

ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENTAL IMPACT REPORT

PROPOSED DEVELOPMENT OF ZANDSPRUIT ESTATES ON THE REMAINDER OF THE FARM HAPPYLAND 241 KT: HOEDSPRUIT; MARULENG LOCAL MUNICIPALITY WITHIN MOPANI DISTRICT MUNICIPALITY, LIMPOPO PROVINCE

LIMPOPO PROVINCIAL GOVERNMENT DEPT. OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM: **REFERENCE NUMBER: 16/1/7/2 M22**

Prepared on behalf of

THE APPLICANT: SUGAR CREEK TRADING 33 (PTY) LTD T/ZANDSPRUIT ESTATES

P.O. Box 1018
HOEDSPRUIT
1380

Tel: (015) 793 1421
Fax: (015) 793 0363

For review and approval by

LIMPOPO DEPT. OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

Private Bag X9484
POLOKWANE
0700

Tel: (015) 291 4347
Fax: (015) 295 5015

March 2008

A Draft Report Compiled By

TRIVIRON EAP (Pty) Ltd

P.O. Box 177
WOODLANDS
0072

Tel: (012) 367 0625
Fax: (012) 367 0624
E mail: pieter@triviron.co.za
Enq.: Mr. P De Lange



tel: (012) 367 0625
fax: (012) 367 0624

e-mail:
kim@triviron.co.za
pieter@triviron.co.za

P.O. Box 177
WOODLANDS
0072

Studio 4A
Open Window Art Academy
410 Rigel Avenue
Erasmusrand
0181

Directors:
K.M.C Read BL (Pret)
P. De Lange BL(Pret)
Pr. LArch
Triviron EAP (Pty) Ltd.
Reg. No.
(2006/007050/07)

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION.....	1
1.1 THE APPLICANT	1
1.2 THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	1
1.3 THE PROJECT PLANNING TEAM.....	2
1.4 RELEVANT DECISION MAKING AUTHORITIES.....	2
1.5 THE STRUCTURE OF THIS REPORT	2
1.6 OBJECTIVES OF THE EIA.....	3
CHAPTER 2: DESCRIPTION OF THE PROPOSED ACTIVITY	5
2.1 THE PROPOSED ACTIVITY IN SUMMARY	5
2.2 PROPOSED PROJECT PARTICULARS	8
2.2.1 The DFA Application	8
2.2.2 Section 49 Application: Zandspruit Bush and Aerodrome Estate.....	8
2.2.3 Section 31 Application: Zandspruit Extension 2	9
2.3 PROPOSED ENGINEERING SERVICES AND INFRASTRUCTURE	12
2.3.1 Roads	12
2.3.2 Electricity	12
2.3.3 Water Supply (Demand, Source, Treatment, Storage and Distribution).....	13
2.3.4 Stormwater Management	13
2.3.5 Wastewater Disposal.....	14
2.3.6 Solid Waste	14
2.4 EMPLOYMENT PREDICTION	15
2.4.1 Planning and Development Phase	15
2.4.2 Construction Phase.....	15
2.4.3 Operational and Maintenance Phase	15
2.5 ARCHITECTURAL CONCEPT AND ELEMENTS	16
CHAPTER 3: DESCRIPTION OF THE PROPERTY	17
3.1 LOCALITY	17
3.1.1 Regional Locality.....	17
3.1.2 Kruger to Canyons Biosphere Reserve (K2C)	17
3.1.3 Locality of Proposed Development	17
3.2 PROPERTY DESCRIPTION	18
3.3 SIZE OF THE PROPERTY.....	18
3.4 TITLE DEED	18
3.5 REGISTERED OWNER	19
3.6 LAND CLAIMS	19
3.7 LOCAL AUTHORITY	19
3.8 TOWN PLANNING SCHEME	19
3.9 PRESENT ZONING	19
3.10 IDP FOR MARULENG LOCAL MUNICIPALITY 2002	19
CHAPTER 4: THE AFFECTED ENVIRONMENT.....	21
4.1 THE PHYSICAL ENVIRONMENT	21
4.1.1 Climate.....	21
4.1.2 Topography.....	21
4.1.3 Geotechnical Characteristics	21

4.1.4	Hydrology	21
4.2	THE BIOLOGICAL ENVIRONMENT	21
4.2.1	General Proposed Sensitivity Zonation	22
4.2.2	Flora.....	22
4.2.3	Fauna	24
4.2.4	Conclusion	24
4.3	PHOTOS ILLUSTRATING SITE CHARACTERISTICS	27
4.4	THE SOCIAL, ECONOMIC AND CULTURAL HISTORICAL ENVIRONMENT	29
4.4.1	Cultural Heritage	29
4.4.2	Economic Environment.....	30
4.4.3	Visual Aspects	31
CHAPTER 5: THE PUBLIC PARTICIPATION PROCESS		32
5.1	SCOPING AND EIA PROCESS	32
5.2	SCOPING STUDY PHASE	33
5.2.1	Scoping Study Objectives and Process Undertaken	33
5.3	EIA PHASE	34
5.3.1	Specialist Studies	34
5.3.2	Integration and Assessment	34
5.4	LIST OF REGISTERED INTERESTED AND AFFECTED PARTIES	36
5.5	SUMMARY OF ISSUES RAISED BY REGISTERED I&APs	41
5.5.1	Potential Issues and Impacts	41
5.5.2	Issues and Concerns Identified during the Scoping Study	41
5.6	COPIES OF ANY COMMENTS RECEIVED FROM REGISTERED I&APs	42
CHAPTER 6: A DESCRIPTION OF THE NEED AND DESIRABILITY		43
6.1	Need and Desirability	43
CHAPTER 7: A DESCRIPTION OF ALL ALTERNATIVES IDENTIFIED		50
7.1	LAYOUT ALTERNATIVES	50
7.2	LAND USE ALTERNATIVES.....	52
7.2.1	Status Quo – Sand Mining / Game Farming	52
7.3	TECHNOLOGY ALTERNATIVES.....	52
7.3.1	Alternative Foundation Systems.....	52
7.3.2	Alternative Domestic Sewage Effluent Treatment Systems	53
7.3.3	“No Go” Option	55
CHAPTER 8: SUMMARY OF FINDINGS & RECOMMENDATIONS OF SPECIALIST REPORTS		56
8.1	Ecological Report.....	56
8.2	Heritage Impact Assessment	56
8.3	Geotechnical Report.....	57
8.4	Traffic Impact Assessment	60
Chapter 9: IMPACT ASSESSMENT		61
9.1	SIGNIFICANCE CRITERIA	61
9.2	ASSESSMENT TABLES.....	63
9.2.1	Climate.....	63
9.2.2	Topography.....	64
9.2.3	Geology and Soils	65

9.2.4	Ecology and Biodiversity	67
9.2.5	Hydrology	68
9.2.6	River Rehabilitation	70
9.2.7	Air Quality	71
9.2.8	Aesthetics	71
9.2.9	Noise Intrusion	72
9.2.10	Littering / Solid Waste Disposal	73
9.2.11	Heritage Resources	74
9.2.12	Employment Equity and Occupational Opportunities	75
9.2.13	Inflow of Temporary Workers	76
9.2.14	Sewerage Management	77

CHAPTER 10: ENVIRONMENTAL IMPACT STATEMENT 79

10.1	BIOPHYSICAL ENVIRONMENT.....	79
10.2	SOCIO ECONOMIC ENVIRONMENT	80
10.3	CULTURAL HISTORICAL ENVIRONMENT.....	81
10.4	CONCLUSION AND RECOMMENDATIONS	81

LIST OF TABLES

Table 1: The Applicant	1
Table 2: The Environmental Assessment Practitioner (EAP)	1
Table 3: The Project Planning Team	2
Table 4: The Decision Making Authorities	2
Table 5: Proposed Land Uses.....	5
Table 6: Listed Activities In Terms of Government Notices No. R. 386 and R. 387 of 21 April 2006.....	6
Table 7: Zandspruit Bush and Aerodrome Estate	8
Table 8: Zandspruit Extension 2.....	9
Table 9: Corner Co ordinates of the Remainder of the Farm Happyland 241 KT (dd.ddddd°, WGS84)	17
Table 10: Protected Trees List	23
Table 11: Protected Fauna	24
Table 12: Tasks Undertaken During the Scoping Study Process	33
Table 13: List of Specialist Studies and Specialists.....	34
Table 14: Public Participation Process Undertaken During the EIA Phase	35
Table 15: List of Potential Interested and/or Affected Parties Identified.....	36
Table 16: Summary of Issues Raised By I&APs	41
Table 17: Significance Criteria.....	61

LIST OF FIGURES

Figure 1: Proposed Development and Layout Plan.....	11
Figure 2: 1: 50 000 2430 BD Hoedspruit Locality Map	18
Figure 3: Environmental Sensitivity Map	26
Figure 4: EIA Process.....	32
Figure 5: Original Layout Plan	50
Figure 6: Proposed Layout – Revision 11	51
Figure 7: Septic Tank and Lilliput	54
Figure 8: Septic Tank and French Drain / Soak Away.....	54
Figure 9: The Bio Mite System.....	55

LIST OF APPENDICES

Appendix 1	Engineering Services Report
Appendix 2	Architectural Guidelines and Controls
Appendix 3	Letter to Land Claims Commissioner
Appendix 4	Geotechnical Investigation Report
Appendix 5	Ecological Report
Appendix 6	Heritage Impact Assessment
Appendix 7	Copies of comments received from registered I&APS
Appendix 8	Environmental Management Plan

LIST OF ABBREVIATIONS

amsl	above mean sea level
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
DWAF	Department of Water Affairs and Forestry
I&APs	Interested and/or Affected Parties
EMP	Environmental Management Plan
LDEDE&T	Limpopo Department of Economic Development, Environment & Tourism
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act
NWA	National Water Act
SAHRA	South African Heritage Resources Agency

CHAPTER 1: INTRODUCTION

Triviron EAP (Pty) Ltd. was appointed by Sugar Creek Trading 33 (Pty) Ltd t/a Zandspruit Estates (the Applicant) as the independent Environmental Assessment Practitioners (EAPs), in accordance to Regulation 17 of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 199), to manage an application for environmental authorisation (subject to a Scoping process and Environmental Impact Assessment (EIA) in terms of the Environmental Impact Assessment Regulations Government Notice No. R.385 of 21 April 2006) for the proposed establishment of Zandspruit Estates on the Remainder of the Farm Happyland No. 241 KT.

1.1 THE APPLICANT

Table 1: The Applicant

Applicant	Sugar Creek Trading 33 (Pty) Ltd T/A Zandspruit Estates
Trading Name	Zandspruit Estates
Physical Address	Suite 4, Khayagelo Village, Hoedspruit
Postal Address	P.O. Box 1018, Hoedspruit
Postal code	1380
Telephone	(015) 291 4347
Fax	(015) 295 5015
E Mail	Dickenson.sg@gmail.com

1.2 THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

In terms of the general requirements for an EAP, the EAP appointed must be independent and have expertise in conducting environmental impact assessments, including knowledge of the Act, the EIA Regulations and any guidelines that have relevance to the proposed activity. The Environmental Assessment Practitioner's particulars in this regard are:

Table 2: The Environmental Assessment Practitioner (EAP)

Environmental Assessment Practitioner	Triviron EAP (Pty) Ltd.
Contact Person	Mr P. De Lange
Physical Address	Studio 4A, Open Window Art Academy, 410 Rigel Avenue, Erasmusrand
Postal Address	P.O. Box 177, Woodlands, 0072
Postal code	0072
Telephone	(012) 367 0625
Fax	(012) 367 0624
E Mail	pieter@triviron.co.za
EAP Qualifications & Relevant Experience	Mr. P. De Lange BL(Pret) Pr. LArch, Registered Professional Landscape Architect with the South African Council for the Landscape Architectural Profession (SACLAP) Member Number 20124, 14 years of experience in Environmental Management.
	Mr. N. Arnott BSc (Hons) Environmental & Geographical Sciences

1.3 THE PROJECT PLANNING TEAM

The project team appointed to perform technical and specialist investigations consists of a number of consultants, each a specialist in his/her own field. The consulting firms involved in the technical and specialist investigations are given in Table 3 below:

Table 3: The Project Planning Team

Mr. S Dickinson	Zandspruit Estates
Mr. M den Dunnen	Zandspruit Estates
Ms. T Engelbrecht	Zandspruit Estates
Ms. L Anderson	Zandspruit Estates
Mr. F Pohl	FPohl Town and Regional Planning
Mr. H Slabbert	FPohl Town and Regional Planning
Mr. B du Plessis	Fortsch & Associates (Architect)
Mr. R Fortsch	Fortsch & Associates (Architect)
Mr. S Triegaardt	Consolv Consulting Engineers
Ms. L Wolmarans	Claassen Auret Inc. Consulting Engineers
Mr. G Clarke	Steyn & Clarke Attorneys
Mr. J.P. Hattingh	Rock and Stock Investments cc (Geologist)
Mr. S Gaigher	Archaeo Info Northern Province (Archaeologist)
Me. J Newenham	Biovista Conservation Consultancy (Ecologist)

1.4 RELEVANT DECISION MAKING AUTHORITIES

The relevant decision making authorities in this case are listed in Table 4 below:

Table 4: The Decision Making Authorities

Limpopo Department of Economic Development, Environment & Tourism	Private Bag X 9484 POLOKWANE 0700 Tel: (015) 291 4347 Fax: (015) 295 5015
---	---

1.5 THE STRUCTURE OF THIS REPORT

This report fulfils the requirement of the South African EIA Regulations (2006) for the documentation of the environmental impact assessment report. The structure of this report has been based on section 32 of GN No.385, the Environmental Impact Assessment Regulations (2006), which clearly specifies the required content of an environmental impact assessment report.

The following information, in accordance with Regulation 32 of Government Notice 385, is included in this report:

- (a) Details of the EAP who compiled the report; and the expertise of the EAP to carry out an environmental impact assessment (Chapter 1);

- (b) A detailed description of the proposed activity (Chapter 2);
- (c) A description of the property on which the activity is to be undertaken and the location of the activity on the property (Chapter 3).
- (d) A description of the environment that may be affected by the activity (Chapter 4);
- (e) Details of the public participation process conducted in terms of subregulation (1), including:
 - (i) steps undertaken in accordance with the plan of study;
 - (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;
 - (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties and the response of the EAP to those comments; and
 - (iv) copies of any representations, objections and comments received from registered interested and affected parties (Chapter 5);
- (f) A description of the need and desirability of the proposed activity (Chapter 6);
- (g) A description and comparative assessment of all alternatives identified during the environmental impact assessment process (Chapter 7);
- (h) A summary of the findings and recommendations of any specialist reports (Chapter 8);
- (i) The Impact Assessment: A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures (Chapter 9);
- (j) An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation (Chapter 10);
- (k) A draft environmental management plan that complies with regulation 34 attached as Appendix 8.

1.6 OBJECTIVES OF THE EIA

An Environmental Impact Assessment (EIA) is a planning and decision making tool. The EIA is a process of identifying, predicting and assessing the potential positive and negative socio economic and biophysical impacts of a proposed project. EIA also includes an evaluation of reasonable alternatives, as well as recommendations on appropriate management actions for minimising or avoiding negative impacts, measures for enhancing the positive aspects of the proposal, and specific arrangements or recommendations for ongoing environmental management and monitoring.

The EIA will address the impacts associated with the project, and provide an assessment of the project in terms of the biophysical, social and economic environments to assist both the environmental authorities as well as the project proponent in making decisions regarding the planning and implementation of the proposed project.

The work will be undertaken in compliance with the South African National Environmental Management Act (No 107 of 1998) (NEMA), specifically Regulations in Government Notice No 385, 386 and 387 of 21 April 2006.

The EIA process will consist of three phases, namely the Scoping Phase, the Environmental Impact Assessment (EIA) Phase and The Decision Making Phase.

CHAPTER 2: DESCRIPTION OF THE PROPOSED ACTIVITY

2.1 THE PROPOSED ACTIVITY IN SUMMARY

An application for the establishment of a Land Development Area in terms of Section 31 and Section 49 of the Development Facilitation Act (DFA)(Act No. 67 of 1995) on the Remainder of the Farm Happyland 241KT, was submitted by FPohl Town and Regional Planners on behalf of the applicant.

The proposed Land Development Area (LDA) will be phased into two separate Land Development Areas. In terms of Section 49 of the Act individual farm portions will be created with a "Residential" zoning as well as farm portions with an "Aerodrome" zoning around the airstrip. This development proposal will be known as **ZANDSPRUIT BUSH AND AERODROME ESTATE**, whereas the second phase of the proposed development (to the north) will be developed in terms of Section 31 of the Act and will operate as a normal "township" – known as **ZANDSPRUIT EXTENSION 2**. The said phasing of the development will be on an incremental basis, especially with regards to the installation of engineering services (FPohl, 2007). The proposed development will consist of the following land uses:

Table 5: Proposed Land Uses

	Land Uses	<i>De Facto</i> Land Use	Use Zone	Total
Section 49	"Special" for Residential Farm Portions	Bush Stands	"IX"	132
	"Private Open Space"	Open Space & Conservation area	"XXIV"	8
	"Special Aerodrome Residential"	Only one dwelling and a hanger will be allocated per portion	"IX"	38
	"Aerodrome"	Landing strip Helipads with hangers	XXVII	2
	"Special" for a lodge	Lodge	"IX"	1
	"Special" for a Caretaker and staff accommodation	Caretaker and staff accommodation	"IX"	1
	"Special" for roads and engineering services	Road and Engineering services	"IX"	1
Section 31	"Residential I"	Town Stands (Full title) [Table D, Column 3 of the Peri Urban Town Planning Scheme, 1975]	"I"	375
	"Residential III"	Town Stands (Sectional Title) [Table D, Column 3 of the Peri Urban Town Planning Scheme, 1975]	"III"	7
	"Special" for Hotel	Hotel	"IX"	1
	"Institutional"	Church [Table D, Column 3 of the Peri Urban Town Planning Scheme, 1975]		1
	"Special" for Retirement Village	Retirement Village	"IX"	1
	"Special" for Contractors Yard	Contractors Yard	"IX"	1
	"Special" for Access, Access Control, Security, Gatehouse and the provision of engineering services	Gatehouse	"IX"	2
	"Special" for Engineering Services	Water Tower, Water Treatment Plant,	"IX"	2

Land Uses		De Facto Land Use	Use Zone	Total
		Sewage Works and other civil engineering services.		
	"Special" for Equestrian Sport	Arenas with stands, ablutions and parking, dressage and reining, driving with small carts, jumping and obstacles, long course for distance and speed training, ablutions and office facilities for instructors, participants, officials and centre management, stables, stabling for horses including stalls, tack room, sick room, food storage, hay storage, bedding store, saddle & bridle storage, gates, reception and security control for Equestrian Centre.	"IX"	1
	"Business I"	Shops, Offices and Professional Rooms. [Table D, Column 3 of the Scheme]	"V"	42
	"Special" for Nursery	Nursery	"IX"	2
	"Special" for Roads and engineering services	Roads and engineering services	"IX"	3
	"Special" for Security control	Security control	"IX"	2
	"Private Open Space"	Open space en conservation area	XXIV	6

The abovementioned development intention involves "listed activities" which must be considered, investigated, assessed and reported on to the Limpopo Department of Economic Development, Environment & Tourism (LDEDE&T), who is the responsible competent authority for granting the relevant environmental authorisation.

An application for environmental authorisation must be made before the activity commences. An activity may not commence until environmental authorisation has been obtained as it is illegal in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and the EIA Regulations to start an activity without an environmental authorisation.

"Listed activities" are activities that due to their nature and/or extent are likely to have significant impacts on the environment. The potential impacts of activities must be assessed and reported to the competent authority for consideration and possible authorisation prior to their implementation. Sugar Creek Trading 33 (Pty) Ltd t/a Zandspruit Estates is applying for an environmental authorisation in order to undertake the following listed activities lawfully with the intention of establishing Zandspruit Estates:

Table 6: Listed Activities In Terms of Government Notices No. R. 386 and R. 387 of 21 April 2006.

Activity No(S)	Description Of Activity
Government Notice No. R. 386 – Listing Notice 1	
1 (e)	Any purpose where lawns, playing fields or sports tracks covering an area of more than three hectares, but less than 10 hectares, will be established.
1(k)	The construction of facilities or infrastructure, including associated structures or

Activity No(S)	Description Of Activity
	infrastructure, for the bulk transportation of sewerage and water, including storm water, in pipelines with – an internal diameter of 0,36 meters or more; or a peak throughput of 120 liters per second or more.
1 (l)	The transmission and distribution of electricity above ground with a capacity of more than 33 kilovolts and less than 120 kilovolts.
1(m)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within the 32 meter from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including canals; channels; bridges; dams; and weirs.
1(q)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the landing, parking and maintenance of aircraft including helicopter landing pads, excluding helicopter landing facilities and stops used exclusively by emergencies services; unpaved aircraft landing strips shorter than 1.4 km; structures for equipment and aircraft storage; structures for maintenance and repair; structures for fuelling and fuel storage; and structures for cargo handling.
1(s)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the treatment of effluent, waste water or sewerage with an annual throughput capacity of more than 2 000 cubic meters but less than 15 000 cubic meters.
4	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in stream dam, floodplain or wetland.
7	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.
15	The construction of a road that is wider than 4 meters or that has a reserve wider than 6 meters, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 meters long.
16	The transformation of undeveloped, vacant or derelict land to – (a) establish infill development covering an area of 5 hectares or more, but less than 20 hectares; or (b) residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.
18	The subdivision of portions of land 9 hectares or larger into portions of 5 hectares or less.
Government Notice No. R. 387 – Listing Notice 2	
1 (k)	The construction of facilities or infrastructure including associated structures or infrastructure, for the landing, parking and maintenance of aircraft, excluding unpaved landing strips shorter than 1.4 km in length, but including:

Activity No(S)	Description Of Activity
	Airports; Runways; Waterways; or Structures for engine testing.
1 (p)	The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic meters or more.
2	Any development activity, including associated structures and infrastructure, where the total area of the development area is, or is intended to be, 20 hectares or more.

2.2 PROPOSED PROJECT PARTICULARS

2.2.1 The DFA Application

A variety of land uses are proposed as part of the proposed land development area. The Farm Happyland will be developed in two phases. Application for the establishment of a land development area is made in twofold, namely (FPohl, 2007):

1. An application in terms of Section 49 of the Development Facilitation Act (Act 67 of 1995) – hereafter referred to as the DFA. (**Zandspruit Bush and Aerodrome Estate**)
2. An application in terms of Section 31 of the Development Facilitation Act (Act 67 of 1995) hereafter referred to as DFA. (**Zandspruit Extension 2**)

2.2.2 Section 49 Application: Zandspruit Bush and Aerodrome Estate

The DFA makes provision for the establishment of a land development area (LDA) in terms of Section 49 of the said Act – focussing on so called “small scale farming”. In using the above clause the applicant will strive to achieve 2 main objectives:

1. Contain the township as far north as possible on the Farm Happyland; and
2. Create a natural “buffer zone” between “town” and “farm” – leading to the restriction of possible future urban sprawl towards the south (FPohl, 2007).

Hence, as can be seen from the proposed settlement plan for the southern extent of the proposed land development area, attached hereto as Figure 1, individual farm portions are being created, each with its own individual zoning (restrictive land use right), these include:

Table 7: Zandspruit Bush and Aerodrome Estate

Land Uses	De Facto Land Use	Use Zone	Total
“Special” for Residential Farm Portions	Bush Stands, with 1 dwelling per individual farm portion	“IX”	132
“Private Open Space”	Open Space & Conservation area	“XXIV”	8
“Special for Aerodrome Residential”	Only one dwelling and a hanger would be allocated per portion	“IX”	38

Land Uses	<i>De Facto</i> Land Use	Use Zone	Total
"Special" for a lodge	Lodge	"IX"	1
"Special" for a Caretaker and staff accommodation	Caretaker and staff accommodation	"IX"	1
"Special" for roads and engineering services	Road and Engineering services	"IX"	1
Aerodrome	Runway, helipads and hangers	XXVII	2

A variety of land uses are proposed as part of the proposed land development area. The Farm Happyland will be developed in two phases.

Phase 1: (Zandspruit Extension 1)

- ≠ It the intension to create individual farm portions each with its own specific zoning in terms of the Peri Urban Town Planning Scheme;
- ≠ Farm Portions with a residential zoning will be used for the erection of a single dwelling unit with a maximum of 10 beds per portion;
- ≠ Farm Portions with an aerodrome zoning will be used for the erection of a single dwelling as well as its associated hanger in the aerodrome "estate";
- ≠ The farm portion with the lodge zoning will be used as a lodge;
- ≠ The farm portion with the caretaker zoning will be used as the caretakers home as well as the potential for a maximum of 3 dwellings on the portion;
- ≠ A road portion, for the provision of engineering services and a access road is also proposed;
- ≠ Private Open Spaces are also proposed as individual farm portions for the use of conservation purposes, walking trails, equestrian trails, etc (FPohl, 2007).

2.2.3 Section 31 Application: Zandspruit Extension 2

The DFA makes provision for the establishment of a land development area (LDA) in the form of the so called "township establishment" process as is defined in the Town Planning and Townships Ordinance, Ordinance 15 of 1986. Hence, an application in terms of Section 31 will create zonings and erven in a proclaimed township and its associated general plan – and operate as such. As stated before the proposed land development area will be developed in two separate "phases". Since the northern part of the Farm "Happyland" borders the main access road towards Hoedspruit as well as Hoedspruit Proper towards the northeast the proposed linear type development along the R527 will be developed as an entity and the extension of the existing Hoedspruit Proper township. A mixture of land uses are being proposed in this area with the main objective being the integration of the existing land uses with the newly proposed uses. Individual full title erven are created in the township, which can be transferred to individual landowners. The mix of land uses are shown herein under as well as on the proposed Development and Layout Plan (See Figure 1) (FPohl, 2007).

Table 8: Zandspruit Extension 2

Land Uses	<i>De Facto</i> Land Use	Use Zone	Total
"Residential I"	Town Stands (Full title) [Table D, Column 3 of the Peri Urban Town Planning Scheme, 1975]	"I"	375
"Residential III"	Town Stands (Sectional Title or full title) [Table D,	"III"	7

	Column 3 of the Peri Urban Town Planning Scheme, 1975]		
"Special" for Hotel	Hotel	"IX"	1
"Institutional"	Church [Table D, Column 3 of the Peri Urban Town Planning Scheme, 1975]		1
"Special" for Retirement Village	Retirement Village	"IX"	1
"Special" for Contractors Yard	Contractors Yard	"IX"	1
"Special" for Access, Access Control, Gatehouse and the provision of engineering services	Gatehouse	"IX"	2
"Special" for Engineering Services	Water Tower, Water Treatment Plant, Sewage Works and other civil engineering services.	"IX"	2
"Special" for Equestrian Sport	Arenas with stands, ablutions and parking, dressage and reining, driving with small carts, jumping and obstacles, long course for distance and speed training, ablutions and office facilities for instructors, participants, officials and centre management, stables, stabling for horses including stalls, tack room, sick room, food storage, hay storage, bedding store, saddle & bridle storage, gates, reception and security control for Equestrian Centre.	"IX"	1
"Business I"	Shops, Offices and Professional Rooms. [Table D, Column 3 of the Scheme]	"V"	42
"Special" for Nursery	Nursery	"IX"	2
"Special" for Roads and Engineering services	Roads and engineering services	"IX"	3
"Special" for Security control	Security control	"IX"	2
"Private Open Space"	Open space and conservation area	"XXIV"	6

Phase 2: (Zandspruit Extension 2)

- € This proposed development consists of 3 residential developments as well as a commercial sector.
- € Application is made in terms of Section 31 of the Development Facilitation Act, Act 67 of 1995;
- € The intension is to create individual erven and its associated zonings as indicated on the proposed development plans;
- € The area demarcated to the north of phase 1 will operate as a township;
- € A variety of land uses, to be incorporated into the Peri Urban Town Planning Scheme, are proposed;
- € Residential: A variety of tenure ships is offered by this township, comprising of entry level, sectional title and more expensive residential developments – catering for a wide variety of the Hoedspruit community;
- € Business uses, an old people's home, a hotel, an equestrian sports facility, a church, nursery, private open spaces, roads and engineering services erven make up the bulk of this phase of the development;
- € Finally, a security erf is propped as a buffer between the two different phases (FPohl, 2007).



Figure 1: Proposed Development and Layout Plan

2.3 PROPOSED ENGINEERING SERVICES AND INFRASTRUCTURE

A preliminary design report for the provision of civil engineering services was undertaken by Consolv Consulting Engineers. A summary is presented here, and the complete report may be found in the volume on specialist reports (Refer to Appendix 1).

The development will be provided with high order internal services which will consist of a metered water connection for each site, a waterborne sewerage connection for each site (except for the Luxury Bush and Aerodrome sites in Phase 1) and access to a paved street which varies from concrete strip roads for the Luxury Bush and Aerodrome sites in Phase 1 to surfaced roads of varying classification in Phase 2.

2.3.1 Roads

2.3.1.1 Access

Access to the proposed land development area will be from the R527 (or P116 1), from 4 different access intersections and to the satisfaction of the relevant authority.

2.3.1.2 Internal Roads

A road network will be provided to distribute traffic between activities within the development area. The types of road which will be provided vary from Class 4 local distributors to local Class 5 access roads. Internal road widths will be 4,5m for short entrances and cul de sacs and 5 5,5m (within a 10m road reserve) and 6,8m (within a 16m road reserve) for the larger collection and ring roads. The road surface will be a combination of concrete strip roads with passing bays and precast concrete paving blocks to contribute to a village character. Edging of the roads will have natural finishes, however hard edging (curbs etc) is required to ensure proper storm water management and control to prevent erosion.

2.3.2 Electricity

The expected maximum and average electricity demand for the development is 8MV bulk power supply. The site is located in an ESKOM electricity supply area and will be directly supplied by ESKOM at a system voltage of 11kV. Claasen Auret Inc. Electrical Consulting Engineers has confirmed that the existing distribution network will require minor alterations/upgrading relating to miniature substations/kiosks and cabling after which ESKOM will be able to supply in the demand of the development.

Connection to the existing ESKOM supply point will be via an underground cable ring feed system. Miniature substations will be positioned on the underground ring feed system inside the boundaries of the site. Service connections will be done with underground cable from kiosks ending at each stand. Services will be located within the road reserves to prevent additional environmental disturbances.

Street lighting will be a combination of low intensity, low level, bollard type area luminaries and low intensity, low level decorative type street lighting. Solar power options for the street lighting are being investigated in order to minimise electricity consumption.

The complete electrical infrastructure required for the development will be supplied and installed by the Applicant. Maintenance of the system will be minimal due to the proposed complete underground distribution system that will be provided.

2.3.3 Water Supply (Demand, Source, Treatment, Storage and Distribution)

The estimated Gross Annual Average Daily Water Demand for the proposed development is approx. 2100m³. The demand amounts have been calculated based on the requirements of the "Guidelines for Human Settlement Planning and Design". A breakdown of the estimated daily demand is given in the Preliminary Design Report for the Provision of Civil Engineering Services Report attached as Appendix 1.

Raw water will be sourced from the Blyde River Irrigation Scheme which is owned by the Blyde River Utility Company. Water rights will be purchased as needed and converted to primary use. Water from the Scheme is available from an existing supply point situated in the north western corner of the development area.

A Water Treatment Plant capable of purifying 2 100 m³/day will be constructed in the north western corner of the property to purify the raw water from the Blyde River Irrigation Scheme. The process will consist of the following elements/processes:

- Chemical dosing (with building), lime for stabilization and poly electrolyte for coagulation;
- Flocculation channels;
- Sedimentation;
- Filtration;
- Chlorination;
- Clean water storage;
- Pump station to storage;
- Offices etc.
- Paving and fencing

The storage requirements are 2100 m³ for domestic consumption (24 hours of GAADD) plus 1440 m³ for fire fighting which equates to 3500 m³. It is expected that storage will be provided in two reservoirs of 1750 m³ each. A site has been provided in the layout at the highest point for storage which is located at the closest entrance to Hoedspruit. The elevation of the site is not sufficient to provide sufficient pressure for ground reservoirs, therefore an elevated storage facility or a booster system with standby electricity will have to be provided for the second phase of development.

A number of distribution mains will be provided to distribute the water from the storage reservoirs to the consumers. No other landowner's property will be affected by the proposed water distribution and reticulation systems

2.3.4 Stormwater Management

The area generally drains to the Zandspruit to the north which flows from east to west. The 1:100 year and 1:50 year flood lines have been calculated and are indicated on the layout drawings. No development will be allowed within the 1:100 year floodplain. A number of drainage gulleys which flow through the development from north to south will be used to channel stormwater to the Sandspruit River. It is proposed that all stormwater drainage inlets be fitted with a litter catcher to avoid polluting of water courses.

It is advised that rainwater storage should be provided on site at various places in order to provide a source for irrigation and landscaping. Rainwater storage tanks could either be buried underground and individual units can pump from larger tanks spread evenly across the development, or individual units could each have a rain water tank within the boundaries of a stand.

2.3.5 Wastewater Disposal

2.3.5.1 Bulk Drainage

The area generally drains towards the Sandspruit to the south which flows through the development from east to west. The topography of the areas necessitates the provision of 4 separate sewage pump stations. A sewer rising main will be provided along the northern boundary of the development with Provincial Road R527 to the sewage treatment plant which will be constructed in the north western corner of the development area.

2.3.5.2 Treatment

All the sites within the first phase of development will be provided by the owners with an on site sewage treatment system. It is proposed that the "MaxiGem" mini sewage treatment plant manufactured by Ballam Waterslot (Pty) Ltd be specified as a standard. For the second phase of development, a sewage Treatment Plant will be constructed in the north western section of the development area, capable of treating 2,100 m³ of effluent per day. The treated effluent will comply with the General Standards required by the department of Water Affairs and Forestry and will be discharged into the Sandspruit just below the proposed sewage treatment plant. The process will consist of:

- Screens and grit channels for the removal of grit and intractable matter such as rags, paper and cotton goods;
- Biological nutrient removal reactor;
- Settler;
- Sludge treatment and drying; and
- Site works, paving and fencing.

The sewer reticulation network will be installed with a minimum pipe size of 100mm (internal diameter) and a maximum manhole spacing of 80m. A house connection to each stand will be provided. Manholes will be located for convenient access. The pipes will be placed on the inside or outside of the stands depending on practice in the area and availability of space within the street reserve. The pipes are located to minimize excavation depths due to the expected rocky formations. The sewer network drains to four separate locations along the Sandspruit, where sewage pump stations will be constructed to pump the effluent to the treatment plant.

2.3.6 Solid Waste

The proposed development will generate solid waste from a range of land uses, but predominantly residential. In order to protect the environment and the quality of life for the residents, this waste must be properly managed from "cradle to grave". In the case of domestic residences, waste will be stored in plastic bins (between 85 and 240 capacity). Bulk containers will be used for storage of waste from the hotel, offices and shops.

Solid waste will then be transferred from the storage containers into a collection vehicle. The most common type of collection vehicle is the compactor rear end loader vehicle. Waste will be manually or mechanically loaded into the rear of the vehicle, where it is mechanically compacted to reduce volume. Bulk containers are generally picked up by custom developed load luggers or roll on roll off vehicles. Approved subcontractors to be employed and overseen by the estate management company will then transport the waste to registered landfill sites.

The amount of waste requiring disposal will be reduced by means of recycling certain types of materials in the waste stream. By the introduction of deposit systems on items such as beverage containers, materials that would normally be wasted can be re used. In addition, recyclable materials such as paper, glass, metals, plastics, etc., will be recovered from the waste stream for subsequent use as raw materials in manufacturing processes. Organic waste such as garden waste can also be transformed into compost, a valuable resource, thereby further reducing the size of the waste stream, requiring disposal.

Due cognizance of the above systems will be taken into account and implemented during the design process of the development.

2.4 EMPLOYMENT PREDICTION

The development will have several phases namely planning, development, construction, operation and maintenance phases. In terms of employment opportunities, both permanent and temporary opportunities will be created for local people, as well as people outside of the region.

2.4.1 Planning and Development Phase

The planning phase is the process of establishing the detail brief of the development and obtaining the necessary development approvals. During this stage, mostly professional firms such as architects, engineers, surveyors, environmental consultants, landscaped architects, etc. will be employed by the applicant. It is estimated that approximately 50 qualified professionals will be temporarily employed.

2.4.2 Construction Phase

The construction phase will be divided into two sections, namely the installation of infrastructure and services and the construction of offices, retail, hotel and residential buildings.

During the construction, it is estimated that 1960 employment opportunities will be created. It is estimated that 1500 will be unskilled labour and the balance 460 will be semi skilled and skilled employment. It is further estimated that 1800 of all the employment opportunities will be created for local people, which will be trained to fulfil certain requirements.

Although in total there will be approximately 1960 new employment opportunities created during the construction phases, most of them will be temporary. This total employment will be over a five year period and therefore several people will be employed more than once.

2.4.3 Operational and Maintenance Phase

During the operational and maintenance phases all people employed will be permanently employed. There will mainly be four sections, general estate maintenance, hotel staff, business operators and domestic workers.

For the estate maintenance, people will be employed for security, road maintenance and facility maintenance purposes. These opportunities will all be for local people which will be employed permanently and whom will obtain training in the different services areas. For the hotel, people will be employed for security, servicing and maintenance purposes. Of these opportunities all will be local people which will be employed permanently and whom will obtain training in the different services areas. Domestic workers will be responsible for servicing and maintenance to all the residential homes. It is estimated that all of these people will be local unskilled people whom will obtain training for the specific services provided.

In summary, during the operational phase, it is estimated that 1320 employment opportunities will be created. It is estimated that 1040 will be unskilled labour and the balance of 280 will be semi skilled and skilled employment. It is further estimated that 90% of all the employment opportunities will be created for local people, which will be trained to fulfil certain requirements.

2.5 ARCHITECTURAL CONCEPT AND ELEMENTS

The concept behind this development is to create an architectural language that will blend into the surroundings and have a friendly influence on the environment. Structures and infrastructure will be built in such a way that it will not damage or disturb the natural fauna and flora. The natural quality and richness of this site is the most important element and carries the highest value. Residents and visitors to this development must first see and experience the nature and natural environment. Buildings should be secondary, to compliment the surrounding nature.

Architectural guidelines and controls (Appendix 2), to ensure a harmonious built environment that will be sympathetic to the existing natural beauty of the estate, will be imposed. The Zandspruit Estates Homeowners Association's constitution will require from all property owners to submit building plans and landscaping proposals, including all alterations and or amendments, for approval, prior to them being submitted to the Local Authority.

The purpose of these guidelines and controls will be to ensure a unified common architectural theme with the use of similar materials, colours, textures and roof theme. Emphasis will be given to retaining the natural character of the site. Analysis of the site, the natural bushveld, maintaining views, natural materials, prevailing winds and the objective to ensure a sense of harmony within the estate will be important design criteria.

