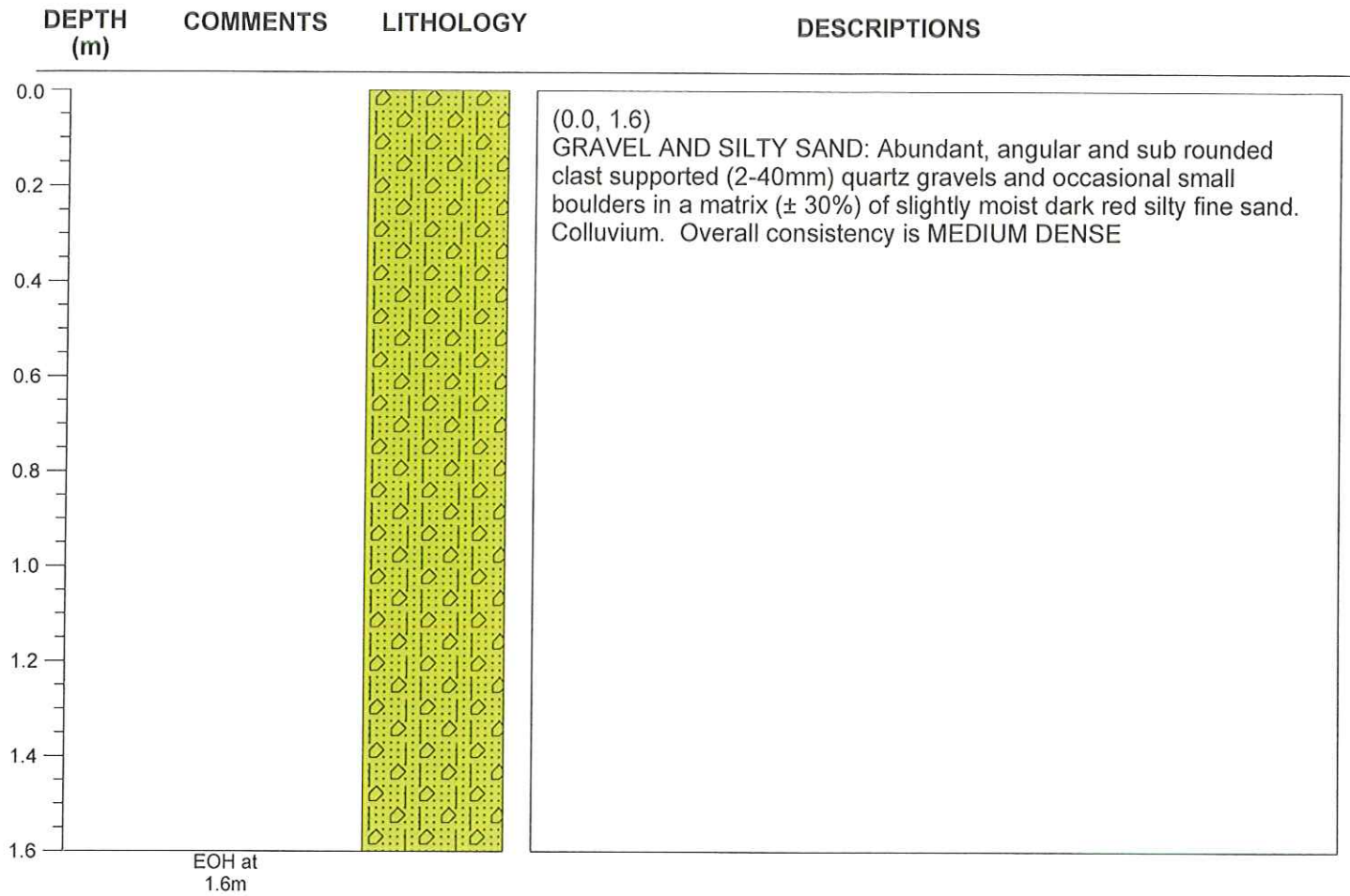
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Fax: (086) 633-7332

**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 6



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. No samples taken

**HOLE No.: TP 6**

**JOB No.:** 4012

**MACHINE:** Auger

**DATE:** 25 October 2012

**CONTRACTOR:** Africa Exposed

**PROFILED BY:** J A

**DIAMETER:** 50mm



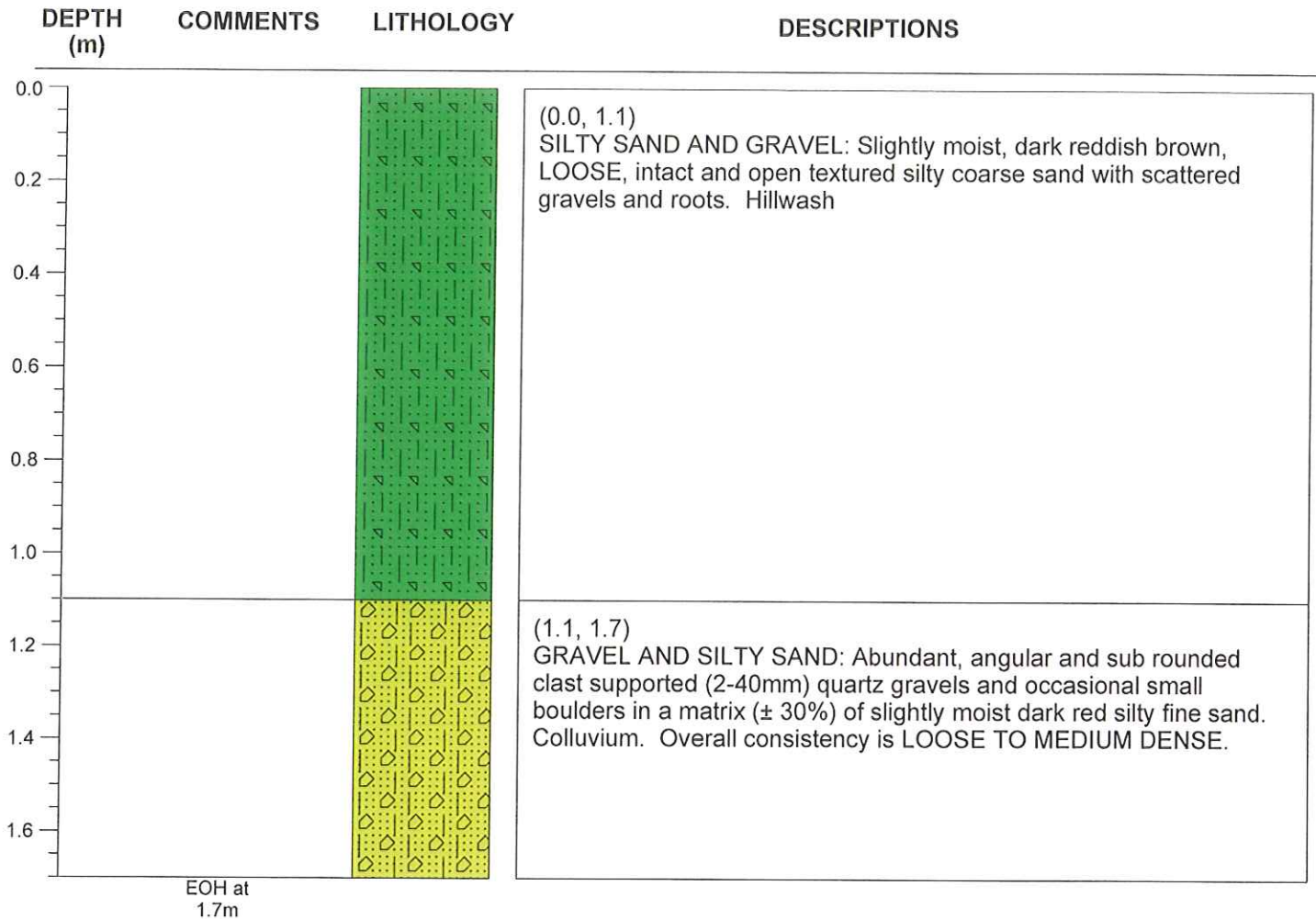
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Tel: (083) 656-0900  
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**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 7



