CLIENT:	**Shellcase 263 (Pty) Ltd**
PROJECT:	**PALM SPRINGS**
DATE:	**AUGUST 2008**
REFERENCE:	**43569**

Assisted by: **Control Civil Services cc**
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AN ENGINEERING GEOLOGICAL INVESTIGATION FOR THE PROPOSED DEVELOPMENT AT PALM SPRINGS, IN THE PROVINCE OF THE EASTERN CAPE

REPORT REFERENCE: 43569 / 2008 **AUGUST 2008**

CONTENTS:

1. INTRODUCTION

1.1 Terms of Reference

This report presents the results of an engineering geological investigation at the proposed residential development at Palm Springs in the Kidd's Beach Nature Reserve close to East London in the Eastern Cape Province. The aim of the investigation was to establish the surface and subsurface engineering geological properties of the site.

1.2 Available Information

a) Site layout plan
b) Profile log
c) Foundation Indicator test result
d) Road Indicators test results
e) California Bearing Capacity test results
f) Dynamic Cone Penetrometer readings
g) Geological Map: Chief Director of Surveys and Mapping: Scale; 1:250000

2. SITE DESCRIPTION

2.1 Topography and Drainage

The site is situated at Palm Springs within the Kidd's Beach Nature Reserve close to East London in the Buffalo City Local Municipality. The site boundaries consisted of a lagoon on the northern, eastern and south eastern sides with the western and southern boundaries being vacant land.

The site varies in elevation between 11 metres above sea level to 18 metres above sea level and slopes gently towards the eastern. At present no drainage has been provided for and occurs by sheetwash in an eastern direction.

2.2 Land Use and Geology

There is no evidence of mining activities having taken place in the study area and was used as agricultural land. The vegetation consisted of natural grasses and small trees.

Moderate coastal climatic conditions prevail in the East London area. Rainfall average is 810mm (as supplied by the Weather Bureau). Summer temperatures vary from an average maximum of 26°C to an average minimum of 17°C whilst winter maximum and minimums are 20°C and 10°C respectively. The prevailing wind direction throughout the year is south westerly with an equally dominant easterly component during the summer months.

Wienerts climatic N number for the area is less than 2, which should indicate that the rocks would decompose implying that chemical weathering would dominate over mechanical weathering

3. INVESTIGATION PROCEDURE

3.1 Field Investigation

The field investigation consisted of eleven (11) trial holes spaced over the study area. The trial pits were excavated on the positions indicated by the client. Dynamic Cone Penetrometer tests were carried out adjacent to each trial hole. The depth of the trial pits varied between 700mm and 1500mm and they were profiled by a qualified Engineering Technician utilising "The Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa" produced by Jennings Brink & Williams. All the trial pits were excavated by Tractor Loader Backactor (TLB).

The trial hole positions are indicated in Appendix A and the soil profiles are included in Appendix B.

3.2 Laboratory Testing

Seventeen (17) disturbed soil samples were taken of typical horizons for Foundation Indicators, California Bearing Ratio's (CBR), Road Indicators and Atterberg Limits tests. Two direct shear tests and two consolidation tests were performed on the sandy material.

RESULT SUMMARY

Trial holes

Hole Trial Number	Material Type	Depth mm	PI	CBR @ 100%	CBR @ 95%	CBR @ 90%	Potential Expansiveness	TRH14 Classification
TP 1	Lt Br sty s	0 – 800	NP	23	15	10		G8
TP 1	Dk R Br sty s	800 – 1200	NP	52	29	16		G7
TP 1	Dk Y sty s	1200 – 1700	6	3	2	1		- G10
TP 1	Dk Y Ss + sty s	1700 – 2200	6	5	3	2		- G10
TP 2	Lt Br sty s	250 – 1000	NP				Low	
TP 2	Dk Y sty s	1000 – 1500	NP				Low	
TP 2	Dk Y Ss + sty s	1500 – 2000	6				Low	
TP 3	Lt Br sty s	600 – 1400	NP				Low	
TP 3	Dk R Br sty s	1400 – 1900	5				Low	
TP 4	Lt Br Lt Y sty s	400 – 2200	NP				Low	
TP 5	Dk Br sty s	0 – 750	5	21	18	15		G8
TP 5	Dk R Br sty s	750 – 1500	4	32	13	5		G9
TP 6	Dk R sty s	200 – 1000	7				Low	
TP 6	Lt R O sty s	1000 – 2400	5				Low	
TP 7	Lt Y sty s	1500 – 2000	NP				Low	
TP 8	Lt R O sty s	1400 – 2300	NP				Low	
TP 9	Dk Y Ss + sty s	1400 – 2000	5				Low	