The architectural concept has taken into account the existing bushveld landscape character that will be maintained throughout the development. Access roads and driveways are to be kept to a minimal allowable width and designed in a natural finish with no hard edging. No bright lights or reflective paint colours for walls and roofs should be allowed. Specific colour palettes will be chosen to ensure that the development blends with the (current) rural landscape. Indigenous vegetation is encouraged to help blend buildings with the natural surroundings. No alien trees or shrubs should be allowed and large lawn areas should be kept to a minimum. All lighting should be shielded to avoid spillage and preferably no brightly lit structures or large colourful signs should be allowed anywhere on the site. Courtyards, water features, decks, pools fenced and pergolas will be designed to be unobtrusive and add to the character of the area and surrounding landscape.

CHAPTER 3: DESCRIPTION OF THE PROPERTY

3.1 LOCALITY

3.1.1 Regional Locality

The Maruleng Municipality is situated in the south eastern quadrant of the Limpopo Province within the Bohlabela District Municipal Area of Jurisdiction. The municipal area extends over 324 699ha. The Maruleng Municipality is bordered by the Kruger National Park to the east, the Ba Phalaborwa and Tzaneen Municipalities to the north, the Lepelle Nkumpi Municipality to the West, and the Tubatse Municipality and Bushbuckridge Municipality to the south.

The main access points to the municipal area are considered to be Klaserie and the Strijdom Tunnel in the south, Ofcolaco in the west and Mica in the north. The town of Hoedspruit can be considered the administrative and economic centre of the area. It is also the location of the Air Force Base Hoedspruit and Eastgate Airport.

There is a booming eco tourism sector in the wider area of the Maruleng Local Municipality. In recent years the amount of game estates, resorts, lodges and guesthouses has risen quickly. There are already more than 100 guesthouses/lodges, holiday resorts and wildlife estates in the Hoedspruit area. The interest in wildlife, arts and crafts, restaurants, shops and tourist infrastructure brings work and opportunity to the region.

3.1.2 Kruger to Canyons Biosphere Reserve (K2C)

The town of Hoedspruit and the subject property falls within the Transition Zone of the Kruger To Canyons Biosphere Reserve. The Transition Zone encompass the regions outside of the buffer zone and largely serves characteristics within the development functions of a Biosphere Reserve. The K2C has five different zone sub divisions namely, agriculture, forestry, mining, urban development and rural.

3.1.3 Locality of Proposed Development

The proposed development is situated approximately 2.5 kilometres west of Hoedspruit and is accessed directly from the main tarred road (the R527) between Hoedspruit and Ohrigstad. The study area comprising the proposed development predominantly falls to the north of the Sandspruit River on the Remainder of Happyland 241 KT (Figure 2) with the exception of a few proposed sites to the south of the river. The Remainder of the Farm Happyland 241 KT is a parallelogram defined by the coordinates in Table 9 below.

Table 9: Corner Co ordinates of the Remainder of the Farm Happyland 241 KT (dd.ddddd°, WGS84)

Farm	Corner	Latitude	Longitude
Happyland 241KT Portion RE	A	S24.35950°	E30.94266°
	B	S24.38679°	E30.90262°
	C	S24.39403°	E30.93153°
	D	S24.37048°	E30.90428°

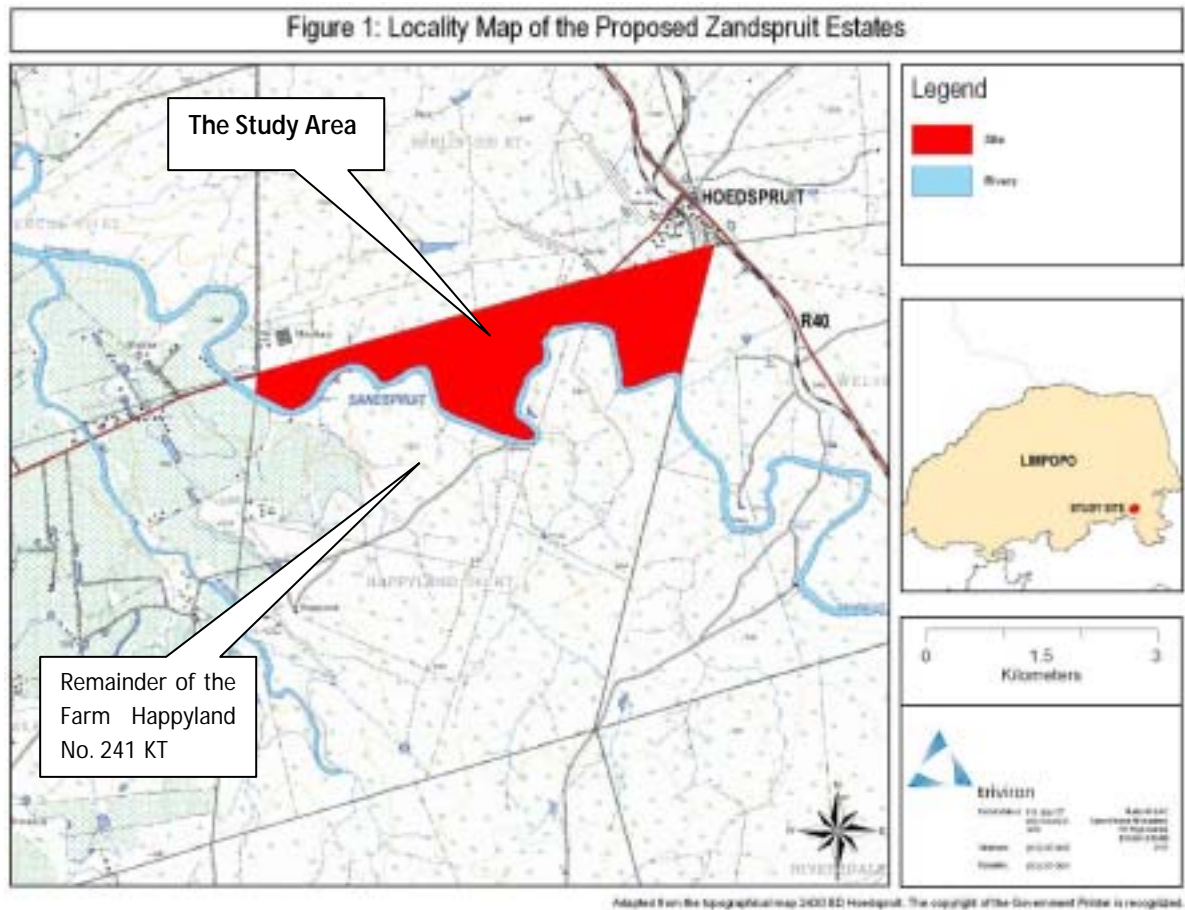


Figure 2: 1: 50 000 2430 BD Hoedspruit Locality Map

3.2 PROPERTY DESCRIPTION

This application is submitted on the Remainder of the Farm HAPPYLAND 241 KT.

3.3 SIZE OF THE PROPERTY

The farm Happyland measures 948.7707ha in extent. The development will be contained between the road (R527) and the Sandpruit River. Hence, the development footprint of the development will be restricted to approximately 300ha. The remainder of the farm (± 600 ha) will be retained as is and will not be developed (FPohl, 2007).

3.4 TITLE DEED

The portion on which this application is being lodged is registered as follows at the Deeds Office (FPohl, 2007):

- € Remainder of the Farm HAPPYLAND 241 KT
- € Title deed number: T115923/2007
- € Owner: Sugar Creek Trading 33 (PTY) LTD
- € Registration Number: 2006/033649/07

3.5 REGISTERED OWNER

In terms of the Title Deed the registered owner of the property is Sugar Creek Trading 33 (Pty) Ltd (FPohl, 2007).

3.6 LAND CLAIMS

A letter to the Land Claims Commission is attached to the application as Appendix 3. The said department will again be formally notified in terms of Regulation 21(10) of Act 67 of 1995 (FPohl, 2007).

3.7 LOCAL AUTHORITY

The site of application is situated within the jurisdiction of Maruleng Local Municipality (FPohl, 2007).

3.8 TOWN PLANNING SCHEME

According to Maruleng Local Municipality, the above site falls under their jurisdiction and within the jurisdiction of the General Peri Urban Areas Town Planning Scheme, 1975 (FPohl, 2007).

3.9 PRESENT ZONING

The site of application is currently zoned "Undetermined" in terms of the Peri Urban Town Planning Scheme, 1975 (FPohl, 2007).

3.10 IDP FOR MARULENG LOCAL MUNICIPALITY 2002

An IDP for the Maruleng Municipal Area has been approved.

In the IDP for Maruleng Municipality it is clear that Maruleng Municipality makes it their priority and earnestness to prevent poverty in their environment, by increasing provision of housing to the needy as well as tourists and such projects that will contribute financially to the Limpopo Province.

Strategy A of the Housing objectives states: "land needs to be acquired to build middle to high income housing in Hoedspruit." The proposed development introduces a variety of tenureships for the entire market, including the lower "beginner" income group.

The Maruleng Municipality is experiencing an economic boom and has gained tremendously the last couple of years from residential developments in and around Hoedspruit. The developments attract buying power to the area, which creates job opportunities for the residents of the area. The under mentioned information are extracts from the IDP.

"Most sectors are very weak, although tourism makes a meaningful contribution to the local economy. The Kruger National Park (KNP) and various world renowned private nature reserves are situated in the district along the boundary of the KNP. "The development introduces a Hotel development as well as a Lodge development to the area.

"The establishment of the Phalaborwa corridor (sub corridor of the Maputo Development Corridor [MDC] presents opportunities for local economic development in the Bohlabela District Municipality. The successful

implementation of these projects could make a meaningful contribution to specifically the Bohlabela District, which has very high levels of unemployment and where household income is very low. The proposed development will create an enormous influx of job opportunities, in the short as well as the long term – since this development will be developed over a number of years and in phases.

The proposed lodge and hotel developments will create in the region of 60 and 100 full time jobs, whereas during the construction phase of the development hundreds of temporary/full time jobs will be created for the following 15 years (FPohl, 2007).

CHAPTER 4: THE AFFECTED ENVIRONMENT

4.1 THE PHYSICAL ENVIRONMENT

4.1.1 Climate

For the Hoedspruit area the average maximum and minimum temperatures for summer and winter are 30.4 / 19.7°C and 25.3 / 11.5°C respectively. Winter temperatures are relatively mild and suitable for the cultivation of sensitive agricultural crops. The relative humidity averages 67.83% and varies within a day and seasonally. Maximum relative humidity occurs in summer months (Nov Feb), minimum in winter (Jun Aug). Annual evaporation approximates 1 500 mm, with a total annual average precipitation of 538 mm. The region is prone to climatic extremes. These include high winds, droughts and hail.

4.1.2 Topography

The topography on which the proposed development is situated is characterised by gently undulating relief sloping southwards to the Sandspruit River. The topography varies in elevation from approximately 520 meters in the north and 480 meters above sea level along the Sandspruit River. The gradient across the property varies between 1:18 and 1:33 excluding the river and stream channels (Rock and Stock, 2007).

Drainage of the development area is towards the south east towards the Sandspruit River which flows from west to east and ultimately northwest discharging into the Blyde River (Rock and Stock, 2007).

4.1.3 Geotechnical Characteristics

Data Collection: Geology and soils information regarding the subject property are presented in the Geotechnical Investigation Report as undertaken by Rock and Stock Investments cc, in 2007 (Refer to Appendix 4).

4.1.4 Hydrology

The Sandspruit River, a non perennial system that may historically have been perennial, dissects the property is the main hydrological feature on the property. The area generally drains to the Sandspruit River to the south which flows from east to west. The 1:100 year and 1:50 year flood lines have been calculated and are indicated on drawings. No development will be allowed within the 1:100 year floodplain. A number of drainage gulleys which flows through the development from north to south will be used to channel stormwater to the Sandspruit.

The ground water table, whether perched or permanent, was not encountered during the geotechnical investigation.

4.2 THE BIOLOGICAL ENVIRONMENT

In order to determine how the biological environment may be effected by the proposed activities, Triviron EAP and Biovista Conservation Consultancy performed an environmental site screening investigation in which they determined the site sensitivity and conservation status for both fauna and flora. The assessment was done at a site specific level (refer to Appendix 5).

The subject property is found within the Acocks Veld Type: Arid Lowveld (11). This veld type typically comprises of *Combretum apiculatum* (Red bushwillow), *Acacia nigrescens* (Knob thorn) and *Sclerocarya birrea caffra* (Marula). This savannah ecosystem has a significant area under formal conservation protection e.g. Kruger National Park. This and the fact that the bushveld is said to be a resilient ecosystem (ability to recover from disturbance) are some of the factors contributing to the belief that it is not considered a threatened environment.

The farm has had some agricultural development in the past, as is evident by the reasonably homogenous, bush encroached habitat to the west of the property (old lands) and various stands of bush encroachment in the rest of the northern portion, most likely attributed to overgrazing from cattle. These stands are dominated by *Dichrostachys cinerea* (sickle bush).

4.2.1 General Proposed Sensitivity Zonation

The subject property has been zoned into 4 Zones (Refer to Figure 3):

1. **Least Sensitive Zone:** Mainly *Dichrostachys* veld – been impacted upon during previous land use practices.
2. **Low Sensitive Zone:** Dominated by typical bushveld vegetation such as *Combretum apiculatum*, *Acacia* sp, *Sclerocarya birrea* and other *Combretum* sp. The only sensitive areas are the very tall trees (10m+) of assorted species and the dead *Combretum imberbe* (Leadwoods).
3. **Intermediate – Sensitive Zone:** Riparian zones of the Sandspruit River and small non perennial drainage lines. These areas are sensitive because it is in these areas that the most biodiversity can be situated. The ecological implications are that the plant diversity is greatest, which in turn provides a variety of habitat for the fauna, food for different species and shelter to different organisms. In addition to this the vegetation helps to stabilise the banks of the drainage lines, thus reducing the erosion potential.
4. **Sensitive Zone:** mainly steep riparian areas. Similarly to the previous zone, this is where the biodiversity is concentrated, but these areas have steep banks – almost vertical in areas, which make them even more susceptible to erosion and collapse, especially close to the edge.

4.2.2 Flora

The following specific areas within the fore mentioned zones are considered to be sensitive:

- € HL 1 (S24.36556°; E030.93779 °): Clump of *Schotias* on the riverbank, burrows beneath, amongst the roots. Important, for bank stabilisation, food and habitat for organisms.
- € HL 2 (S24.37796°; E030.93573 °): *Acacia* sp in association with other species – biologically diverse clump.
- € HL 3 (S24.37699°; E030.93310 °): Knobwood and associated species, biologically diverse clump.
- € HL 4 (S24.37673°; E030.93163 °): A tree clump that is biologically diverse and important for food and habitat (Weeping Boer Bean and *Spirostachys africanus* (Tambotie).
- € HL 5 (S24.36938°; E030.92332 °): Tree clump in the riparian zone including: Marulas and Leadwood.
- € HL 6 (S24.36967°; E030.92129 °): *Spirostachys* in small drainage line.
- € HL 7 (S24.37006°; E030.92075 °): *Schotias* etc. – clump.
- € HL 8 (S24.37401°; E030.90977 °): *Spirostachys*.

- € **HL 9** (S24.37405°; E030.90915 °): Tree clump, although it is small, it is biologically diverse, especially compared to the surrounding vegetation that has been encroached upon, thus providing refuge for more specialised faunal species. (*Acacia*, *Euclea*, *Schotia* etc).
- € **HL 10** (S24.37413°; E030.90886 °): Tree clump – small but as for HL 9.
- € **HL 11** (S24.37328°; E030.91056 °): Tree clump including Leadwood and *Acacia* sp.
- € **HL 12** (S24.37266°; E030.91116 °): Tree clump including Leadwood and *Acacia* sp, *Scotia*, *Grewia*, *Lonchocarpus*. Valuable source of food and shelter especially for birds and small mammals.
- € **HL 13** (S24.36771°; E030.91890 °): *Combretum* clump.
- € **HL 14** (S24.36929°; E030.93650 °): Tree clump including *Schotia*, *Spirostachys*, *Lonchocarpus* & *Diospyros*. Valuable source of food and shelter especially for birds and small mammals.
- € Individual **Marula & Weeping Boer Bean** (*Schotia brachypetala*) trees that are 8m and higher in any of the zones. These big trees are important to genetic diversity of the respective species as well as being valuable habitat and especially food resources to different organisms.
- € All other **tree species** that are **greater than 10m** in height – in particular: Leadwoods, Knobthorns, Apple Leaf (formerly *Lonchocarpus capassa*). These large specimens are important genetically for each of the respective species and they are also important habitats for a variety of organisms, especially reptiles, small mammals and birds.
- € All **big large** (c. 7m and higher) **dead trees** in particular the Leadwoods. These trees, despite being dead, provide habitat for a number of organisms, in particular reptiles (lizards, geckoes and skinks mainly) and nest sites for a variety of birds (e.g. wood peckers, and a variety of raptors).
- € The list of relevant (to this site) **protected tree species** under the National Forests Act, 1988 (Act No. 84 of 1988), is summarized in the table below. The act states that “no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or to both a fine and imprisonment”.

As with all the above mentioned areas it is acceptable to incorporate the identified sites in the plans but avoid removal.

Table 10: Protected Trees List

Scientific Name	Common Name	Relevant legislation
<i>Afzelia quanzensis</i>	Pod Mahogany (207)	Schedule A Protected trees in Forest Act
<i>Balanites maughammi</i>	Torchwood (251)	Schedule A Protected trees in Forest Act
<i>Combretum imberbe</i>	Leadwood (539)	Schedule A Protected trees in Forest Act
<i>Pittosporum viridiflorum</i>	Cheesewood (139)	Schedule A Protected trees in Forest Act
<i>Pterocarpus angolensis</i>	Wild Teak (236)	Schedule A Protected trees in Forest Act
<i>Sclerocarya birrea caffra</i>	Marula (360)	Schedule A Protected trees in Forest Act
<i>Spirostachys africana</i>	Tambotie	Schedule 11 Protected plants (section 69 (1) (a))
<i>Berchemia zeyheri</i>	Red ivory	Schedule 11 Protected plants (section 69 (1) (a))
<i>Adenium species</i>	Impala Lilies	Schedule 11 Protected plants (section 69 (1) (a))
<i>Olea species</i>	Olive trees	Schedule 11 Protected plants (section 69 (1) (a))
<i>Stapelia species</i>	Stapeliads	Schedule 11 Protected plants (section 69 (1) (a))

4.2.3 Fauna

The only possible Red data Species that may be found on the property include:

- € Bat Hawk (Rare): Breeds & roosts in tall trees.
- € Martial Eagle (Vulnerable): All terrestrial habitats except montane grasslands and the interior of evergreen forests.
- € Bateleur (Vulnerable): any woodland / savannah – prefers tall leafy trees in which to place nests.
- € Thickbilled cuckoo (Rare): Woodland & forest edges – dependent on the survival of woodland in the eastern Transvaal lowveld and its host Redbilled Helmetshrike.
- € Ground hornbills (Vulnerable): Breeds in holes in trees – especially old dead trees, and forages in grassland / savannah woodland.
- € African rock python (Vulnerable): variety of habitats including moist areas, it is a very good climber.
- € Honey badger (near threatened): Savannah – generalist carnivore.
- € Schreiber's long fingered bat (near threatened): Savannah woodland, insectivore.
- € Welwitsch's bat (near threatened): savannah, insectivore roosts in shrubs & trees.
- € Rusty bat (near threatened): savannah, riparian woodland, insectivore.
- € Pangolin (Vulnerable): variety including savannah woodland, ant / termite niche.

In addition to these species there are some organisms that are protected by provincial legislation.

Table 11: Protected Fauna

Scientific Name	Common Name	Relevant legislation
Mammals		
<i>Otolemur crassicaudatus</i>	Bushbaby	Schedule 2 Protected game (section 4(1)(b))
<i>Galago moholi</i>	Lesser Bushbaby	Schedule 2 Protected game (section 4(1)(b))
<i>Mellivora capensis</i>	Honey Badger	Schedule 2 Protected game (section 4(1)(b))
<i>Manis temminckii</i>	Pangolin	Schedule 2 Protected game (section 4(1)(b))
<i>Orycteropus afer</i>	Antbear	Schedule 2 Protected game (section 4(1)(b))
<i>Raphicerus campestris</i>	Steenbok	Schedule 2 Protected game (section 4(1)(b))
Birds		
All birds except those exuded in other schedules (34 species)		Schedule 2 Protected game (section 4(1)(b))
Reptiles		
All retiles except water and rock leguans, & all snake species.		Schedule 2 Protected game (section 4(1)(b))
Invertebrates		
<i>Ceratogyrus spp.</i> , <i>Harpactira spp.</i> & <i>Pterinochilus</i>	Baboon Spider Genera	Schedule 7 Invertebrates (section 35 (1))

4.2.4 Conclusion

The proposed Zandspruit Estates development is located in the Arid Lowveld, which is not a threatened ecosystem, never the less there are a few areas that are considered to be sensitive or potentially sensitive. The area has been allocated a rough zonation, consisting of 4 different zones, namely: Least sensitive, Low

sensitivity, Intermediate to sensitive and sensitive. The most sensitive areas are those located along the Sandspruit River, the bush clumps, the very tall trees and the old dead leadwoods. The riparian and bush clumps are the most biologically diverse areas, providing habitat, shelter and food resources for different organisms, hence their rating as sensitive.

There are a few taxa that are either protected or are Red Data species (both flora & fauna) that may / may not occur on the property. The habitats of these species have been taken into consideration in this general assessment, and therefore no further deliberation needs to be made when planning the layout of the development.

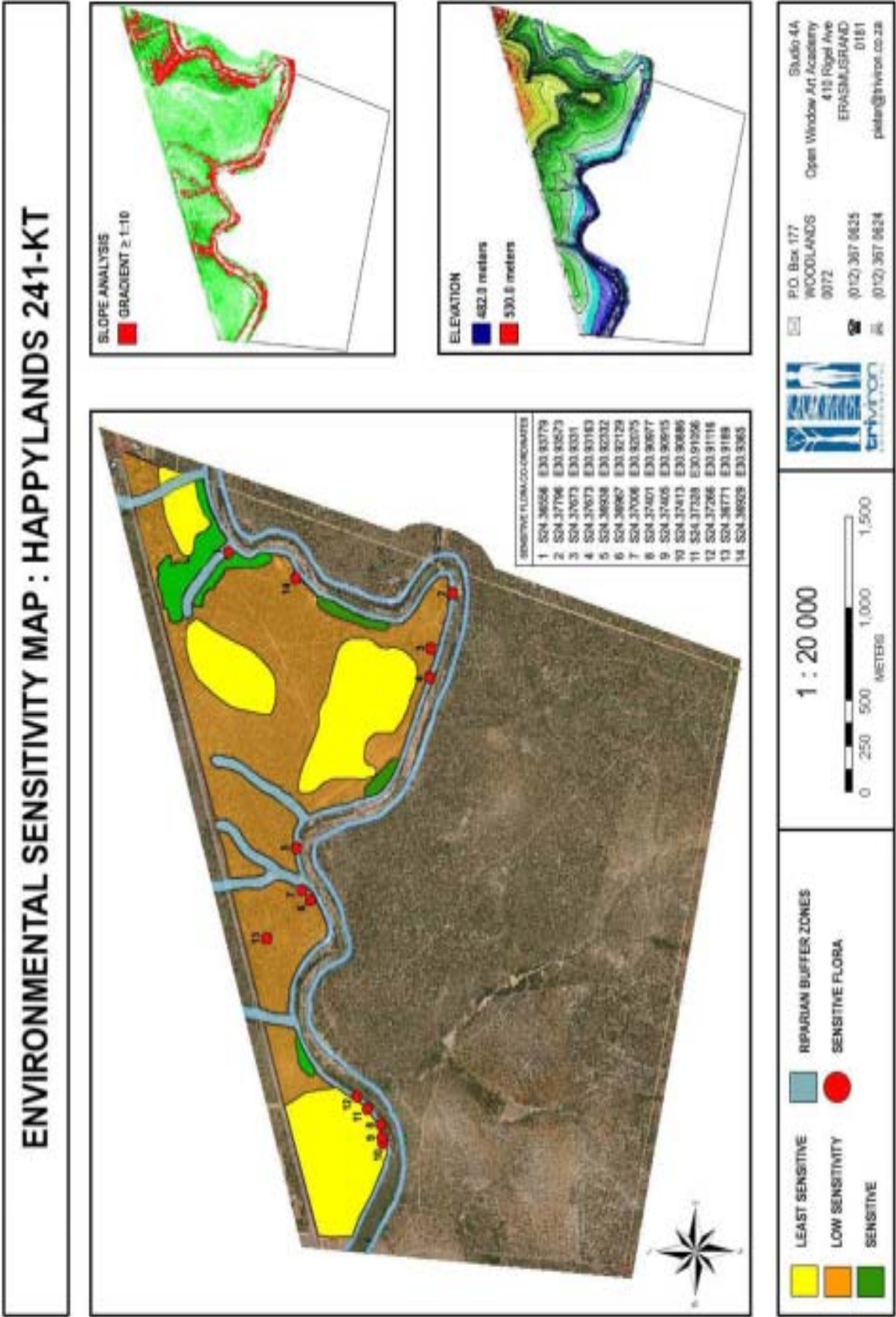


Figure 3: Environmental Sensitivity Map

4.3 PHOTOS ILLUSTRATING SITE CHARACTERISTICS



Existing Buildings



Existing Buildings – Vodacom Tower



Existing Buildings



Remains of Brick Manufacturing Operations



Remains of brick Manufacturing Operations



Existing Gravel Roads



Existing Gravel Roads



Existing Landing Strip



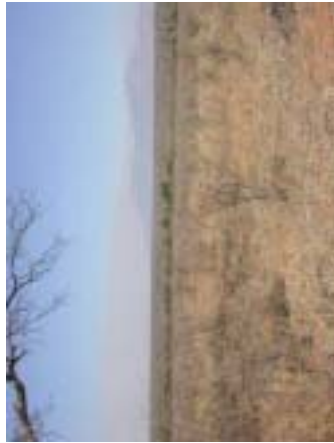
Rubble and Waste Dump



Sand Mining In Sandspruit River



Remains of Brick Manufacturing Operations



Agricultural Fields



Sand Mining In Sandspruit River



Sand Mining In Sandspruit River



4.4 THE SOCIAL, ECONOMIC AND CULTURAL HISTORICAL ENVIRONMENT

4.4.1 Cultural Heritage

Archaeo Info Northern Province (AINP) conducted a cultural heritage survey, focussing on the archaeological and historic remains on the Remainder of the Farm Happyland 241 KT. More specifically, the aim of this investigation was to record and document cultural heritage which consist of visible archaeological and historical artefacts, structures (including graves) and settlements of cultural significance within the boundaries of the proposed development. (Refer to Appendix 6).

In summary 3 important sites were identified, namely:

€ Site 1: ZEE 001

GPS Location: 24,37192° S, 30,92655° E

This site was located on the eastern side of the existing landing strip along the middle of the runway. The site is poorly defined on the surface and only the occurrence of a few ash concentrations as well as numerous potshards gives any indication of the locality of the site. After intensive investigations it seems that the site is located over an area of roughly 50m x 200m reaching from the edge of the existing runway 50m to the east and 200m along the length of the runway. It is quite likely that the construction of the existing airstrip could have contributed to damage to the site as well as causing heightened erosion from runoff from the compacted airstrip. Several potshards (some with identifiable decoration) as well as several animal bones (eco facts), upper and lower grinding stones as well as polishing stones were identified over the area of the site.

€ Site 2: ZEE 002

GPS Location: 24,37021° S, 30,91827° E

This site is located in the western section of the farm. A number of brick and concrete buildings as well as several concrete slabs were founded over an area of approximately 50m x 100m. Although the buildings seem to be of different ages none of them showed indications of being more than 40 years old. None of the buildings are currently being inhabited on a permanent basis. This site is clearly from the recent history of the farm, <40 years of age which placed it within the post contact phase but also places it outside the jurisdiction and protection of the National Heritage Resources Act.

€ Site 3: ZEE 003

GPS Location: 24° 21' 38" S, 30° 56' 29" E

This is the location of the Happyland farm homestead. Three brick and cement buildings are located here with two of the structures being occupational and the third a shed. Several smaller structures are also scattered over the approximately 1ha area. The houses are all built in the classic late colonial style with wide veranda's and corrugated iron roofs.

Interviews with several people gave a wide variety of estimates for the age of the buildings located here. Estimates vary from over 100 years to 60 years of age. It does however seem clear that these buildings are at least more than sixty years old (no physical proof of this could be found however). This places them under the

protection of the National Heritage Resource Act (NHRA). The sites are also definitely from the post contact phase.

€ Recommendations

Due to the sensitive nature of the site identified at ZEE 001, combined with the destructive nature of the development proposed a second phase of investigation is recommended. This will entail the following action;

- § A site visit with representatives of SAHRA Limpopo and if possible SAHRA National Office.
- § Discussion of the relevance of the heritage practitioner's evaluation of the significance of the site.
- § Discussions concerning the importance of the site versus the public benefit from the development.
- § Determining the mitigatory measures that will be imposed by SAHRA for satisfactory mitigation of the site.
- § Compilation of a report setting out the necessary steps for the client.
- § Submission of report to client and SAHRA provincial.

The site at ZEE 002 does not entail a site of any heritage importance and provided care is taken of unmarked graves in the area, construction here can continue. It is recommended that the social consultant on the project tries to identify the previous occupants of these structures and determines if any unmarked graves are located in the vicinity.

The buildings at site at ZEE 003 are old enough to be classified as historic structures and enjoy protection from the NHRA. Should the developer decide to demolish, alter or remove any part of it from its original position, a permit will have to be obtained from SAHRA. It is the recommendation of AINP that these structures rather be incorporated within the development as a possible site museum for the site at ZEE 001. This will add to the historic significance of the development and give a unique angle on the areas history.

4.4.2 Economic Environment

The subject property is located within the jurisdiction area of the Maruleng Municipality with the following profile:

- **Demography**

The majority of the population of the Maruleng Municipality reside in 21 rural villages, most of which are situated to the west. The current total population of the Maruleng Municipality is approximately 98 000 people. Less than 2% of the population reside in Hoedspruit, the air force base, and Kampersrust. Population figures display a variation of almost 40% between alternative information sources. Without research it is not possible to establish which figures are most accurate.

- **Income per Household**

Income from employment is a critical factor as it determines the overall living standards of people. The Limpopo Province is characterised by high levels of poverty, especially in the rural areas, and is reflected by the low annual income per household in these local municipal areas. By far the majority of the people in the Bohlabela District live in rural areas and the majority (at least 70%) of these rural residents are poor. Incomes in these rural areas are constrained by the rural economy, which is unable to provide these people with remunerative jobs or self employment opportunities. It is evident from the available information that approximately 74,66% of the households in the District Municipality area are dependent on a subsistence income (breadline income) and include some 31,85% with no income. These households have less than R9600

per annum (R800/month), which is generally regarded as a minimum (subsistence) income for households to survive in the Limpopo Province. The situation is very similar in the two local municipal areas, with Bushbuckridge registering 70,23% of the households having less than R12000/year and 20.86% of these households have no income at all. Maruleng has 74,66% households which have less than R9600/year and a very high 31,85% of these households have no income at all.

- **Employment**

Interpretation of the employment status per local municipality and for the Bohtabela District as a whole, leaves no doubt that unemployment is high in all the local municipalities, but more specifically in the local municipalities with mainly rural settlements. It is evident that the number of people employed as a percentage of the total population is relatively low in both Maruleng and Bushbuckridge Local Municipalities and therefore only 9,28% (1992) of the total population were employed in 2001.

- **Land**

The land area of Maruleng extends over approximately 3247 sq.km. Land within Maruleng is characterized by the following:

- € Considerable land area held in ownership by the State under custodianship of Traditional Authorities which accommodates some 90% of the residents of the municipal area.
- € Large areas of land in private ownership are utilized mainly for conservation/tourism/game farming and commercial hunting.
- € Approximately 18,5% of the total land area (\pm 600 sq.km) is subject to 45 registered land claims.

The situation exerts considerable existing and potential influence on future spatial/land use patterns, which, if managed effectively, could be utilized to the benefit of Maruleng.

4.4.3 Visual Aspects

Two broad landscape types, namely a flat expansive plain and the Drakensberg mountain range, characterise the general area in the vicinity of the proposed project. Given the noticeable presence of the mountain and rural/natural quality of the landscape, the quality of the landscape and its value as a visual resource is considered to be moderate to high.

CHAPTER 5: THE PUBLIC PARTICIPATION PROCESS

5.1 SCOPING AND EIA PROCESS

This EIA consists of two phases: A Scoping Study Phase and EIA Phase. A flowchart indicating the EIA process is presented in Figure 4 below.

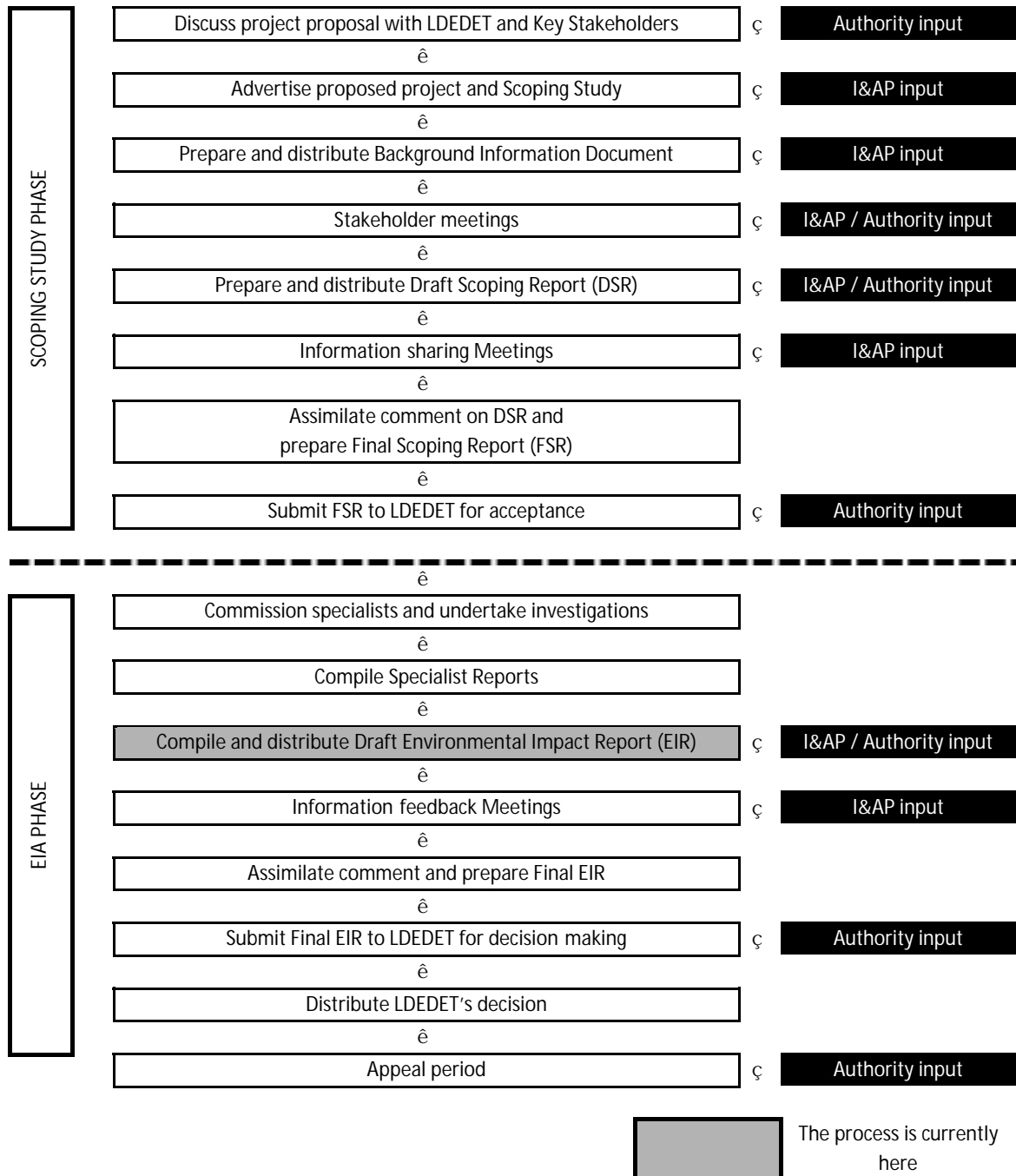


Figure 4: EIA Process

5.2 SCOPING STUDY PHASE

The Scoping Study is the first phase of the EIA process and has an emphasis on public participation. I&APs play an important role in the process, in identifying concerns and issues and to ensure development is as environmentally acceptable as possible. The Scoping Study was undertaken between July 2007 and October 2007.

5.2.1 Scoping Study Objectives and Process Undertaken

The main purpose of the Scoping Study was to obtain agreement between I&APs, the relevant authorities and the project team on the key issues and alternatives to be addressed in the next phase of the EIA process. The Scoping Study had the following specific objectives:

- ≠ To provide a reasonable opportunity for I&APs to be involved in the study;
- ≠ To ensure that all potential key environmental issues and impacts that would result from the proposed project were identified;
- ≠ To identify any potential environmental issues and impacts related to the proposed project requiring further investigation in the EIA;
- ≠ To identify feasible alternatives related to the project proposal; and
- ≠ Through the above, to ensure informed, transparent and accountable decision making by the relevant authorities.

The Scoping Study complied with the EIA Regulations as set out in GN R385. This involved an open, participatory approach to the study and full involvement of I&APs to ensure that all impacts were identified and that planning and decision making takes place in an informed, transparent and accountable manner. The Scoping Study process that was followed is summarised in Table 12.

The Final Scoping Report (FSR), which included the Plan of Study for EIA, was accepted by LDEDET on 6 February 2008. LDEDET requested that Triviron EAP proceed with the EIA as outlined in the Plan of Study for EIA.

Table 12: Tasks Undertaken During the Scoping Study Process.

1	<p>Media Notices The EIA process was advertised in four different newspapers, namely The Mpumalanga News (publication date: 19 July 2007), the Lowvelder (publication date 20 July 2007), the Kruger2Canyon (publication date 20 July 2007) and the Hoedspruit Week (publication date 19 July 2007).</p> <p>On site Notices Various notices were placed at strategic locations on site and in Hoedspruit. The notices invited the public to register as I&APs and to comment on the proposed development. A 30 day response period was allowed.</p>
2	<p>Triviron EAP undertook various site visits during the project planning and scoping process in order to determine the environmental characteristics of the study area, to identify potential areas for development and to identify potential environmental issues and concerns.</p> <p>An authority meeting and site visit was held between Triviron EAP and Limpopo Department of Economic Development, Environment & Tourism (Mr. MP Seshoka) on 2 August 2007. The focus of this meeting was on the process requirements and way forward.</p>

3	A preliminary I&AP database (35 I&APs) was compiled of neighbouring landowners, authorities (local and regional), non governmental organisations, community based organisations and other key stakeholders. This database was compiled using databases of previous studies in the area and responses to newspaper advertisements. This database continued to grow during the EIA.
4	A public open house meeting was held on 2 August 2007 at Suite 3, Khayagelo Village, in Hoedspruit. The meeting was attended by 12 attendees.
5	Registered I&APs were informed of the availability of the Draft Scoping Report (DSR) via email, fax or post. The report was available for a comment period of 30 days (from 21 September 2007 – 22 October 2007).
6	All comments received during the Scoping Study process were included in the Final Scoping Report, which was submitted for acceptance to LDEDET in November 2007.
7	A notification letter was sent to all I&APs informing them that the FSR had been submitted to the LDEDET for acceptance, as well as where the FSR could be reviewed.