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. No samples taken

**HOLE No.:** TP 7

**JOB No.:** 4012

**DATE:** 25 October 2012

**PROFILED BY:** J A

**MACHINE:** Auger

**CONTRACTOR:** Africa Exposed

**DIAMETER:** 50mm



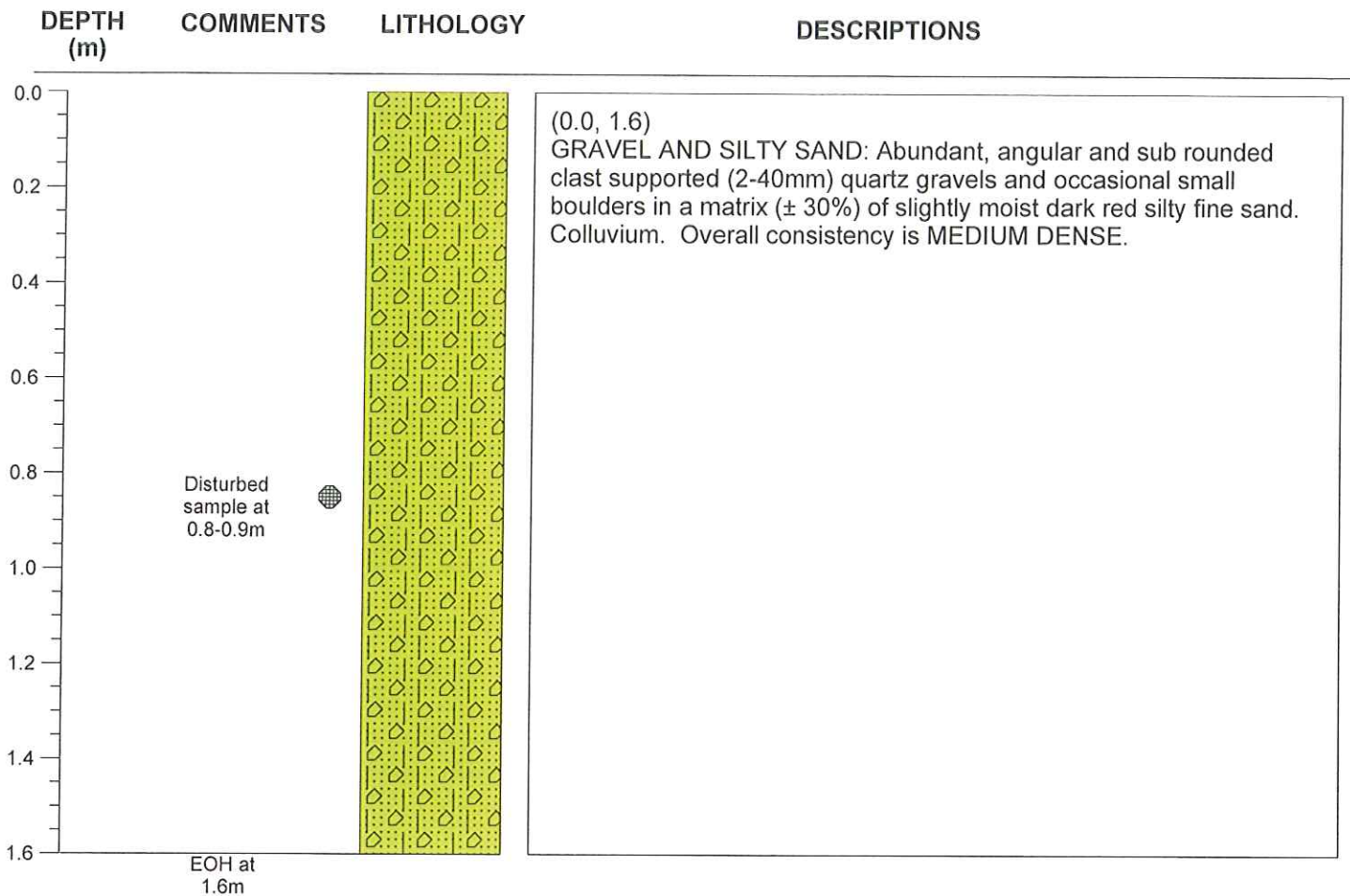
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**CLIENT:** HydroScience

**SITE:** Portion 385 Waterkloof 305-JQ.

**HOLE No.:** TP 8



**NOTES**

1. EOH easy dig
2. No ground water seepage
3. Disturbed sample taken at 0.8 to 0.9m

**HOLE No.: TP 8**

**JOB No.:** 4012

**MACHINE:** Auger

**DATE:** 25 October 2012

**CONTRACTOR:** Africa Exposed

**PROFILED BY:** J A

**DIAMETER:** 50mm



APPENDIX 3  
LABORATORY TEST RESULTS

# AFRICA EXPOSED

## CONSULTING ENGINEERING GEOLOGISTS

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Fax: (086) 633-7332

### FOUNDATION INDICATOR

Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 1 @ 0.6-0.7m
Job No	4012	Checked By	JA

#### SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	99.00
2.00	86.00
0.425	52.00

#### HYDROMETER ANALYSIS

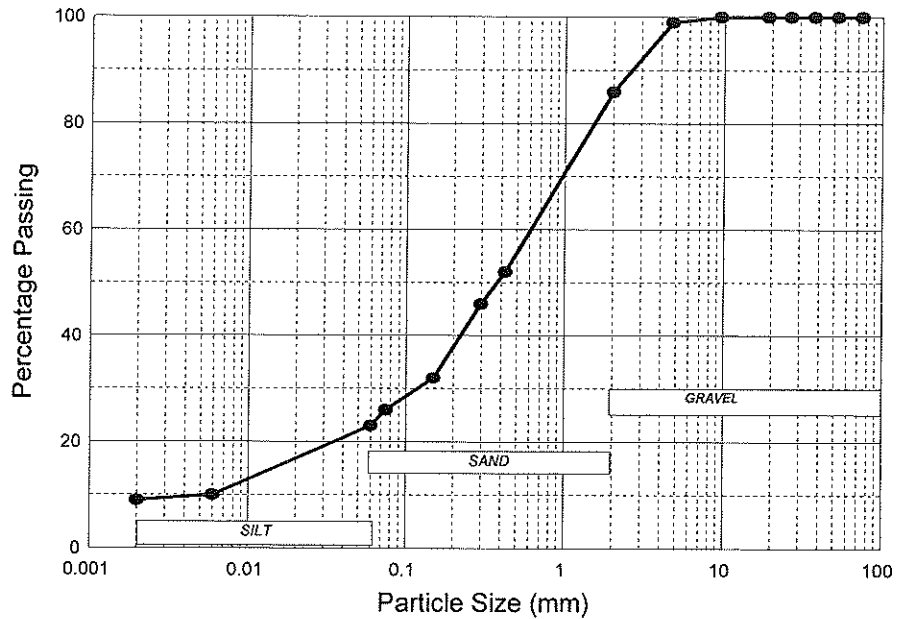
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	46.00
0.1500	32.00
0.0750	26.00
0.0600	23.00
0.0060	10.00
0.0020	9.00

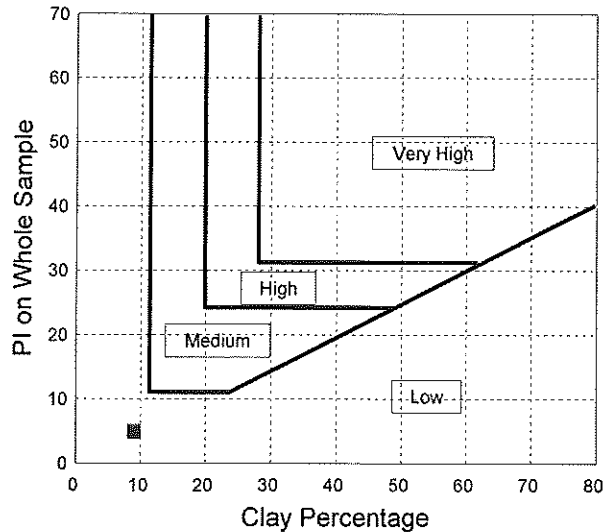
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	27
Plastic Limit	17
Plastic Index	10
Linear Shrinkage	4
Grading Modulus	1.36
PI on Whole Sample	5

#### GRADING ANALYSIS



#### ACTIVITY CHART



# AFRICA EXPOSED

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## FOUNDATION INDICATOR

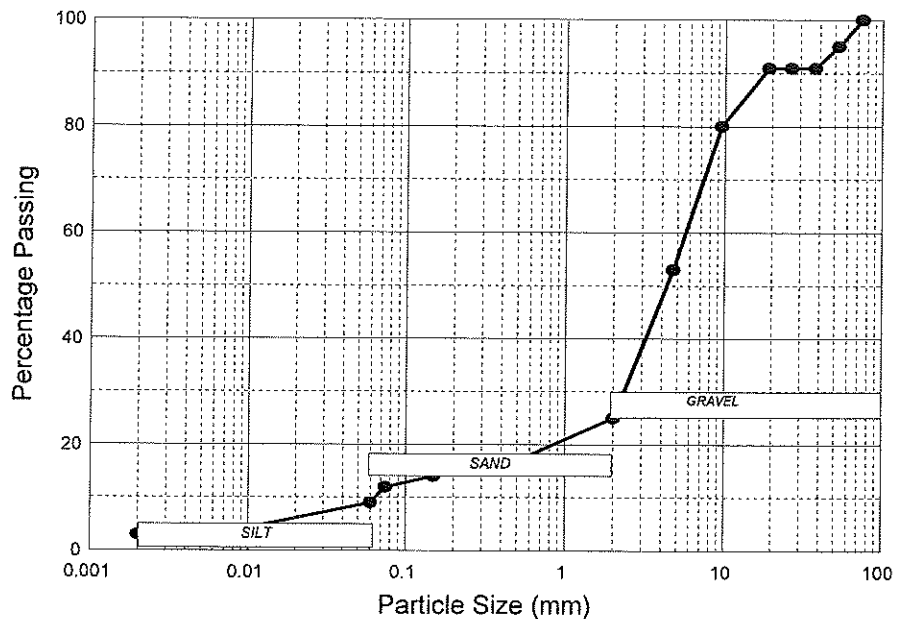
Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 2 @ 1.2-1.3m
Job No	4012	Checked By	JA

### SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	95.00
37.50	91.00
26.50	91.00
19.00	91.00
9.50	80.00
4.75	53.00
2.00	25.00
0.425	16.00