The swell recorded during the determination of the CBRs indicated that the material had a low swell potential.

The two shear box tests indicated that the angle of internal friction varied between 18.7 and 24.7 degrees with the apparent cohesion 7.6kPa and 0.3kPa respectively. The cohesion values were low and this would have to be taken into consideration for the foundation design.

Two consolidation tests were done and the results indicated a low risk associated with collapse of the material.

4. GEOLOGY

4.1 Regional Geology

According to the geological map published in 1984 by the Chief Director of Surveys and Mapping, the site under investigation falls within the Karoo Sequence represented by the Dwyka Formation, the Ecca Group and the Beaufort Group. These formations consist of sedimentary rocks of mudstones, sandstones and shales with some dolerite dyke intrusions.

4.2 Soil/Rock Horizons

The material sampled and profiled in the trial pits can generally be described as follows:

Transported
The top horizons varied between a silty sand and sandy silt. The depths of these horizons varied between 1400mm up to 2200mm.

Residual
The residual material generally consisted of sandstone. The sandstone was sampled and profiled at six of the ten trial pits at depth in excess of 1400mm.

5. ENGINEERING GEOLOGICAL EVALUATION

5.1 Ground Water

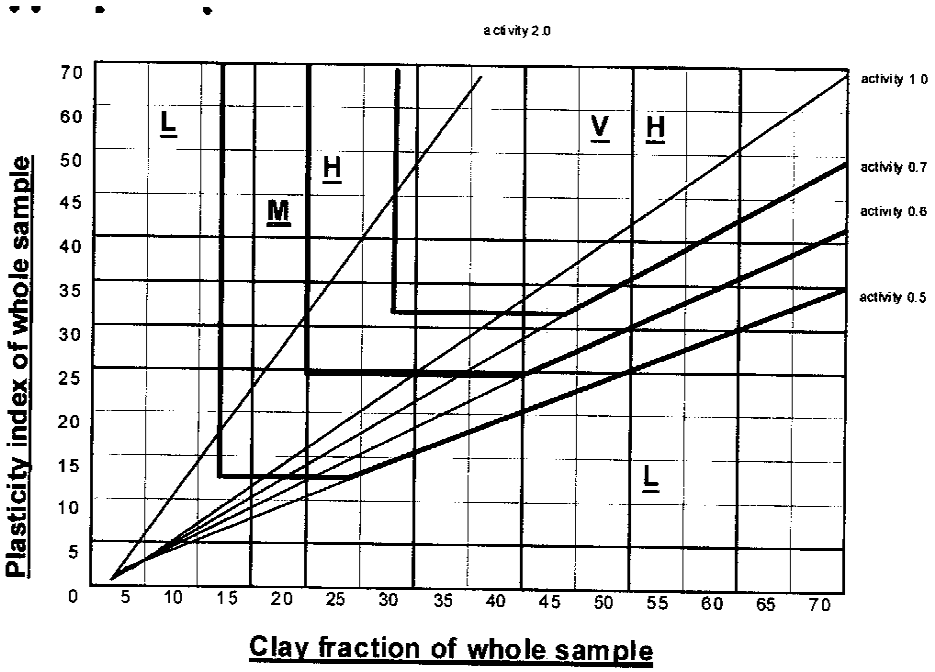
Permanent or perched water tables were encountered in trial pit 7 at a depth of 2000mm. No seepage was encountered in any of the other trial pits.