5.3 EIA PHASE

5.3.1 Specialist Studies

Three specialist studies were undertaken to address the potential impacts associated with the key issues raised during the Scoping Study. A list of the specialist studies undertaken is provided in Table 14. Specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the project. These impacts were then assessed according to predefined rating scales (see Chapter 9), which are based on criteria set out in the EIA Regulations Guideline Document (DEAT 1998). Specialists also recommended appropriate mitigatory or control measures to minimise potential impacts or enhance potential benefits.

Specialist reports undertaken during the EIA are attached as appendices to this document.

Table 13: List of Specialist Studies and Specialists

Specialist Study	Specialist/s	Organisation	Location In EIR
Geotechnical Investigation of Happyland 241KT for Proposed Zandspruit Estate	Mr. J.P. Hattingh	Rock and Stock Investments cc	Appendix 4
Ecological Assessment and associated impacts for the proposed Zandspruit Estate Development	Ms. J Newenham	BioVista Conservation Consultancy	Appendix 5
Heritage Impact Assessment for the Proposed Eco Estate on the Farm Happyland, Limpopo Province	Mr. S Gaigher	Archaeo Info Northern Province	Appendix 6

5.3.2 Integration and Assessment

The specialist information, which addresses the key issues identified during the EIA process, and other relevant information, has been integrated into this EIR. The Final EIR aims to present all information in a clear and understandable format and suitable for easy interpretation by authorities. Public participation is an important focus during the EIA phase. The public participation process to be undertaken during the EIA Phase is described in Table 5.

Table 14: Public Participation Process Undertaken During the EIA Phase

1	The draft EIR will be distributed for a 30 day review / comment period from 3 March 2008 to 2 April 2008. Copies of the full report will also be made available at the following locations: 1. Offices of Triviron EAP (Hoedspruit) 2. Offices of Sugar Creek Trading 33 (Pty) Ltd T/Zandspruit Estates (Hoedspruit)
2	All written comments to be received from I&APs on the Draft EIR will be presented in an Appendix of the final report. Where applicable, responses to comments and questions are given or cross referenced to the relevant section of text in the Final EIR where this concern has been addressed.

5.4 LIST OF REGISTERED INTERESTED AND AFFECTED PARTIES

Table 15: List of Potential Interested and/or Affected Parties Identified

Name	Representing	Physical Address	Postal Address	Contact Details	Notification Method and Date
Maruleng Local Municipality					
Mr. Makhafole Jephther	Budget & Treasury		P.O. Box 627 HOEDSPRUIT 1380	Tel: 015 793 2409 Fax: 015 793 2341 Cell: 083 278 0090 Email: 0832780090@mtnice.co.za	Email
Ms. Mafunda N. Mavis	Corporate Services		P.O. Box 627 HOEDSPRUIT 1380	Tel: 015 793 2409 Fax: 015 793 2341 Cell: 082 386 9095 Email: mafunda@marulengmunicipality.gov.za	Email
Refilwe Ramothwala	Municipal Manager	64 Springbok Street Hoedspruit 1380	P.O. Box 627 HOEDSPRUIT 1380	Tel: 015 793 2409 Fax: 015 793 2341 Cell: 076 880 5377 Email: mapeki@ananzi.co.za / phina@ananzi.co.za	Email / Registered Mail
Kopele T. Nelson	Spatial Planning & Economic Development		P.O. Box 627 HOEDSPRUIT 1380	Tel: 015 793 2409 Fax: 015 793 2341 Cell: 084 767 0493 Email: tukisetsoke@yahoo.com	Email
Modiba T. San	Technical Services		P.O. Box 627 HOEDSPRUIT 1380	Tel: 015 793 2237 Fax: 015 793 2341 Cell: 084 709 4410 Email: sible@webmail.co.za	Email

Name	Representing	Physical Address	Postal Address	Contact Details	Notification Method and Date
MOPANIE DISTRICT MUNICIPALITY					
Mr M T Maake	Municipal Manager	Old Government Building Giyani Main Road	P.O. Box 9687 GIYANI 0826	Tel: 015 811 6300 Fax: 015 812 4301 Cell: 083 256 7563 E mail: mathebulab@mopani.org.za / tim@mopani.gov.za	Email / Registered Mail
STAKEHOLDERS					
Mr. Gawie Bestbier	Senior Manager Civil Aviation Authority of South Africa	Ikhaya Lokundiza Building 16 Treur Close Waterfall Park Bekker Street MIDRAND	Private Bag X 73 HALFWAY HOUSE 1685	Tel: 011 545 1000 Fax: 011 545 1465 Email: bestbiereg@caa.co.za	Email
Mrs. Paulie Boshielo (General Manager: Transport)	Limpopo Department of Roads and Public Transport	Department of Transport Building 40 President Kruger Street POLOKWANE	Private Bag X9491 POLOKWANE 0700	Tel: 015 295 1174 Email: boshieleop@ldrt.gov.za	Email
Mrs. Tolmae Hopkins	Department of Water Affairs and Forestry			Tel: 013 759 7343 Email: hopkinst@dwaf.gov.za	Email
The Provincial Manager	South African Heritage Resource Agency Limpopo Provincial Office	25 Jorriison Street POLOKWANE	P.O. Box 1371 POLOKWANE 0700	Tel: 015 291 1804 Fax: 015 291 1819 Email: vnetshiavha@lp.sahra.org.za / dlithole@lp.sahra.org.za	Email (both)
Mashile Thandlos	Department of Health	Buffelshoek Trust Acornhoek 1360	P.O. Box 1476 Acornhoek 1360	Fax: 015 793 1689 Cell: 082 740 3797	By Hand
WARD COUNCILLOR					

Name	Representing	Physical Address	Postal Address	Contact Details	Notification Method and Date
Maite Ralepelle	Ward Councillor for Ward 11			Cell: 073 2345 369 / 082 573 3798 Fax: 015 793 2341	Fax
INTERESTED & AFFECTED PARTIES					
Marina Louw	Adjacent Landowner Remainder of the Farm Happylands			Cell: 083 741 2050 Email: marinalouw@lantic.net	Email
Annelise Smit	Adjacent Landowner The Farm Glencoe	Farm Gelncoe	P.O. Box 8 HOEDSPRUIT 1380	Cell: 082 924 4893 Email: smitbrdy@mailbox.co.za	Email
Trevor Jordan	Adjacent Landowner	Remainder of Farm Happylands		Tel: 015 793 0471 Cell: 082 568 5951 Email: trevor@jordanprops.co.za / jane@jordanprops.co.za / guypaterson@gmail.com	Email
Faan Boshoff	Adjacent Landowner Grovedale	Farm Grovedale	P.O. Box 61 HOEDSPRUIT 1380	Cell: 078 171 0421	Registered Mail
Brian Mentis / Ishmael Bandaras	Adjacent Landowner Andrew Mentis Family Trust The Farm Berlin	Farm Berlin	P.O. Box 8045 ELANDSFONTEIN 1406	Tel: 011 255 3200 Fax: 011 828 2124 / 011 828 1463 / 086 605 1415	Fax to all
Desiree & Pottie Potgieter	Adjacent Landowner Parma Nursery		P.O. Box 18 HOEDSPRUIT 1380	Tel: 015 793 2636 Cell: 083 263 8449 Email: parma@global.co.za	Email
Stanley Watt	Adjacent Landowner	Raptor's View	P.O. Box 1502 HOEDSPRUIT	Tel: 015 793 0267 Fax: 086 684 0514	Email

Name	Representing	Physical Address	Postal Address	Contact Details	Notification Method and Date
	Raptor's View Home Owners Association		1380	Cell: 083 268 6687 Email: rvhoa@mwweb.co.za / stan@reearthtravel.co.za	
Mr. Johan Potgieter	Hoedspruit Chrisian School	Farm Happylands Lydenburg Street Hoedspruit	P.O. Box 443 HOEDSPRUIT 1380	Tel: 015 793 2067 Fax: 015 793 2067 Cell: 084 556 2337	Fax
Leon Erasmus	Hoedspruit Lewende Water Gemeente	Farm Happylands Lydenburg Street Hoedspruit		Tel: 015 793 0329 Fax: 086 694 9168 Cell: 082 323 9572	Fax (015 793 2067)
Mr. N de Jager	Hoedspruit Township Developers (Pty) Ltd		P.O. Box 11463 HATFIELD 0028	Tel: 012 361 8687 Fax: 012 361 9867	Fax
Mr Fred Barnard	Die Brug	Farm Glencoe Hoedspruit / P.O. Box 1091 Hoedspruit 1380	P.O. Box 1091 HOEDSPRUIT 1380	Cell: 083 564 4177	Registered Mail
Adv. R Jansen	Lawyers for Human Rights	357 Visagie Street Pretoria 0002		Tel: 012 320 2943/5 Fax: 012 320 7681 Email: riansen@lhr.org.za	
Mr. M Mokono				Fax: 015 297 8570	Fax
Ds. Ockie Struwig	Gereformeerde Kerk Hoedspruit	Gereformeerde Kerk Hoedspruit Happylands	P.O. Box 594 Hoedspruit 1380	Tel: 015 793 2406 Cell: 083 653 1989 Email: ostruwig@telkomsa.net	By Hand
Mr. Etas Chiloame	New Line Trust		P.O. Box 227 Acornhoek	Tel: 013 795 5127 Fax: 013 795 5126	By Hand
Joan	K2C Props		P.O. Box 1127 Hoedspruit 1380	Tel: 015 793 0766	By Hand

Name	Representing	Physical Address	Postal Address	Contact Details	Notification Method and Date
Mr. Chiloane Jan			P.O. Box 63 Acornhoek 1360	Tel: 013 795 0159 Cell: 073 694 3336	By Hand
Mr. Masgine Henoirolo			P.O. Box 1156 Hoedspruit 1380	Cell: 072 230 2282	By Hand
Mr. H.T. Nkosi			P.O. Box 1826 Acornhoek 1360	Cell: 083 475 1424	By Hand
Mr. S. Johnson			P.O. Box 1233 Hoedspruit 1380	Cell: 082 408 6618	By Hand
Mr. H. Preston		228 Raptors View Hoedspruit	P.O. Box 1571 Hoedspruit	Tel: 015 793 0032	By Hand
Ms. D. Thomson	Kruger 2 Canyons Biosphere Reserve		P.O. Box 1180 Hoedspruit	Tel: 015 795 5970 Cell: 086 515 5112	By Hand

5.5 SUMMARY OF ISSUES RAISED BY REGISTERED I&APS

5.5.1 Potential Issues and Impacts

Based on the work conducted by the project team and the issues and concerns raised by I&APs the following environmental issues have been identified:

- ⊘ Botanical Degradation, destruction or elimination of species and ecosystems;
- ⊘ Faunal potential loss of red data species;
- ⊘ Nuisance potential impacts from dust and noise during the construction phase of the proposed development.
- ⊘ Visual and Sense of Place loss of current semi wilderness sense of place as a result of development as well as potential adverse visual impacts related to layout and building design and the introduction of elements that are uncharacteristic to the aesthetics and landscape character of the area; and
- ⊘ Heritage potential impacts on the heritage landscape due to increased human activity and heritage resources located on the land consumed by buildings and infrastructure may be eliminated.

To address these issues a number of specialist studies were commissioned during the EIA phase. Certain issues were addressed by Triviron with input from the project planning team and do not warrant specialist investigations. A summary of issues raised by I&APs is given in the table below.

5.5.2 Issues and Concerns Identified during the Scoping Study

The key issues and concerns identified by the project team and I&APs during the Scoping Study are provided in Table 13. This information provided the basis on which the specialist studies and terms of references were determined.

Table 16: Summary of Issues Raised By I&APs

Name	Issue	Response
Adv. Rudolph Jansen	The land earmarked for development is subject to a land claim.	The applicant has provided relevant information to Land Claims Commissioner for consideration. The outcomes of this will be reported in the Environmental Impact Report.
Ds. Ockie Struwig	<ul style="list-style-type: none"> ⊘ Aesthetics Objection to the "Beginner Stands" being built directly adjacent to the fence of the Church. A suggestion is made for a 70m buffer zone around the church's boundaries. ⊘ Privacy A suggestion is made for a 70m buffer zone around the church's boundaries. It is also requested that a wall be built on the boundary of the buffer zone where the "Beginner Stands" are to be erected, to ensure privacy and noise disturbances. 	<p>The applicant held a meeting with Ds. Ockie Struwig to resolve his concerns. The following measures were proposed:</p> <ul style="list-style-type: none"> i) A bush buffer zone of ±20m to be introduced. This will form part of remainder of farm. ii) A perimeter security road of 4m will be implemented along the boundary fence. iii) Erven affected to the south will be relocated. iv) A written application for right of way for the Zion Church members will be prepared.

Name	Issue	Response
	<ul style="list-style-type: none"> ∄ Increase in traffic ∄ Safety and Security 	vi) It was explained that the existing church fence does not match the cadastral boundaries of the property. A Surveyor will need to check these boundaries prior to the fences being installed.
Ms. Jacqueline Preston	<ul style="list-style-type: none"> ∄ Privacy ∄ Light Pollution 	The applicant and project planning team will propose mitigating measures which will be included in the Environmental Management Plan and the Environmental Impact Report.
Mr Mashile Thandios	The land earmarked for development is subject to a land claim.	The applicant has provided relevant information to Land Claims Commissioner for consideration. The outcomes of this will be reported in the Environmental Impact Report.
Mr Philippus Smit	<ul style="list-style-type: none"> ∄ What data or assumptions were used to support the demand for retail and commercial space in Hoedspruit? ∄ What is the current situation within Hoedspruit regarding the supply and occupation of retail space? ∄ Requested that firm proposals and conditions be made to the local municipality regarding potential community projects, specifically in terms of potable water, the fire station and community hall. ∄ Requested information regarding the status of land claims on the property. ∄ Stated that the conditions of the roads within Hoedspruit are poor and queried whether any upgrades to the road to accommodate traffic generated by the development. 	<ul style="list-style-type: none"> ∄ Information regarding the demand and status of retail space will be presented in the Environmental Impact Report. ∄ Applicant to enter into negotiations with the local authority. ∄ The applicant has provided relevant information to Land Claims Commissioner for consideration. The outcomes of this will be reported in the Environmental Impact Report. ∄ A Traffic Impact Assessment (TIA) has been independently commissioned by the applicant.

5.6 COPIES OF ANY COMMENTS RECEIVED FROM REGISTERED I&APs

Refer to Appendix 7

CHAPTER 6: A DESCRIPTION OF THE NEED AND DESIRABILITY

6.1 Need and Desirability

6.1.1 Limpopo Province General

The Limpopo Province reflects the quintessence of untamed Africa. The Limpopo Province is a land of dramatic contrasts characterized by hot savannah plains and mist clad mountains, age old indigenous forests and cycads alongside latter day plantations, ancient mountain fortresses and the luxury of contemporary infrastructure and modern day facilities (FPohl, 2007).

Much of the land, particularly in the Kruger National Park and other game and nature reserves, is unspoilt, providing sanctuary to large numbers of game. For those who wish to experience the thrill of Africa in a more tangible manner, wilderness areas and trails, hunting safaris and hikes may prove the solution. The beauty and infinite variety of the province will not only delight all who visit, but will entice visitors back again and again (FPohl, 2007).

Zandspruit Estate (The Farm Happyland) lies in the centre of this exciting region.

The Limpopo Province is divided in four (4) regions known as:

- € Bushveld (Western Section)
- € Soutpansberg (Northern Section)
- € Capricorn (Central Section)
- € Valley of the Olifants (Eastern Section)

Zandspruit Estate lies in the centre of the Valley of the Olifants region. A short summary of this region explains the importance of this region for tourism and leisure development (FPohl, 2007).

As the name suggests, this region falls within the Valley of the Great Olifants River, which stretches, from Giyani through to the Kruger National Park (FPohl, 2007).

The Olifants Valley is an area rich in wildlife, scenery, mountains, rivers, dams, history and cultural and ethnic attractions (FPohl, 2007).

The contrast in climate, scenery and landscape are striking and dramatic. The Valley of the Olifants encompasses some of the largest remaining wilderness areas in the country. It harbours the heartland of the lowveld, unspoilt indigenous forests and the beautiful escarpment and mountain ranges of the northern Drakensberg. There are numerous private game parks and conservancies for instance Timbavati, Klaserie, Kapama and Tsukudu reserves, as well as easy access to the northern section of the Kruger National Park (FPohl, 2007).

Throughout this region there are accommodation facilities to meet all tastes and pockets. There are four superb golf courses in the region (Merensky in Phalaborwa, TCC between Tzaneen and Duiwelskloof, Orangedene on the Letaba Estates near Tzaneen and Drakensig near Hoedspruit) (FPohl, 2007).

Anglers in search of trout, bass, bream, tilapia, yellow fish or barbell will find a variety of dams and rivers set in tranquil and scenic surroundings. Many other sporting amenities are available and the needs of the hiker, the

rambler, the canoeist and the mountain biker are well catered for. The town is a premier eco tourist destination for visitors to game lodges and private reserves (FPohl, 2007).

Some of the activities and attractions available to owners and visitors to Zandspruit Estate are:

- € Bombyx Mori Tour
A tour to view the whole spectrum of silk production and purchase exclusive silk goods
- € Hoedspruit Research and Breeding Centre
Caters for endangered species, including the unique cheetah project at Kapama Lodge.
- € Kapama Private Game Reserve.
A 12 000 ha game reserve offering evening game drives.
- € Leguan Adventure Safaris
Rafting, abseiling and hiking in "Big Five" country. Also mountain biking, micro light flights and 4 x 4 trails.
- € Moholoholo Rehabilitation Centre
One of the most unique wildlife rehabilitation centres, where injured wild animals and raptors are cared for, rehabilitated and reintroduced into the wild.
- € Monsoon Gallery
African art gallery, information centre and museum displaying traditional hunting artifacts.
- € Nyandi Tribal Village
A place to experience the daily lives of a true Shongaans tribe.
- € Phuza Moya Private Game Reserve
Walking trails, night safaris and scheduled game drives to Kruger National Park.
- € Swadini Reptile Park
A private reptile park allowing visitors to view a number of fascinating species.
- € Timbavati White Lions
The original breeding pair of the famous white lions can be seen on one of many guided drives through Mossie Mosterts Game Farm.
- € Tsukudu Game Lodge
Renowned for projects to reintroduce orphaned animals back into the bush.
- € Umhlametsi Private Nature Reserve
Evening game drives and dinner or morning drives and brunch
- € Umlani Bush Camp
Evening game drives in the famous Timbavati Reserve.

At the nearby town of Phalaborwa the following activities and attractions are available:

- € Foskor Mine Museum

A highly informative museum providing a historical perspective on mining and ancestral tribes of the area.

€ Golf

The Hans Merensky Country Club features one of the highest rated courses, designed by eminent designer Bob Grimsdell. Near the Kruger National Park, the two annual golf tournaments are often visited by wildlife.

€ Kruger National Park

Phalaborwa is the only town offering night drives into the Kruger National Park.

€ Micro light Flights

The magic of the bushveld is perhaps best seen from the seat of a micro light.

€ Olifants River Sunset Cruises

Available down the Olifants River

€ Open Cast Mine

Few will be left unimpressed by this excavation. At almost 2 km wide it is considered the widest man made hole in Africa.

€ Phalaborwa Foundation

Organizes free escorted trips into townships Namakgale and Lulekane to see the variety of community projects.

6.1.2 Uses not directly related to the Leisure Market

6.1.2.1 Residential Development

This proposed development also provides for a residential segment that covers the total spectrum of residential development, including residential stands as small as 150m² (average 180m²) in the proposed Zandspruit Valley development, erven of ± 500m² in the Zandspruit Manor and ± 800m² average in the Zandspruit Ridge developments, a Retirement Village, townhouses at a density from 20 – 60 units per ha up to luxury bush farm portions and farm portions that form part of an Aerodrome Development (FPohl, 2007).

This development is therefore not only aimed at the leisure market but provides mainly for a much needed shortage in the normal residential market in Hoedspruit – especially for beginners and first time home owners (FPohl, 2007).

The Provincial as well as the Local Authorities identified this need a long time ago. This proposed development would make a huge contribution to the identified shortages in the residential market (FPohl, 2007).

There is an existing runway on the property suitable for small aircraft. This facility provides the ideal opportunity to also cater for this segment of the market, and therefore a typical “aerodrome estate” that caters for residents with their own aircraft or aircraft enthusiasts to stay alongside the runway and also to build a hanger for their aircraft on their properties, all of which are included in the development proposal (FPohl, 2007).

Preliminary market testing confirmed a big interest in these erven and these erven are very popular among potential buyers (FPohl, 2007).

6.1.2.2 Commercial Erven

The proposed development also provides for a wide range of non residential uses. These uses are all located on the northern boundary of the proposed development along road R527 (FPohl, 2007).

These uses include uses for which the developers are of the opinion that there exists a need for or alternatively that the growth in the town and surrounding areas would make the provision of these erven necessary to cater for the expansion of the town which have developed within very fixed boundaries (FPohl, 2007).

The westward expansion of the town is a logic direction in which the town will grow over the next couple of years (FPohl, 2007).

These non residential erven include the following:

- € Business 1
- € Hotel
- € Nursery
- € Institutional
- € Equestrian Centre

6.1.2.3 General

The total residential development will be a security development, which will have access through 2 access points only (FPohl, 2007).

The bush development (Zandspruit Extension 1) will be developed as Phase I followed by the three residential townships. The commercial erven will be developed as the last phase (FPohl, 2007).

6.1.3 The Study on Tourism Promotion and Development Plan in the Republic of South Africa 1996

The Department of Environmental Affairs and Tourism and the Japanese International Cooperation Agency completed the study. Although the statistics dates back to 1996, it still illustrates the overall demand for tourism facilities within the subject area (FPohl, 2007)

In this study the Valley of the Olifants was rated as one of the areas with the highest tourism potential. This area rated high due to:

- € High ratings on the criteria with high importance weightings, such as poverty relief (given its location in a high poverty area) and the capacity for this study to add value; and
- € Reasonable ratings on criteria with high importance weightings, such as latent tourism supply and demand potential.

Therefore the Valley of the Olifants is also selected as one of the primary focus areas for Tourism Development (FPohl, 2007). The area in the Valley of the Olifants identified as the area with the major strengths and the highest development potentials are the Hoedspruit, Phalaborwa, Bosbokrand area (FPohl, 2007).

Again, Zandspruit Estate falls in the centre of this area (FPohl, 2007).

The greatest tourism strengths of the greater Valley of the Olifants tourist area lie in the eastern sub area between Phalaborwa and Bushbuckridge, with Hoedspruit in the centre for the following reasons (FPohl, 2007):

- € This sub area offers a small but established tourism base, primarily related to private game reserves, bordering the Kruger National Park (some with established brands)
- € It offers definite development possibilities due to good road connections linked to strong tourism icons in Mpumalanga such as Hazyview and Blyde River Canyon.
- € Its tourism offering is more easily associated with the Limpopo Province Tourism Boards marketing focus (i.e. wildlife) than that of the western Valley of the Olifants.
- € The sub area takes full advantage of what the earlier study identified as the Valley of the Olifants main comparative advantage, i.e. its location adjacent to the Kruger National Park, which is the actual draw card and providing this area with the opportunity to develop other products around this main attraction.

6.1.4 Eastgate Airport

The Central Lowveld is renowned as one of South Africa's premier inland holiday playgrounds, home of the Big Five and aptly called the Valley of the Olifants. With access to the central part of the Kruger National Park, and studded with exclusive game lodges secluded in private game reserves, it offers South Africa's ultimate wildlife experience (FPohl, 2007).

Central in this sub region a few kilometers away from the Town of Hoedspruit is the Eastgate Airport. This airport caters mainly for tourists (FPohl, 2007).

- € Services available at Eastgate Airport (Daily scheduled flights – SA Express Airways, Charter flights, Reservations – accommodation, Transfers, Tours, Car Rental, Airline Reservations, Cafeteria/Restaurant, Private Bar, Sickbay) (FPohl, 2007)
- € The proposed development caters for an additional airstrip, for the use of the residents of Zandspruit Estate as well as acting as an emergency alternative in the event that the airstrip in Hoedspruit is not operational (FPohl, 2007).
- € The proposed aerodrome development could enhance the accessibility of tourists to this particular area – leading to financial gain for the immediate community (FPohl, 2007).
- € Furthermore, the following lodges are served from the airport and are in the vicinity of Zandspruit Estate. (Chitwa Chitwa, Djuma, Gomo Gomo, Goronga, Honey guide, Ingwe Game Lodge, Ingwelala, Kapama Lodge, Kambaku, Khoka Moya, Kings Camp, Kwa M'Bili, Makalai, Mohalabetsi, Motswere, Matumi, Ngala, Royal Malewane, Pezulu Tree Lodge, Phuza Moya, Tanda Tula, Thorny Bush and Tshukudu.

6.1.5 General

The following other facilities are in the direct vicinity (FPohl, 2007):

- € Holiday Resorts (Hippo Pools, Manoutsa, Aventura Swadini)
- € Guest Houses (Clivia's Cottage, Hunters Nest, Kokkariba, Loerie)

- € Motel (Fort Coepieba)
- € National Park (Kruger National Park)

Zandspruit Estate is close to the following important towns and destinations (FPohl, 2007):

- | | |
|------------------------|--------|
| € Hazyview | 105 km |
| € Nelspruit | 170 km |
| € Kruger National Park | 60 km |
| € Phalaborwa | 75 km |
| € Skukuza | 150 km |
| € Orpen Gate | 65 km |

6.1.6 Need to provide ownership in Game Reserves, Game Farms and Nature Reserves

The type of development as proposed is catering for an ever growing market of people who want to own a house in a game reserve, nature reserve or game farm without the responsibility of managing a game farm, maintenance, etc (FPohl, 2007).

Many such developments have already been approved in especially the Limpopo Province (FPohl, 2007). Well known similar developments are:

- € Muditlo Estate – of which this proposed development will form an integral part
- € Mabula
- € Mabalingwe
- € Madikwe (Krokodil drift and Laastepoort)
- € Mkai Kai (Next to Mabula)
- € Epsom
- € Raptures view
- € Grietjie
- € Lizitaba

6.1.7 Social Responsibilities

Elements of the proposed development will make a huge contribution to the local community and the town of Hoedspruit as a whole, which are the following (FPohl, 2007):

- € Affordable Housing More than 50% of the proposed residential units fall into the affordable segment of the market. All other developments in and around Hoedspruit were mainly aimed at the Leisure and residential market.
- € As part of the development, a new water pipeline providing water to this development but which is also available for the town is being installed.
- € A second sewerage works is being built which could also be used as an alternative sewerage works for the town.
- € The existing church premises of the Z.C.C. Church are being incorporated into the development and this church will therefore be accommodated on an official basis.

6.1.8 Aerodrome

A meeting was held with officials from Civil Aviation, as this is an existing runway. The only requirement was that we have to notify the National Air force Base Commander in Hoedspruit about the proposed development. A Letter in this regard was sent to the Air force Base Commander (FPohl, 2007).

6.1.9 Concluding remarks

It is clear from the above that the proposed development will introduce a fresh approach to mixed land uses to the Hoedspruit area. The proposed development was carefully planned by various professionals to ensure its integrated and sustainable nature. Maruleng identified the need for housing in their 2002 IDP where it is categorically stated that: "...increase the provision of housing accommodation to tourists by 10% p.a. for the next five years." However, the provision of housing should be to the benefit for local people as well, hence the provision of the different options in the residential market and job creation as a spin off effect (FPohl, 2007).

The "Valley of the Olifants region" is an area that is deemed to have outstanding universal value from a natural and cultural point of view (FPohl, 2007).

It is respectfully submitted that the land development proposal complies with and supports the notion of sustainable and integrated development in the interests of those living and working in the area, and its use for the economic and social benefit of the population at large (FPohl, 2007).

It is believed that if the above principles and development approach is employed, this development will ensure that socially, ecologically and that financial viability is reached. This development has the unique opportunity to act as an example for environmentally responsible development. This is also the reason why this development should be considered as integrated concept, which has a clear environmental focus (FPohl, 2007).

CHAPTER 7: A DESCRIPTION OF ALL ALTERNATIVES IDENTIFIED

Reasonable and realistic alternatives must be assessed to an equal level of detail, to ensure comparative assessment. Reasonable and realistic alternatives mean those options that can realistically be implemented by the applicant within the ambit of his/her core business. Reasonable and realistic alternatives include, identified during the scoping can be summarised as follows:

7.1 LAYOUT ALTERNATIVES

The Applicant has considered various alternative layouts as illustrated in Figures 5 and 6 below. The proposed development footprints have been chosen on the basis of available space, disturbed areas, sensitive vegetation communities, slopes, flood lines, proximity to existing roads and services and visual impact on the surrounding area. The area available for development on the subject property is restricted by topography, the 1:100 year flood line, cultural historical sites and sensitive ecosystems.

Various layouts, taking cognisance of the above mentioned site layout criteria have been considered, however these alternatives do not substantially differ from the latest proposal and were therefore not considered further within the scope of this assessment.

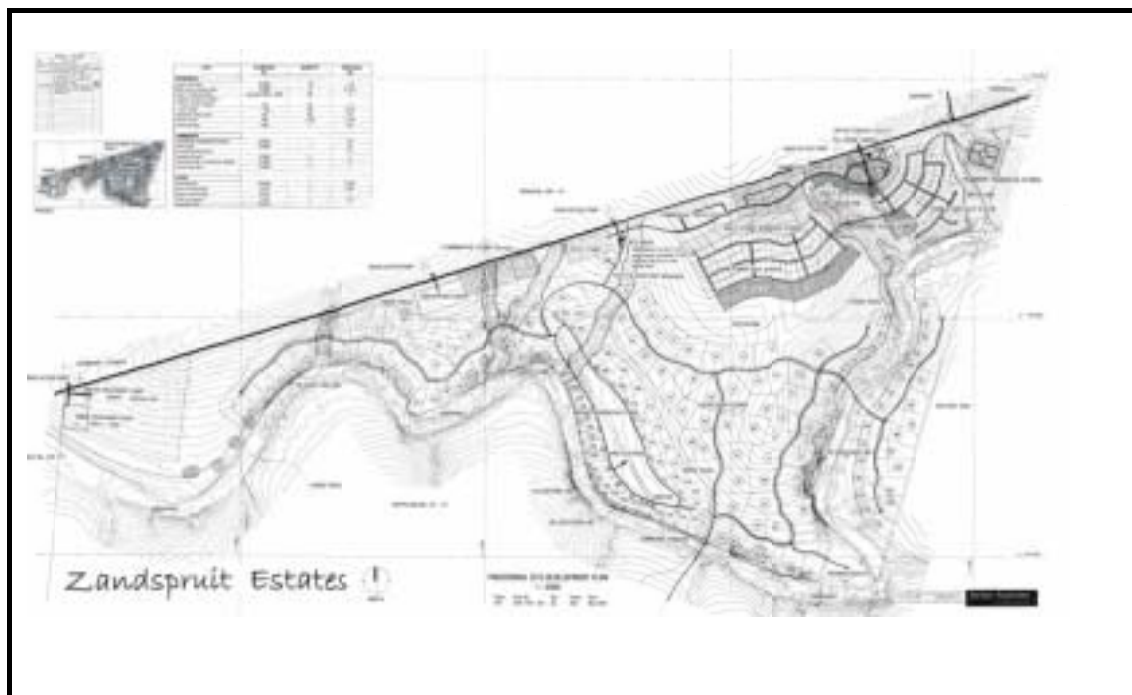


Figure 5: Original Layout Plan

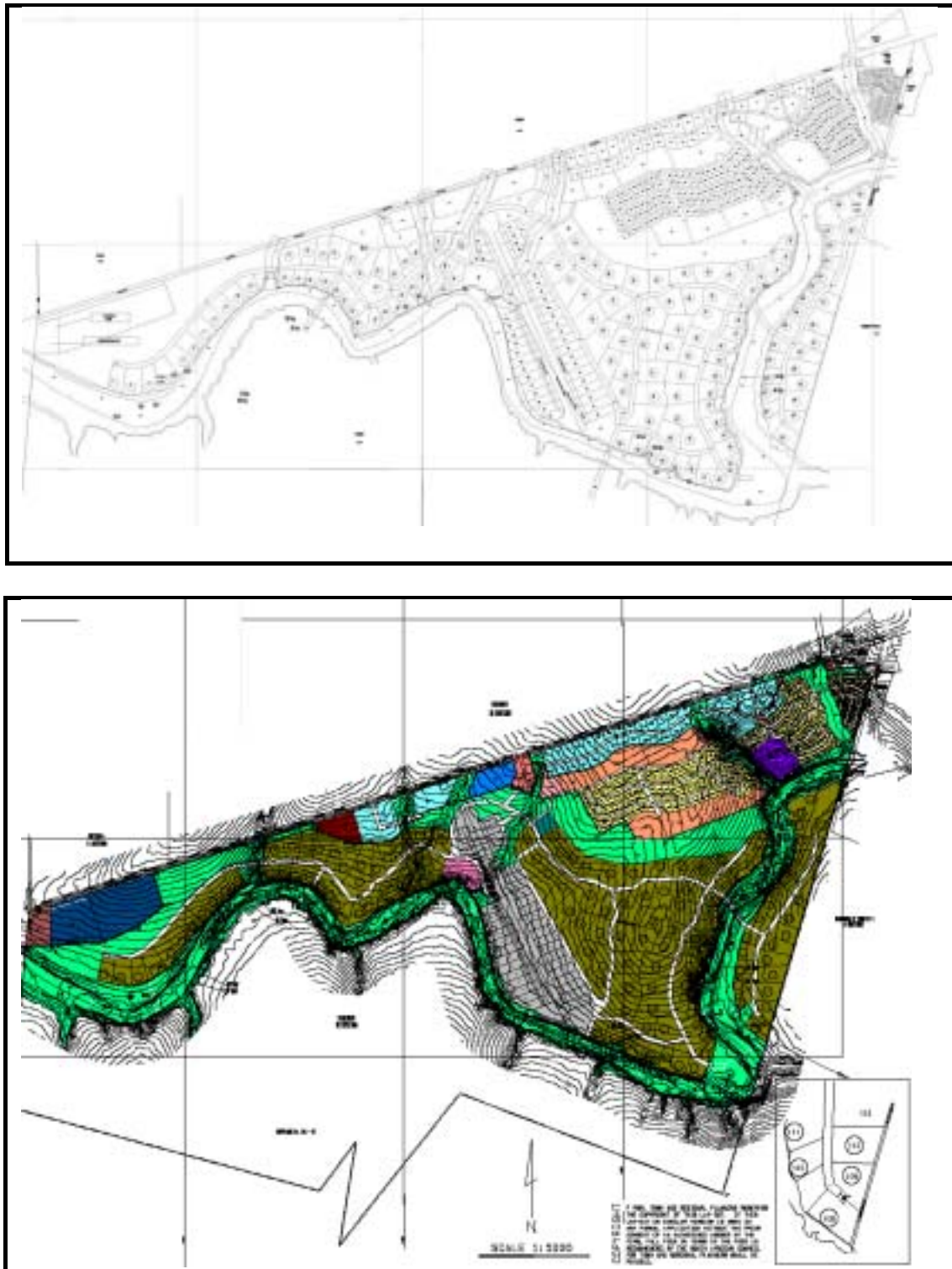


Figure 6: Proposed Layout – Revision 11

Final proposed layout accommodates all specialist recommendations in terms of sensitive ecological and cultural historical environments

7.2 LAND USE ALTERNATIVES

7.2.1 Status Quo – Sand Mining / Game Farming

To date, the predominant land use was brick manufacturing on certain portions of the subject property, sand mining from the Sandspruit River and associated floodplain and game farming. The sand mining and associated brick manufacturing operations have a direct impact on the stream's physical habitat characteristics and consequently the biota. Due to sand skimming or scalping operations on the river bed and terraces the following impacts are present:

- € Disturbance of the natural hydraulics of the riparian zone caused by temporary river crossings and mounds of soil overburden and sand;
- € Stockpiles and overburden left in the floodplain have altered the channel hydraulics;
- € The river bed degradation has changed the morphology of the channel;
- € Destruction of the riparian zone (including the stream bank, riparian vegetation and vegetative cover) caused by stream bank destabilisation, resulting in increased erosion, sediment and nutrient inputs, and reduced shading and bank cover;
- € River bed degradation, with an increase in suspended sediments and erosion;
- € Destabilising of river banks;
- € Reduced vegetative bank cover caused by the undercutting of sections of the river bank that were removed during sand extraction;
- € Destruction of riparian vegetation caused by heavy equipment and sand stockpiles at or near the extraction site;
- € Removal of large woody debris from the riparian zone which is important in protecting and enhancing recovering vegetation in streamside areas; and
- € Operation of heavy equipment in the channel bed has possibly destroyed spawning habitat for fish and macroinvertebrate habitat.

The subject property is adjacent to the existing Raptors View residential development therefore continued active hunting will not be possible due to noise and safety issues.

Based on the above the applicant considers the extension and/or intensifying of the existing land use as unpractical and unsustainable and is not within the ambit of their core business.

7.3 TECHNOLOGY ALTERNATIVES

7.3.1 Alternative Foundation Systems

No overly adverse conditions were encountered during the geotechnical investigation, and no onerous requirements are envisaged for compliance. Founding where reasonably possible should be on bedrock. Where deep soil profiles are encountered which preclude founding on bedrock, cognisance must be taken of the collapsible nature of soils. Where foundations may cross differing founding strata there may be minor differential movements and any design needs to take this into account.

The following foundation system may be considered for a structural development:

- € Stiffened strip footings, Stiffened or Cellular Raft

- ≠ Soil Raft
- ≠ Piled or Pier Foundations
- ≠ Deep Strip Foundations
- ≠ Compaction of In Situ Soils below Individual Footings.

7.3.2 Alternative Domestic Sewage Effluent Treatment Systems

The following domestic sewage effluent treatment systems are considered:

a) The "Gem" Mini Sewage Treatment Plant (MSTP) – The Preferred Alternative

The "GEM" mini sewage treatment plant is a miniature size biological plant. The unit is designed and engineered specially for those who are temporarily, or permanently, residing outside the reach of municipal sewage disposal systems, or for use in areas where french drains/soak aways are prohibited.

The "GEM" mini sewage treatment plant is compact and needs minimal maintenance. It can be installed at almost any location. The installation procedure is simple and the plant can be installed by the owner himself following the installation instructions.