### GRADING ANALYSIS



### HYDROMETER ANALYSIS

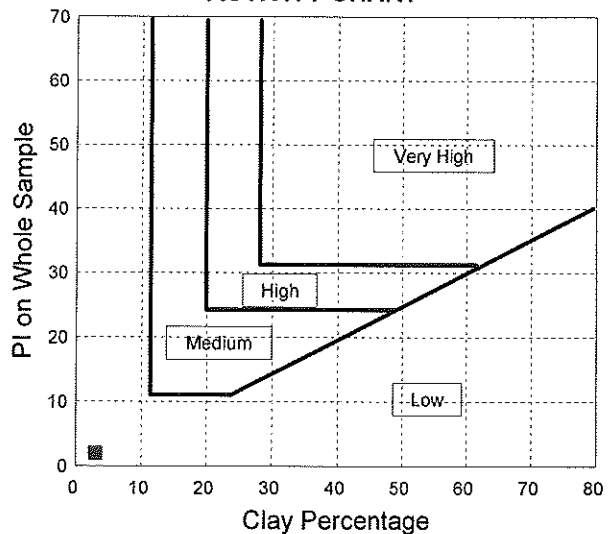
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	15.00
0.1500	14.00
0.0750	12.00
0.0600	9.00
0.0060	3.00
0.0020	3.00

### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	34
Plastic Limit	23
Plastic Index	11
Linear Shrinkage	5
Grading Modulus	2.47
PI on Whole Sample	2

### ACTIVITY CHART



# AFRICA EXPOSED

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### FOUNDATION INDICATOR

Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 5 @ 1.0-1.1m
Job No	4012	Checked By	JA

#### SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	99.00
2.00	93.00
0.425	47.00

#### HYDROMETER ANALYSIS

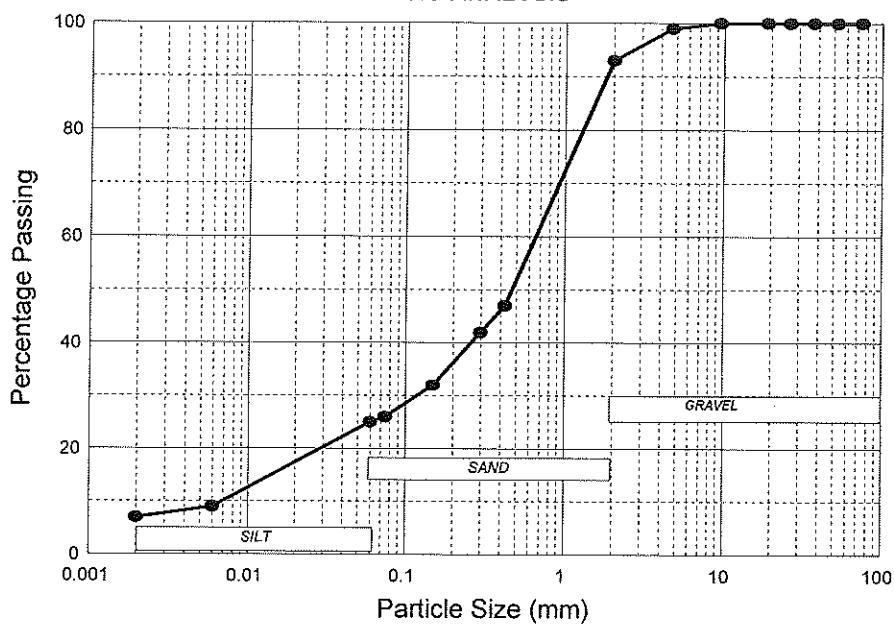
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	42.00
0.1500	32.00
0.0750	26.00
0.0600	25.00
0.0060	9.00
0.0020	7.00

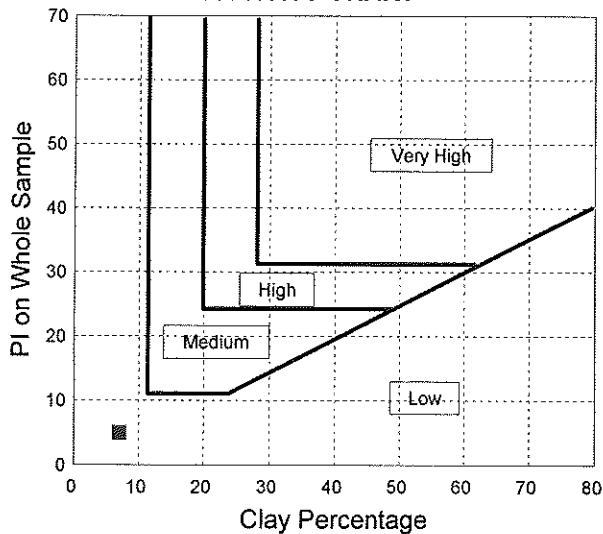
#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	29
Plastic Limit	18
Plastic Index	11
Linear Shrinkage	5
Grading Modulus	1.34
PI on Whole Sample	5

#### GRADING ANALYSIS



#### ACTIVITY CHART



# AFRICA EXPOSED

## CONSULTING ENGINEERING GEOLOGISTS

e-mail: jan@africaexposed.co.za

Tel: (083) 656-0900

P.O.Box 68, Honeydew 2040

Fax: (086) 633-7332

### FOUNDATION INDICATOR

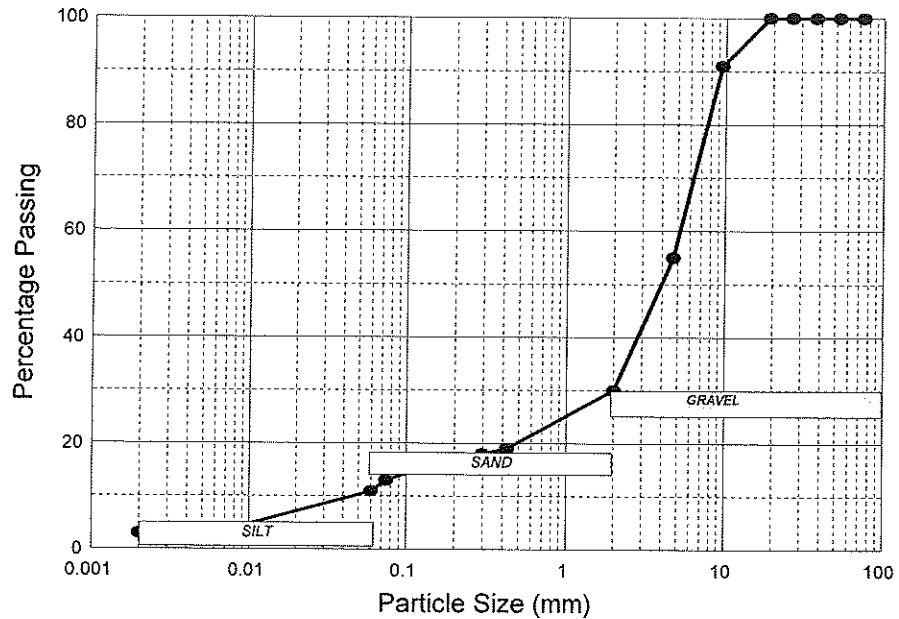
Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 8 @ 0.8-0.9m
Job No	4012	Checked By	JA

#### SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	91.00
4.75	55.00
2.00	30.00
0.425	19.00

#### GRADING ANALYSIS



#### HYDROMETER ANALYSIS

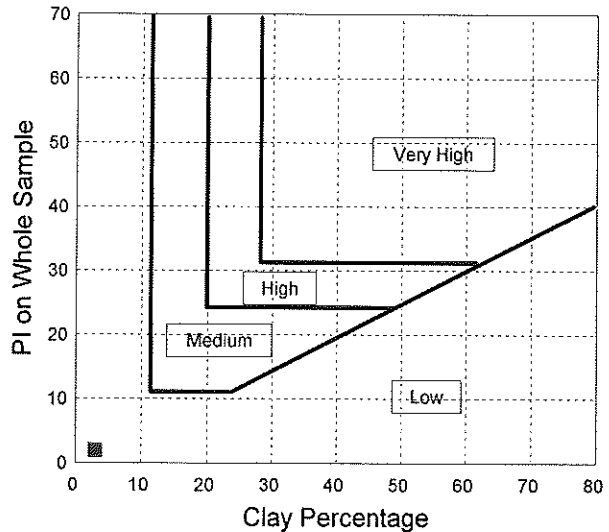
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.3000	18.00
0.1500	16.00
0.0750	13.00
0.0600	11.00
0.0060	3.00
0.0020	3.00

#### ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	29
Plastic Limit	19
Plastic Index	10
Linear Shrinkage	4
Grading Modulus	2.38
PI on Whole Sample	2

#### ACTIVITY CHART





# AFRICA EXPOSED

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Tel: (083) 656-0900

Fax: (086) 633-7332

## COLLAPSE POTENTIAL AT 100KPA

Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 2 @ 1.2-1.3m
Job No	4012	Checked By	JA

Sample Height (mm)	19.03	Sample Diameter (mm)	75	Sample Specific Gravity	2.715
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Sample Preparation	NMC
--------------------	-----

Effective Stress (kPa)	Consolidation Reading	Voids Ratio	Strain (%)
1	1000	0.844	0.000
10	9922	0.837	0.410
20	9870	0.832	0.680
50	9802	0.825	1.040
100	9668	0.812	1.750
100	7494	0.601	13.180
200	6593	0.514	17.910
400	5644	0.422	22.900
200	5665	0.424	22.790
100	5683	0.426	22.700
50	5711	0.428	22.550
20	5753	0.432	22.330
10	5795	0.437	22.110

### Moisture Content Calculations

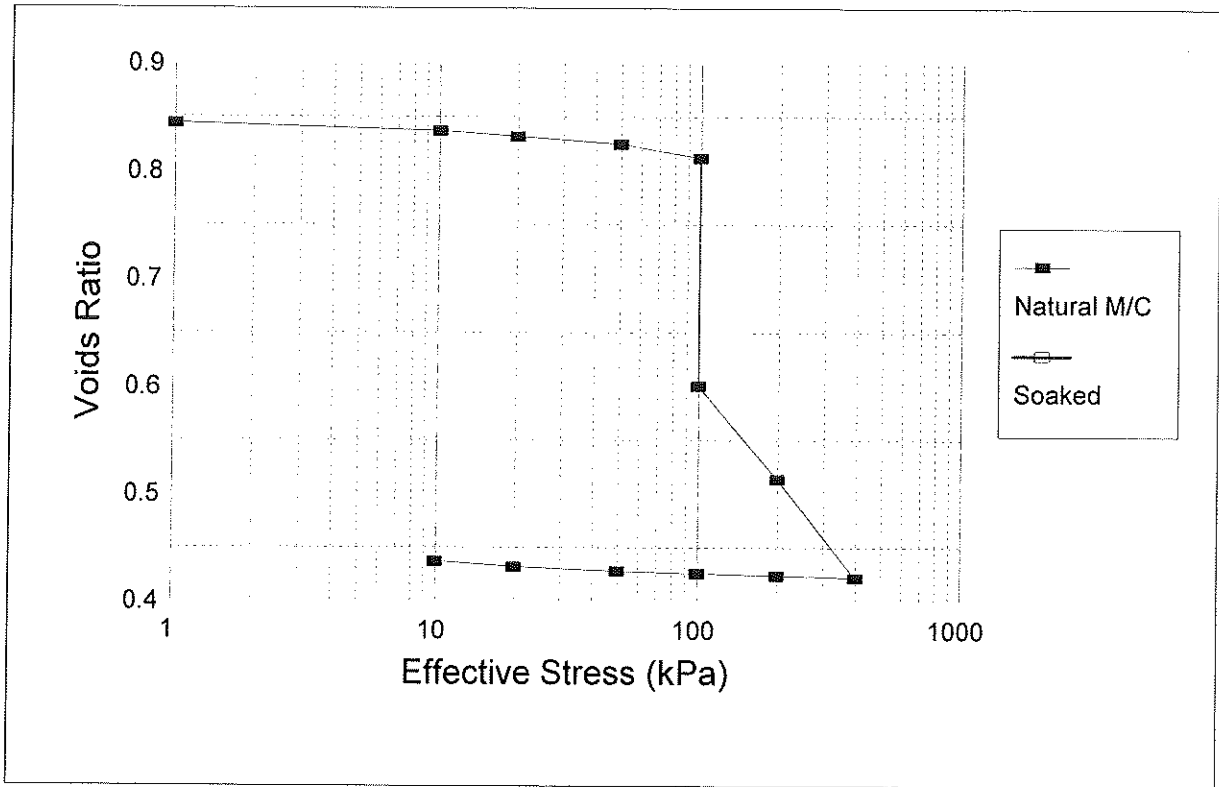
Mass wet sample plus ring before test (gms)	250.30
Mass wet sample plus ring after test (gms)	259.80
Mass dry sample plus ring (gms)	239.90
Mass ring (gms)	116.20
Moisture content before test (%)	8.41
Moisture content after test (%)	16.09