5.2 Expansive Soil

No clays susceptible to swelling or heaving were encountered on site, and problematic movements associated with expansion are not expected.

From the Foundation Indicator tests carried out all the horizons tested displayed a "low" potential expansiveness classification.

The low expansive sand potential heave of less than 7.5mm per meter may be expected from this horizon. The expansiveness of the horizons tested was evaluated using Van der Merwe's method of classification.



5.3 Collapsible and Compressible Horizons

No signs of a potentially collapsible grain structure were noted in any of the trial holes. The low risk with regards to collapsible material was confirmed by the consolidation tests performed on the sandy material

5.4 Dispersive and Erodable Soil

The soil profile encountered is erodable but and no significant erosion channels were evident during the site investigation, however the fine sandy silt encountered in the top horizon will be dispersive when the vegetation is removed and exposed to the environment, it would therefore be recommended that precautions be taken during construction phase for storm water runoff.

5.5 Bearing Capacity

From the Dynamic Cone Penetrometer (DCP) test the estimated safe bearing capacity from a depth of 500mm is in excess of 70 kPa.

The DCP tests indicated that the bearing capacity of some of the material was low and that needed to be taken into account when designing the foundations.

The shear box tests confirmed the low values with the internal cohesion varying between 0.3kPa and 7.6kPa.

5.6 Excavatibility

No excavation refusals were recorded in all of the trial pits up to a depth of 2000mm. Excavations can be classified as being "soft". Excavations below the refusal depths may require heavier earth moving equipment.

The stability of trenches may be problematic due to the soft sandy transported material profiled and sampled on site. The low internal cohesion and angle of friction indicate that the trenches may collapse and must be taken into account during construction.

5.7 Differential Settlement

Differential settlement should not pose a problem on this site as the materials encountered are fairly homogeneous at founding depths.

5.8 Damp

No seepage of water was encountered in one of the trial pits at a depth of 2000mm. There should not be a problem with regards to dampness.

5.9 Slopes

No indication of the presence of unstable natural slopes was found during the field investigation. However the angle of friction of the sandy material was low and should be taken note off.

5.10 Sinkholes

The materials sampled and profiled on this site should not be susceptible to solution and the likelihood of sinkholes forming was remote.

5.11 Undermined Ground

No indication of the presence of undermined ground was found during the desk study or the field investigation.

5.12 Areas Subject to Flooding

There are no major drainage channels affecting the site.

5.13 Parking Area and Roadways

The material quality of the top 500mm horizon when analysed in accordance with TRH 14, (Guidelines for Road Construction Materials) can generally be classified as G8 material classification.

The material will not be suitable for use in any layer works required for roads, but can be used for subfloor material as well as in the formation (fill) required for the roads. It is recommended that the material for the pavement layers required for the road works be imported from outside the site.

5.14 Construction Material

Some of the silty sand can be used for the under floor compaction material.

6. DEVELOPMENT POTENTIAL

According to the SAICE Code of Practice (Foundations and Superstructures for Single Storey Residential Buildings and Masonry Construction) the site may be classed C1 Class and is defined as silty sands, sandy and gravelly soils. The low internal cohesion must be taken into account in the foundation design.

7. CONCLUSIONS AND RECOMMENDATIONS

Founding conditions on site were not favourable due to the low estimated bearing pressure and cohesion of the sandy material sampled and tested on the site. Material required for the layer works for the roads and parking areas would have to be imported. Selected material may be used for the subfloors.

The site classification is a C1 site class.

Detailed structural design falls outside the scope of this report and it is recommended that suitable foundations be designed for the conditions as set out in items 5 and 6.

The foundation excavations should be inspected by a suitably qualified person prior to construction.