The "Gem" MSTP was designed to be used in environmentally sensitive areas. According to the manufactures the advantages of using the "Gem" MSTP are the following:

- ≠ Proven sludge anaerobic/aerobic treatment process;
- ≠ Low cost, low maintenance, hygienic solution;
- ≠ The final purified and chlorinated effluent may be used for controlled irrigation purposes;
- ≠ A prevention against the spread of waterborne disease;
- ≠ Can be installed in close proximity to dwellings/buildings
- ≠ Available in units of a normal household of say 6 – 8 capita
- ≠ The ultimate solution in replacing pit latrines, subject to a water supply and a 220V power supply (of say 180W) being made available; and
- ≠ Ideally suited for single households, caravan parks, clinics, prisons, schools, game reserves, lodges, offices, coastal chalets, public toilets, ablution blocks, etc.

b) Lilliput

The Lilliput is designed for the purification of organic wastes, so as to permit safe discharge to the environment, or selective re use of the treated stream. Some of the advantages of using the Lilliput system are the following:

- ≠ The plant does not require continuous supervision and minimal maintenance;
- ≠ System is odourless and virtually silent;
- ≠ Environmentally friendly;
- ≠ Efficient process; and
- ≠ Can be recycled for flushing, irrigation or use in water features.

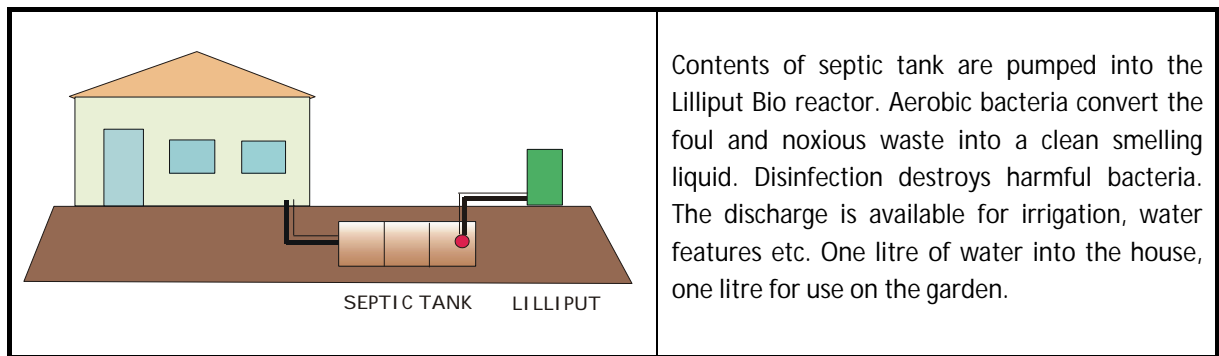


Figure 7: Septic Tank and Lilliput

c) **Septic Tank – French Drain**

A soak away also known as a French drain is not the ideal option for sewage disposal. Eating habits have changed in recent years and more indigestible fats are consumed, and most of households use a variety of sanitisers and disinfectants, many of which are harsh and do not biodegrade. As the population of microbes decreases, struggling to digest the excess fats, the soak away clogs, the chambers back up, and start to smell and overflow. The system dies, which means higher cost and maintenance to revive the system.

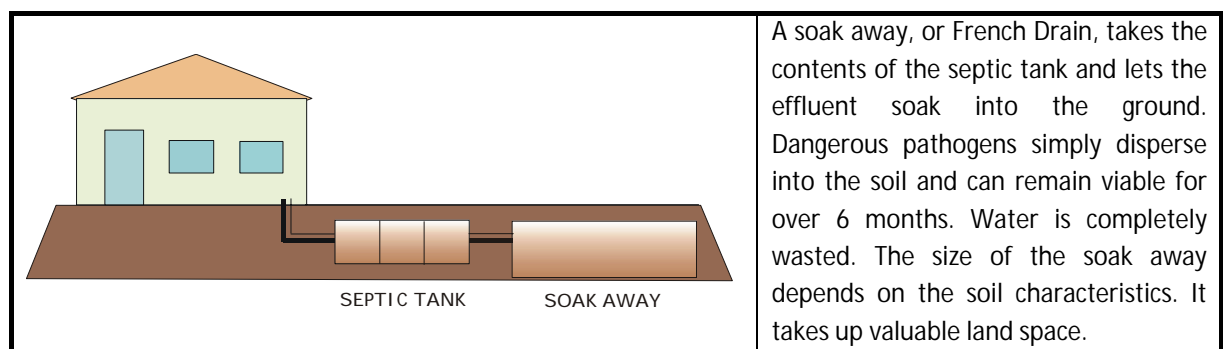


Figure 8: Septic Tank and French Drain / Soak Away

d) **The Bio Mite System**

The Bio Mite incorporates a biological process to clean waste water that flows from the septic tank. In this process a biomass of bacteria breakdown biodegradable waste and convert it into carbon dioxide and water. Any non biodegradable matter collects at the bottom of the tank and is periodically removed in the same way as the septic tank is pumped out. The biomass is a colony of self regenerating bacteria that will survive as long as they have a suitable food source (the waste) and a comfortable environment (sufficient oxygen and no harsh chemicals). The septic tank provides the food source and the Bio Mite the comfortable environment. Inside the Bio Mite is a matrix of plastic media upon which the slimy bacteria cling. As the waste water circulates through the media food is delivered to the bacteria. A powerful air blower aerates the waste water introducing oxygen into the system and ensuring that the waste stream is continuously circulated through the media.

If you wish to use your effluent for irrigation it will be necessary to chlorinate the waste stream which will kill any pathogenic organisms that may be present. This is done in the specially constructed chlorination capsule provided for this purpose. The onus will be on the home owner to refill this capsule from time to time

(approximately every three months). Once the waste has been treated it then can be passed into a drain field or be used for irrigation.

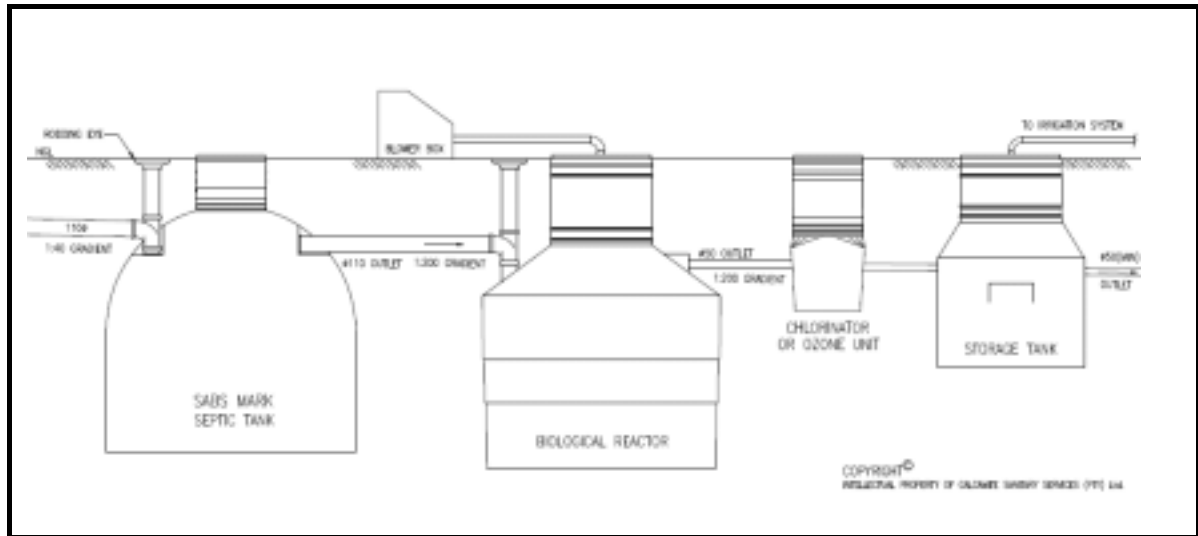


Figure 9: The Bio Mite System

7.3.3 "No Go" Option

The No Go alternative is the option not to act. This option is usually considered when the proposed development is envisaged to have such significant long term negative environmental impacts that mitigating measures cannot ameliorate identified impacts effectively.

Should a "No Go" Option be considered it can be deduced that potential impacts associated with the proposed development, identified as being either negative or positive, would not manifest. In reviewing what option is the most suitable, cognisance must be taken of the fact that the status quo scenario itself does not reflect a sustainable and/or desirable scenario. It was already indicated that sand skimming or scalping operations on the river bed and terraces caused significant damage to the environment and if the no go option is enforced the rehabilitation of the river and associated floodplain will not be realised.

CHAPTER 8: SUMMARY OF FINDINGS & RECOMMENDATIONS OF SPECIALIST REPORTS

8.1 Ecological Report

BioVista Consultancy Services compiled a comprehensive Ecological Report, which is attached to this EIR as Appendix 5. In summary:

The proposed Happyland development is located in the Arid Lowveld, which is not a threatened ecosystem, never the less there are a few areas that are considered to be sensitive or potentially sensitive. The area has been allocated a rough zonation, consisting of 4 different zones, namely: Least sensitive, Low sensitivity, Intermediate to sensitive and Sensitive. The most sensitive areas are those located along the Sand River, the bush clumps, the very tall trees and the old dead leadwoods. The riparian and bush clumps are the most biologically diverse areas, providing habitat, shelter and food resources for different organisms, hence their rating as sensitive.

There are a few taxa that are either protected or are Red Data species (both flora & fauna) that may / may not occur on the property. The habitats of these species have been taken into consideration in this assessment, and therefore no further deliberation needs to be made when planning the layout of the development.

8.2 Heritage Impact Assessment

Archaeo Info Northern Province (AINP) was contracted by Triviron EAP (Pty) Ltd. to conduct a Heritage Impact Assessment (HIA) on the Proposed Eco Estate on the Farm Happyland 241 KT, Limpopo Province.

A member of AINP performed the assessment on 03 August 2007.

The extent of the proposed development sites were determined as well as the extent of the areas to be affected by secondary activities (access route, construction camp, etc.) during the development. The sites were plotted using a Global Positioning System (GPS) and photographed digitally. The sites were surveyed on foot and by vehicle.

The result of this survey was the identification of a single occupational site on the eastern side of the existing runway on the property. The site was deemed of high scientific and cultural importance and a second phase of investigation was recommended. A site visit with representatives of the South African Heritage Resource Agency (SAHRA) corroborated the initial findings.

Mitigation Recommendations:

The following guideline recommendation is proposed for the mitigation of the site identified at Zandspruit Estate:

1. Surveying of surface deposit and features

- € A site plan will be compiled to indicate the surface features of the site before excavations of any kind are commenced.

2. Determination of the extent of the deposit as well as the depth.

- € It is recommended that two diagonal excavation trenches be dug across the north/south and east/west lines of the site. These trenches will be 500mm wide and will descend to virgin soil or bedrock to determine the depth of the deposit. Should the deposit extend further than the boundaries identified on the surface the trenches will be extended to include this deposit. The trenches will be excavated in arbitrary layers, only if no distinct occupational layers can be identified. These trenches will also serve to identify possible sub surface features.

3. Excavation of features

- € Should any cultural features be identified during the trench excavations, the excavations will be extended to include the features and expose them. Blocks measured from the datum point will be measured out to be excavated.

4. Documentation of materials and features

- € All features and materials will be documented in detailed and plotted on a site plan.

5. Curation of finds

- € All finds will be marked, inventoried and curated according to standard practices. Materials will be stored in a local institution.

8.3 Geotechnical Report

Rock & Stock Investments cc compiled a comprehensive Geotechnical Report, which is also attached to this EIR as Appendix 4. In summary:

Geotechnical Considerations

1. Soil Classification

The results of the Atterberg Limits showed that the transported sands and gravels showed a large range in terms of subgrades and from good to poor subgrades in the AASHTO classification; owing to the variable nature of the subgrades they should generally be thought of as forming poor sugrade material. Looking in more detail at the upper hillwash horizon it will be seen that it generally classifies as sandy gravels and gravely sands with smaller amounts of silty sands and minor clayey sands. It will be seen that hillwash classified as SC, SM, SM, GP, GC and CL and combinations thereof according to the Unified Soil Classification System and varied between A 1 b, A 2 4, A 2 6 and A 6 according to the AASHTO group classification.

2. Outcrop

Pervasive float was encountered across the proposed estate. Outcrops of the gneisses and amphibolites were confined to the stream channels while dolerite dykes were seen to outcrop in a number of localities. Where soil profiles are thin (less than 75cm), foundations should be excavated to bedrock level and as such both gneiss and dolerite will be encountered during excavation for the development while hard outcrops of dolerite may be expected to occur throughout the development.

3. Potential Expansiveness

The Atterberg Limits were determined for all the samples. It was found that on the Potential Expansiveness chart all of the samples plot as low to very low in terms of their potential expansiveness – heave on these

soils can therefore be expected to be negligible (vd Merwe, 1975). Looking at the results of the double consolidation test and foundation indicator results the total swell should not be expected to exceed 1cm in the soils. Founding conditions across this site may be expected to exhibit negligible heave.

4. Collapse Potential

From the laboratory test results in conjunction with the relationship between dry unit density and liquid limit determined by Holtz and Hilf (1961), the soils can be deemed to have a low to moderate collapse potential.

Settlement collapse in the fine grained hillwash can be estimated to be an average of 23cm for a 1.5m susceptible layer; where foundations on the north of the property lie on bedrock this will obviously not be a factor. The depth of influence on the soil horizon will of course be related to the planned loading, it is unlikely for the residential portions that the soils will be influenced to a 1.5m depth. Settlement collapse is likely to be of concern in the southern part of the property proximal to the Sandspruit River channel, i.e. for the luxury bush stands and the airport residential area. In all cases in order to assess the soil profile in these areas, test pits should be excavated by TLB around the margins. The collapse potential on the site is thought to be severe. The underlying rock in all cases is not collapsible.

5. Percolation Rate and French Drain Design

Three in situ percolation tests were carried out in accordance with the method prescribed by the NHBRC in the upper transported layer. The percolation rate was found to be:

Percolation Test	Percolation Rate	Required Surface Area
1	5 minutes	16.0 m ²
2	10 minutes	20.0 m ²
3	3 minutes	14.8 m ²

The required surface area was calculated using a figure of 1600 litres of sewerage per day per development portion. If one uses the worst case scenario for all French drain design (test 2) then the total required surface area for French drains for the development is not less than 20.0m². Therefore a 0.6 m deep, 0.60 m wide trench one will need not less than 16.1 m length of trench for a French drain.

Where it is not possible to excavate the French drains to a depth of 0.6m the required length of French drain will obviously need to be increased. The French drains should be laid out subparallel to the contour of the site, away from any surface run off channels or water sources, and any parallel drains should not be closer to one another than twice their depth.

6. Drainage and Soil Chemistry

No water seepages were encountered during the investigation. The necessary damp proofing precautions should be taken underneath structures and surface beds. The foundation materials are considered to be very mildly aggressive with regards to buried ferrous pipes and the use of non ferrous metal pipes or plastic pipes should preferably be used for wet services. Foundation soils should be treated with an environmentally friendly insecticide to combat termites.

7. Excavatability

Bulk excavation in the site area (up to the observed bedrock depth, 0.3 0.41m) will classify as "soft"

excavation in accordance with SABS 1200D. Excavation into the underlying bedrock will classify as intermediate to hard rock. Boulders will be encountered within the transported gravels and cobbles, as well as core stones in any residual dolerites and possibly in the gneisses.

8. Slope Stability and Erosion

The proposed development area is on gently undulating topography with gradients varying between 1:18 and 1:33, the maximum slope is therefore approximately 3°. The Sandspruit stream channel is to the south of the proposed development area and only contained isolated pools of water during the time of the investigation, but is known to be fast flowing during the rainy season. The stream channel is well away from the sites of proposed construction. No slope stability problems are envisaged, where possible service and access routes should be made as close to the contour as possible to minimise any chance of erosion.

9. Engineering Design Considerations

Where foundations will be on rock, it is estimated that the UCS of the gneisses is between 3 and 10MPa, while any unweathered dolerite will likely have a UCS in excess of 200MPa. The upper transported hillwash is not expansive but is potentially severely collapsible, these soils will require compaction in order to improve their founding properties.

10. Seepage zones

No permanent seepage zones were encountered.

11. Trenching

The TLB (CAT 416B) used during the site investigation freely excavated the test pits up to the depth of bedrock with refusal being recorded at depths between 0.44m and 1.63m for the excavations. In the southern part of the proposed development area, in the vicinity of the Sandspruit River channel, some excavations did not encounter refusal at bedrock depth but were rather stopped at the limits of the TLB's mechanical arm extension, in these instances calcrete and cemented sand were encountered at depths greater 2.0 meters. All the test pits stood unsupported during the excavation of the inspection pits.

12. Earthworks

Earthworks will be shallow in the northern part of the farm as a result of very thin soil cover and deeper towards the Sandspruit River which forms the southern boundary of the proposed development area. Both during and after construction, the site should be well graded to permit water to drain away readily and to prevent ponding of water anywhere on the ground surface. It is recommended that all earthworks be carried out in accordance with SANS 1200 (latest version).

13. Subgrade Preparation

The variable soils encountered generally classify as good to poor subgrades as per the AASHTO classification. The variable nature of the soils means that as a class they should be regarded as poor subgrade material and will require improvement to be used as suitable subgrades.

14. Conclusions

No overly adverse conditions were encountered during the investigation in terms of the National Department of Housing's Generic Specification (GFSH 2) and no onerous requirements are envisaged for compliance in terms of the NHBRC's Home Building Manual. Founding where reasonably possible should be on bedrock. Where deep soil profiles are encountered which preclude founding on bedrock, cognisance should be taken of the collapsible nature of the soils. Where foundations may cross differing founding strata there may be minor differential movements and any design should take this into account.

8.4 Traffic Impact Assessment

Access to the proposed land development area will be from the R527, from 4 different access intersections and to the satisfaction of the relevant authority. A separate traffic impact study was undertaken, however not ready for submission at the time of writing of this report. The said traffic impact study will be submitted to all the relevant authorities and all the necessary approvals will be obtained.

Chapter 9: IMPACT ASSESSMENT

This chapter describes and assesses the significance of potential impacts on the biophysical and social environment as a result of the proposed Zandspruit Estates development and associated infrastructure. Mitigation measures are proposed which could ameliorate the negative impacts or enhance potential benefits.

The significance of an environmental impact depends on its extent, intensity and duration, the sensitivity of the affected environment along with the degree of change and probability that the impact will occur. For the purpose of this document, environmental impacts include: (a) impacts of the development on the environment; (b) the development constraints that the environment imposes on the development; and (c) concerns and issues commonly raised by stakeholders or interested and affected parties during the PPP.

9.1 SIGNIFICANCE CRITERIA

Table explains the methodology used in determining the significance of potential environmental impacts

Table 17: Significance Criteria

<p>€ Significance Points Formula</p> <p>The significance (SP) is determined by the following formula: $SP = (s + d + m) \times P$</p> <p>Where: s = scale of impact rating d = duration of impact rating m = magnitude rating P = probability of occurrence</p> <p>The maximum value is 100 significance points. Depending upon the numerical value, potential impacts are rated as:</p> <p>€ High – more than 60 significance points.</p> <p>The impacts will have a major influence on the proposed development and/or environment and will require significant mitigation or avoidance. The impacts may have the “no go” implication on portions of the development regardless of any mitigation measures that could be implemented.</p> <p>€ Moderate – between 30 and 60 significance points.</p> <p>The impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures, etc.</p> <p>€ Low – less than 30 significance points.</p> <p>The impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.</p> <p>This process is followed to determine the significance rating for each of the aspects assessed.</p>

RANKING CRITERIA

The significance of potential environmental impacts was determined by using the ranking formula indicated above. The ranking criteria are briefly summarised below to guide the reader through the assessment process.

a) Scale of the impact

This category serves to describe the geographical focus of an impact and is based on the demarcation of the study area. Within the impact tables, the impact variables are conceptually related to the demarcation of the study area. This serves to indicate where the impact would most likely prevail.

€ None	(0)
€ site only;	(1)
€ local	(2)
€ regional	(3)
€ national	(4)
€ international	(5)

b) Duration of the impact

This serves as an indication of what the anticipated lifespan of the impact would be:

€ Immediate	(1)
€ Short term (0 5 years)	(2)
€ Medium term (5 25 years)	(3)
€ Long term (ends post operation)	(4)
€ Permanent	(5)

c) Magnitude

Under this rating criterion, the magnitude (intensity) of the impact is described using a rating continuum of minor to very high.

€ Minor	(2)
€ Low	(4)
€ Moderate	(6)
€ High	(8)
€ Very high	(10)

d) Probability of occurrence

This includes a description of the probability of the impact actually occurring, i.e.

€ None	(0)
€ Improbable;	(1)
€ Low probability;	(2)

€ Medium probability	(3)
€ Highly probable; and	(4)
€ Definite	(5)

9.2 ASSESSMENT TABLES

9.2.1 Climate

General recommendations: Analyze whether the climate is comfortable, too cold or too hot for the anticipated activities, and then which of the primary climatic components of temperature, sun, wind and moisture will increase comfort level (asset) or decrease it (liability). The following planning guidelines should be considered.

Temperature: Temperature is a liability in climates where it is consistently too hot or too cold; when climate is predominantly too hot for comfort:

- use elongated or segmented floor plans to minimize internal heat gain and maximize exposure for ventilation
- separate rooms and functions with covered breezeways to maximize wall shading and induce ventilation
- isolate heat generating functions such as kitchens and laundries from living areas
- provide shaded outdoor living areas such as porches and decks
- capitalize on cool night time temperatures, breezes or ground temperatures

Sun: (when solar gain causes conditions too hot for comfort):

- use overhangs to shade walls and openings;
- use site features and vegetation to provide shading to walls with northern and western exposure
- use shading devices such as louvers or covered porches and trellises with natural vines to block sun without blocking out breezes and natural light
- orient broad building surfaces away from the hot late day western sun (only northern and southern exposures are easily shaded)
- use light coloured wall and roofing material to reflect solar radiation (be sensitive to resulting glare and impact on natural/cultural setting).
- moisture can be an asset by evaporating in hot, dry climates to cool and humidify the air (a natural air conditioning). Techniques for evaporative cooling include placing facilities where breezes will pass over water features before reaching the buildings, and providing fountains, pools and plants.

Wind:

- Wind can be an asset in hot, humid climates to provide natural ventilation:
- Use natural ventilation wherever feasible; limit air conditioning to areas requiring special humidity or temperature control.
- Control exposure to wind through plan orientation and configuration, number and position of wall and roof openings and relationship to grade and vegetation

Other Climatic Considerations:

- Rainfall can be a liability if concentrated runoff from developed surfaces is not managed to avoid erosion;
- Rainfall can be an asset if it is collected from roofs for use as drinking water.

THEME	CLIMATE	
Nature of impact	Resource use / comfort levels Climatic conditions (temperature, wind, humidity, etc) play an integral role in determining the level of comfort experienced by occupants of a residential development, and their associated energy requirements for lighting and space heating and/or cooling.	
Impact focal point	Future residents and employees	
Stage	Planning / Construction	Normal Operation
Scale of impact (s)	Site Only (1)	Site Only (1)
Duration of impact (d)	Short term (2)	Permanent (5)
Magnitude (m)	Low (4)	Minor (2)
Probability of occurrence (p)	High probability (4)	Medium Probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	Low (28)	Low (24)
Cumulative Impacts	None	None
Mitigation measures	<p>≠ Design of housing units should be in accordance with the architectural guidelines in order to maximise use of natural light, provide sufficient insulation and cross ventilation and protect against extreme climatic conditions.</p>	<p>≠ Apply natural conditioning techniques to achieve appropriate comfort levels for human activities.</p> <p>≠ Avoid overdependence on mechanical systems to alter the climate such dependency signifies inappropriate design, disassociation from the environment and non sustainable use of resources.</p>
Level of significance after mitigation	Low	Low

9.2.2 Topography

No development is planned on steep slopes (10%). No excessively steep cuttings and embankments are planned. The buildings will be constructed in accordance with the recommendations and specifications of an engineering assessment. Such specifications will be in response to ground water conditions, soil characteristics and gradient.

THEME	TOPOGRAPHY	
Nature of impact	<ul style="list-style-type: none"> • Bulk earthworks: Deep cuttings, high embankments, disposal of spoil and excavations cause local changes to topography. • Visual impacts: Topographical features contribute to the landscape character and sense of place of an area. Visual scarring due to cuttings and embankments and areas devoid of vegetation are most obvious when located on elevated areas in the landscape. • Erosion: Topography dictates drainage patterns and the subsequent potential for erosion or waterlogging. 	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation

Scale of impact (s)	Local (2)	Local (2)
Duration of impact (d)	Immediate (1)	Short term (2)
Magnitude (m)	Very High (10)	Moderate (6)
Probability of occurrence (p)	High probability (4)	Medium probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (52)	Low – Moderate (30)
Cumulative Impacts	Visual Impact	Visual Impact
Mitigation measures	<ul style="list-style-type: none"> Avoid development on excessively steep slopes. Avoid excessively steep cuttings and embankments. Provide the necessary erosion protection measures. 	<ul style="list-style-type: none"> All buildings and landscaped areas must be maintained. Planting of indigenous tree and shrub species must be encouraged. Stormwater on site must be managed as determined in a Stormwater Management Plan.
Level of significance after mitigation	Moderate to Low	Low

9.2.3 Geology and Soils

THEME	GEOLOGY AND SOILS	
Nature of impact	<p>Soil erosion, loss of topsoil, deterioration of soil quality:</p> <ul style="list-style-type: none"> Development may result in the disruption of the balance between vegetation growth, natural weathering patterns and soil formation. The stabilising vegetation cover of soils will be removed from certain areas in order to facilitate construction. Soils may also be compacted by heavy vehicles and construction equipment. Once disturbed, soils become more susceptible to erosion. Erosion risk is depending on the time of year and the location of construction – the greater the slope the greater the run off. Changes to natural drainage patterns are often necessary to accommodate the creation of slopes suitable for the construction of structures and roads. Diversion of stormwater may result in large volumes of water being concentrated in certain areas, thereby increasing the risk for erosion. Erosion of the soil surface has dramatic impact on topsoil availability and the ability of an area to support vegetation growth. Soil particles that enter watercourses due to erosion result in the elevation of sediment loads and are regarded as pollutants. <p>Soil pollution</p> <ul style="list-style-type: none"> During construction, petrochemical products leaking from construction vehicles, spills at construction camps, sewerage and grey water from temporary sanitation facilities, refuelling depots and concrete batching plants, may result in contamination of soils. During operation and maintenance, soil contamination may occur as a result of inappropriate sanitation and waste management practices, and the use of hazardous substances. 	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation
Scale of impact (s)	Local (2)	Local (2)
Duration of impact (d)	Short Term (2)	Long term (4)
Magnitude (m)	Very High (10)	High (8)
Probability of occurrence (p)	Definite (5)	Medium probability (3)

Level of significance (SP) $SP = (s + d + m) \times P$	High (70)	Moderate (42)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> • Avoid development on inherently unstable areas and areas with high rates of natural weathering and high likelihood of mass movements of soil and substrata. • Avoid excessively steep slopes, deep cuttings and high embankments. • Balance cut and fill volumes to minimise spoil material quantity and reduce the need for borrow pits for sourcing of fill material. • Ensure correct position of construction camps, equipment yards, refuelling depots, concrete batching plants, etc. to avoid areas susceptible to soil and water pollution. • Minimise the area of vegetation clearance and avoid exposing soils that are vulnerable to erosion. • Protect areas that are susceptible to erosion with mulch or suitable fabric. • Implement appropriate topsoil management practices (stripping, stockpiling and reuse during rehabilitation of disturbed areas). • Rehabilitate areas disturbed during construction, including spoil dumps, stockpile areas, construction camps, and temporary access and hauling routes, as soon as possible after the disturbance has ceased. • Ensure appropriate handling of hazardous substances. • Remediate polluted soil. • Topsoil shall be stripped from all areas that are to be utilized during the construction period and where permanent structures and access is required. These areas will include pipeline trenches, stockpiles, access roads, construction camps and laydown areas. Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences. 	<ul style="list-style-type: none"> • The use of any fertilizers other than environmentally friendly fertilisers and pest control products should be prohibited. • Litter blocking stormwater system must be removed. • If soils compaction occurs – rip compacted areas to improve infiltration, reduce runoff and ease of landscaping. Maintain plant cover and avoid unnecessary trafficking. • Protect areas that are susceptible to erosion with mulch or suitable fabric.
Level of significance after mitigation	Moderate	Low

9.2.4 Ecology and Biodiversity

THEME	FAUNA AND FLORA	
Nature of impact	Degradation, destruction or elimination of ecosystems	
	<p>∄ Ecosystems will be permanently lost where structures, roads and other infrastructure consume land.</p> <p>∄ Ecosystems may be disturbed or destroyed during construction. Many of the areas disturbed during construction such as construction camps will be rehabilitated after construction, but impacts will remain until rehabilitation has been implemented successfully. Even after rehabilitation, species diversity and ecosystem dynamics may not be the same as prior to the disturbance.</p> <p>∄ Land consumption by development mainly affects terrestrial habitats, but aquatic habitats may also be affected where development is located in close proximity to watercourses or wetlands.</p> <p>∄ Firewood collection and poaching can have a major impact on local floral and faunal populations. This may result in gradual habitat degradation, deforestation and depletion of fauna populations.</p>	
	Loss of large trees with Airstrip extension	
	<p>∄ It appears that in order to upgrade the airstrip it will be necessary to lengthen and widen it. There are a few large Leadwood trees in this area that will most likely not be able to be saved. These trees are protected species and are important habitats – especially breeding – for a number of birds in particular.</p>	
	Ecosystem fragmentation	
	<p>∄ Development may result in the fragmentation of an ecosystem, dividing it into smaller parts. Fragmentation may affect the integrity and stability of the ecosystem. Smaller habitats are more vulnerable and their ability to support the original number and diversity of species may be compromised.</p>	
	Impacts on migration routes of wildlife	
	<p>∄ In some instances, development with their road networks, perimeter fences, paved areas and structures may create a barrier to movement of faunal species. Bulk earthworks: Deep cuttings, high embankments, disposal of spoil and excavations cause local changes to topography.</p>	
	Impact focal point	Site
	Stage	Construction
	Scale of impact (s)	Site only (1)
	Duration of impact (d)	Short term (2)
	Magnitude (m)	Very High (10)
	Probability of occurrence (p)	Definite (5)
	Level of significance (SP) $SP = (s + d + m) \times P$	High (65)
	Cumulative Impacts	N/A
	Mitigation measures	<ul style="list-style-type: none"> • While bush clearing will most likely need to be undertaken in some areas, the areas needing to be cleared and the degree of clearing required will be • Control poaching and firewood collection. • Avoid the establishment of invasive species.

	<p>determined and demarcated prior to construction. Such a determination will be undertaken in consultation with the ECO before clearing begins. Ancillary activities, such as stockpiles, and storage yards, will be demarcated to areas already disturbed or where they will cause minimal disturbance.</p> <ul style="list-style-type: none"> • Avoid development in sensitive ecosystems. • Control poaching and firewood collection. • Avoid the establishment of invasive species. • Loss of trees – Landing Strip: Try to lose as limited number as far as possible. Ideally leaving these “stumps”/ logs in the bush as habitat for animals would be the best solution, however if they trees are intended for ornamental purposes or anything similar, Limpopo Parks (Klaserie office) can be contacted for guidance. • Bush encroachment by woody (mainly indigenous) species occurs as a result of disturbance to the balance between tree and grass components in the Savanna ecosystem. This disturbance is invariably due to over grazing. There is an opportunity to try and restore the balance and remove patches of the bush encroached areas. The main species that have encroached on the Happylands property include Sickie bush (<i>Dichrostachys cinerea</i>) and <i>Acacia exuvialis</i>. • No go / sensitive areas No go areas must be demarcated with fencing / warning tape and signs before any construction activities commence. All construction activities must remain within the boundaries of the development area, as demarcated at the start of construction. 	<ul style="list-style-type: none"> • Continue with existing policy of only removal of indigenous species if absolutely necessary. Where possible only trim / prune plants rather than actually removal of whole trees. Plant additional indigenous species where screening is required. • The Estate should establish a policy on planting exotic species. It is recommended (due to the location in the buffer zone as well as the nature of the proposed development) that only indigenous plants (not necessarily indigenous to the area – although this would be preferred) may be grown, and in addition it is suggested that these gardens be water wise with species that do not require regular watering. • Vegetation is to be retained within the open space area. • Natural vegetation to be retained on erven where practically possible.
Level of significance after mitigation	Moderate	Low

9.2.5 Hydrology

Water Abstraction / Utilisation Nature of the impact: Although water will be piped from the Blyde Pipe Line (part of the Irrigation scheme), and not abstracted from the site, it still remains a critical resource in this arid region. Water supply is very stressed in the whole Kruger to Canyons Biosphere Region. This is due to a number of reasons including over abstraction out of the rivers, damage in the catchments systems especially the Olifants River and periodic drought typical of the region.

THEME	WATER RESOURCES	
Nature of impact	<p>Stormwater flow</p> <ul style="list-style-type: none"> Developments often involve the modification of drainage patterns. Stormwater may be concentrated at certain points, increasing the velocity of flow in one area and reducing flow in another. This may contribute to flooding, soil erosion, sedimentation, scouring, and channel modification downstream of the development. <p>Impacts on water quality</p> <ul style="list-style-type: none"> Elevation of sediment loads due to eroded soil particles entering watercourses may affect sun penetration, water temperature and levels of oxygen available to aquatic species. Sedimentation problems are most problematic during construction when large areas are cleared of vegetation. Sediments may also contain traces of nutrients, herbicides and pesticides and other chemicals. <p>Water abstraction</p> <ul style="list-style-type: none"> Water abstraction and unnecessary wastage of a scarce resource may cause depletion of local water resources. 	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation
Scale of impact (s)	Local (2)	Regional (3)
Duration of impact (d)	Short term (2)	Long term (4)
Magnitude (m)	High (8)	Moderate (6)
Probability of occurrence (p)	Definite (5)	Medium probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	High (60)	Moderate (39)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> Avoid locating development where the development would require canalisation or diversion of watercourses. Install adequate stormwater drainage systems. Locate construction camps, refuelling depots, sanitation facilities and concrete batching plants in order to minimise impacts. Ensure that appropriate waste management practices are implemented. Ensure that transport, storage, handling and disposal of hazardous substances is adequately controlled and managed. Provide containment areas for potential pollutants at construction camps, refuelling depots and concrete batching plants. Implement measures to minimise water consumption. 	

		<p>infiltration.</p> <ul style="list-style-type: none"> Where silt traps have been incorporated as part of the storm water management system these must be maintained as per the engineers requirements, the maintenance crew must be informed as to the correct procedure, in terms of the engineers specifications, how the silt trap is to be maintained.
Level of significance after mitigation	Moderate	Low

9.2.6 River Rehabilitation

THEME	RIVER REHABILITATION	
Nature of impact	<p>As mentioned in the previous section the mining has had a significant impact on the geomorphology of the riverbed. This has resulted on loss of habitat for a variety of different organisms e.g. clams and trees and even more importantly this action has resulted in the drying up of the riverbed. In addition to this it is also un aesthetically pleasing to see large areas of excavated sand. However despite this negative impact (not due to the proposed development) there is an opportunity to turn it into a positive impact by rehabilitating the system.</p>	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation
Scale of impact (s)	Site only (1)	Local (2)
Duration of impact (d)	Short term (2)	Permanent (5)
Magnitude (m)	Very High (10)	High (8)
Probability of occurrence (p)	Definite (5)	Definite (5)
Level of significance (SP) $SP = (s + d + m) \times P$	High (65) – Positive impact due to rehabilitation	High (75) – Positive due to rehabilitation
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> It is suggested that the remaining sand piles be evened out to provide some areas with a buffer of sand onto the clay bottom substrate. This can be done with a bulldozer to help landscape the riverbed. It is important to try and avoid further damage to the population of Anabooms, and don't take soil / sand from the banks – only the piles in the middle. This rehabilitation action will help improve the aesthetics of the river and most likely also contribute towards improving its water retention ability. 	<ul style="list-style-type: none"> Areas susceptible to erosion must be protected by installing temporary or permanent drainage works and energy dispersion mechanisms and could include: vegetation, mitre drains (afleivore), drainage pipes, reno mattresses (biodegradable material, upon which soil and rocks are packed which then keeps it in place to bind the soil), benches (grondwalle), benches consisting of sandbags, gabions, gabion mattresses, scarifying (ripping) area along the natural contours, and packing branches and rocks in small gullies and disturbed areas.
Level of significance after mitigation	High	High

9.2.7 Air Quality

THEME	AIR QUALITY	
Nature of impact	Dust from construction activities, unsurfaced roads and unvegetated areas.	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation
Scale of impact (s)	Local (2)	Site only (1)
Duration of impact (d)	Immediate (1)	Immediate (1)
Magnitude (m)	Moderate (6)	Low (4)
Probability of occurrence (p)	Definite (5)	Medium Probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (45)	Low (18)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> Implement dust suppression measures and reduce vehicle speeds on unsurfaced roads near sensitive receptors (the impact on water resources associated with the use of water for dust suppression should be weighted up against the actual impact of the dust). Avoid excessive movement of construction vehicles over unsurfaced access and hauling routes. Revegetate disturbed areas as soon as possible after the disturbances (i.e., construction activities) have ceased. Avoid dust generating construction activities during strong winds. 	
Level of significance after mitigation	Moderate	Low

9.2.8 Aesthetics

THEME	AESTHETICS	
Nature of impact	<ul style="list-style-type: none"> Introduction of elements that are uncharacteristic to the aesthetics and landscape character of the area, such elements include, lighting, fencing, smoke and dust. Landscape disfiguration by deep cuttings, embankments and erosion scars. Litter 	
Impact focal point	Site and Surroundings	
Stage	Construction	Normal Operation
Scale of impact (s)	Local (2)	Local (2)
Duration of impact (d)	Short term (2)	Permanent (5)
Magnitude (m)	High (8)	Low (4)
Probability of occurrence (p)	Definite (5)	Medium Probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	High (60)	Moderate (33)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> Avoid locating developments close to sensitive receptors. Utilise topography to minimise visual exposure of the developments to 	
	<ul style="list-style-type: none"> Provide waste disposal facilities and enforce anti littering campaigns. The design and planning of the residential development will be such 	

	<p>sensitive receptors.</p> <ul style="list-style-type: none"> • Avoid steep cuttings and embankments that require engineering solutions for slope stabilisation. • Minimise vegetation clearance. • Implement appropriate design features to ensure visual appeal of the development. • Provide waste disposal facilities and enforce anti littering campaigns. 	<p>that it will blend unobtrusively into the surrounding natural landscape and is consistent with the sense of place. Height restrictions, use of appropriate natural materials (such as thatch, stone and timber) and the use of camouflage techniques are important mitigation measures in terms of short distance visual impact mitigation. A structure's shape, colour and texture can be softened by means of appropriate techniques which include non reflective paint (lightning masts), natural coloured paint (water towers) and screening with appropriate materials (thatch, stone and timber). Power supply lines and telephone lines will be underground. No trees will be removed and as much as possible of the original vegetation will be retained during development. Only down lights or lights with shields may be used for external lighting.</p> <ul style="list-style-type: none"> • Security lights are to be angled downwards to avoid disturbance to adjoining residents and businesses.
Level of significance after mitigation	Moderate	Low

9.2.9 Noise Intrusion

The main noise related impacts are anticipated to be emanating from construction activities and construction camp activity. The severity would thus depend on whether a construction camp(s) would be erected and the location thereof.