### Other Data

Initial Dry Density (kg/m <sup>3</sup> )	1472
Initial Void Ratio	0.84
Collapse Potential (%)	11.4

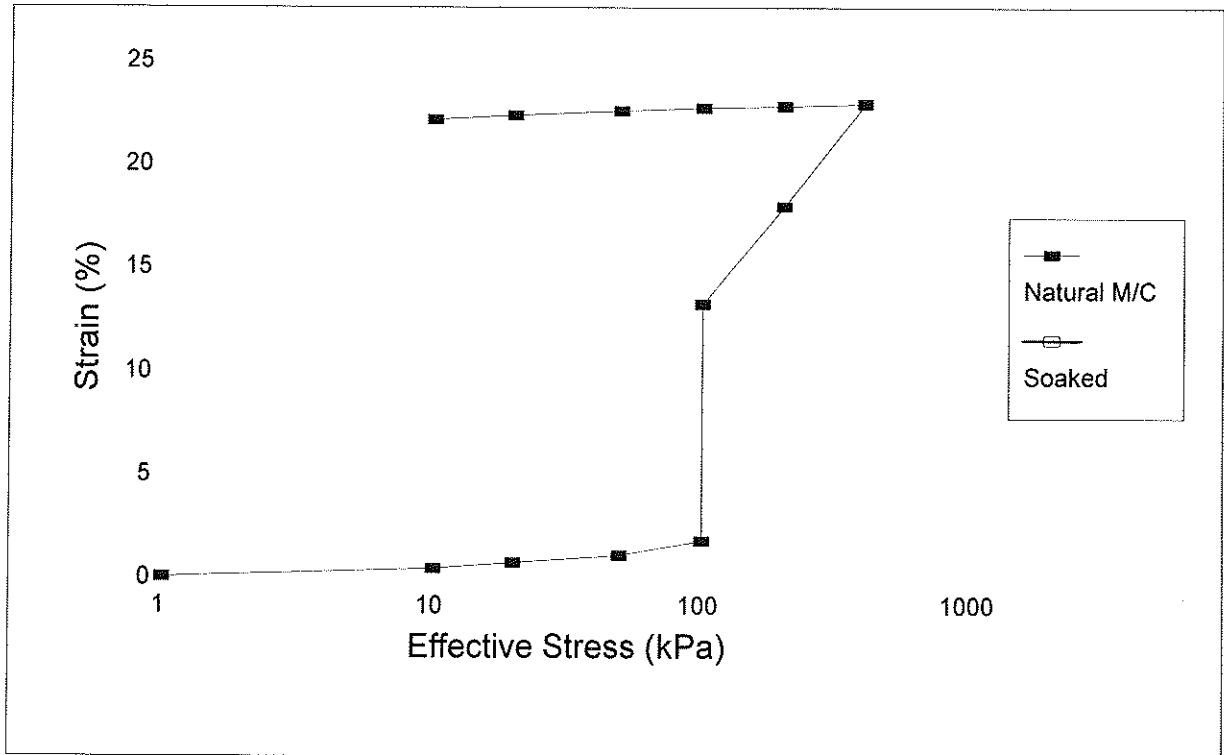
# VOIDS RATIO v EFFECTIVE STRESS

Test No: TP 2 @ 1.2-1.3m



# STRAIN v EFFECTIVE STRESS

Test No: TP 2 @ 1.2-1.3m



# AFRICA EXPOSED

CONSULTING ENGINEERING GEOLOGISTS

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Fax: (086) 633-7332

## COLLAPSE POTENTIAL AT 100KPA

Client	HYDROSCIENCE		
Location	PTN 385 WATERKLOOF 305-JQ, RUSTENBURG		
Date	2012/11/05	Test No	TP 5 @ 1.0-1.1m
Job No	4012	Checked By	JA

Sample Height (mm)	19.03	Sample Diameter (mm)	75	Sample Specific Gravity	2.715
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Sample Preparation	NMC
--------------------	-----

Effective Stress (kPa)	Consolidation Reading	Voids Ratio	Strain (%)
1	1000	0.792	0.000
10	9860	0.779	0.740
20	9780	0.771	1.160
50	9682	0.762	1.670
100	9552	0.751	2.320
100	7258	0.534	14.420
200	6607	0.472	17.840
400	5856	0.402	21.790
200	5865	0.403	21.740
100	5897	0.406	21.570
50	5911	0.407	21.500
20	5925	0.408	21.420
10	5925	0.408	21.420

### Moisture Content Calculations

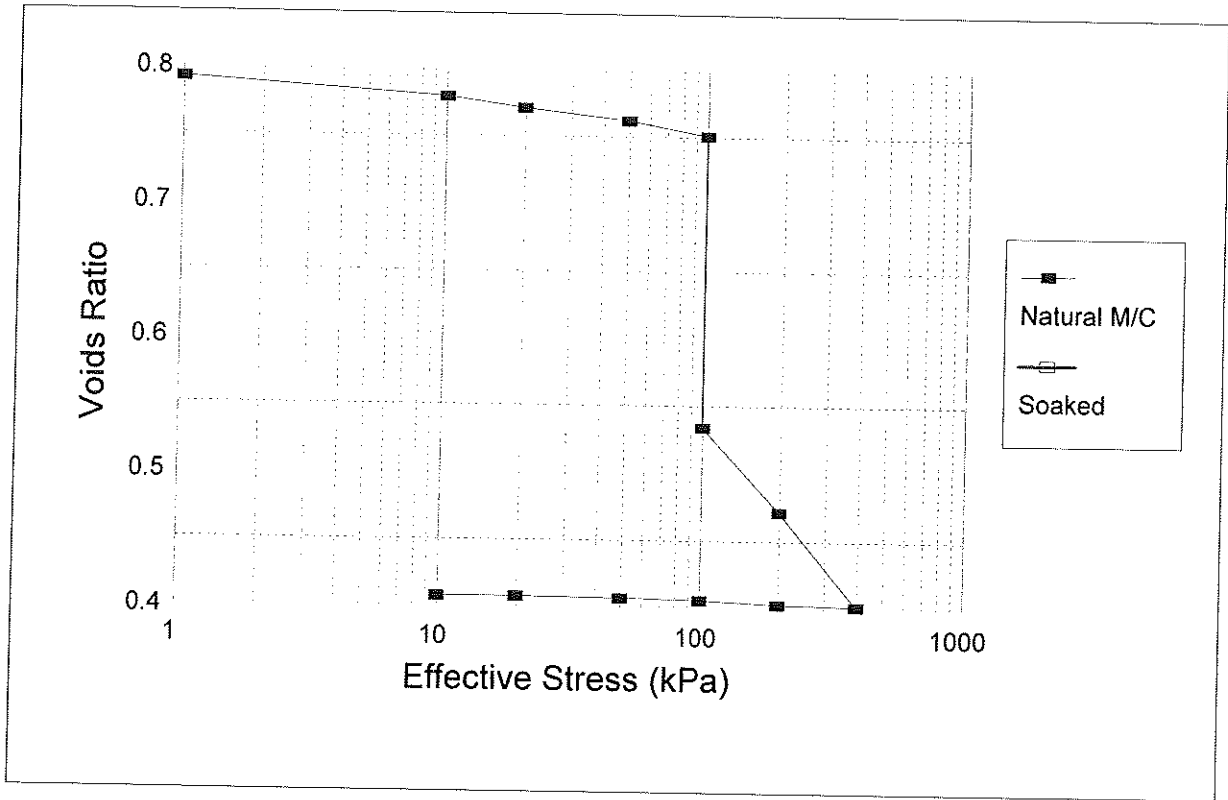
Mass wet sample plus ring before test (gms)	253.10
Mass wet sample plus ring after test (gms)	262.10
Mass dry sample plus ring (gms)	242.90
Mass ring (gms)	115.70
Moisture content before test (%)	8.02
Moisture content after test (%)	15.09