8. REPORT PROVISIONS

This investigation is aimed at providing the engineers and developers with prior warning of the prevailing engineering geological conditions on site. While every effort has been made during the fieldwork phase of this investigation to identify the various soil horizons, their problems and distribution, it is impossible to guarantee that isolated zones of poorer material have not been missed. The investigation was, however, thorough and conditions are not expected to vary from those described in this report.

The engineers are nevertheless strongly urged to inspect service trenches and foundations once opened to assure themselves that conditions are not at a variance with those described in this report. Disparities in founding material type should be referred to an expert.

9. REFERENCES

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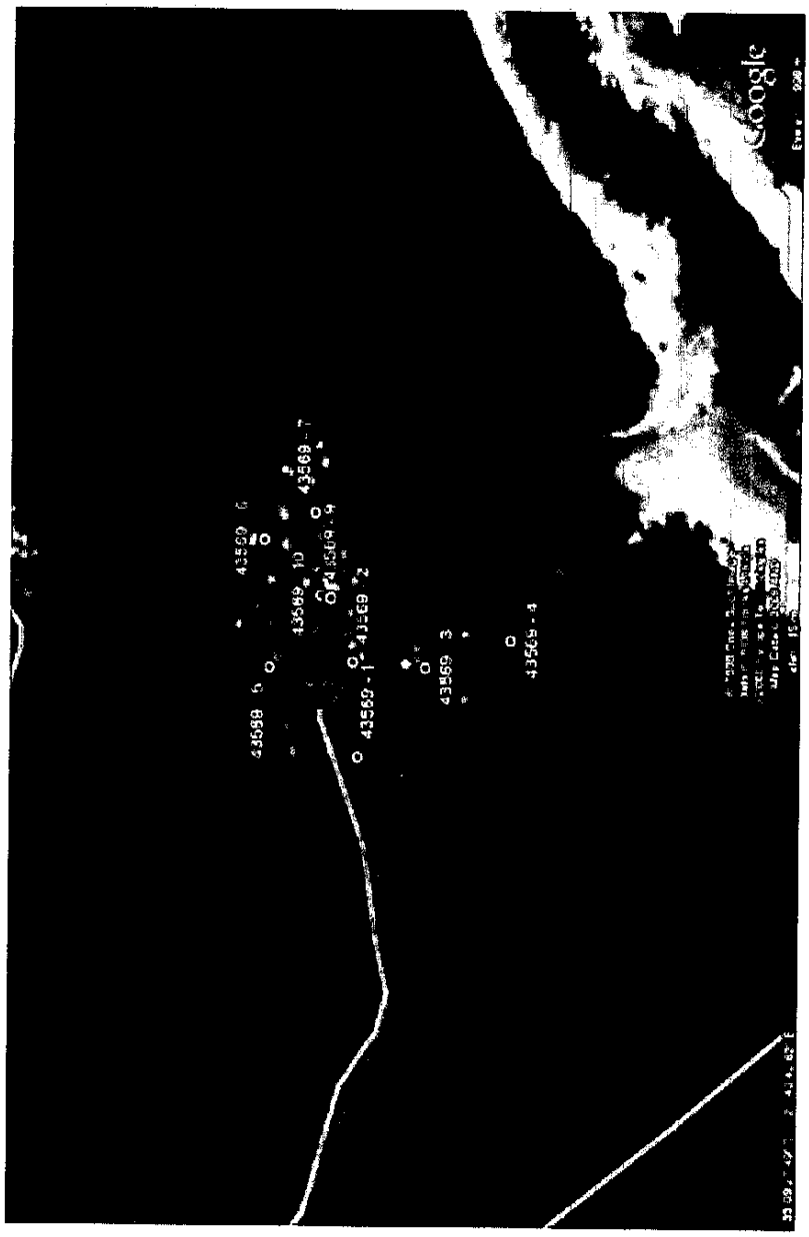
APPENDIX A:

SITE LOCALITY PLAN AND TRIAL HOLE POSITIONS



APPENDIX B:

TRIAL HOLE PROFILES

LABORATORY TEST RESULTS