The influx of visitors to the proposed development could also lead to additional noise in the existing low noise level area. The impact is, however, considered to be restricted to the site only. Further noise pollution is expected due to the aircrafts and landing strips. At this stage there is no information readily available on the number of aircraft that would land at the proposed development on a daily basis. Although the number of aircraft might not be excessive, it is still a considerable impact due to low ambient noise levels in the area.

THEME	INTRUSION IMPACTS	
Nature of Impact	Noise Intrusion	
Impact focal point	Site and adjacent properties	
Stage	Construction	Normal Operation
Scale of impact (s)	Local (2)	Local (2)
Duration of impact (d)	Short term (2)	Medium term (3)
Magnitude (m)	Moderate (6)	Moderate (6)
Probability of occurrence (p)	Highly probable (4)	Medium probability (3)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (40)	Moderate (33)
Cumulative Impacts		

Mitigation measures	<ul style="list-style-type: none"> Limit construction activities with potential noise impacts to non intrusive times (i.e. not on Sundays, night times, etc. Ensure that all vehicles comply with noise abatement regulations. The adjacent property owners must be informed of the construction schedule. Construction camp workers should be instructed to limit recreation related noise after hours. 	<ul style="list-style-type: none"> Flights to the area should be scheduled to limit the impact of noise on the daily living and movement of residents in the area.
Level of significance after mitigation	Moderate	Low

9.2.10 Littering / Solid Waste Disposal

Naturally with such a development there will be an accumulation of rubble, litter and general building rubbish. Such accumulations can be both a health hazard, unsightly as well as being a place where wild animals go to scavenge.

The building rubble and solid construction waste (such as sand, gravel, concrete and waste material) that cannot be used for filling and rehabilitation and other litter and waste generated during the construction phase will be removed from site and be disposed of safely and responsibly at a landfill licensed in terms of section 20 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989).

THEME	WASTE	
Nature of impact	<ul style="list-style-type: none"> During the operation of facility, it is anticipated that pollution could occur through injudicious littering by contractors and labourers. The risk of soil pollution and the associated contamination of the ground water zone exist as a direct result of littering and the inefficient handling of solid waste. This concern is elevated during the rainy season, when infiltration and runoff contribute to the area of contamination and the depth of infiltration. 	
Impact focal point	Site	
Stage	Construction	Normal Operation
Scale of impact (s)	Site Only (1)	Site Only (1)
Duration of impact (d)	Short term (2)	Long term (4)
Magnitude (m)	Moderate (6)	Low (4)
Probability of occurrence (p)	Highly Probable (4)	Low Probability (2)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (36)	Low (18)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> Adequate numbers of waste disposal receptacles are to be positioned at strategic locations within the development. All areas where food is expected to be prepared and consumed are to serviced with such receptacles. Notices should be strategically placed encouraging people not to litter and to 	<ul style="list-style-type: none"> An integrated waste management approach must be used that is based on best practises and should incorporate reduction, recycling, re use and disposal, where appropriate. All waste must be disposed of at a registered site. It is the management bodies' responsibility to ensure that the contracted party responsible for

	<p>clean up their refuse before leaving.</p> <ul style="list-style-type: none"> No burying or burning of waste will be allowed. All refuse generated at the facility, whether biodegradable or otherwise, will be collected in purpose designed containers within a fenced storage area. Such containers may be 200 litre plastic or galvanised steel drums. All waste is to be transported properly (i.e. without illicit dumping, spillage of waste or release of odours en route). 	waste disposal disposes of the waste at the correct facility.
Level of significance after mitigation	Low	Low

9.2.11 Heritage Resources

THEME	HERITAGE RESOURCES	
Nature of impact	<ul style="list-style-type: none"> Land consumption: Heritage resources located on the land consumed by development, roads and other services will be eliminated. Construction activities: Those heritage resources located in close proximity to the development may be destroyed or damaged during construction. Increased accessibility: Increased human activity in an area also increases the risk of vandalism of accessible heritage sites and artefacts. 	
Impact focal point	Site	
Stage	Construction	Normal Operation
Scale of impact (s)	Site Only (1)	Site Only (1)
Duration of impact (d)	Short term (2)	Long term (4)
Magnitude (m)	High (8)	High (8)
Probability of occurrence (p)	Highly Probable (4)	Low Probability (2)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (44)	Low (26)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> Avoid developments on land where known heritage sites will be affected. Demarcate and/or barricade known heritage sites and protect them during construction. Ensure compliance with the National Heritage Resources Act. Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. In the event of a heritage object being unearthed, construction work that could impact on it should be stopped and the input of specialists in the field should be obtained. Ensure that heritage objects are not to be moved or destroyed without the necessary permits from the South 	

	African Heritage Resources Agency (SAHRA) in place.	
Level of significance after mitigation	Moderate	Low

9.2.12 Employment Equity and Occupational Opportunities

This aspect refers to the extent to which employment opportunities emerging from the proposed project match the job skills of the unemployed in the area, as well as the creation of new job opportunities and employment equity of minority groups.

Employment Equity and Occupational Opportunities

The proposed project will create a significant number of jobs. The majority of the work aimed at locals would be for unskilled labour. It is therefore expected that the local unemployed people and the youth could benefit, especially during the construction phase that would last for approximately 5 years. To maximise the benefits of the additional employment opportunities, although just temporary, local labour should thus be used during the construction phase. Considering that the agricultural (e.g. citrus and game farms) sector is the economic backbone of the area it is evident that basic adult education and training opportunities, which could enhance the construction skills base of the local workforce, would be required.

The jobs created during the operational phase, however, will have a more marked impact on the local community if it is ensured that the benefits to the local community and youth are enhanced.

Over and above the direct jobs created, a number of downstream benefits may emerge due to the increase in income, although it is not possible to determine in which sectors this would be spent. Overall this could lead to improved quality of life among many individuals residing in the area.

THEME	IMPACTS ON OCCUPATIONAL AND COMMUNITY RESOURCES	
Nature of the impact	Employment Equity and Occupational Opportunities.	
Impact focal point	Local, regional	
Stage	Construction	Normal Operation
Scale of impact (s)	Local, regional (3)	Local (2)
Duration of impact (d)	Short term (2)	Medium term (3)
Magnitude (m)	Moderate (6)	Moderate (6)
Probability of occurrence (p)	High probability (4)	High probability (4)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (44)	Moderate (44)
Cumulative Impacts		
Mitigation measures	<ul style="list-style-type: none"> € Source skills from the local community as far as possible. € Contractors should capacitate locals where practical. € Structuring a local employment policy that spreads jobs as widely within the area as possible € The project proponent could consider training to lessen the skills disparity € Communicate the skill requirements 	<ul style="list-style-type: none"> € Contractors and/or developer should make use of local recruitment agencies to obtain list of jobseekers. € Adhere to labour legislation and regulations; € Ensure fair labour practices; € Ensure an equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account.

	<p>to the local community leaders and community based organisations</p> <ul style="list-style-type: none"> € Contractors and/or developer should make use of local recruitment agencies to obtain list of jobseekers € Ensure an equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account. € A skills audit should assist in determining what benefits could accrue to the locals in terms of employment opportunities. 	
Level of significance after mitigation	Moderate (Positive)	Moderate (Positive)

9.2.13 Inflow of Temporary Workers

This section deals with the potential inflow of temporary workers to the site during the construction as well as domestic, commercial and maintenance workers during the life of the project.

The number of temporary workers introduced into the area would depend on the number of locals actually being employed during the construction phase of the proposed project. Considering that the area is characterised by largely low density, rural residential and farming areas, the impact would be felt especially in terms of the additional burden on the local economy, infrastructure (e.g. housing) and services, as well on the social system of the area. The influx of a large number of outsiders to an area is almost always perceived to increase the crime levels in the area due to the densification of the population. One could therefore assume that security concerns are also prevalent in the Hoedspruit communities.

THEME	POPULATION IMPACTS	
Nature of impact	Inflow of Temporary Workers	
Impact focal point	Mainly construction workers, but also maintenance and related workers on the proposed development.	
Stage	Construction	Normal Operation
Scale of impact (s)	Regional (3)	Local (2)
Duration of impact (d)	Short term (2)	Medium term (3)
Magnitude (m)	Moderate (6)	Low (4)
Probability of occurrence (p)	Medium probability (3)	Improbable (1)
Level of significance (SP) $SP = (s + d + m) \times P$	Moderate (33)	Low (9)
Cumulative Impacts	None	None
Mitigation measures	<ul style="list-style-type: none"> € Develop a strategy to minimise the influx of outsiders to the area € Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process. € As far as possible, the movement of construction workers should be confined to the work site to avoid 	<ul style="list-style-type: none"> € Maximise the usage of local service providers € Use local workforce. € Ensure safe and secure public transport access points. € Implement education and skills development programmes to ensure transferable skills are obtained. € Focus on also creating employment

	<p>any potential for impact from this variable in proximate residential areas.</p> <p>€ Specify the conduct of contract workers in worker related management plans and employment contracts.</p> <p>€ Temporary workers should undergo skills training. This process should also ensure that the skills required could be transferable to other sectors.</p> <p>€ Before construction commences, representatives from the local authority and community based organisations, as well as neighbouring residents should be informed of the details of the construction company, size of the workforce and construction schedules.</p>	opportunities for the youth and women.
Level of significance after mitigation	Low	Low to none

9.2.14 Sewerage Management

THEME	SEWERAGE MANAGEMENT	
Nature of impact	Nature of the impact: There has been an extensive sewerage system planned for the proposed development, and with such a development there will be huge quantities of sewerage generated. It is obviously necessary to have a system in place that will limit and/ prevent any seepage into the drainage lines and ground water systems. In addition to this there will be the unpleasant smells associated with a sewerage system, and in an Estate of this nature it obviously very important to avoid this.	
Impact focal point		
Stage	Construction	Normal Operation
Scale of impact (s)	Regional (3)	Regional (3)
Duration of impact (d)	Short term (2)	Long term (4)
Magnitude (m)	Very High (10)	Very High (10)
Probability of occurrence (p)	Definite (5)	Definite (5)
Level of significance (SP) $SP = (s + d + m) \times P$	High (75)	High (85)
Cumulative Impacts	N/A	N/A
Mitigation measures	<ul style="list-style-type: none"> The contractor will be responsible for providing all sanitary arrangements for his and the sub contractors team. A minimum of one chemical toilet shall be provided per 15 persons. Sanitary arrangements shall be to the satisfaction of the ECO, EO or RE and the local authority. Toilets shall be of the chemical type. The contractor shall keep the toilets in a clean, neat and 	<ul style="list-style-type: none"> The design, installation and operation of sewage treatment systems will conform to the National Water Act, including all the regulations made under section 26 of the National Water Act. The treatment and disposal of effluent must comply with all applicable legislation. Waste water discharges will be sampled and analysed on a monthly

	<p>hygienic condition.</p> <ul style="list-style-type: none"> • The contractor shall supply toilet paper at all toilets at all times. Toilet paper dispensers shall be provided in all toilets. • Toilets provided by the contractor must be easily accessible and a maximum of 50 m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the RE, EO or ECO (As applicable). • The contractor (who must use reputable toilet servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. • The contractor (using reputable toilet servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays. • Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times. 	<p>basis to ensure that liquid wastes are treated to a level that meets and / or exceeds South African water quality standards prior to discharge or re use.</p> <ul style="list-style-type: none"> • All temporary chemical toilets will be placed above the 100 year flood line or at least 100m away from any water course. • It is recommended that septic tanks combined with soak aways may not be closer than 200m to the river. Where houses are placed close to the river it may not, under gravity, be possible to place the soak away 200m away. In these cases the effluent from the septic tank will have to be pumped to the soak away. This requirement will strictly be enforced by the Home Owner Association. The use of septic tanks and soak aways are subject to site specific percolation test.
Level of significance after mitigation	N/A	N/A

CHAPTER 10: ENVIRONMENTAL IMPACT STATEMENT

The key findings of the Environmental Impact Assessment are as follows:

10.1 BIOPHYSICAL ENVIRONMENT

In general, the Environmental Impact Report reveals that, from a bio physical perspective, the site can be described as a medium impact area with medium to high sensitivity and conservation value, as large areas are still pristine.

Development cannot be supported in the 1:100 year floodplain of the Sandspuit River, riparian zones, and small non perennial drainage lines as well as the following identified sensitive areas:

- € **HL 1** (S24.36556°; E030.93779 °): Clump of *Schotias* on the riverbank, burrows beneath, amongst the roots. Important, for bank stabilisation, food and habitat for organisms.
- € **HL 2** (S24.37796°; E030.93573 °): *Acacia* sp in association with other species – biologically diverse clump.
- € **HL 3** (S24.37699°; E030.93310 °): Knobwood and associated species, biologically diverse clump.
- € **HL 4** (S24.37673°; E030.93163 °): A tree clump that is biologically diverse and important for food and habitat (Weeping Boer Bean and *Spirostachys africanus* (Tambotie).
- € **HL 5** (S24.36938°; E030.92332 °): Tree clump in the riparian zone including: Marulas and Leadwood.
- € **HL 6** (S24.36967°; E030.92129 °): *Spirostachys* in small drainage line.
- € **HL 7** (S24.37006°; E030.92075 °): *Schotias* etc. – clump.
- € **HL 8** (S24.37401°; E030.90977 °): *Spirostachys*.
- € **HL 9** (S24.37405°; E030.90915 °): Tree clump, although it is small, it is biologically diverse, especially compared to the surrounding vegetation that has been encroached upon, thus providing refuge for more specialised faunal species. (*Acacia*, *Euclea*, *Schotia* etc).
- € **HL 10** (S24.37413°; E030.90886 °): Tree clump – small but as for HL 9.
- € **HL 11** (S24.37328°; E030.91056 °): Tree clump including Leadwood and *Acacia* sp.
- € **HL 12** (S24.37266°; E030.91116 °): Tree clump including Leadwood and *Acacia* sp, *Scotia*, *Grewia*, *Lonchocarpus*. Valuable source of food and shelter especially for birds and small mammals.
- € **HL 13** (S24.36771°; E030.91890 °): *Combretum* clump.
- € **HL 14** (S24.36929°; E030.93650 °): Tree clump including *Schotia*, *Spirostachys*, *Lonchocarpus* & *Diospyros*. Valuable source of food and shelter especially for birds and small mammals.
- € Individual **Marula & Weeping Boer Bean** (*Schotia brachypetala*) trees that are 8m and higher in any of the zones. These big trees are important to genetic diversity of the respective species as well as being valuable habitat and especially food resources to different organisms.
- € All other **tree species** that are **greater than 10m** in height – in particular: Leadwoods, Knobthorns, Apple Leaf (formerly *Lonchocarpus capassa*). These large specimens are important genetically for each of the respective species and they are also important habitats for a variety of organisms, especially reptiles, small mammals and birds.
- € All **big large** (c. 7m and higher) **dead trees** in particular the Leadwoods. These trees, despite being dead, provide habitat for a number of organisms, in particular reptiles (lizards, geckoes and skinks mainly) and nest sites for a variety of birds (e.g. wood peckers, and a variety of raptors).

The abovementioned elements have played an important role in the compilation of the proposed layout plan and have ultimately guided the layout to its current form. The rest of the area can be developed provided that

no bush clumps or riparian bush be disturbed. The rehabilitation of the Sandspruit River and eradication of the invasive alien species, in especially the flood plain, is a positive impact.

10.2 SOCIO ECONOMIC ENVIRONMENT

From a socio economic point of view there are no significant detrimental impacts. Based on the findings derived from the information available at this stage it is concluded that the negative social impacts resulting from the construction and operation of the proposed Zandspruit Estates development can in most instances be successfully mitigated. The critical issue remains to bring about significant and sustainable direct benefits to the local communities, by involving the Local Municipality and communities in the planning process, ensuring local sustainable employment, undertaking skills training and making the development accessible to the local communities.

The proposed project would have the following anticipated positive social impacts:

- € The proposed project is expected to result in a positive impact on job opportunities in the area, even if the majority of these jobs would only be of a temporary nature.
- € The Local Municipality's tax base would be extended resulting in improved income due to the proposed development. This could be used to ensure enhanced service delivery and infrastructure developments in the area.
- € Expand the business and tourism industry,
- € Provision of houses for the local community, particularly by making provision for more affordable "Beginner Stands".

In addition there are also possibilities for other benefits for the local community, which can be realised with the co operation of the Local Municipality, the following are proposed:

- € Increase the availability of potable water throughout the town – currently potable water is supplied by the Air Force (or the Department of Public Works who are contracted to supply the Air Force with potable water). The problem is that the DOPW water treatment plant is running at its maximum capacity and the town often experiences water shortages. The proposed development requires a water treatment plant, and there will be sufficient space to allow for the expansion of the treatment plant in order to supply water to the rest of the town. This will be possible if the Maruleng Local Municipality wish to conclude a supply agreement with the applicant;
- € Provide land for the establishment of a fire station There is potential to provide some land for the establishment of a fire station. Currently there is no fire station in Hoedspruit and with the co operation with the Maruleng Municipality it may be possible to provide land for the establishment of a fire station;
- € Provision of a community hall – There is potential to allocate a site for the construction of a community Hall.

The proposed project could have the following negative social impacts:

- € The inflow of temporary workers and people dissimilar in demographics to that of the local communities can create negative social impacts. The intensity of many of the negative social impacts depends on whether the recruitment and employment process would be able to be beneficial to locals opposed to "outsiders". These impacts refer to the influx of outsiders and temporary workers, the change in the living and movement patterns, disruption of social networks, attitude formation, employment equity and occupational opportunities, as well as health, safety and security. As indicated the use of local labour

could reduce many of the negative impacts, although some negatives such as the influx of jobseekers cannot be controlled.

From a social perspective, the following recommendations are made:

- Maximising the use of local labour during the construction phase to ensure direct local benefits from the proposed development, as this could prevent conflict between the local community members, outsiders and the proponent as such. Such an approach would also limit some negative impacts associated with the influx of large construction teams such as conflict between locals and outsiders, additional need for accommodation, the construction of and activities at construction camps, the spread of HIV and so forth.

10.3 CULTURAL HISTORICAL ENVIRONMENT

The identified archaeological site must be protected.

10.4 CONCLUSION AND RECOMMENDATIONS

While a number of environmental issues have been identified, none of these are considered that severe after mitigation as to prevent the further planning, design and construction of the proposed development. Given the nature of the project and the proposed selected development footprints, Triviron EAP concludes that the potential negative impacts associated with the proposed development are of a nature and extent that can be reduced, limited, and eliminated by the introduction of appropriate management and mitigation measures.

It is therefore recommended that the application for authorisation for the proposed establishment of Zandspruit Estates on the Remainder of the Farm Happyland No. 241 KT, be approved, subject to the mitigation measures outlined in Chapter 9 above and as set out below.

It is recommended that, based on the findings of the scoping report and supplemental specialist information that:

- Should the project proponent obtain the necessary environmental authorisation for the proposed activity, an Environmental Management Plan (EMP) must be implemented for the construction and operational phases of the development. The EMP must give comprehensive guidelines on how to manage and mitigate impacts and monitor performance.
- The construction of all structures, roads and implementation of services must be in accordance with the specifications of the geotechnical engineering assessment. Such specification will be in response to site specific soil characteristics, gradient and anticipated runoff.
- The riverbank and 1:50 and 1:100 year floodplain areas must be excluded from development and should be treated as extremely sensitive for erosion and degradation during the residential development and thereafter.
- All declared alien invasive species must be removed.
- The design and implementation of the infrastructure and services provision are to be done in accordance with engineering specifications so as to comply with the regulations and standards of the local controlling authority.

- An effective storm water management plan needs to be planned according to the local authority's standards and regulations and be implemented to ensure that erosion and run off water on the property and adjacent areas are controlled.
- The conditions for approval of the development as stipulated in the specialist ecological assessment and the heritage assessment should be incorporated in any approval conditions that may be forthcoming from this application.
- All temporary chemical toilets, septic tanks and soak aways must be placed above 100 year flood lines or at least 100m away from any boreholes. Soak aways are to be subject to a geotechnical percolation test, and must be individually situated in such a manner so as not to affect the groundwater of the area.
- The design, installation and operation of sewage treatment systems must conform to the standards and specifications of the Department of Water Affairs and Forestry and applicable National Water Act, including all the regulations made under section 26 of this Act. The treatment and disposal of effluent will comply with all applicable legislation.
- All requirements of the Department of Water Affairs and Forestry, including the relevant application in terms of the National Water Act (Act. No 36 of 1998) must be complied with.
- An integrated waste management approach must be used that is based on best practises and should incorporate reduction, recycling, re use and disposal, where appropriate.
- Building rubble and solid waste (such as sand, gravel, concrete and waste material) that cannot be used for filling and rehabilitation and other litter and waste generated during the construction and operational phases must be removed from site and be disposed of safely and responsibly at a landfill licensed in terms of section 20 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989).

APPENDIX 1: ENGINEERING SERVICES REPORT



TABLE OF CONTENTS

DESCRIPTION		PAGE
SECTION A : INTRODUCTION		
A-1	TERMS OF REFERENCE	1
A-2	OBJECTIVES	1
A-3	SCOPE OF INVESTIGATION	1
A-4	BACKGROUND	2
SECTION B : SUMMARY AND RECOMMENDATIONS		
B-1	SUMMARY	3
B-2	RECOMMENDATIONS	3
SECTION C : PLANNING		
PART 1 : GENERAL		
C-1.1	STUDY AREA	4
C-1.2	INFORMATION	4
C-1.3	TOWN PLANNING ASPECTS	4
C-1.4	GEOTHECHNICAL INVESTIGATION	5
C-1.5	EXISTING INFRASTRUCTURE	5
C-1.6	GOVERNING LEGISLATION	5
PART 2 : SERVICE DEMANDS		
C-2.1	GENERAL	7
C-2.2	DESIGN CRITERIA	7
C-2.3	PROPOSED LEVELS OF SERVICE	7
C-2.4	SERVICE DEMANDS	
C-2.4.1	Water Supply for Household Use	8
C-2.4.2	Water Supply for Firefighting	9
C-2.4.3	Sewage Disposal	10
C-2.4.4	Streets	11
C-2.4.5	Stormwater	11
C-2.5	DESIGN PARAMETERS	
C-2.5.1	Water Supply	12
C-2.5.2	Sewage Disposal (waterborne sewerage)	12



DESCRIPTION		PAGE
C-2.5.3	Streets	12
C-2.5.4	Stormwater Drainage	13
C-2.6	CONSTRUCTION REQUIREMENTS	
C-2.6.1	General	13
C-2.6.2	Water Reticulation	13
C-2.6.3	Sewerage Reticulation	14
C-2.6.4	Streets	15
C-2.6.5	Stormwater Drainage	15
PART 3 : BULK SERVICES		
C-3.1	GENERAL	16
C-3.2	WATER SUPPLY	16
C.3.2.1	Source	16
C.3.2.2	Water Treatment	16
C.3.2.3	Storage	16
C.3.2.3	Distribution	16
C-3.3	SEWAGE DISPOSAL	16
C.3.3.1	Bulk Drainage	16
C.3.3.2	Treatment	17
C-3.4	ACCESS	17
C-3.5	STORMWATER	17
PART 4 : INTERNAL SERVICES		
C-4.1	GENERAL	18
C-4.2	WATER RETICULATION	18
C-4.3	SEWERAGE RETICULATION	18
C-4.4	STREETS	18
C-4.5	STORMWATER	18



SECTION A: INTRODUCTION

A-1 TERMS OF REFERENCE

Consolv Consulting Engineers has been appointed by Sugar Creek Trading 33 (Pty) Ltd to determine the feasibility of the development of Zandspruit Estates on the Remainder of the Farm Happylands 241-KT and to compile detailed costs therefore.

The study will be used as a supporting document for an application for the development right in terms of the Development facilitation Act (Act 67 of 1995).

A-2 OBJECTIVES

The objectives of the investigation are the following:

- to investigate the required bulk and connector services all existing services and planned future infrastructure, as well as to propose on an appropriate level of service for all internal services which may be phased in the implementation thereof, should this be so required due to budgetary constraints;
- to evaluate all aspects pertaining to the internal and bulk engineering services to Zandspruit Estates, in order to enable all role players to make decisions on the provision of services to the development.

A-3 SCOPE OF INVESTIGATION

The scope of the report includes:

- Study area and demarcation;
- Information and design criteria;
- Existing and anticipated development;
- Applicable Legislation;
- Water Supply:
 - Water Treatment
 - Bulk Water Supply
 - Storage facilities
 - Distribution
 - Proposed new infrastructure
- Sanitation:
 - Sewage Treatment
 - Sewerage flows and loading;



- Outfall sewers;
- Connector sewers ;
- Roads:
 - Existing roads network;
 - Future roads;
 - Proposed new roads;
- Stormwater Drainage:
 - Drainage areas;
 - Stormwater flows;
 - Proposed infrastructure;
- Environmental Issues;
- Financial Implications;
- Summary and Recommendations.

A-4 BACKGROUND

The development of zandspruit Estates is intended to address the shortage of residential and commercial properties for the rapidly expanding town of Hoedspruit. The Maruleng Local Municipality however, does not have any spare capacity in their bulk water supply and sewage disposal infrastructure to accommodate the demands of the proposed development and it is accepted that dedicated infrastructure for this purpose will have to be provided.



SECTION B: SUMMARY AND RECOMMENDATIONS

B-1 SUMMARY

- B.1.1 Zandspruit Estates is located directly to the east and adjacent to Hoedspruit.
- B.1.2 Access to the development will be from 4 intersections with Provincial road R527.
- B.1.3 The development comprises a mix of land uses ranging from residential to commercial.
- B.1.4 It has been proposed that a first phase consisting of 137 Bush sites and 40 Aero sites. This portion of the Estate will be developed as agricultural land portions (not a formal township). The remainder of the development will be developed as a formal township with land uses ranging from residential to commercial.
- B.1.5 Bulk services are not available in the area, and all required infrastructure will have to be provided.
- B.1.6 Raw water will be sourced by purchasing water rights from the Blyde River Irrigation Scheme which is owned and operated by the Rand Merchant Bank. The water will then be purified and stored within the development area and will
- B.1.7 The level of services which will be provided for the first phase of the development will be a water connection to each site, as well as a network of access roads varying from a high order access roads from the intersection with the provincial road to concrete strip roads to provide access to the Bush and Aero sites.
- B.1.8 The level of services to be provided for the remainder of the development (formal township portion) is as follows:
 - Water supply – metered connection per site for in-house supply;
 - Sanitation – full waterborne sewerage system with a connection for each site;
 - Roads – Class 4 (bus routes) - designed structure, surfaced and kerbed;
Class 5 – designed light structure, surfaced and kerbed;
 - Stormwater drainage – kerb and gutter with underground pipes system;
 - Refuse removal – weekly door-door, owner supplies storage.

B-2 RECOMMENDATIONS

It is recommended that:

- B.2.1 This report be considered by all role players.



SECTION C: PLANNING

PART I - GENERAL

C-1.1 STUDY AREA

The study area comprises a large portion of Remainder of the Farm Happylands 241-KT, which is located directly east and adjacent to the Raptors View Wildlife Estate and Hoedspruit. The remainder of the property will be used for wildlife and recreation (game viewing etc.).

The area is located between contours 480 and 525 above mean sea level and the average annual rainfall is 760mm. The terrain is undulating with relative flat gradients and various natural waterways, with specific reference to the Zandspruit, a seasonal river flowing from east to west through the development. The geological formations are rocky. The study area has been extended beyond Zandspruit Estates only in so far as bulk services are concerned.

C-1.2 INFORMATION

Information has been obtained from the following sources:

- Fotogramensura : Topographical and cadastral information
- Förtsch & Associates/Frik Pohl & Associates : Township Layout Plan
- Rock and Stock Investments (Mr. JP Hattingh) : Engineering geological investigation
- CSIR Building and Construction Technology : Human Settlement Planning and Design
- Government Printer : Legislation, Topographical Maps

C-1.3 TOWN PLANNING ASPECTS

A layout plan for Zandspruit Estates East was compiled by Förtsch & Associates - Architects and Frik Pohl & Associates - Town and Regional Planners. This layout plan is used for the investigation into the provision of engineering services to the area. It is understood that the development will be implemented in two phases.

The following land uses have been allowed for in the township layout:

LAND USE	NUMBER OF SITES	TOTAL AREA	AVERAGE AREA	FAR
PHASE I				
Luxury Bush Sites	130			
Aero Sites	37			



LAND USE	NUMBER OF SITES	TOTAL AREA	AVERAGE AREA	FAR
PHASE II				
Retirement Village	1			
Town Stands	230			
Commercial Lodge	1			
Beginner Stands	13			
Equestrian Stand	1			
Office (Business 1) Sites	1			
Retail (Commercial) Sites	17			
Hotel Site	1			
Cluster Units sites (residential 3)	9			
Special Zoning (local authority use)	1			

Please note that the table above does not include public or private open spaces.

The township has not been surveyed or pegged.

C-1.4 GEOTECHNICAL INVESTIGATION

An engineering geotechnical investigation for the township was done by Mr. JP Hattingh of Rock and Stock Investments, a registered professional consulting geologist. .

In brief, the geotechnical investigation indicated that the development is located on mainly thin gravels or thin sands and gravels overlying gneiss. The soils are classified as C2 in terms of the soil classification, except where shallow bedrock is encountered where the classification will be R. The area has been declared suitable for township development.

C-1.5 EXISTING INFRASTRUCTURE

There are no existing civil engineering services within the study area.

C-I .6 GOVERNING LEGISLATION

The development of any area and the provision of services are inter alia governed by the following legislation:

- Constitution;
- National Environmental Management Act (Act 107 of 1996);
- Environmental Protection Act (Act 73 of 1989);
- Water Services Act (Act 108 of 1997);
- National Water Bill (Act 36 of 1998);
- Local Government Transitional Act: Second Amendment Act (Act 97 of 1996).
- The Development facilitation Act (Act 67 of 1995)

The main aspects with regard to legislation to be taken into account are the following:

- The right to a healthy environment and the protection of the environment are included in Chapter 2 of the Constitution as a basic human right. This means that any person can approach a court



for relieve should he or she be of the opinion that his or her human rights are threatened. This places restrictions on the development of areas and the provision of infrastructure.

- The **Environmental Protection Act (Act 73 of 1989)** gives the Minister the power to require full Environmental Impact Assessments (EIA) on certain projects. In September 1997 the Minister identified various activities that require full EIA's, which activities include the following:
 - Rezoning of any area for development Waste water treatment facilities;
 - Bulk water supply facilities for potable water;
 - Roads, air fields, railways, etc;
 - Canals and channels including diversion of normal river flows;
 - Disposal of water.
- The **Water Services Act** requires that a water services development plan be compiled for all areas supplied with potable water by the supply authority concerned. One of the main objectives of the Act is to monitor and control the use of water and to limit losses. This requires the provision of metering facilities together with network requirements to facilitate zone metering, etc if practical.



PART 2 : SERVICES DEMANDS

C-2.1 GENERAL

The level of services to be provided will depend on the availability of funds as well as practical considerations with regard to the rocky soil conditions.

C-2.2 DESIGN CRITERIA

The design criteria as recommended in the "Guidelines for Human Settlement Planning and Design", issued by the CSIR - Building and Construction Technology are applied, except where indicated otherwise.

C-2.5 PROPOSED LEVELS OF SERVICE

The levels of service adopted for the development are the following:

PHASE I	
Water Supply	Metered Connection for in-house supply.
Sanitation	On site sewage treatment (not septic tank with soak aways. Owner to supply treatment plant
Roads (Class 5)	Designed light structure (concrete strip roads with passing bays at intervals.
Stormwater drainage	Unlined channels or V-drains with dips across roads at intervals
Refuse removal	Weekly collection door-to-door, owner supplies storage
PHASE II	
Water Supply	Metered Connection for in-house supply
Sanitation	Full waterborne sanitation to sewer system.
Roads (Class 4)	Designed structure surfaced and kerbed.
Roads (Class 5)	Designed light structure surfaced and kerbed.
Stormwater drainage	Kerb and gutter with underground piped system
Refuse removal	Weekly collection door-to-door, owner supplies storage



C-2.4 SERVICE DEMANDS

C.2.4.1 Water Supply for Household Use

The anticipated Average Daily Water Demand is as follows:

Phase I:

DESCRIPTION	Luxury Bush Stands	Airport Residential Stands	Totals
Number of sites	137	37	174
WATER DEMAND			
Rate (l/stand)	2000	2000	
AADD (kl/day)	274	74	348.0
GAADD (kl/day)	301.4	81.4	382.8
Storage (m ³)	301.4	81.4	382.8
Required minimum delivery capacity (kl/day)	452.1	122.1	574.2
GAADD peak flow (8 hrs) (l/s)	10.5	2.8	13.3
Reticulation pipe peak flow (8 hrs) (l/s)	15.7	4.2	19.9

Phase II – Residential:

DESCRIPTION	Multi Storey Residential Stands	"Beginner" Residential Stands	"Town" Stands	Retirement Village Stands	Cluster Stands	Special 12,9 ha - 20 units/ha	Totals
Number of sites	270	75	234	50	150	2 0	1039
WATER DEMAND							
Rate (l/stand)	800	1000	1500	1000	1200	1500	
AADD (kl/day)	21	75	351	50	180	390	1262.0
GAADD (kl/day)	237.	82.5	38 .1	55	198	429	1388.2
Storage (m ³)	237.	82.5	38 .1	55	198	429	1388.2
Required minimum delivery capacity (kl/day)	35 .4	123.75	579.15	82.5	297	43.5	2082.3
GAADD peak flow (8 hrs) (l/s)	8.3	2.9	13.4	1.9	.9	14.9	48.2
Reticulation pipe peak flow (8 hrs) (l/s)	12.4	4.3	20.1	2.9	10.3	22.3	72.3

Phase II – Other:

ITEM	DESCRIPTION	Commercial Stands	Hotel (80 bed)	Commercial Park (Offices)	Syndicate Lodge 1 (16 bed)	Totals
A	Gross Area (m ²)	108100	20000	35000	15000	178100
B	Open Space (m ²)	10810	2000	3500	1500	17810
C	Roads (m ²)	1 215	3000	5250	2250	26715
D	Net Area (m ²)	81075	15000	2 250	11250	133575
E	FAR	0.45	0.15	0.8	0.1	
F	Floor Area (m ²)	3 483.75	2250	21000	1125	60858.75
G	Cover Factor	0.3	0.3	0.3	0.1	
H	Coverage (m ²)	24322.5	4500	7875	1125	37822.5



Project 07/ZAN/01:
Preliminary Design Report for the Provision of Civil Engineering Services for ZANDSPRUIT ESTATES

ITEM	DESCRIPTION	Commercial Stands	Hotel (80 bed)	Commercial Park (Offices)	Syndicate Lodge 1 (16 bed)	Totals
I	Parking Factor		4	3	3	
J	Parking Bays	2189	90	30	33	2942
K	Parking Area (m ²)	54725	2250	15750	825	73550
L	Irrigation Area (m ²)	892	9150	4200	9975	30217
WATER DEMAND						
M	Rate (l/100m ²)	400	800	400	800	
N	AADD (kl/day)	145.935	18	84	9	256.9
O	GAADD (kl/day)	1 0.5	19.8	92.4	9.9	282.6
P	Storage (m ³)	1 0.5	19.8	92.4	9.9	282.6
Q	Required minimum delivery capacity (kl/day)	240.8	29.7	138.	14.9	423.9
R	GAADD peak flow (8 hrs) (l/s)	5.	0.7	3.2	0.3	9.8
S	Reticulation pipe peak flow (8 hrs) (l/s)	8.4	1.0	4.8	0.5	14.7
IRRIGATION						
T	Unit demand (mm/week)	10	10	10	10	
U	AADD (kl/day)	9.8	13.1	.0	14.3	43.2
V	Storage (m ³)	9.8	13.1	.0	14.3	43.2
W	Flow (5days x hrs/week) (l/s)	0.	0.8	0.4	0.9	2.8

It can be seen from the tables above that the total Gross Annual Average Daily Water Demand is approximately 2100 m³/day.

C.2.4.2 Water Supply for Fire Fighting

The water supply system caters for varying fire-risk categories varying from Moderate for the commercial (Offices and Retail) to Low Risk Group 4 (Beginner residential stands). For Moderate fire risk, the following criteria must be met:

Design Fire Flow

Each trunk mains within the development are must be designed for a design flow equivalent to the sum of the design fire flow for the highest fire risk category given in the table below plus the design instantaneous peak domestic demand for the area served by it

Fire Risk Category	Minimum Design Fire Flow (l/min)	Max no. of hydrants discharging simultaneously
Moderate Risk	6000	All hydrants within a radius of 270m from any one of them
Low Risk Group 1	900	1
Low Risk Group 2	500	1
Low Risk Group 3	350	1

Water Storage

The storage capacity of reservoirs serving fire areas should, over and above the allowance for domestic demand, include for the design fire flow obtained from the table above for a duration at least equal to that



Project 07/ZAN/01:
Preliminary Design Report for the Provision of Civil Engineering Services for ZANDSPRUIT ESTATES

given in the table below:

Fire Risk Category	Duration of Design Fire Flow (hours)
Moderate Risk	4
Low Risk Group 1	2
Low Risk Group 2	1
Low Risk Group 3	1

The minimum additional storage capacity require for fire fighting is therefore 6000 l/min for a duration of 4 hours, which equates to 1440 m³.