### Other Data

Initial Dry Density (kg/m <sup>3</sup> )	1514
Initial Void Ratio	0.79
Collapse Potential (%)	12.1

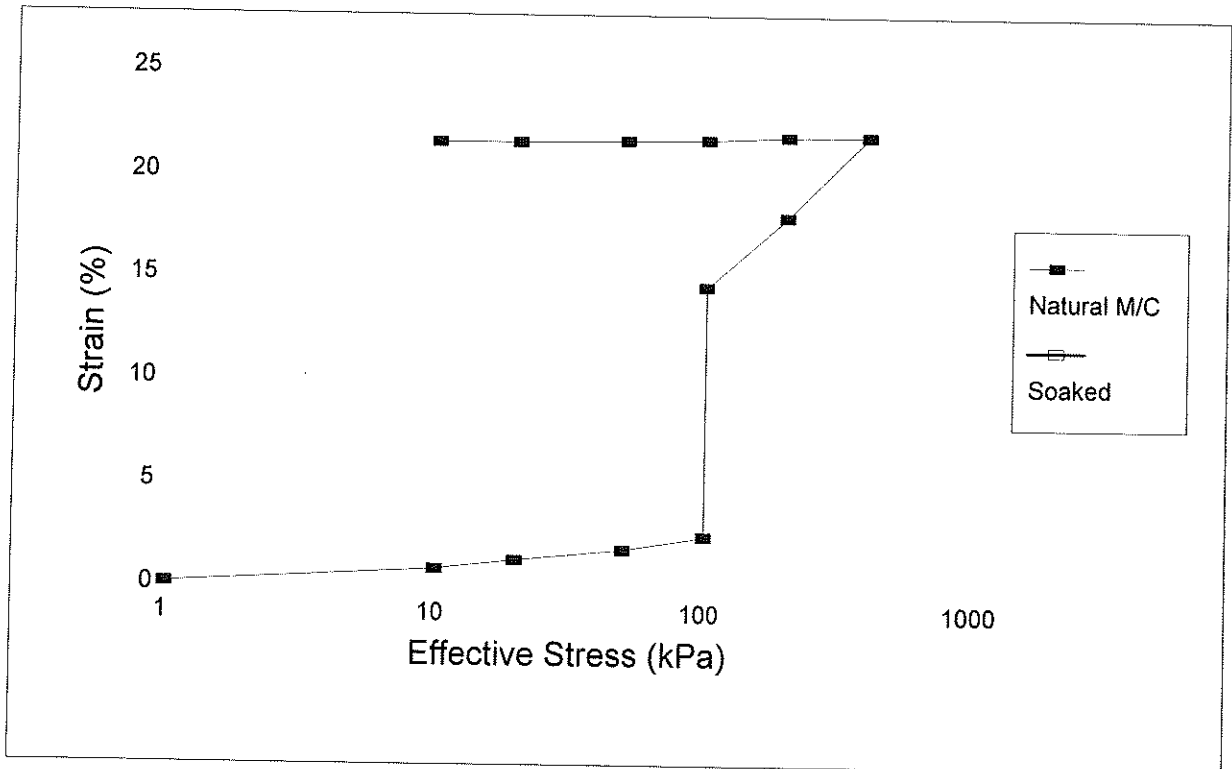
### VOIDS RATIO v EFFECTIVE STRESS

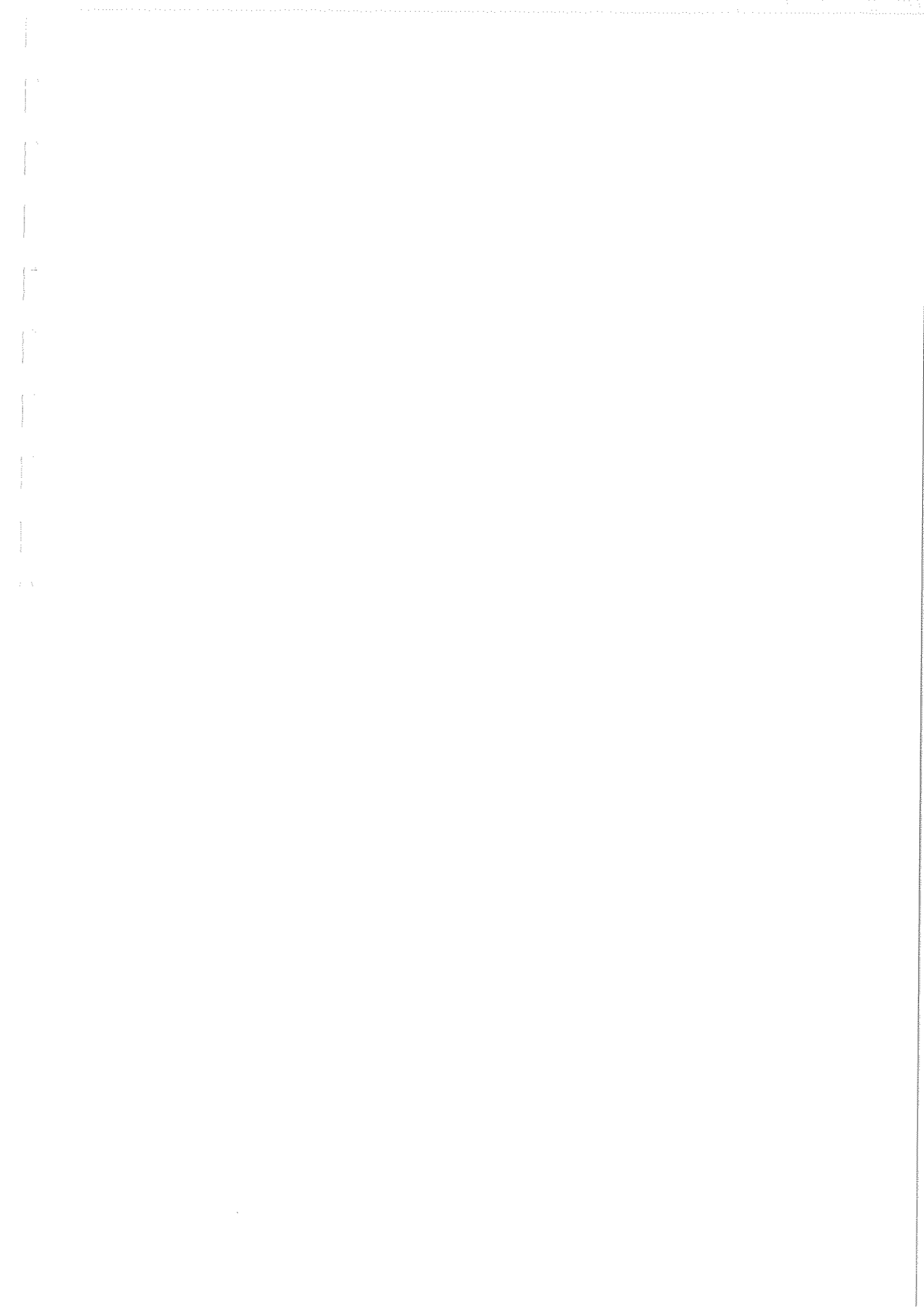
Test No: TP 5 @ 1.0-1.1m

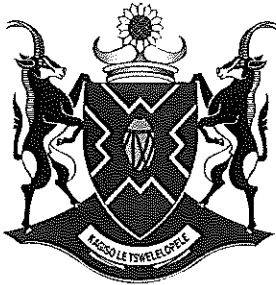


### STRAIN v EFFECTIVE STRESS

Test No: TP 5 @ 1.0-1.1m







the DEDECT

Department:
Economic Development, Environment, Conservation and Tourism
North West Provincial Government
Republic of South Africa

Agricentre Building
Cnr. Dr. James Moroka &
Stadium Road
Private Bag X2039,
Mmabatho, 2735

DIRECTORATE: ENVIRONMENTAL
QUALITY & PROTECTION

Tel: (018) 389 5959/ 5156
Fax: (018) 389 5006
Smukhola@nwpg.gov.za

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

File Reference Number:
NEAS Reference Number:
Date Received:

(For official use only)

Form with three empty rows for reference numbers and date received.

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION 385 OF THE FARM WATERKLOOF 305 JQ, RUSTENBURG, NORTH WEST PROVINCE

Specialist:
Contact person:
Postal address:
Postal code:
Telephone:
E-mail:
Professional affiliation(s) (if any)

Contact details for HydroScience cc, Louise van Wyk, including postal address, phone numbers, and email.

Project Consultant:
Contact person:
Postal address:
Postal code:
Telephone:
E-mail:

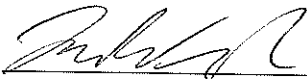
Contact details for HydroScience cc, Paulette Jacobs, including postal address, phone numbers, and email.

4.2 The specialist appointed in terms of the Regulations\_

I, **Louise van Wyk**, declare that --

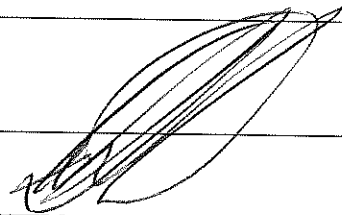
General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

  
Signature of the specialist:

HydroScience cc  
Name of company (if applicable):

2012/11/01  
Date:



COMMISSIONER OF OATHS (RSA)  
DAVID BENJAMIN DICKS PASTOR  
V5317

Signature of the Commissioner of Oaths:

Date:

Designation:

Official stamp (below)



**the DEDECT**

Department:  
**Economic Development, Environment, Conservation and Tourism**  
North West Provincial Government  
**Republic of South Africa**

Agricentre Building  
Cnr. Dr. James Moroka &  
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**DIRECTORATE: ENVIRONMENTAL  
QUALITY & PROTECTION**

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Fax: (018) 389 5006  
Smukhola@nwpg.gov.za

**DETAILS OF SPECIALIST AND DECLARATION OF INTEREST**

File Reference Number: NEAS Reference Number: Date Received:	(For official use only)

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

**PROJECT TITLE**

PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION 385 OF THE FARM WATERKLOOF 305 JQ, RUSTENBURG, NORTH WEST PROVINCE

Specialist:	Africa Exposed Consulting Engineering Geologists	
Contact person:	Jan Arkert	
Postal address:	PO Box 68 Honeydew	
Postal code:	2040	Cell: 083 656 0900
Telephone:	083 656 0900	Fax: 086 633 7332
E-mail:	jan@africaexposed.co.za	
Professional affiliation(s) (if any)	Pr.Sci.Nat (Reg. No. 400050/91)	

Project Consultant:	HydroScience cc		
Contact person:	Paulette Jacobs		
Postal address:	P.O. Box 1322, Ruimsig,		
Postal code:	1732	Cell:	082 850 5482
Telephone:	082 850 5482	Fax:	086 692 8820
E-mail:	paulette@hydroscience.com		



4.2 The specialist appointed in terms of the Regulations\_

I, Jan Arkeest, declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Signature of the specialist:

Africa Exposed Consulting Engineering Geologists

Name of company (if applicable):

21 November 2012

Date:

Signature of the Commissioner of Oaths:

2012-11-21

Date:

CONSTABLE

Designation:

Official stamp (below)