C.2.4.3 Sewerage

The anticipated Annual Average Daily Wet Weather Sewerage flows are as follows:

Phase I:

ITEM	DESCRIPTION	Luxury Bush Stands	Airport Residential Stands	Totals
A	Number of sites	119	39	
B	SEWAGE FLOW			
B	Rate (l/stand)	1200	1000	
C	ADDWF (kl/day)	142.8	39	181.8
D	ADWWF (kl/day)	1 4.22	44.85	209.1
E	Outfall pipe peak flow (l/s)	4.8	1.3	6.0

Phase II – Residential:

ITEM	DESCRIPTION	Multi Storey Residential Stands	"Beginner" Residential Stands	"Town" Stands	Retirement Village Stands	Cluster Stands	Special 12,9 ha - 20 units/ha	Totals
A	Number of sites	270	75	234	50	120	2 0	
B	SEWAGE FLOW							
B	Rate (l/stand)	40	800	900	750	800	800	
C	ADDWF (kl/day)	172.8	0	210.	37.5	9	208	784.9
D	ADWWF (kl/day)	198.72	9	242.19	43.125	110.4	239.2	902.6
E	Outfall pipe peak flow (l/s)	5.8	2.0	7.0	1.2	3.2	.9	26.1

Phase II – Other:

ITEM	DESCRIPTION	Commercial Stands	Hotel (80 bed)	Commercial Park (Offices)	Syndicate Lodge 1 (16 bed)	Totals
F	Gross Area (m ²)	108100	20000	35000	15000	
G	Open Space (m ²)	10810	2000	3500	1500	
H	Roads (m ²)	1 215	3000	5250	2250	
I	Net Area (m ²)	81075	15000	2 250	11250	
J	FAR	0.45	0.15	0.8	0.1	



*Project 07/ZAN/01:
Preliminary Design Report for the Provision of Civil Engineering Services for ZANDSPRUIT ESTATES*

K	Floor Area (m ²)	3 483.75	2250	21000	1125	
	SEWAGE FLOW					
L	Rate (l/100m ²)	400	800	400	800	
M	ADWWF (kl/day)	145.935	18	84	9	256.9
N	ADWWF (kl/day)	1 0.5	19.8	92.4	9.9	282.6
O	Outfall pipe peak flow (l/s)	4.	0.	2.7	0.3	8.2

It can be seen from the tables above that the total Annual Average Daily Wet Weather Flow is approximately 1395 m³/day.

C.2.4.4 Streets

The street hierarchy within Zandspruit Estates varies from limited Class 4 – Local Distributor roads and Class 5 access roads with classifications varying from Class 5a Access collectors (access for up to about 200 dwelling units) to Class 5e Access Courts (access for up to about 30 dwelling units).

C.2.4.5 Stormwater Management

Proper stormwater management is essential to ensure protection of life and property from flood hazards and that the natural environment is protected. The objectives of stormwater management can be summarised as follows:

- to provide a stormwater drainage system for the convenience of the community and the protection of property from damage by runoff from frequent storms;
- to prevent loss of life and reduce damage of property from severe storms;
- to prevent land and watercourse erosion;
- to protect water resources from pollution;
- to preserve natural watercourses and their eco-systems;
- to achieve the foregoing objectives at optimal total cost.

The area generally drains to the Zandspruit to the north which flows from east to west. The 1:100 year and 1:50 year floodlines have been calculated and are indicated on the drawings. No development will be allowed within the 1:100 year floodplain. A number of drainage gulleys which flows through the development are from north to south will be used channel stormwater to the Zandspruit.

It is proposed that all stormwater drainage inlets be fitted with a litter catcher to avoid polluting the zandspruit.



C-2.5 DESIGN PARAMETERS

2.5.1 Water Supply

Item	Sub-Item	Criteria
Velocity	Maximum	1,2 m/s
	Preferred	0,6 m/s
Pressures	Minimum peak flow	12 m
	Maximum	90 m
Minimum storage capacity		24 h of ADWD
Fire Flow		Moderate Fire Risk

2.5.2 Sewage Disposal (Waterborne Sewerage)

Item	Sub-Item	Criteria
Minimum pipe Ø		100 mm
Minimum manhole spacing		80 m
Minimum flow velocity		0,7 m/s (full flow)
Peak design flow		Full bore capacity of pipe
Allowance for extraneous flows		15 %
COD loading		600 g/stand/day
Nitrogen loading		60g stand/day

2.5.3 Streets

Item	Sub-Item	Criteria
Local Distributors (Bus Routes)	Road Category	Class 4
	Traffic Class	E2 (0,8-3,0 x 10 ⁶ E80's)
	Surfaced Width	6,8 m
Residential access collectors	Road Category	Class 5a
	Traffic Class	E1 (0,2-0,8 x 10 ⁶ E80's)
	Surfaced Width	5,5 m
Residential access roads	Road Category	Class 5b
	Traffic Class	E0 (0,05-0,2 x 10 ⁶ E80's)
	Surfaced Width	5,0 m
Access cul-de-sacs	Road Category	Class 5c
	Traffic Class	ER (<0,05 x 10 ⁶ E80's)
	Surfaced Width	4,5 m



2.5.4 Stormwater Drainage

Item	Sub-Item	Criteria
Mean annual rainfall		760 mm
Rainfall distribution		Triangle
Time to peak ration		0,39
Infiltration model		Horton
Starting infiltration value		45 mm/h
End infiltration value		15 mm/h
Decay constant		0,00115
Conduit routing		Time shift
Effective % area impermeable	Developed area	5-15
	Undeveloped area	1
Manning factor	Pipes	0,013
	Unlined canals	0,013
Design storm recurrence interval	Minor storms	1 year
	Major storms	20 years

C-2.6 CONSTRUCTION REQUIREMENTS

2.6.1 General

The proposed construction and material requirements are indicated below and will be incorporated in the detail design.

2.6.2 Water Reticulation

ITEM	CRITERIA
Location	1,0 m from boundary within road reserve
Pipe material	uPVC Class 9 for distribution
	HDPe Class 10 Type 4 for house connections
Valves	Resilient seal valve anti-clockwise closing to SABS 664, socketed for uPVC or flanged to Table D
Valve chambers	600mm x 600mm brick with cast iron cover
Air valves	Single orifice plastic
Water meters	Kent meters, complete with chamber



ITEM	CRITERIA		
Fire Flow	Fire Risk category	Minimum Hydrant Flow Rate (l/min)	Minimum Residual Head (m)
	Moderate Risk	1500	15
	Low Risk Group 1	600	7
	Low Risk Group 2	500	6
	Low Risk Group 3	350	6
Hydrants	Fire Risk category	Location of Hydrants	
	Moderate Risk	Distance apart 180m maximum	
	Low Risk Groups 1 to 3	Distance apart 240m maximum	

2.6.3 Sewerage Reticulation

ITEM	CRITERIA	
Location	1,5 m from boundary	
Pipe material	Heavy duty PVC pipes	
Manholes	1 000mm diameter precast concrete	
Rodding eyes	ABC cast iron with cast iron cover and frame box	
Manhole covers	Cast iron Type 2A in roadways	
	Cast iron type 4 VP for midblock sewers	
Stand connections	110 mm diameter with end cap , location 1m x 1m on low point of stand	
Minimum pipe diameter	100 mm	
Minimum gradients	Diameter	Minimum gradient
	100	1:120
	150	1:200
	200	1:300
	300	1:400



2.6.4 Streets

ITEM	CRITERIA
Location	Central in road reserve
Side walks	750mm wide, grassed
Kerbs	Figure 8c mountable
	Figure 3 barrier on curves
Edge restraints	Concrete 150 mm x 200 mm
Wearing course	Premix, double seal or precast concrete paving blocks
Structural design	Catalogue method
Road markings	To SARTSM

2.6.5 Stormwater

ITEM	CRITERIA
Minimum diameter	450 mm Ogee
Junction boxes	Brick, Precast with concrete lids
Stormwater channels	V-shaped
Kerb inlet	Open inlet, 600mm x 600mm internal dimension



PART 3 – BULK SERVICES

C-3.1 GENERAL

The Maruleng Local Municipality cannot provide any bulk services to the development and bulk services are planned to cater for this development exclusively.

The proposed infrastructure is indicated on the drawings.

C-3.2 WATER SUPPLY

C.3.2.1 Source

Raw water will be sourced from the Blyde River Irrigation Scheme which is owned by the Blyde River Utility Company. Water rights will be purchased as needed and converted to primary use. Water from the Scheme is available from an existing supply point situated in the North western corner of the development area.

C.3.2.2 Water Treatment

A Water Treatment plant capable of purifying 2 100 m³/day will be constructed in the north western corner of the property to purify the raw water from the Blyde River Irrigation Scheme. The process will consist of the following elements/processes:

- Chemical dosing (with building), lime for stabilization and poly electrolyte for coagulation;
- Flocculation channels;
- Sedimentation;
- Filtration;
- Chlorination;
- Clean water storage;
- Pumpstation to storage;
- Offices etc.
- Paving and fencing

C.3.2.3 Storage

The storage requirements are 2100 m³ for domestic consumption (24 hours of GAADD) plus 1440 m³ for fire fighting which equates to 3500 m³. It is expected that storage will be provided in two reservoirs of 1750 m³ each. A site has been provided in the layout at the highest point for storage which is located at the closest entrance to Hoedspruit. The elevation of the site is not sufficient to provide sufficient pressure for ground reservoirs. And an elevated storage facility or a booster system with standby electricity will have to be provided for the second phase of development.

C.3.2.4 Distribution

A number of distribution mains will be provided to distribute the water from the storage reservoirs to the consumers.

C-3.3 SEWAGE DISPOSAL

C.3.3.1 Bulk Drainage

The area generally drains towards the Zandspruit to the north which flows through the development from east to west. The topography of the areas necessitates the provision of 4 separate sewage pumpstations., which is indicated on the sewerage layout. A sewer rising main will be provided along



the northern boundary of the development with Provincial Road R527 to the sewage treatment plant which will be constructed in the north western corner of the development area.

C.3.3.2 Treatment

All the sites with the first phase of development will be provided by the owners with an on site sewage treatment system. It is proposed that the "MaxiGem" mini sewage treatment plant manufactured by Ballam-Waterslot (Pty) Ltd be specified as a standard.

For the second phase of development, a sewage Treatment Plant will be constructed in the north-western section of the development area, capable of treating 2,100 m³ of effluent per day. The treated effluent will comply with the General Standards required by the department of Water Affairs and Forestry and will be discharged into the Zandpruit just below the sewage treatment plant. The process will consist of:

- Screens and grit channels for the removal of grit and intractable matter such as rags, paper and cotton goods;
- Biological nutrient removal reactor;
- Settler;
- Sludge treatment and drying;
- Site works, paving and fencing.

C-3.4 ACCESS

There will be four separate access intersections with Provincial Road R527 (or P116-1) from Hoedspruit to Tzaneen and Ohrigstad. Chris Brandt & Partners have been appointed to conduct a Traffic Impact Study and to make recommendations towards the geometric alignment of the intersections and to determine the upgrade requirements of the existing road network of Hoedspruit.



SECTION C: PLANNING

PART 4 – INTERNAL SERVICES

C-4.1 GENERAL

The development will be provided with high order internal services which will consist of a metered water connection for each site, a waterborne sewerage connection for each site (except for the Luxury Bush and Aero sites in Phase I) and access to a paved street which varies from concrete strip roads for the Luxury Bush and Aero Sites in Phase I to surfaced roads of varying classification in phase II.

C-4.2 WATER RETICULATION

The proposed water reticulation network will consist mainly of uPVC Class 9 piping of varying diameters. The network will be designed to ensure a minimum peak flow pressure of 24 m to each stand, with a maximum static pressure of 90 m. Provision will be made for fire flow and fire hydrants will be provided.

The pipelines are located within the street reserves. The water meters will be located along the road reserve boundaries for easy access.

Isolating valves will be provided so that a maximum of four valves must be closed to isolate a section of the network for maintenance. Scouring will be allowed at low points with the provision of fire hydrants. Air valves will be provided where required.

C-4.3 SEWER RETICULATION

The sewer reticulation network will be installed with a minimum pipe size of 100mm (internal diameter) and a maximum manhole spacing of 80m. A house connection to each stand will be provided. Manholes will be located for convenient access.

The pipes will be placed on the inside or outside of the stands depending on practice in the area and availability of space within the street reserve. The pipes are located to minimize excavation depths due to the expected rocky formations.

The sewer network drains to four separate locations along the Zandspruit, where sewage pump stations will be constructed to pump the effluent to the treatment plant.

C-4.4 STREETS

A road network will be provided to distribute traffic between activities within the development area. The types of road which will be provided vary from Class 4 Local Distributors (but routes) to local Class 5 Access Streets. All roads will be surfaced with the minimum standard being concrete strip roads with passing bays for the Luxury Bush and Aero suites.

C-4.5 STORMWATER

The stormwater channels and structures are designed for a 1:1 year storm recurrence, except at the piped crossings where a 1:5 year storm recurrence is catered for. Run-offs from 1:20 year storms will also be evaluated to prevent or limit possible damage.

APPENDIX 2: ARCHITECTURAL GUIDELINES AND CONTROLS

The logo for Zandspruit Estates is a dark red rectangular box with a thin gold border. Inside the box, the words "Zandspruit Estates" are written in a gold, cursive script font.

Zandspruit Estates

Architectural Guidelines:
Aero and Bush Estate Properties

**ZANDSPRUIT ESTATE:
ARCHITECTURAL GUIDELINES
AERO AND BUSH ESTATE PROPERTIES**

TABLE OF CONTENTS:

A. ARCHITECTURAL THEME AND CONCEPT:

- A.1 Introduction to the Architectural Theme
- A.2 The Architectural Guidelines
 - Ø Objectives of the guidelines
 - Ø Building Levy and Plan approval fees
 - Ø Amendments to Architectural Guidelines
- A.3 Estate Key Plan

B. ARCHITECTURAL STYLES – AIRPARK AND BUSH PROPERTIES:

- B.1 Introduction to Architectural Styles
- B.2 Architectural Styles: Images
 - Ø Contemporary Bush Pavilion
 - Ø Modern Farmhouse Style
 - Ø Traditional Farmhouse Style
 - Ø Thatch
- B.3 Detailed Description of Architectural Styles
 - Ø Contemporary Bush Pavilion
 - Ø Modern Farmhouse Style and Traditional Farmhouse Style
 - Ø Thatch
- B.4 **Residential Bush Estate Properties:** Architectural, Town Planning and Siting Controls
 - Ø Allowable Architectural Styles
 - Ø Common architectural, Town Planning and Siting controls
 - Ø Style Specific Architectural Controls
- B.5 **Residential Aero Estate Properties:** Architectural, Town Planning and Siting Controls
 - Ø Allowable Architectural Styles
 - Ø Common architectural, Town Planning and Siting controls
 - Ø Style Specific Architectural Controls

PROCEDURES AND APPROVALS:

- A.3 Procedures and Approvals
 - A.3.1 Architects
 - A.3.2 Work Requiring ZHOA Permission prior to Commencement
 - A.3.3 Procedure for Approvals of Building Plans
 - A.3.4 Approval of building plans by local Authorities
 - A.3.5 Time within which building is to be commenced and completed
 - A.3.6 Selection and Conditions of appointment of a building contractor
 - A.3.7 Procedures for Handing over of a site to a contractor
 - A.3.8 Conditions relating to the execution of the works
 - A.3.9 Approval by the Home Owners Association
 - A.3.9 Transgression and Penalties

A. ARCHITECTURAL THEME AND CONCEPT:

A.1. Introduction to the Architectural Theme:

Zandspruit Estate is a unique and diverse Residential Wildlife Estate developed in magnificent African bush surroundings adjacent to the Sandspruit River only a few hundred meters outside the town of Hoedspruit. The Sandspruit River runs through the centre of the property. Residential stands vary from affordable to large riverside and bush estate properties, unique aero estate properties, high density components as well as town and commercial stands, the latter closer to the town centre and main access to Hoedspruit.

The Estate aims to be inclusive rather than exclusive as a development. The architecture on the estate seeks to capture truly South African architectural themes, using affordable local natural materials, colours and textures, including both modern and traditional farmhouse styles, thatch and more modern bush pavilions that compliment the overall development. These are described in more detail in this document.

Both the selection of stands available to the owner in size and location; as well as the choice from four architectural styles provide variety on the overall estate; affordability to each individual owner, and choice of architectural style and identity that can be selected by each owner to suit their lifestyle and chosen property. All styles are interwoven in textures and feel to ensure that the entire Zandspruit development will form a coherent whole when fully developed, yet provide individual choice to each owner, whichever component of the estate he or she has purchased in.

As described further below a variety of styles are permitted, but non-negotiable limitations are set on certain design elements to ensure the coherence of the development. Limits will be described in detail below but are broadly listed as:

- Ø choices of outside wall colours
- Ø roof pitch, materials and colours
- Ø window frame material and colours
- Ø a single choice of locally available natural rock
- Ø height restrictions
- Ø control of high level natural and artificial lighting

These guidelines are provided with the intention to encourage creativity in the use of the listed and prescribed materials. Restrictions in the envelope of the residences ensure that houses are developed with sensitivity to other owners and the environment.

All sites have been carefully mapped with sensitivity to the natural environment, trees, views and orientation with ample green zones and buffer zones between various areas inside the development. It is the intention that the buildings should be as unobtrusive as possible and that they should blend away into the surrounding bush.

The architectural guidelines below establish the architectural character of all the various residential stands on the estate and are in addition to the local authority bye-laws and the National Building regulations.

The Zandspruit Home Owners association constitution makes it incumbent on all home owners to obtain the Zandspruit Aesthetic Committees approval of plans before submission to the local authority for approval, and before the commencement of any building activities on the estate, as well as before making any changes to the external appearance of any building.

The local authorities will accept plans for submission only if approved by the Zandspruit Home Owners Association.

The procedures for obtaining these approvals are outlined below and submissions are to comply with the guidelines for each estate component shown below.

A.2. The Architectural Guidelines:

Owners agree to abide by these guidelines when they conclude their purchase agreements. The Zandspruit Estate Manager/s appointed by the Home Owners Association, together with the appointed Estate Architects, will administer these guidelines as well as approve and monitor the owners contractors and architects compliance with the architectural guidelines, development procedures and security protocols.

This document is specific to the Zandspruit Estate and outlines procedural, planning and aesthetic considerations. Each homeowner is strongly encouraged to peruse this document as it forms part of the sales agreement and is contractually binding.

This Document describes the *Bush Estate Properties*, with development circle restrictions and guidelines as to architectural finishes and styles, as well as *Residential Aero Estate Properties* with building line and hangar building zone restrictions and guidelines to applicable styles and architectural finishes. Each of these development components have separate general and specific guidelines listed below that are to be complied with.

It is to be noted that, whilst a proposal may comply with the Architectural and town planning Controls as set out in this document, it must also capture the intended architectural ethos of the estate. Zandspruit Estate reserves the right to request owners to re-visit submissions that it deems to have failed in this respect.

Objectives of the Guidelines:

The objective of the Architectural Guidelines is as follows:

1. To create a harmonious environment on Zandspruit Estate that will be sensitive to the natural beauty of the Bushveld surround and add to the creation of an environmentally sensitive estate.
2. To ensure that all owners co-operate on the estate to enhance the living experience of all its residents.
3. The Architectural Guidelines and prescriptive procedures with regard to plan approvals and building operations on the estate are described to prevent deviations from the theme each owner has bought into.
4. Contractors' regulations are necessary to ensure that the tranquility of the estate is preserved for all, during its time of establishment as well as thereafter.
5. The guidelines and regulations with regard to the buildings themselves are to ensure that buildings of quality are erected by professional contractors in an effective and organised manner.

Owners, their appointed professionals and building contractors, must comply with these architectural rules and guidelines to ensure an orderly development which will protect the interests of all residents. These guidelines form part of the Home Owners Rules of the Estate.

Any proposed improvements on the estate planned by the owner will require the submission of building plans to the Zandspruit Estate Home Owners Association for approval according to the procedures outlined below.

Building Levy and Plan Approval Fees:

Zandspruit Estate Home Owners Association will manage the process of plan submissions, site handovers and handbacks and general contractors activity on the estate on behalf of all home owners. For this purpose a building levy will be charged for each freehold stand purchased based on the size of the intended residence to be constructed and payable by the owner on commencement of construction.

The following benefits will be gained by all owners from payment of the levy stipulated below:

1. The payment of the estate architect for all plan approvals and the management of plan approvals and site handovers by the home owners association.
2. A dedicated Environmental/ Building Activity Control Officer will be appointed by the estate from the building levy fund to ensure contractors rules and security guidelines are adhered to.
3. The general upkeep of estate roads and verges, erosion of common areas and cleanliness of sites will be monitored by Zandspruit during the development of houses and maintained from the building levy fund. The management and implementation of fines and other punitive measures will ensure compliance to the established rules.
4. The increased demands on the estate security system and management thereof will be funded from the building levy fund.

This levy will ensure orderly development and protect the home owner's investment from the negative connotation of uncontrolled construction. It will remain the individual home owners responsibility however, through his appointed contractor/professionals, to ensure the timeous construction and acceptable building quality of the constructed home.

This levy has been made reasonable and is proportional to the size of the intended residence to be constructed on the freehold stand purchased. The following levies will apply:

Bush and Aero Estate Properties:	
House Size in Square Meters including Patios and Outbuildings, Carports and garages	
150 square meters to 199 square meters	R 15 000
200 square meters to 249 square meters	R 20 000
250 square meters and above	R 25 000
Any alterations and additions to an existing residence	2% of the alteration/addition contract value

All the above figures include VAT.

Amendments to the Architectural Guidelines:

The Home Owners Association, in collaboration with the controlling architect, reserves the right to make additions or alterations to these guidelines, as it deems necessary. The sole purpose of any changes would be to ensure the estate develops in the style and character that is envisaged for the whole estate.

B. ARCHITECTURAL STYLES:

B.1 Introduction to the Architectural Styles:

The three architectural styles selected for Zandspruit Estate seeks to capture the best elements of the African Bushveld house with its cool external and internal spaces, roofs with large overhangs, ample internal volumes as well as wide verandahs aiding in shading of interiors, large external living spaces and careful use of natural textures and colours to blend into the African Bush. The basic principles of the styles selected are to ensure that living spaces are shaped around the enjoyment of the environment and the natural outdoors as well as maximizing the views available on the estate.

At the same time the selected styles ensure that living is made comfortable and affordable and compatible with modern planning principles.

These design principles are successfully applied to all of the following styles selected as a basis of choice for each individual investor into the estate:

- Ø Contemporary Bush Pavilion
- Ø Modern and Traditional Farmhouse Styles
- Ø Thatch

It is intended that these guidelines are used by owners to develop their houses in a traditional architecture which will also allow modern planning principles of contemporary homes.

The residences are intended to interact with the environment and climate that make them naturally comfortable. As described later in more detail in this document, certain set roofing materials will be accepted on the development, which suit the particular architectural style selected.

Grey sheeted roofs will reflect comfortably in the lush landscape that will surround the estate and its inhabitants for both the Contemporary bush pavilion, modern and traditional farmhouse styles. Thatch will be available as an option that will blend with the environment in selected bush stands. Thatch will however be limited to the 1 hectare bush stands only and will be excluded as a roof finish at the Airpark stands.

Although a variety of styles are selected and available, the common language of the four styles consists of the following elements which will be limited in the detailed guidelines below:

- Ø A colour range limited to two colours of external earthy cementitious paint finishes.
- Ø The use of a compatible range of building materials limited to natural rock, timber and textured plaster elements.
- Ø Consistency in the approach to roof forms with a focus on specific roofs and pitches for each style.
- Ø The use of natural stone for feature walls or for building bases/plinths constructed from a single locally available natural rock product
- Ø Wood-floated or bagged plaster above plinths/bases. (Bagged plaster walls allowed only if even selected clay or cement stock bricks are used.)
- Ø The use of extensive shaded glass areas to maximize views and reduce reflection.
- Ø The use of timber structures to enhance the natural appearance of residences.

The colors chosen have been put together to resemble elements of the local soil and colours of the summer and winter bush particular to Zandspruit.

Height restrictions and other limitations on lighting ensure buildings are as unobtrusive as possible and blend away in their settings.

The images shown below provide a visual guide of previous examples of similar architecture. Each design produced will be evaluated in the context of the styles and will need to comply with the limitations as outlined.

B.3 Detailed Description of Architectural Styles:

Contemporary Bush Pavilion:

The architectural line is predominantly horizontal. Low-pitched roofs (with a fixed pitch of 10 degrees) extend beyond the walls and are supported by lightweight but well designed posts.

The architecture creates a gentle fusion between indoor and outdoor spaces. Large outdoor living areas shade glass faces from aggressive sun.

A lighter more contemporary style, distinguished by the generous use of clear glass panels (sliding, openable or fixed). Structural use of steel, timber with glass infill panels on a solid stone plinth or base.

Chimneys must be understated.

Mono pitched roofs are a predominant feature with flat roof interlinks.

Design elements must be 'layered' to create a play of textures and elements. Rockwork is used as main anchoring elements and feature only in its natural form.

Modern and Traditional Farmhouse Styles

Both these styles are reminiscent of the old Transvaal Farmhouse which was the typical architectural typography of the lowveld. Whether traditional or modern a building is envisaged of a main house with roof pitches of between 30 and 35 degrees and wide verandahs surrounding the house to shade against the harsh sun. The verandahs are to have pitches of between 10 and 15 degrees. Gabled and double hipped roofs will be allowed. No double storeys will be permitted. Mezzanine spaces in the roof area are allowed. No gable windows will be permitted to protect against light pollution. Window or shutter elements in the gables will only be decorative. Where bargeboards are used, they shall be painted the colour of the roof.

This style makes extensive use of outside living spaces that interact with internal living areas – the outside patios shade internal living areas against the climate.

Thatch

The traditional South African thatch house has a strong affiliation to the bush and is synonymous with a typical game lodge. A height restriction of 8,5m from the peg position to the highest point has been placed in order to minimize the visual affect of a large thatch roof structure. Separate pavilion structures are encouraged linked together with concrete roofs to break up the house into smaller units.

The outside textures shall be as generally allowed on the other styles. Thatch roofs shall be at 45 degrees.

B.4. RESIDENTIAL BUSH STANDS: Architectural, Town Planning and Siting Controls

ALLOWABLE ARCHITECTURAL STYLES

The following architectural styles shall be allowed on the Bush estate properties:

- Ø Contemporary Bush Pavilion
- Ø Modern and Traditional Farmhouse Styles
- Ø Thatch

COMMON ARCHITECTURAL, TOWN PLANNING AND SITING CONTROLS: (APPLICABLE TO ALL STYLES) ON BUSH STANDS:

TOWN PLANNING CONTROLS

Zoning and Land Use:

The estate falls under rural residential zoning allowing one residence per stand. The development will be incorporated into the existing town planning scheme of Hoedspruit.

Building Lines and Development Restrictions:

A building peg shall demarcate the centre of the development radius of all bush estate properties.

The limit to any structure or landscaping to be built on the site shall be at a maximum radius of 20 meters from the peg. Peg positions are fixed with GPS co-ordinates that are verified at commencement of construction and shall not be moved under any circumstances.

In addition to the aforesaid building lines other built to lines, servitudes and or right of ways may be imposed by the Home owners association, the local authority or the developer and it is incumbent upon the owner to carefully peruse the contract of sale to ascertain whether any further building lines may be applicable to the property.

Boundary Pegs

The pegs driven into the ground on the property, including the central building peg represents the contractual property boundaries and shall under no circumstance be moved.

It is the express responsibility of the purchaser to verify the position and its accuracy prior to commencement of building works. Pegs and services must be pointed out to the contractor at site handover.

Floor areas and Coverage:

On the bush estate stands, it can be generally accepted by each owner that a residence can be designed to fit into the 20m radius limit and will not exceed the floor area ratio or coverage restrictions laid down by the approved town planning scheme. It must be noted again however that no part of the structure of the intended residence shall be built over the 20m radius limit.

Allowed beds/ living Units per stand:

One dwelling unit per stand shall be permitted. Secondary living units such as servant's quarters and "granny flats" shall conform to the style of the main residence and comply with the following design principles:

- Ø One secondary living quarter to the main dwelling may be erected subject to ZHOA and local authority approval. The maximum area of the secondary living quarters shall be 60 square meters.
- Ø Only one main kitchen per residence shall be allowed. A second prep kitchen will only be allowed with a small fridge and preparation bowl.
- Ø The erection of the main / primary buildings and out / secondary buildings are to take place simultaneously.
- Ø The total number of beds (each single sleeping position counted as one bed) to each house shall not exceed ten beds. This shall include servant's quarters.
- Ø All plans submitted for approval shall show beds drawn in on plan.
- Ø Bedrooms may be separated from a central living unit as stand alone satellite structures or loose standing pavilions. These must be connected to the central area with walkways/pathways, on condition that such bedrooms are all constructed within the designated 20m radius limit and that they are the same style as the main building. No individual kitchens shall be allowed in such satellite bedrooms.
- Ø The garage / carport may be detached from the main building.

Heights and Levels of Buildings Generally:

The development has imposed storey restrictions to all stands on the estate with the intent to ensure controls to preserve views and privacy as the development is established. No owners shall be allowed to construct double storey residences on their stands. Mezzanine levels will be allowed in the roof spaces of the Modern and traditional farmhouse styles, pavilion style and thatch style as long as the building remain within the overall height restrictions. No dormer or high level windows will be allowed to such mezzanine levels – ventilation louvers emitting no light at night may be installed at high level.

Refer to height restrictions under specific architectural controls described in more detail below per style.

House Size

The maximum house size is not prescribed and will be determined by development radius. Houses are restricted to development circles as indicated for each stand. The minimum house size allowed on the estate shall be 150 square meters.

Town Planning and Building Regulations

The restrictions as set out in this document are in addition to any restriction imposed in terms of conditions of title, town planning schemes or national or any other building regulations. Notwithstanding that any plans or improvements may comply with any such restrictions improved on later to existing structures by third parties, the approval of any plans or improvements within the Estate shall be at the sole discretion of the Zandspruit Home Owners Association (ZHOA). Similarly, compliance with restrictions imposed by the ZHOA shall under no circumstances absolve the owners from the need to comply with restrictions imposed by third parties, nor shall the ZHOA approval be construed as permitting any contravention of restrictions imposed by any authority having legal jurisdiction.

Maintenance

The Owner shall at all times maintain the exterior of the house, the swimming pool, garden, screen walling or fencing and decks, or any visible element to the satisfaction of the ZHOA. Should the ZHOA find at any time that this is not done; the ZHOA shall advise the owner in writing to have the particular element repaired/ maintained/ remedied within 7 calendar days of the written notice. Should the owner fail to comply with the written notice the ZHOA shall have the authority to repair or maintain the element on behalf of the owner and recover the cost directly from the owner or through the estate levy system.

Appearance

Owners shall at all times ensure that any object which could, in the opinion of the association, be considered unsightly or to the detriment of the appearance of the Estate, should not be visible from common areas or other properties. Objects which should be screened from view include among others washing lines, exposed plumbing and swimming pool pumps, trailers etc.

Yard walls to conceal washing lines and lockable refuse bin housings in yards are mandatory. Yard walls shall be minimum 2.1m high

Courtyards:

The ZHOA may prescribe to the owner to construct a courtyard of maximum 50 square meters in size with solid built walls to enclose animals/pets should the home owners' association rules permit the keeping of pets on the estate. It must be noted that the Home Owners rules shall take precedent in this regard over this document and must be referred to separately.

Recycling of Waste and 'Green' refuse system:

Zandspruit Estate shall prescribe to a green refuse system. It will be mandatory for each owner to keep four coded bins at the residence suitably enclosed in a lockable bin room.

Each bin shall be for a particular waste type and it will be each owner's responsibility to separate waste into the designated bins.

All bins shall be of a prescribed standard size and type the details of which will be found in the home owners association rules.

Lockable bin rooms to suit the architecture of the residence shall be allowed for in the yards of each residence which shall prevent baboon access and which shall be fully screened from the exterior. These bin rooms shall be easily accessible through one yard door.

Flood lines:

All building areas have been positioned outside the flood lines. Under no circumstances can any structure be erected inside the flood line or riverine forest area.

Treatment of Stand Boundaries & Erection of Barricades:

In order to avoid the unsightly appearance of many residential areas, the planning of stand boundaries is considered to be of great importance and shall preclude the erection of any fences or barricades. The following rules will apply:

- Ø No structures shall be erected outside the demarcated "building zone".
- Ø If, for reasons of privacy, a screen (for example to screen a swimming pool or to screen a laundry area), is desired, then this design should be integrated into the design of the house and of a design and approved by ZHOA's Estate Architect.
- Ø Walls, screen elements shall be 2.1m (Two Comma One Meters) in height and shall be linked to the house.

No security spikes, razor wire, electric shock wires or any similar devices shall be permitted to be erected on the designated boundaries of the individual stands or outside the building radius limit described above. Where erected inside the radius it shall be done to the approval of the ZHOA.

Treatment of Storm water

It will be expected from all owners of lower lying properties to accommodate the excess Storm water from higher lying areas, which cannot be directed to the storm water channel as provided, where applicable.

EXTERNAL ELEMENTS AND SERVICES:

Aerials

Careful consideration is to be given to the positioning of satellite dishes and TV aerials. Their highest point should be below the nearest roof eave line and all externally mounted aerials or satellite dishes shall be painted in approved colours to match the background onto which they have been mounted. Aerials, satellite dishes etc shall not be mounted on chimneys.

Generators:

The installation of generators is not allowed on the estate.

Solar Panels:

Solar heating panels are allowed but are to be proprietary systems and not home made. Panels shall only be flat mounted on the residence roof at the same angle as the roof. Solar panels shall not be allowed to be mounted on flat roofs.

Pools, Pool Pumps and Filters

It is generally recommended that pools are raised at least 1meter off the natural ground level to prevent drowning of animals. The following further rules shall apply:

- Ø Pools shall be maximum 18 square meter in size where 18 square meters is measured as the internal pool dimension – i.e. taken as the surface area of the water including the water in the rim flow section if applicable
- Ø Pools can be of any shape except beach type pools. Rim flow pools will be allowed. (area of rim flow shall be counted as pool area)
- Ø Pools should be fenced with approved fencing only where required by law. These fences shall be of wattle lathe or thin steel fencing only to match the general architecture of the building.
- Ø All pool pumps should be screened off or hidden below decks or within pool structure or house plinths.
- Ø Pool finish colours allowed are Portland grey and dark grey. No blue or white marbelite finish is allowed.
- Ø No water features shall be allowed which feed from the pool system.
- Ø No fake rock pool surrounds shall be allowed.
- Ø No fake water holes are to be constructed as part of pools or separated from pools
- Ø All backwash pipe exits are to be properly packed with rock i.e. with a French drain to protect against erosion.
- Ø Each owner shall be responsible for the safety aspects in the design of his/her pool

Air-conditioning Condensers

External condenser units should be installed at ground level or on flat roofs and screened off from view with screens that suit the architecture of the residence.

Clothes Lines

Clothes lines will only be permitted behind a 2.1m high yard wall or in a concealed courtyard. No clothes lines shall be visible from any vantage point and the ZHOA reserves the right to instruct increases of yard walls on site should this be the case.

Drainage Pipes

Sewer, waste and vent pipes to be concealed where possible or painted to match the building's colour scheme.

Sewer Package System;

Each owner shall install at their own cost install an on-site sanitation system that shall comply with the following ZHOA standards:

- Ø The system generally approved on the estate is the Calcamite Biomite Sewage Treatment System. (See diagram A below) The system consists of a septic tank, a biological reactor with air blower, a disinfection unit and a holding tank with irrigation pump.
- Ø The positioning on site of this system shall be pointed out the ZHOA prior to commencement of construction and agreed at site handover.
- Ø The installation must be inspected and approved by the ZHOA before an occupation certificate will be issued.
- Ø The ZHOA may at their discretion allow alternatives but have described the generally approved system to ensure a standard of maintenance.

- Ø The ZHOA will direct where applicable and possible that the sewage system is concealed from view and/or buried. This will be determined at site handover and prior to commencement of construction.
- Ø The ZHOA shall issue water quality minimum requirements of outflow water to the system to which each owners water treatment system shall comply. It will be incumbent on all owners to ensure proper maintenance of their installed systems strictly in accordance with the manufacturers specification.
- Ø Each owner shall be responsible for the correct choice and design of the sewage treatment system, including size and capacity, positioning (with approval of ZHOA), longevity and maintenance considerations.

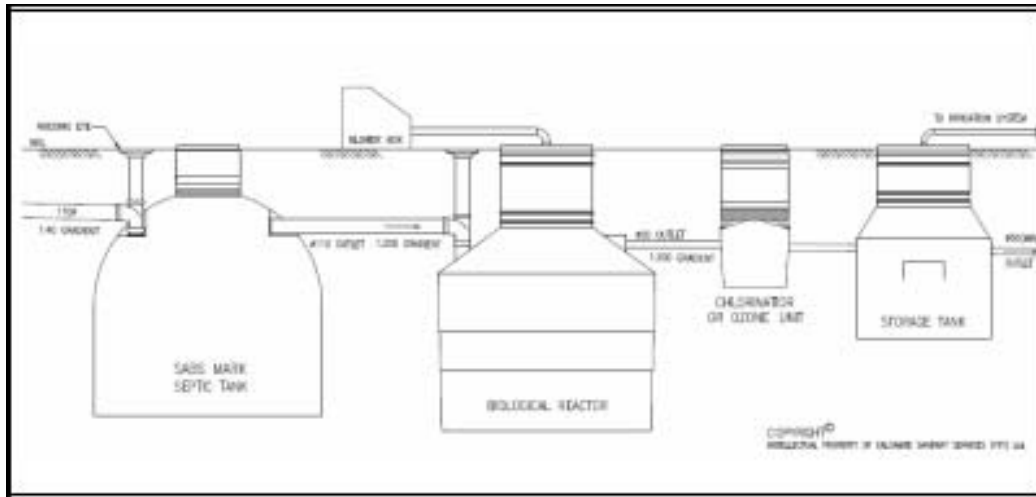


DIAGRAM A: CALCAMITE SEWAGE TREATMENT PLANT

Water connection and Metering:

A prepaid water meter system is intended for use on the estate and all owners will be advised of the system and specified meters by the ZHOA office on application of the connection.

The water meter shall be purchased by the owner at site handover and installed in an approved position close to the residence which shall be accessible for maintenance purposes. The following must be noted with regard to the prepaid water meter system:

1. Owners are to ensure that the pre-paid system has sufficient credit loaded to ensure the system does not shut off the connection when the house is not occupied for an extended period of time. (so as to protect hot water cylinders and ensure water is at hand to fire hose reels in case of fire)
2. Meters are to be installed close to the residence and supplied with power from the residence. This will mean the pipeline from the boundary of the stand to the meter shall be installed and maintained by each owner to SABS standards. It will be the owner's responsibility to maintain all water lines from the boundary of the stand and fix all leaks to this section of pipe.

Fire Protection:

It will be a minimum requirement for each owner to install sufficient fire hose reels to ensure all built areas can be reached by the hose reels in the case of a fire. The installation of hose reels are to comply with the National building regulations as well as minimum SABS standards.

Hose reels shall be connected to the main water system as part of the main supply line and metered water supply to the residence.

Electrical Meters:

Electricity will be supplied to Zandspruit Estate by a Specialist Company on behalf of the ZHOA; and to measure electricity consumption, a pre-paid electricity meter system shall be installed in each section.

Each owner shall apply directly to the ZHOA for the prepaid meter installation on commencement of construction and pay all necessary meter fees as levied by the ZHOA. The metering system shall be installed by a registered electrician through the appointed main contractor and a certificate of compliance shall be issued on completion to the ZHOA office.

The vending of power for the pre-paid meter system shall be accessible to each owner at the Zandspruit Entrance or office as determined by The ZHOA from time to time.

Ownership of the pre-paid meter shall irrespective of the manner in which it is installed in or affixed to the section, remain vested in the Specialist Company.

An owner or occupant of the section shall grant the Specialist Company reasonable access to the section for purposes of inspecting and carrying out accuracy tests on the pre-paid meter.

An owner or occupant shall have the right to request the body corporate to instruct the Specialist Company to carry out an accuracy test upon payment by the owner or occupant to the body corporate of the requisite test fee charged by the Specialist Company from time to time.

The pre-paid meter shall be deemed to be accurate if the accuracy test reveals a divergence of no more than 2.5% (two comma five percent).

Should the pre-paid meter be found to be inaccurate:

- Ø The owner or occupant shall be entitled to recover from the body corporate the test fee paid, and
- Ø The owner or occupant shall be entitled to recover from the Specialist Company an amount equivalent to the amount which was overpaid as a result of the pre-paid meter having been inaccurate, calculated from the date on which the pre-paid meter was installed or the date on which the Specialist Company conducted the last accuracy test, whichever date is the later.

No owner or occupant nor any guest nor employee of the owner or occupant of a section may in any manner whatsoever tamper or interfere with the pre-paid meter.

In the event of the Specialist Company ascertaining that the pre-paid meter has been tampered or interfered with:

- Ø The owner or occupant shall be liable to reimburse the body corporate for all costs charged by the Specialist Company to the body corporate pertaining to the repair or replacement of the pre-paid meter.
- Ø The owner or occupant shall be liable for payment to the Specialist Company of the amount equivalent to the amount underpaid to the Specialist Company, if any, as a result of the pre-paid meter having been tampered or interfered with, calculated from the date on which the pre-paid meter was installed or the date of which the Specialist Company conducted the last accuracy test, which ever date is the later; and

The Specialist Company shall be entitled to lay such criminal charges with the South African Police Services as shall be appropriate in the circumstance against such person/s that the Specialist Company reasonably suspects of having tampered or interfered with the pre-paid meter.

No person shall be entitled to open any electricity distribution kiosks, electricity meter rooms or electricity distribution boards in the scheme.

Gardens and Landscaping:

Only plants indigenous and endemic to the area shall be allowed to be planted on Zandspruit Estate. Gardens and landscaping, including lawns shall be contained within the 20m radius and further physically contained with low level plinth walls.

The ZHOA association will have available an approved plant species list for reference should owners not be sure regarding the suitability of a specific plant.

Decks:

The following decks are allowed on Zandspruit Estate:

1. Solid Hardwood Balau, Billian or similar approved.
2. CCA treated Pine Decks stained Dark in colour
3. Composite PVC type decks "Timbertech" or similar approved products. Preferred colour is Walnut.

Decks are to be constructed within the 20m radius circle and shall not encroach this limit. All decks are to be either stained dark in color (Mahogany or Teak) or naturally weathered in the case of Balua or resistant hardwoods

STYLE SPECIFIC ARCHITECTURAL CONTROLS:

CONTEMPORARY BUSH PAVILION:

Height Restriction:

The following height restrictions shall apply to the allowed styles:



HEIGHT RESTRICTION: Contemporary Bush Pavilion: 6m vertically at peg position including chimneys.

Roofs

- Ø Main house roofs are to be mono pitched at an angle of 10 degrees. No other roof pitch angles will be permitted unless technically not suited to the sheeting type.
- Ø The roof covering is to be corrugated iron sheeting – (see Brownbuilt – Custom Orb or similar approved)
- Ø **Approved Colours:** Dark Dolphin Grey only.
- Ø Only if flat roofs form links to main sheeted roof structures and they do not comprise more than 10% of the floor area of the house will they be allowed. These small roofs are to be covered with colored brown river pebbles.
- Ø Under no circumstances will silver waterproofing products be allowed to be visible.
- Ø Under no circumstances will galvanized sheeting be allowed
- Ø No sheet metal gutters and downpipes will be allowed. Water discharge from eaves are to be controlled through ground level erosion and stormwater controls i.e. pebble beds.

Chimneys

- Ø Chimneys positioned on the ridgeline should not project more than 1.2m above the ridgeline. Chimneys positioned elsewhere should not project more than 2.0m above the point where they intersect the roof plane.
- Ø Chimneys shall be considered as part of the height restriction of the residence.

External Wall Finishes

All walls shall be either bagwash plaster or vertically brushed plaster. A combination of smooth and bagwash plaster shall be allowed. No facebrick will be allowed

All walls to be constructed in stock bricks plastered. The use of precast elements for window sills, copings and window heads are acceptable .

Prescribed colours: Selected prescribed colours will be available from the ZHOA office by means of samples and codes. No other samples colours will be permitted. Owners are requested to obtain these codes from the ZHOA office or estate architect and specify their selection on the submitted drawings

Stonework

A single approved type of Natural stone is permitted as a wall finish up to plinth level and for other minor elements to a maximum of 30% of external wall finishes. Precast stone cladding imitations will not be permitted. The approved rock selected by the estate will be available by samples at the ZHOA office or available from the Estate Architects.

Steel:

Steel will be allowed as structural elements such as beams and columns, but shall be coated in the approved external colours with non reflective matt finish.

Timber:

The use of solid timber elements for columns to patios, handrails, pergolas etc is encouraged. CCA treated solid timber posts/beams are available from selected timber merchants in the area. These can be left natural or planed all round to have a rustic element to the residence. Accepted colours will be Mahogany, Teak or Ebony

The use of external timber louvers are encouraged to ensure filtered light on expansive glass area thereby reducing reflection and kerbing interior light spilling out at night and causing light pollution. These external louver devices can be woven latte type screens or timber louvers and must be detailed on drawings submitted for approval.

Carports

- Ø The built form of any carports should reflect the structure of the house.
- Ø Walls/piers – Cemwash, finished plaster or stonework.
- Ø Roofs - 10° pitched sheeting as per main house or flat lathe structure shall be permitted. (waterproofed or open)
- Ø No shadenet carports will be allowed
- Ø Carports will not be used for any storage other than to park a vehicle. A suitable storage facility for garden equipment etc. should be provided for in the design

Pergolas

- Ø Pergolas should be constructed with brick piers finished with plaster and Cemwash or stonework. Gumpole structures will only be allowed if the base and columns of the pergola is built from solid brick or rock.

Boundary and Screen Walls

No boundary walls are allowed.

Screen walls are to be finished in the prescribed approved Cemwash colours and are not to exceed 2.1m height above ground level, except in special circumstances with the prior approval of the Estate Architect and where so directed by the ZHOA.

Lights and Lighting

In order to prevent light pollution on Zandspruit estate, minimal external lighting is encouraged.

Floodlights, uplighters and starlights in trees and gardens, as well as coloured lighting, will not be allowed.

All external lights shall be low level (not more than 600mm above ground level) and shall be of the shaded or louvred type where the light bulb is not visible to any onlooker. Lights at level of 1.2m from the finished floor level of the house will be allowed adjacent to the entrance door only. The origin of the lights shall be screened from view as far as possible.

External Doors

To be in naturally finished hardwood or Aluminium to match windows and doors.

Garage Doors

All garage doors shall be horizontally slatted timber stained dark as per approved timber stains.

Windows

To be in naturally finished hardwood or Aluminium. Windows to preferably comprise of larger glazed panels. Cottage panes will not allowed in this style.

Aluminium colours are to be:

Powder Coated.

Dark Brown

Bronze

Black

Window cills and Reveals

Features such as plastered surrounds to be finished in one of the prescribed paint colours. Window cills are to be either plastered finish or precast concrete with a similar finish to the wall it is in. Tiled window cills will be permitted if they complement the colour scheme.

Security Elements

All burglar guards, "Trellidoors" or other security elements should be internal.

Driveway Paving

Driveways shall be constructed to match the estate road paving. Specifications of the estate paving is available from the estate architects offices.

Handrails Balustrades External

All external balustrades shall be timber hardwood with steel elements.

MODERN OR TRADITIONAL FARMHOUSE STYLE:

Height Restrictions:

The following height restrictions shall apply to the modern or traditional farmhouse styles:



HEIGHT RESTRICTION: Modern and Traditional Farmhouse Style: 7m vertically at peg position including

THATCH:



HEIGHT RESTRICTION Thatch Style: 8.5m vertically at peg position including chimneys.

B.5. RESIDENTIAL AIRPARK STANDS: Architectural, Town Planning and Siting Controls

ALLOWABLE ARCHITECTURAL STYLES

The following architectural styles shall be allowed on the 1 Ha bush stands:

- Ø Contemporary Bush Pavilion
- Ø Modern and Traditional Farmhouse Styles

COMMON ARCHITECTURAL, TOWN PLANNING AND SITING CONTROLS: (APPLICABLE TO ALL STYLES) ON RESIDENTIAL AIRPARK STANDS:

TOWN PLANNING CONTROLS

Zoning and Land Use:

The estate falls under rural residential zoning allowing one residence per stand. The development will be incorporated into the existing town planning scheme of Hoedspruit.

Building Lines and Development Restrictions:

No building peg is placed on aero estate properties. Sites are regulated by building lines and the residence can be placed within the demarcated building lines taking into account preservation of trees. The limit to any structure or landscaping to be built on the site shall be within building lines. Boundary peg positions are fixed with GPS co-ordinates that are verified at commencement of construction and shall not be moved under any circumstances.

In addition to the aforesaid building lines other built to lines, servitudes and or right of ways may be imposed by the Home owners association, the local authority or the developer and it is incumbent upon the owner to carefully peruse the contract of sale to ascertain whether any further building lines may be applicable to the property.

Boundary Pegs

The pegs driven into the ground on the property, including the central building peg represents the contractual property boundaries and shall under no circumstance be moved.

It is the express responsibility of the purchaser to verify the position and its accuracy prior to commencement of building works. Pegs and services must be pointed out to the contractor at site handover.

Allowed beds/ living Units per stand:

One dwelling unit per stand shall be permitted. Secondary living units such as servants quarters and "granny flats" shall conform to the style of the main residence and comply to the following design principles:

- Ø One secondary living quarters to the main dwelling may be erected subject to ZHOA and local authority approval. The maximum area of the secondary living quarters shall be 60 square meters.
- Ø Only one main kitchen per residence shall be allowed. A second prep kitchen will only be allowed with a small fridge and preparation bowl.
- Ø The erection of the main / primary buildings and out / secondary buildings are to take place simultaneously.
- Ø The total number of beds (each single sleeping position counted as one bed) to each house shall not exceed ten beds. This shall include servants quarters.
- Ø All plans submitted for approval shall show beds drawn in on plan.
- Ø Bedrooms may be separated from a central living unit as stand alone satellite structures or loose standing pavilions. These must be connected to the central area with walkways/pathways, on condition that such bedrooms are all constructed within the designated 20m radius limit and that they are the same style as the main building. No individual kitchens shall be allowed in such satellite bedrooms.
- Ø The garage / carport may be detached from the main building.
- Ø Hangars will only be allowed in demarcated zones.

Heights and Levels of Buildings Generally:

The development has imposed storey restrictions to all stands on the estate with the intent to ensure controls to preserve views and privacy as the development is established. No owners shall be allowed to construct double storey residences on their stands. Mezzanine levels will be allowed in the roof spaces of the Modern and traditional farmhouse styles, pavilion style and thatch style as long as the building remain within the overall height restrictions. No dorma or high level windows will be allowed to such mezzanine levels – ventilation louvers emitting no light at night may be installed at high level.

Refer to height restrictions under specific architectural controls described in more detail below per style.

House Size

The maximum house size is not prescribed and will be determined by development boundaries. The minimum house size allowed on the estate shall be 150 square metres.

Town Planning and Building Regulations

The restrictions as set out in this document are in addition to any restriction imposed in terms of conditions of title, town planning schemes or national or any other building regulations. Notwithstanding that any plans or improvements may comply with any such restrictions improved on later to existing structures by third parties, the approval of any plans or improvements within the Estate shall be at the sole discretion of the Zandspruit Home Owners Association (ZHOA). Similarly, compliance with restrictions imposed by the ZHOA shall under no circumstances absolve the owners from the need to comply with restrictions imposed by third parties, nor shall the ZHOA approval be construed as permitting any contravention of restrictions imposed by any authority having legal jurisdiction.

Maintenance

The Owner shall at all times maintain the exterior of the house, the swimming pool, garden, screen walling or fencing and decks, or any visible element to the satisfaction of the ZHOA. Should the ZHOA find at any time that this is not done; the ZHOA shall advise the owner in writing to have the particular element repaired/ maintained/ remedied within 7 calendar days of the written notice. Should the owner fail to comply with the written notice the ZHOA shall have the authority to repair or maintain the element on behalf of the owner and recover the cost directly from the owner or through the estate levy system.

Appearance

Owners shall at all times ensure that any object which could, in the opinion of the association, be considered unsightly or to the detriment of the appearance of the Estate, should not be visible from common areas or other properties. Objects which should be screened from view include among others washing lines, exposed plumbing and swimming pool pumps, trailers etc.

Yard walls to conceal washing lines and lockable refuse bin housings in yards are mandatory. Yard walls shall be minimum 2.1m high

Courtyards:

The ZHOA may prescribe to the owner to construct a courtyard of maximum 50 square meters in size with solid built walls to enclose animals/pets should the home owner's association rules permit the keeping of pets on the estate. It must be noted that the Home Owners rules shall take precedent in this regard over this document and must be referred to separately.

Recycling of Waste and 'Green' refuse system:

Zandspruit Estate shall prescribe to a green refuse system. It will be mandatory for each owner to keep four coded bins at the residence suitably enclosed in a lockable bin room.

Each bin shall be for a particular waste type and it will be each owner's responsibility to separate waste into the designated bins.

All bins shall be of a prescribed standard size and type the details of which will be found in the home owners association rules.

Lockable bin rooms to suit the architecture of the residence shall be allowed for in the yards of each residence which shall prevent baboon access and which shall be fully screened from the exterior. These bin rooms shall be easily accessible through one yard door.

Flood lines:

All building areas have been positioned outside the flood lines. Under no circumstances can any structure be erected inside the flood line or riverine forest area.

Treatment of Stand Boundaries & Erection of Barricades:

In order to avoid the unsightly appearance of many residential areas, the planning of stand boundaries is considered to be of great importance and shall preclude the erection of any fences or barricades. The following rules will apply:

- Ø No structures shall be erected outside the demarcated "building zone".
- Ø If, for reasons of privacy, a screen (for example to screen a swimming pool or to screen a laundry area), is desired, then this design should be integrated into the design of the house and of a design and approved by ZHOA's Estate Architect.
- Ø Walls, screen elements shall be 2.1m (Two Comma One Meters) in height and shall be linked to the house.

No security spikes, razor wire, electric shock wires or any similar devices shall be permitted to be erected on the designated boundaries of the individual stands or outside the building radius limit described above. Where erected inside the radius it shall be done to the approval of the ZHOA.

Treatment of Storm water

It will be expected from all owners of lower lying properties to accommodate the excess Storm water from higher lying areas, which cannot be directed to the storm water channel as provided, where applicable.

Aero Estate Stand Building Lines, Hangar zones and Build Areas:

Refer to Diagrams A and B below. Each of the Airpark stands border the runway and has hangar zones. Sites are divided into Riverside and Bush stands with each side having their own restrictions as set out in the diagrams below.

2 Separate building line restriction types exist on the Airpark Stands.

Riverside Stands have an integrated road between hangar space and the site and the bush side stands have no road.

- Ø The limit to any structure or landscaping to be built on the site shall be limited to 5meter side building lines and 10meter road/ hangar side lines
- Ø Hangar zones shall be used exclusively for the construction of hangars which shall be of a pre-approved design and size only.
- Ø The prescribed design is available from the offices of the estate architect.

Please note:

In addition to the aforesaid building lines other built to lines, servitudes and or right of ways may be imposed by the Home owners association, the local authority or the developer and it is incumbent upon the owner to carefully peruse the contract of sale to ascertain whether any further building lines may be applicable to the property.

EXTERNAL ELEMENTS AND SERVICES:

All guidelines with regard to external elements and services shall be as per Bush Estate Properties above.

STYLE SPECIFIC ARCHITECTURAL CONTROLS:

All guidelines with regard to style specific controls shall be as per Bush Estate Properties above.

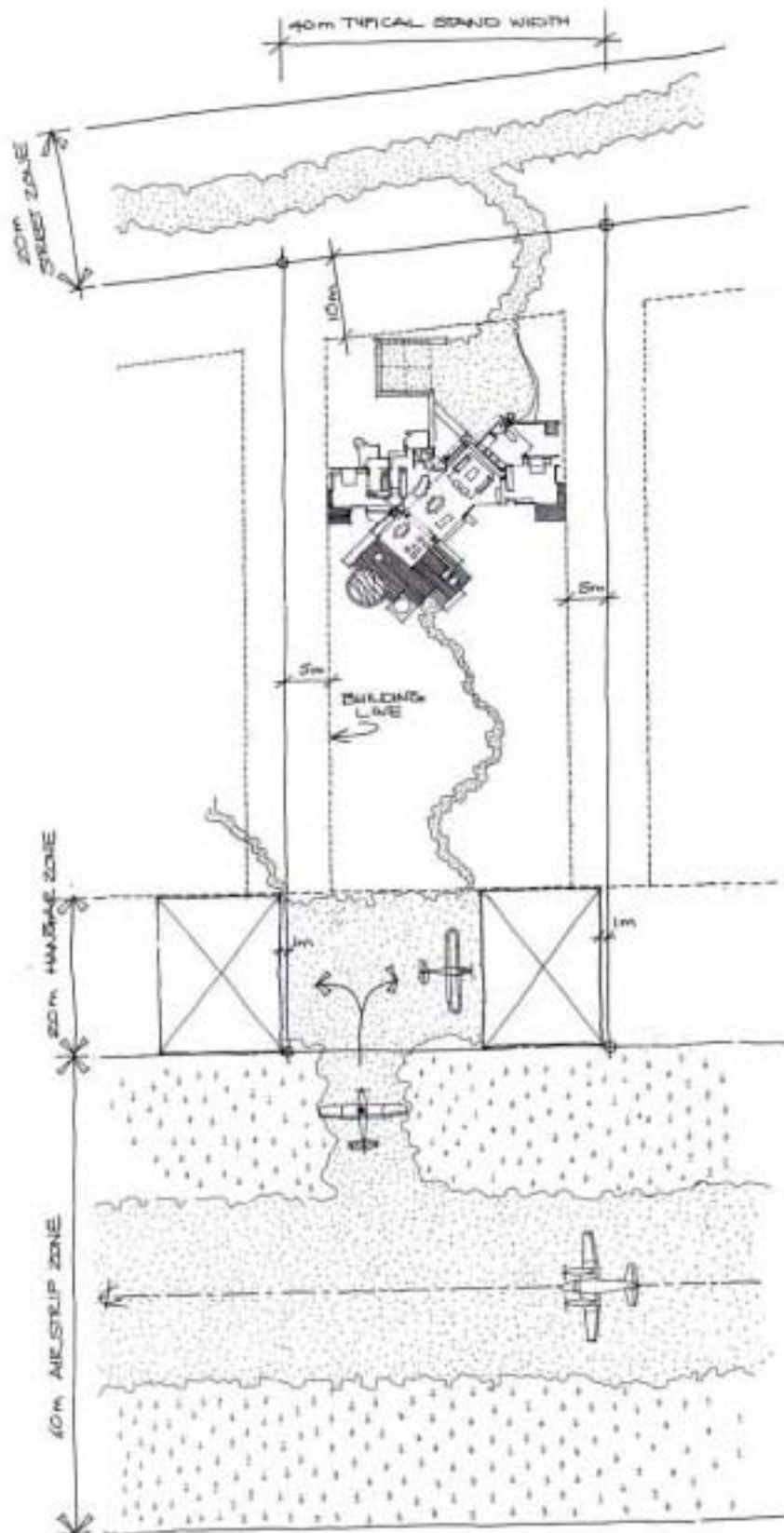


DIAGRAM A: BUSH SIDE STAND

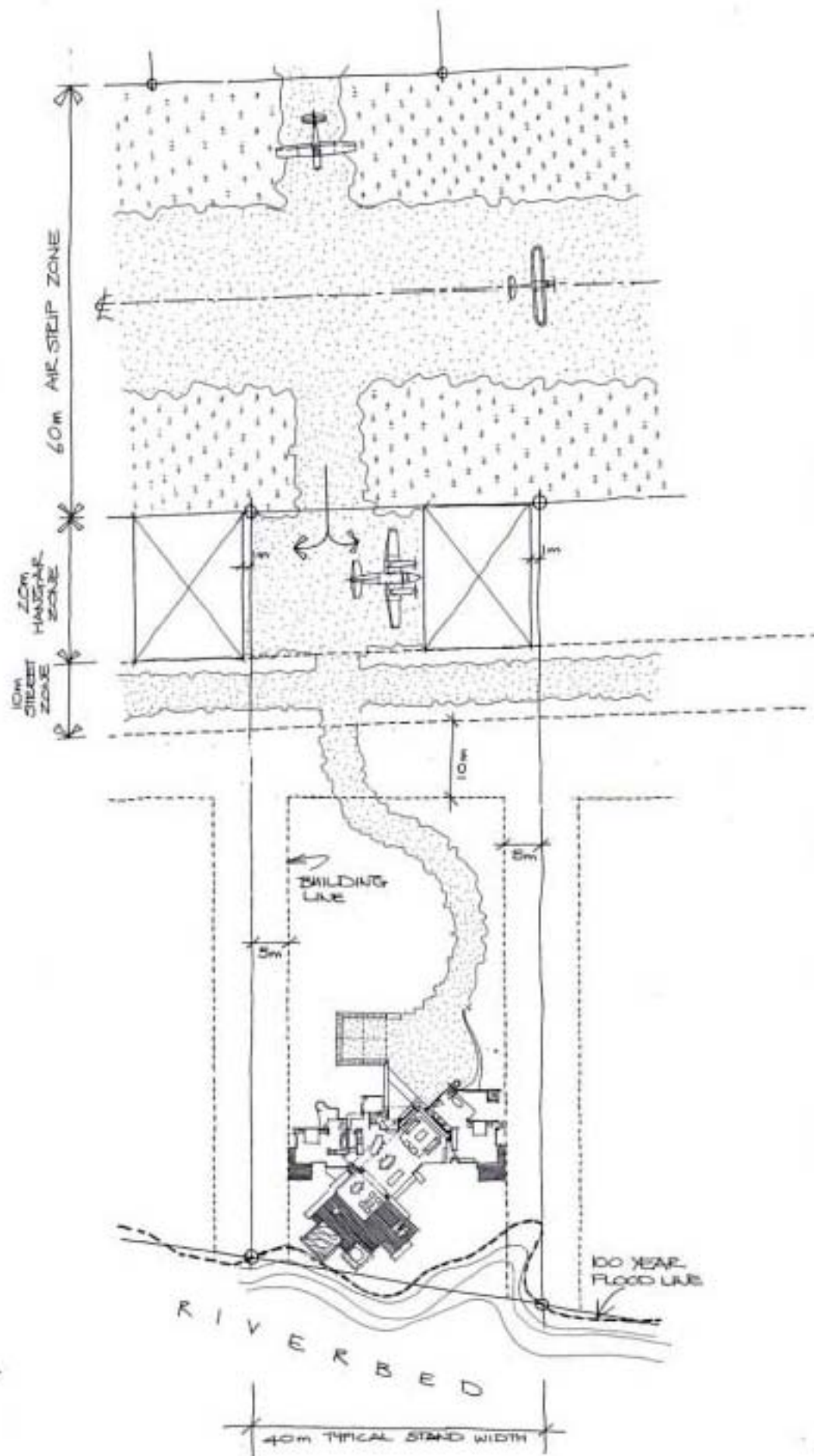


DIAGRAM B: RIVERSIDE STAND

A.3 Procedures and Approvals:

A.3.1. Architects:

The Zandspruit Estate has appointed an approved architect to design, document and supervise improvements on the Estate to Home Owners requirements and subject to the Architectural Guidelines outlined below. Should the member elect not to use the approved architect, procedures for the approval of building plans are to be adhered to which are detailed below.

In the case of owners electing to use their own architect the following minimum requirements are prerequisites:

1. Where homes are designed it shall be by a Professional Architect Registered with the South African Institute of Architects and South African Council for the Architectural Profession.
2. Such architects shall be appointed to perform full services, which shall include supervision of the building project for which they shall be professionally liable. Under no circumstances will building operations proceed without professional supervision or will owner-building be allowed.
3. The architect is to register with the Zandspruit Home Owners Association and agree in his appointment to attend Estate meetings called by the controlling architects from time to time as detailed below.
4. Plan approval procedures, Site Hand-over Procedures at commencement of construction as well as Site Hand-back procedures to the owner on completion as detailed below are to be adhered to.

A.3.2. Work Requiring ZHOA Permission Prior to Commencement:

Any owner intending to carry out any of the following improvements must obtain prior written approval from the Zandspruit Estate Home Owners Association (ZHOA) with plans approved/ written approval obtained for each of the following:.

- Ø The construction of new buildings on open stands, whether a building package or not
- Ø All structural, aesthetic and external alterations or additions to existing structures whether the construction of existing buildings is in progress or completed.
- Ø Underground construction (i.e.) drains water pipes, electricity, telephone conduits or any other underground work.
- Ø Painting any existing external facades if the colour varies from the original. (written approval)
- Ø The construction of Garages and carports
- Ø Installation of any outdoor lighting.
- Ø The construction of swimming pools.
- Ø Walls, gates or any landscaping construction.
- Ø Cutting down of any indigenous trees or removal of any natural rock outcrop. (written approval)

Procedures to obtain approval will include meetings where necessary with the ZHOA and the submission of plans as described below, or obtaining written approval as required or directed by the Zandspruit Estate Home Owners Association.

A.3.3. Procedure for Approval of Building Plans by ZHOA:

The directors of the Zandspruit Estate Home Owners Association (ZHOA) have appointed an Estate Architect to whom they have delegated the authority to approve building plans for new houses or alterations to existing houses within the Estate. This system of plan submission will be dealt with through the Home Owners Association offices.

Project Registration (applicable to all freehold portions of the development):

Prior to commencing the owner and or his appointed architect shall register the commencement of the project on the purchased stand with the ZHOA and the following procedure is to be followed:

- £ Registration of the site with the ZHOA. On registration of the project with the ZHOA a project Registration pack will be received which contains the following:
 - £ Project registration form
 - £ Prepaid meter information and payment details for water and electricity
 - £ Building levy value and payment information.
 - £ Survey Checklists
 - £ Checklists for plans which are to be submitted to the estate architect.
 - £ Site Handover and handback Procedures and checklist
 - £ Contractors Rules for signature by the selected contractor

- ⌘ Application forms for water and electrical connection points.
- ⌘ Registration shall be subject to the submission of professional details of responsible architect, including the SA Council of Architects registration details. (see exemptions above)
- ⌘ Registration shall also be subject to proof of transfer of the property into the name of the owner applying to register a project.
- ⌘ Registration shall also be made on the Zandspruit Estate security system for owners.

Plan Submission:

An owner will be required to submit final building plans to the ZHOA for scrutiny prior to the construction of any building on the Estate. The plans shall be in accordance with the requirements of the local authority, National Building Regulations as well as the requirements of this document.

A survey of the site shall be mandatory to accurately show tree positions as well as contours

Three copies of all documents shall be submitted for approval:

- ⌘ One copy is to be retained by the Committee/ estate architect for its records when checked.
- ⌘ The second is to be collected from the ZHOA estate architects offices, which will be returned with stamped approval together with any comments to the owner. This copy is to be kept on site at all times during construction for periodic inspections by ZHOA.
- ⌘ The third copy will be kept on record at the Zandspruit Estate Home Owners Association offices.

If building plans contain adequate information and conform to the Estate rules and the approved architectural style, they will be approved within two weeks of submission. A checklist of items to be shown on plans will be issued on registration of the site the ZHOA office. The following information is required in broad terms: (refer to checklist issued on registration for full details):

A **Site plan** showing the following:

- ⌘ A survey of the site show tree positions as well as contours
- ⌘ Boundaries, building lines and servitudes.
- ⌘ All intended buildings and structures to be erected on the stand
- ⌘ Adjacent stands with stand numbers
- ⌘ The proposed access driveway to the residence from the road and the treatment of the surface of the access route.
- ⌘ Contours with intervals of not more than 1 meter are required to be shown on site plans. (detailed contour layouts of all stands are to be commissioned by each owner by a surveyor showing tree positions etc prior to compiling plans)
- ⌘ Electrical and Water connections to be shown
- ⌘ Proposed Sewer treatment plant and location. Details of system
- ⌘ 1:50 and 1:100 year flood lines where applicable

This site plan must indicate surveyed positions of all trees with trunks larger than 150mm diameter and natural protected areas such as rocky outcrops and the like that fall within the development circle. Site plans are also to indicate the trees that are proposed to be removed in the building process.

Plans, Sections and Elevations of all buildings– including outbuildings are to be shown showing all finishes and describing materials and colours.

- Ø An electrical layout is to be included showing the proposed positions of all light fittings intended for the building and surrounding garden.
- Ø A landscaping layout showing the intended trees to be planted in terms of the landscaping requirements that form part of this document.

The building plans must be submitted to Zandspruit Estate Home Owners Association to the Zandspruit Development Offices Suite no 2 Kayagelo Village, Hoedspruit (may change)

A.3.4. Approval of Building Plans By Local Authorities:

Once plans have been approved and stamped and signed by the ZHOA, the building plans are to be submitted to the Local Authority for its approval. On receipt of the Local Authority's approval, the owner may proceed with the construction of the building in accordance with the building by-laws, standard building regulations and the approved building plans as well as the Site Handover procedures provided at the registration of the project with the ZHOA.

Zandspruit Estate Construction procedures received upon registration of the site with the ZHOA are to be followed.

The first step for commencement of construction is to arrange a formal site handover meeting at which the ZHOA representative shall be present, together with the client and building contractor. A site handover certificate must be signed by all three the above parties prior to construction commencing. The procedures for **commencement of construction & handing over of the site to a building contractor** and **conditions for execution of the works** is provided in further detail below and contained in the registration pack.

A.3.5. Time Within Which Building is to be Commenced and Completed

- .1 Construction must be completed within 9 months from the date of signature to the builders code of conduct document and SITE HANDOVER CERTIFICATE.
- .2 The erection of the main / primary buildings and out / secondary buildings are to take place simultaneously.
- .3 The ZHOA would have full right to instruct the owner or appointed contractor to complete any building project shelved for a period longer than 6 months in an incomplete state. In extreme cases where these buildings are left incomplete, the ZHOA shall have the right to re-habilitate the stand to its original condition.

A.3.6. Selection and Conditions of Appointment of A Building Contractor:

Although a list of approved contractors for the Estate shall be updated from time to time by the Estate architects, the owner of the stand shall be solely responsible for the choice of building contractor for the construction of the proposed residence.

The owner and contractor shall be required to sign an agreement with the ZHOA to regulate the building activities on the stand. This contract will include, but will not be limited to the following:

- Ø The requirement that the building contractor pay a refundable deposit to the association of R10 000 per stand as security against default of any of the conditions of such a contract.
- Ø The obligation to ensure that any material suppliers and delivery trucks, or vehicles for that contractor, do not damage the Estate roads or any parts thereof. Any damage so caused will be the responsibility of the contractor.
- Ø The obligation to erect a screen to minimise the visual impact during the building period.
- Ø Conditions relative to the delivery and storage of materials
- Ø Noise
- Ø Working hours (summer 6am to 6pm, winter 7am to 5pm – winter = May to June)
- Ø Transportation routes to the estate and to the stand.
- Ø Security procedures within the Estate
- Ø Removal of rubble from the stand and the Estate.
- Ø The erection of boards and signs.
- Ø Maximum loads of delivery and construction vehicles.

A.3.7. Procedures for Handing Over of a Site to A Contractor:

The following must be in place prior to the handing over of the site to a contractor for commencement of construction:

- Ø The plans duly stamped and approved by the ZHOA.
- Ø The plans approved by the Local Authority (Maruleng District Municipality)
- Ø Transfer of ownership of the stand in the name of the owner with a letter of confirmation from the owner in this regard. (see registration procedure above)
- Ø The proposed house set out on site with danger tape showing the full extent of all structures to be erected and trees to be removed/ affected by the residence.
- Ø NHBRC Unit Enrolment and registration certificates (Statutory requirement)
- Ø A temporary toilet for all workers on site.

A formal meeting should be arranged by the professional responsible for the building with the Estate Architects and should be arranged given two weeks notice.

A **SITE HANDOVER CERTIFICATE** will be issued with the registration pack listing the information to be issued at site handover.

On COMPLETION of any building contract or improvements to the stand the contractor and registered architect must arrange another meeting at which a completion inspection will be held and a **PROJECT COMPLETION CERTIFICATE** to be signed by the contractor, architect and registered owner. The **PROJECT COMPLETION CERTIFICATE** will be issued with the registration pack listing the information to be issued at site handover.

A.3.8. Conditions Relating to the Execution of the Works

The conditions laid out in the Builders code of conduct that is to be signed by each owner and their builder are to ensure that all construction activity at Zandspruit Estate proceeds in an orderly manner, with the least possible disruption to other property owners. These conditions relate specifically to building contractors activities and are binding on all owners. It is the responsibility of the owners to ensure that their building contractor is made aware of the conditions and comply strictly with them. The conditions for building contractors are set out in the document "Builders Code of Conduct", which document must be read in conjunction with this document.

If it becomes apparent that a contractor is not following the conditions, the ZHOA will have the right to advise the applicable party in writing to have the default rectified within 7 days of such notice. Should default persist the ZHOA shall have the right to suspend building activities immediately and it accepts no liability for any losses sustained by the owner as a result of this action.

A.3.9. Approval by the Home Owners Association:

The decision on whether or not the plans are acceptable, shall be at the sole discretion of the ZHOA's Estate Architect in collaboration with the aesthetics committee of the home owners association, which decision shall be taken within the framework of the guidelines contained herein together with the registration pack issued to the owner/appointed professional on registration of the project with the Estate Architect.

- € The ZHOA shall be entitled not to approve the plans for any house, which in their sole opinion would detract from the appearance of, or reduce the value of other houses in the Estate and which are in the opinion of the ZHOA against the intent of the developer. The decision in this regard shall be full and final.
- € Where required ZHOA shall give reasons for rejecting such a plan, but ZHOA shall not incur any liability to any person in provisions of these reasons. The proper design of residences shall remain the responsibility of the appointed professional architect.
- € Approvals by the Estate Architect and ZHOA shall be for conformity to the architectural guidelines only and shall not be for scrutiny of the submitted design in terms of functionality or technical correctness. The Estate architects or ZHOA shall not carry any responsibility in this regard.

A.3.10. Transgression and Penalties

Should any construction work not comply with the terms and conditions of the approved project, the Zandspruit Estate Owners Association will formally notify the owner to cease all activities and modify the work and/or drawings in order to comply with the terms and conditions therein. If the owner fails to comply with this notice then the ZHOA will apply to the judicial authorities in order to obtain a formal stop order. The legal costs will be for the account of the owner and the owner will also be responsible to restore the site to its former state.

APPENDIX 3 : LETTER TO LAND CLAIMS COMMISSIONER

STEYN & CLARKE PROKUREURS / ATTORNEYS

NOTARISSE	AKTEVERVAARDIGERS	BOEDELBEDEREDDERAARS	TAKSATEURS
NOTARIES	CONVEYANCERS	ADMINISTRATORS OF ESTATES	APPRAISERS

Hoedspruit Kantoorpark / Hoedspruit Office Park
Hoofstraat / Main Street

Postbus / P.O. Box : 724
Hoedspruit
1380

Tel: (015) 793 0258
Faks/Fax: (015) 793 0155

BTW NR / VAT NO, 4180220461

Faks na e-pos / Fax to e-mail: 086 6164 896
E-pos / E-mail: hoedpruk@mweb.co.za

C.H.M. STEYN: 083 299 7388
G.C. CLARKE: 082 929 1249

Ons verw./ Our ref: GC CLARKE / SUG1/0001
U verw./Your ref: 16/1/7/2-M22

1 FEBRUARY 2008

**THE HEAD OF THE DEPARTMENT OF ECONOMIC DEVELOPMENT,
ENVIRONMENT AND TOURISM
PO BOX 55464
POLOKWANE
0700**

BY FAX: 015 296 5016
AND
BY REGISTERED POST

Dear Sir / Madam

**APPLICATION FOR ENVIRONMENTAL AUTHORIZATION FOR THE
PROPOSED DEVELOPMENT OF ZANDSPRUIT ESTATES ON REMAINDER
OF THE FARM HAPPYLAND 241 KT IN HOEDSPRUIT: MARULENG LOCAL
MUNICIPALITY WITHIN MOPANI DISTRICT MUNICIPALITY, LIMPOPO
PROVINCE**

We have been furnished with a copy of your letter dated 15/01/2008 addressed to Triviron (Pty) Ltd of which a copy is attached hereto for your easy reference.

We confirm that we act on the instructions of the developer.

With reference to paragraph 2 and 3 of your said letter we reply thereto as follows:

1. The Department of Economic Development, Environment and Tourism has absolutely no mandate to withhold consideration of the submitted scoping report as a result of the land claim issue. It is abundantly clear that a land claims issue can never fall within the ambit of the mandate of the Department of Economic Development, Environment and Tourism and that the public participation process is not the correct forum to address issues pertaining to land claims.

C.H.M. STEYN: B.A. B. PROC., G.C. CLARKE: B.COMM. LL.B

2

2. Nevertheless in order to maintain transparency we herewith attach the following:

- 2.1 Letter received from the Land Claims Commissioner confirming that the purchase of the property will not be pursued in order to settle the claim;
- 2.2 Acknowledgment of receipt of our notice in terms of the Restitution of Land Claims Act that was served by hand at the offices of the Commissioner whereafter no objection was received within the stipulated one month period as defined in the act.

It is therefore our submission that:

1. The objection that was raised does not effect the decision that needs to be taken by your department and;
2. secondly that only the Commissioner of Land Claims has a mandate to pursue any land claim, which in this case is clearly not the position.

We urgently request your department to proceed with consideration of the scoping report without further avail and we await your confirmation thereof within 14 days from date hereof.

As our client is being severely prejudice by your non consideration of the submitted scoping report, our client reserves the right to proceed with any legal means necessary to protect its rights.

Yours faithfully

GC CLARKE

STEYN & CLARKE ATTORNEYS

CC: Mr. MP SESHOKA 015 295 4013

CC: TRIVIRON (PTY) LTD

P:3

10-JAN-2000 09:55 FROM: TRIUIRON 0123670024

17. JAN. 2008 12:07 DEP ECN DEV TOUR

TO: 00066195055

NO. 383 P. 1

P:1



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
ECONOMIC DEVELOPMENT, ENVIROMENT & TOURISM

Enq: Mr M P Seshoka, Tel No: 015 281 4247, Fax No: 015 295 4013, E-mail: seshokamp@ednet.gov.za, Ref No: 18/17/2 - M22.

Triviron (Pty) Ltd
P O Box 177
WOODLANDS
0072

Fax No: 012 367 0624

Dear Mr P de Lange

APPLICATION FOR ENVIRONMENTAL AUTHORIZATION FOR THE PROPOSED DEVELOPMENT OF ZANDSPRUIT ESTATES ON REMAINDER OF THE FARM HAPPYLAND 241 KT IN HOEDSPRUIT: MARULENG LOCAL MUNICIPALITY WITHIN MOPANI DISTRICT MUNICIPALITY, LIMPOPO PROVINCE.

The above matter with has reference.

2. Based on the review findings of your submitted scoping report received on 2 November 2007, the Department of Economic Development, Environment and Tourism (the Department) as the competent authority would like the following objection raised during the public participation process to be addressed before any consideration of your submitted scoping report. The objection is listed below as follows:
3. The proposed development area is currently under land claim commission (Appendix 1).

Please do not hesitate to contact this department if this response is not clear.

~~Yours~~ Sincerely,

DEPUTY MANAGER
ENVIRONMENTAL IMPACT MANAGEMENT

DATE: 15/01/2002

Gnr Guild and Deep Streets, POLOKWANE, 0700, P O Box 55464, POLOKWANE, 0700
Tel: 015 268 0200, Fax: 015 263 5016, website: <http://www.Limpopo.gov.za>

[Faint handwritten text at the bottom of the page]



COMMISSION ON RESTITUTION OF LAND RIGHTS
IKHOMISHANA YOKUBUYISELWA KWAMALUNGELO OMHLABA
KHOMISHINI E MABAPI LE PUSETSO YA DITSHWANELO TSA
LEFATSHE
KOMMISSIE OP HERSTEL VAN GRONDREGTE

OFFICE OF THE REGIONAL LAND CLAIMS COMMISSIONER
LIMPOPO

Private Bag 0052, Polokwane, 0700. 80 Schoeman Tel (015) 267 0300 Fax (015) 267 0611/0929; BSA Building Tel (015) 267 4330 Fax (015) 267 4750

Enquiries : S Chene
 Ref : KRP 4028

RAPTOR'S VIEW HOME OWNERS ASSOCIATION
P.O BOX 1502
HORDSPRUIT
1380

Attention: Mrs Joan Amestad

RE: LAND CLAIMS - RAPTOR'S VIEW WILDLIFE ESTATE - HAPPYLAND 241 KT

Mkulani

Your letters dated 3 and 10 August 2006 as well as our letter dated 24 November 2005 refer.

We hereby confirm that in view of the highly developed nature of farm Happyland 241 KT, it is and will not be feasible for us to acquire same for purposes of restitution. Therefore, the claim on this property by the Molatele claimants or any other claimant will not be prosecuted or proceeded with any further, and other settlement alternatives are presently being explored by us so as to bring the Molatele claim to finality.

We trust you find the above in order.

MASHILE MOKONO
REGIONAL LAND CLAIMS COMMISSIONER: LIMPOPO
DATE: 17/08/2006

STEYN & CLARKE PROKUREURS / ATTORNEYS

NOTARISSE AKTEVERVAARDIGERS BOEDELBEDEREDDERS TAKSATEURS
NOTARIES CONVEYANCERS ADMINISTRATORS OF ESTATES APPRAISERS

Hoedspruit Kantoorpark / Hoedspruit Office Park
 Hoofstraat / Main Street
 Hoedspruit

Posbus / P.O. Box : 724
 Hoedspruit
 1380

Tel: 015 793 0258
 Faks/Fax: 015 793 0155

BTW NR / VAT NO. 4180220461

Direkte Faks: 086 631 8037
 E-pos / E-mail: aktes02@mweb.co.za

G.H.M. STEYN: 083 299 7368
 G.C. CLARKE: 082 929 1249

Our Ref.: GEORGE CLARKE/Jean-Mari/YON1/0004
 Your Ref.: MASHILE MOKONO / MIALANI NKATENKI

Date 20 SEPTEMBER 2007

THE REGIONAL LAND CLAIMS COMMISSIONER
 PRIVATE BAG X9552
 POLOKWANE
 0700

BY HAND

RE: NOTICE OF SALE, EXCHANGE, DONATION, LEASE, SUBDIVISION, REZONING OR
 DEVELOPMENT OF LAND TO THE REGIONAL LANDS CLAIMS COMMISSIONER.

We are representing SUGAR CREEK TRADING 33 (PTY) LTD

the owner of the land known as

REMAINING EXTENT OF THE FARM HAPPYLAND 241

REGISTRATION DIVISION K T LIMPOPO PROVINCE

IN EXTENT: 948,7707 (NINE HUNDRED AND FORTY EIGHT COMMA SEVEN SEVEN ZERO
 SEVEN) HECTARES

1.

We herewith submit a notice in terms of of Section 11 (7) (aA) of the Resitution of
 Land Rights Act number 22 of 1994 (as amended) in terms whereof:

G.H.M. STEYN: B.A. B. PROC., G.C. CLARKE: B.COMM. LL.B

Once a notice has been published in respect of any land:

"No person may sell, exchange, donate, lease, subdivide, rezone or develop the land in question without having given the regional Land Claims Commissioner one month's written notice of his or her intention to do so..."

2.

We hereby notify the Regional Land Claims Commissioner in terms of the above section, as follows:


The owner intends applying for the rights to develop a township on the land.

We herewith attach the following for your attention:

1. Draft Environmental Scoping Report - September 2007 TRIVIRON ENVIRONMENTAL
2. Proposed Land Development Area Layout Plan - Revision N (19/09/2007)

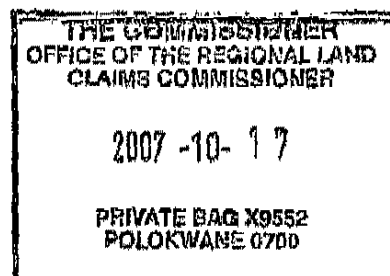
Kindly forward an acknowledgement of receipt to the above address.

Yours faithfully,


STEYN & CLARKE ATTORNEYS

I herewith acknowledge receipt of the above letter as well as the Deed of Sale annexed thereto.

Signature:  Name: Retole Date: 17/10/2007



C.M.M. STEYN: B.A. B. PROC., G.C., CLARKE: B.COMM., LL.B

APPENDIX 4 : GEOTECHNICAL INVESTIGATION REPORT



Geotechnical Investigation of Happyland 241KT for Proposed Estate

1 July 2007

J.P. Hattingh

1. Introduction	3
2. Proposed Development	3
3. Site Description.....	5
4. Fieldwork.....	5
5. Site Geology	8
Regional Geology.....	8
Local Geology	8
Structural Geology.....	9
Geotechnical Considerations	12
6. Mining potential.....	13
7. Laboratory Soil Testing	13
8. Geotechnical Considerations	15
Soil Classification	15
Outcrop.....	15
Potential Expansiveness	15
Collapse Potential	15
Percolation Rate and French Drain Design	16
Drainage and Soil Chemistry.....	17
Excavatability	17
Slope Stability and Erosion	17
Engineering Design Considerations	17
Seepage zones	18
Trenching	18
Earthworks	18
Subgrade Preparation	18
Site Classification and Foundation Recommendations	18
9. Conclusions	20
10. References.....	21
Annexure A – Pit Photos	22
Annexure B – Pit Profiles	32
Annexure C – Geotechnical Soil Sampling Results	33

1. Introduction

Rock And Stock Investments was commissioned by Zandspruit Estates to undertake a geological and geotechnical investigation on the remainder of the farm Happyland 241KT for the proposed development of various sites including residential, industrial, commercial and equestrian sites including associated infrastructure.

The proposed development is situated approximately 2.5 kilometres west of Hoedspruit and is accessed directly from the main tarred road (the R527) between Hoedspruit and Ohrigstad (Figure 1).

The sites comprising the proposed development predominantly fall to the north of the Sandspruit River on the remainder of Happyland 241KT (Figure 1) with the exception of a few proposed sites in the east of the property. The remainder of the farm Happyland 241KT is a parallelogram defined by the coordinates in table 1 below, the proposed development is predominantly north of the Sandspruit River.

Farm	Corner	Latitude	Longitude
Happyland 241KT Portion RE	A	S24.35950°	E30.94266°
	B	S24.38679°	E30.90262°
	C	S24.39403°	E30.93153°
	D	S24.37048°	E30.90428°

Table 1 Corner Co-ordinates of Estate (dd.ddddd°, WGS84)

Rock and Stock Investments' brief was to determine the site's geology with respect to:

- € The general subsoil conditions and the presence of problem soil types;
- € The general founding conditions for structures.

2. Proposed Development

The farm estate will comprise approximately 68 individual portions. The positions of the development portions forming the Estate have been proposed and predominantly fall to the north of the Sandspruit River on the Remainder Portion of the farm Happyland 241KT. The majority of the sites are on the south facing slopes of the Sandspruit River channel. The development will be split between "equestrian", residential and commercial/industrial sites with the bulk of the sites being allocated to residential use. The commercial/industrial sites all occur along the northern boundary, along the R527 with the bulk of the farm portion being reserved for luxury residential sites (Figure 1 and 2).

The proposed development comprises residential development portions. Sanitation disposal for the luxury residential sites is to be by means of septic tanks with French drains (soak aways). The position of the estate and development portions relative to the surrounding area is indicated in Figure 1 and 2.

3. Site Description

The topography on which the proposed development is situated is characterized by gently undulating relief sloping southwards to the Sandspruit River. The topography varies in elevation from approximately 520 metres in the north to 480 metres above sea level along the Sandspruit River. The gradient across the property varies between 1:18 and 1:33 excluding the river and stream channels.

The Sandspruit River meanders across the southern and eastern parts of the property, defining the southern boundary of the proposed development area. Drainage of the development area is towards the south and south east towards the Sandspruit River which flows from west to east and ultimately northwest discharging into the Blyderivier. The Sandspruit River channel contained isolated pools of water during the period of the investigation. The water table, whether perched or permanent, was not encountered during the investigation.

Northwest trending dolerite dyke outcrops were encountered in the south-eastern parts of the property and badly weathered dolerite dykes were all exposed in the excavation of test Pits 3, 17 and 19. Outcrops of amphibolites and biotite-gneisses are exposed in some places along the Sandspruit River bed. The soil cover is variable in thickness, becoming increasingly thicker towards the Sandspruit River and thinner in the northern parts of the property. This soil cover is predominantly hillwash from the proximal gneisses. The Remainder portion of Happyland 241KT has been utilised for agriculture, predominantly for cattle and game grazing.

The sites for the proposed development portions all slope in a southerly direction. The sites for the development will all be positioned above the level of the hundred year flood line as determined by the civil engineer.

4. Fieldwork

The fieldwork carried out, took the form of reconnaissance mapping of the site, the excavation of twenty inspection pits (Figure 3) and the excavation of three percolation test pits.

The fieldwork was carried out in order to:

- £ Determine the rock and soil types covering the site.

- £ Profile the subsoil and identify problem soil types.
- £ Take Foundation Indicator, pH and conductivity, and double consolidation test samples to determine the required soil parameters.
- £ Determine percolation rates for the design of French drains (soak aways).

Pit	Latitude	Longitude
PIT1	-24.36317202	30.93778507
PIT2	-24.36408137	30.94094287
PIT3	-24.3724849	30.93385446
PIT4	-24.37702387	30.93411648
PIT5	-24.37423462	30.92820774
PIT6	-24.37043896	30.92573432
PIT7	-24.36983102	30.92056755
PIT8	-24.36627508	30.9195261
PIT9	-24.37219187	30.90424899
PIT10	-24.3701813	30.91073927
PIT11	-24.36353001	30.92879288
PIT12	-24.36926398	30.93090814
PIT13	-24.36454782	30.9335481
PIT14	-24.36781299	30.91367343
PIT15	-24.36635982	30.93130611
PIT16	-24.36446811	30.92534649
PIT17	-24.36931226	30.93373418
PIT18	-24.36131995	30.94198641
PIT19	-24.36609495	30.94042981
PIT20	-24.37173623	30.93864262
Perc_Test1	-24.36371257	30.93705601
Perc_Test2	-24.36985759	30.92966242
Perc_Test3	-24.37591494	30.93056708

Table 2 Location of test pits and percolation test points (dd.dddd°, WGS84)

A SACNASP registered geologist undertook the surface mapping, inspected the test pits and collected the samples. The soil and rock strata exposed were described using standard terminology (Jennings et al, 1973). Representative disturbed and undisturbed soil samples were taken from the sides of the test pits for laboratory testing, undisturbed samples were extremely difficult to collect from the incohesive sandy gravels and gravelly sands. Percolation tests were

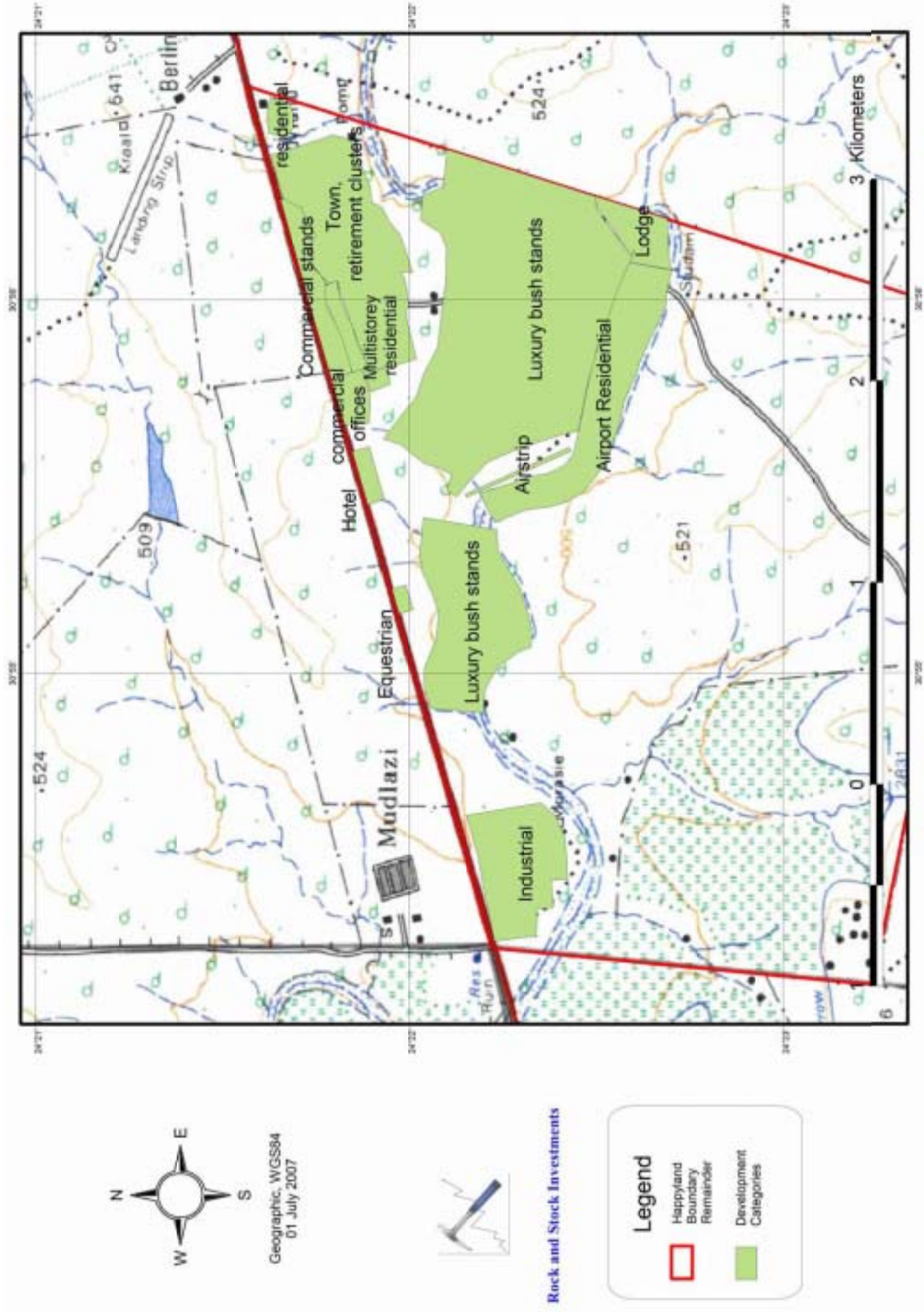


Figure 2 Location of Proposed Development Categories on Farm Estate

conducted at three representative sites according to the method prescribed in the NHBRC's Home Building Manual.

Figure 3 shows the position of the twenty inspection pits and three percolation test pits relative to the proposed development area and the portion boundary. The photos of the inspection pits, pit profiles, and laboratory soil test results are attached as Annexure A, B and C respectively.

5. Site Geology

Regional Geology

The farm Happyland 241KT is entirely underlain by Makhutswi Gneiss of the Swazian Erathem. Approximately 4.5 kilometres northwest are younger (Vaalian) outcrops of Harmony Granite, while approximately 7 kilometres south are younger Nelspruit Suite and other gneisses also of the Swazian Erathem (Figure 4). The Makhutswi Gneiss is stratigraphically the oldest lithology and underlies the Murchison Sequence of volcanics and sediments, while the Nelspruit Suite is stratigraphically above the Murchison Sequence. The Murchison Sequence is in turn overlain by various granites and gneisses of Swazian to Vaalian age.

Local Geology

Isolated outcrops of Makhutswi gneiss are predominantly confined to the drainage channel of the Sandspruit River, although abundant gneiss float occurs throughout the area. Float rock includes generally leucocratic granite and granite gneiss, dolerite and occasional migmatitic and amphibolitic lithologies. The site is further characterised by occasional dolerite dykes that form negative to very low relief.

The **Makhutswi Gneiss** is Swazian in age and is a light-grey, medium grained biotite gneiss with coarse grained quartz-feldspar leucosomes. Excellent exposures of the gneiss are viewed in the Sandspruit stream channel. The residual soils forming from adjacent granites and granite-gneisses may potentially give rise to collapsible soils as well as heaving movements. No residual soils were encountered.

The **Karoo Dolerite** is Jurassic in age and forms numerous sub-vertical dykes throughout the region with a general northeast-southwest strike. Several dolerite dykes were observed on the site of the proposed developments. The dolerites are susceptible to chemical decomposition in this region (N-value is between 2 and 5) and as such may give rise to localised active soils though the dykes are thought to measure 10 metres or less in thickness. Of a likely greater concern will be differential settlements where founding structures traverse both basement gneisses and dolerite

dykes. The 1:250 000 scale geological map published by the Council for Geoscience confirms the presence of at least two major dolerite dykes striking northeast-southwest and east-west across the property.

Structural Geology

The published 1:250 000 geological sheet (Figure 4) shows 2 significant inferred and undifferentiated lineations interpreted and derived from aeromagnetic and Landsat imagery which intersect the aerial extent of the proposed estate. These lineaments which trend north-northeast to south-southwest may represent faults or igneous dykes, which may possibly weather to clay-rich soils in places.

The 1:250 000 geological sheet further indicates two major Karoo age dolerite dykes striking northeast-southwest and east-west across the Remainder portion. Dolerite dykes were encountered during the excavation of the inspection pits.

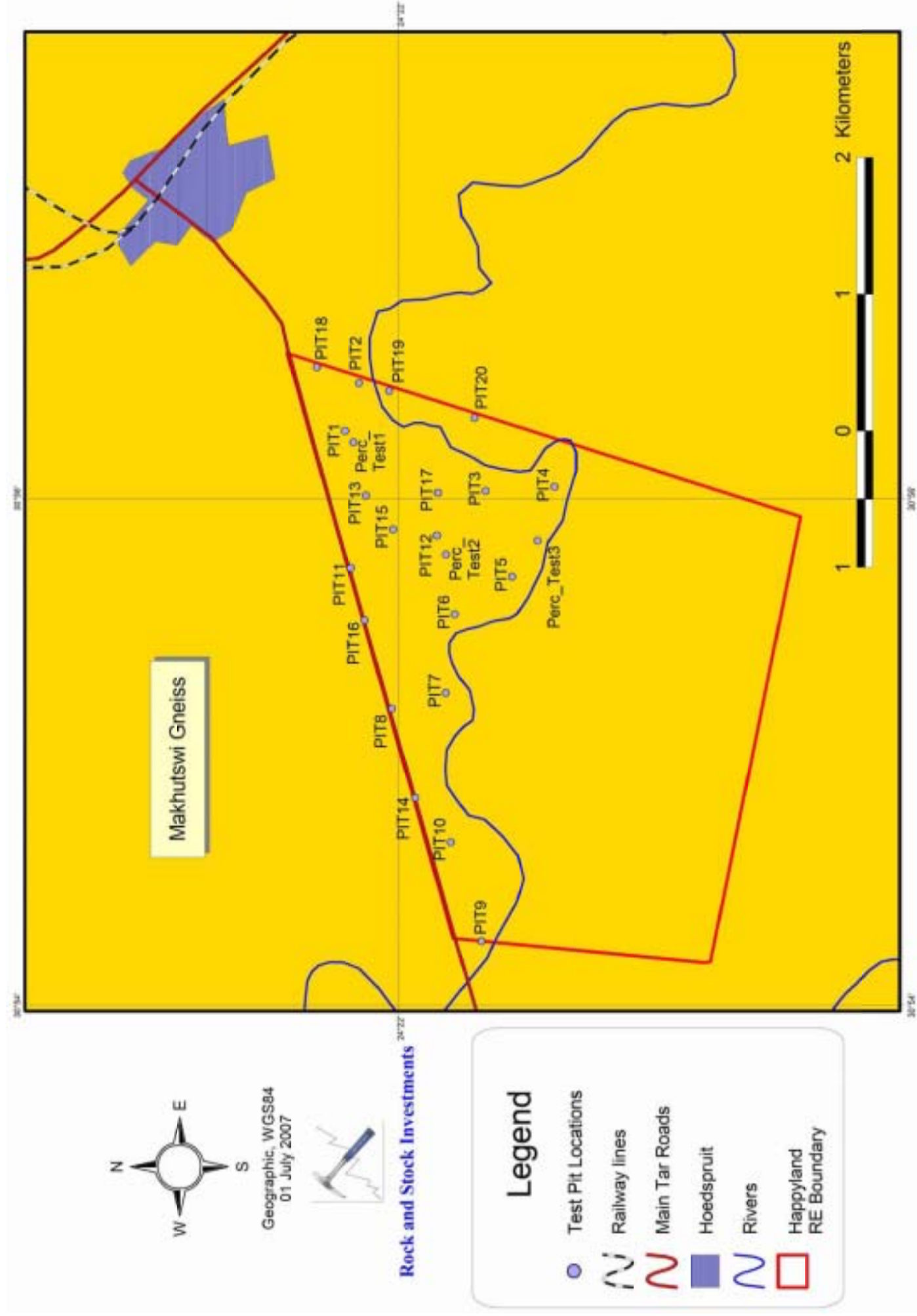


Figure 3 Location of Pits Relative to Geology and Property Boundary

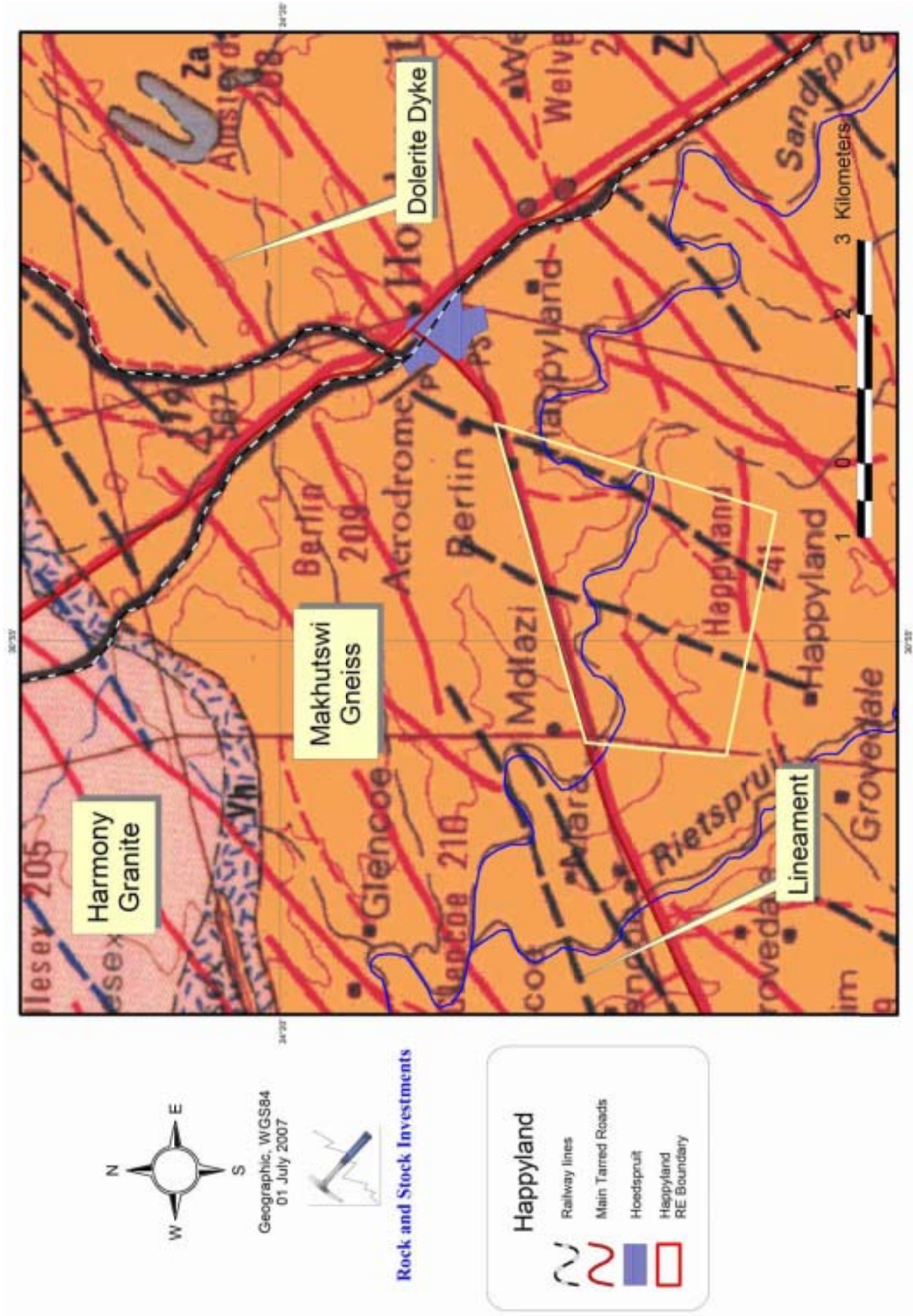


Figure 4 Location of the Farm Portion Relative to Geology (modified from the 1:250000 CGS sheet).

Geotechnical Considerations

The area is gently undulating with most outcrop of the gneisses being confined to stream channels. The dolerites are seen to form low positive relief with outcrops of dolerite visible in a number of locations. Soils measuring 0.17 to 1.90 metres overly gneisses, dolerites and calcrete. The soils sampled classify as sandy gravels, gravely sands, silty sands and clayey sands. The soil profiles vary according to distance from the Sandspruit channel and underlying lithology. The soils are generally thin and gravely away from the stream channel becoming thicker and sandier closer to the stream channel. The thin transported soils are fairly inert in terms of expansiveness with little expectation for geotechnical complication. The presence of thin soils away from the stream channel means that much of the proposed development along the northern boundary of the portion will found on bedrock. The notable exceptions will be the luxury bush stands and airport residential stands close to the Sandspruit River channel where thicker soil profiles were encountered.

The exploration pits were excavated to refusal at between 0.44 and 1.63 metres. In the case of Pits 4, 5, 6 and 9 the pits were excavated freely and stopped due to the maximum depth limit of the TLB being reached. Generally, the base of the soil profile is within residual, weathered gneiss which is dry, dark yellowish orange to light brown in appearance and classifies as a soft rock.

There are essentially three soil profiles which will be encountered:

1. The first is found in the north of the property away from the Sandspruit River channel and consists of thin gravels or thin sands and gravels overlying gneiss. Where no sand overlies the gravel the gravel is generally thin, up to 0.57m (Pits 1, 10, 11 and 14). Where sand and gravel overlie the residual gneiss the combined soil profile measures up to 0.96m overlying gneiss (Pits 2, 8, 12, 13, 15, 16, 18 and 20). Foundation conditions where these profiles occur are generally likely to be favourable, especially where founding occurs on bedrock. Minor differential movements may be expected where foundations traverse differing lithologies.
2. The second soil profile consists of sand or gravel or gravel and sand layers overlying calcrete. In these instances one can encounter soils of at least 1.90m before intersecting calcrete (Pits 4, 5, 7 and 9) and in the case of Pit 6 the pit was excavated to 2.60m and remained in sand. These profiles all occur proximal to the Sandspruit River channel and these thick transported sands and gravels are a combination of material deposited as levees by the stream and hillwash depositing along the banks and levees of the river. The underlying calcretes may be problematic due to their variable nature; much of the calcrete observed in this investigation would classify as calcified soil or nodular calcrete. Foundations on these thicker soils and underlying variable calcretes are likely to be prone to some collapse.

3. The third soil profile consists of sands and gravels overlying dolerite. In the case of Pits 3, 17 and 19 the soils developed were relatively thin varying between 0.34 and 0.69 metres. These three profiles were excavated close to dolerite dykes observed in the field and indicated on the 1:250000 geological map from the Council for Geoscience.

The hillwash is dominated by sub-angular clasts of granite-gneiss in a sandy matrix and is dark reddish brown to dark brown in colour, firm in consistency and contains plant roots. Where the profile is underlain by dolerite (Pits 3, 17 and 19) then the base of the profile is defined by a dry, dark olive, soft to hard, weathered to badly weathered residual dolerite which is in turn overlain by the same transported hillwash as before. The hardness and colour of the dolerite is associated with the degree of weathering of that dolerite.

The ground water table, whether perched or permanent, was not encountered during the investigation.

6. Mining potential

No mineral occurrences of economic importance have been reported in the vicinity of the study area and no evidence of mining activity under the study area is apparent.

It is highly unlikely that any economically exploitable minerals occur on the farm.

7. Laboratory Soil Testing

Representative soil samples were taken from the sides of the test pits and were submitted to Soillab (Pty) Ltd for the following tests (Table 3). The soil samples included both disturbed and undisturbed samples. Samples were collected for the following analyses:

Foundation Indicator Tests (Sieve Analysis down to 0.075mm & Atterberg Limits)

Double Consolidation Tests

Triaxial Shear Strength

pH

Sample	Foundation Indicator	Double Consolidation	Triaxial- Consolidated & Undrained	Ph & Conductivity	Sample Locality		Sample Type
HL1	x				PIT1	0.00-0.35m	Disturbed
HL2	x			x	PIT2	0.38-0.75m	Disturbed
HL3	x			x	PIT3	0.00-0.34m	Disturbed
HL4		x		x	PIT4	1.30-1.72m	Undisturbed
HL5	x					0.39-1.06m	Disturbed
HL6	x	x			PIT5	0.24-0.72m	Undisturbed
HL7	x					0.24-0.72m	Disturbed
HL8	x	x			PIT6	0.28-0.84m	Undisturbed
HL9			x			0.28-0.84m	Undisturbed
HL10	x				PIT7	0.25-0.49m	Disturbed
HL11	x					0.55-0.75m	Disturbed
HL12	x				PIT8	0.25-0.65m	Disturbed
HL13	x	x			PIT9	0.35-0.60m	Undisturbed
HL14			x				Undisturbed
HL15	x				PIT10	0.15-0.25m	Disturbed
HL16	x				PIT11	0.00-0.18m	Disturbed
HL17	x	x			PIT12	0.39-0.89m	Undisturbed
HL18			x	x			Undisturbed
HL19	x				PIT13	0.21-0.54m	Disturbed
HL24	x			x	PIT14	0.45-0.70m	Disturbed
HL25	x			x	PIT15	0.36-0.65m	Disturbed
HL26	x				PIT16	0.40-0.70m	Disturbed
HL27	x				PIT17	0.20-0.52m	Disturbed
HL28	x			x		0.55-0.76m	Disturbed
HL29	x			x	PIT18	0.23-0.50m	Disturbed
HL30	x					0.50-0.70m	Disturbed
HL31	x	x			PIT19	0.30-0.45m	Undisturbed
HL32			x	x		0.40-0.69m	Undisturbed
HL33	x	x			PIT20	0.30-0.50m	Undisturbed
HL34			x	x		0.49-0.64m	Undisturbed
Totals	24	7	5	10			

Table 3 Soil samples collected

8. Geotechnical Considerations

Soil Classification

The results of the Atterberg Limits showed that the transported sands and gravels showed a large range in terms of subgrades and from good to poor subgrades in the AASHTO classification; owing to the variable nature of the subgrades they should generally be thought of as forming poor subgrade material. Looking in more detail at the upper hillwash horizon it will be seen that it generally classifies as sandy gravels and gravelly sands with smaller amounts of silty sands and minor clayey sands. It will be seen that hillwash classified as SC, SM, SM, GP, GC and CL and combinations thereof according to the Unified Soil Classification System and varied between A-1-b, A-2-4, A-2-6 and A-6 according to the AASHTO group classification.

Outcrop

Pervasive float was encountered across the proposed estate. Outcrops of the gneisses and amphibolites were confined to the stream channels while dolerite dykes were seen to outcrop in a number of localities. Where soil profiles are thin (less than 75cm), foundations should be excavated to bedrock level and as such both gneiss and dolerite will be encountered during excavation for the development while hard outcrops of dolerite may be expected to occur throughout the development.

Potential Expansiveness

The Atterberg Limits were determined for all the samples. It was found that on the Potential Expansiveness chart all of the samples plot as low to very low in terms of their potential expansiveness – heave on these soils can therefore be expected to be negligible (vd Merwe, 1975).

Looking at the results of the double consolidation test and foundation indicator results the total swell should not be expected to exceed 1cm in the soils (Appendix C).

Founding conditions across this site may be expected to exhibit negligible heave.

Collapse Potential

From the laboratory test results in conjunction with the relationship between dry unit density and liquid limit determined by Holtz and Hilf (1961), the soils can be deemed to have a low to moderate collapse potential.

Sample	Collapse Potential %	Severity of Problem
HL4	7	trouble
HL6	6	trouble
HL8	11	severe trouble
HL13	5	moderate trouble
HL17	6	trouble
HL31	15	severe trouble
HL33	11	severe trouble

Table 4 Collapse Potential after Jennings and Knight, 1975

Settlement collapse in the fine grained hillwash can be estimated to be an average of 23cm for a 1.5m susceptible layer; where foundations on the north of the property lie on bedrock this will obviously not be a factor. The depth of influence on the soil horizon will of course be related to the planned loading, it is unlikely for the residential portions that the soils will be influenced to a 1.5m depth. Settlement collapse is likely to be of concern in the southern part of the property proximal to the Sandspruit River channel, i.e. for the luxury bush stands and the airport residential area. In all cases in order to assess the soil profile in these areas, test pits should be excavated by TLB around the margins. The collapse potential on the site is thought to be severe. The degree of consolidation for the sandy gravels and gravelly sands may be estimated from the double consolidation test in Appendix C. The underlying rock in all cases is not collapsible.

Percolation Rate and French Drain Design

Three in situ percolation tests were carried out in accordance with the method prescribed by the NHBRC in the upper transported layer.

The percolation rate was found to be:

Percolation Test	Percolation Rate	Required Surface Area
1	5 minutes	16.0 m ²
2	10 minutes	20.0 m ²
3	3 minutes	14.8 m ²

Table 5 Percolation Test Results

The required surface area was calculated using a figure of 1600 litres of sewerage per day per development portion. If one uses the worst case scenario for all French drain design (test 2) then the total required surface area for French drains for the development is not less than 20.0m². Therefore a 0.6 m deep, 0.60 m wide trench one will need not less than 16.1 m length of trench for a French drain.

Where it is not possible to excavate the French drains to a depth of 0.6m the required length of French drain will obviously need to be increased. The French drains should be laid out sub-

parallel to the contour of the site, away from any surface run-off channels or water sources, and any parallel drains should not be closer to one another than twice their depth.

Drainage and Soil Chemistry

No water seepages were encountered during the investigation. The necessary damp-proofing precautions should be taken underneath structures and surface beds.

The foundation materials are considered to be very mildly aggressive with regards to buried ferrous pipes (Annexure C) and the use of non-ferrous metal pipes or plastic pipes should preferably be used for wet services.

Foundation soils should be treated with an environmentally friendly insecticide to combat termites.

Excavatability

Bulk excavation in the site area (up to the observed bedrock depth, 0.3-0.41m) will classify as “soft” excavation in accordance with SABS 1200D. Excavation into the underlying bedrock will classify as intermediate to hard rock.

Boulders will be encountered within the transported gravels and cobbles, as well as core stones in any residual dolerites and possibly in the gneisses.

Slope Stability and Erosion

The proposed development area is on gently undulating topography with gradients varying between 1:18 and 1:33, the maximum slope is therefore approximately 3°. The Sandspruit stream channel is to the south of the proposed development area and only contained isolated pools of water during the time of the investigation, but is known to be fast flowing during the rainy season. The stream channel is well away from the sites of proposed construction.

No slope stability problems are envisaged, where possible service and access routes should be made as close to the contour as possible to minimise any chance of erosion.

Engineering Design Considerations

Where foundations will be on rock, it is estimated that the UCS of the gneisses is between 3 and 10MPa, while any unweathered dolerite will likely have a UCS in excess of 200MPa. The upper transported hillwash is not expansive but is potentially severely collapsible, these soils will require compaction in order to improve their founding properties.

Seepage zones

No permanent seepage zones were encountered.

Trenching

The TLB (CAT 416B) used during the site investigation freely excavated the test pits up to the depth of bedrock with refusal being recorded at depths between 0.44m and 1.63m for the excavations. In the southern part of the proposed development area, in the vicinity of the Sandspruit River channel, some excavations did not encounter refusal at bedrock depth but were rather stopped at the limits of the TLB's mechanical arm extension, in these instances calcrete and cemented sand were encountered at depths greater 2.0 meters.

All the test pits stood unsupported during the excavation of the inspection pits.

Earthworks

Earthworks will be shallow in the northern part of the farm as a result of very thin soil cover and deeper towards the Sandspruit River which forms the southern boundary of the proposed development area.

Both during and after construction, the site should be well graded to permit water to drain away readily and to prevent ponding of water anywhere on the ground surface. It is recommended that all earthworks be carried out in accordance with SANS 1200 (latest version).

Subgrade Preparation

The variable soils encountered generally classify as good to poor subgrades as per the AASHTO classification. The variable nature of the soils means that as a class they should be regarded as poor subgrade material and will require improvement to be used as suitable subgrades.

Site Classification and Foundation Recommendations

The soil types overlying the gneisses and dolerite dykes on the site are not expansive but are fairly collapsible, in the north of the property, founding will often occur directly on the residual gneisses (and dolerites). Where a foundation structure may span gneiss and dolerite allowance should be made for minor differential movements. The site class designation in terms of the NHBRC requirements in such areas is therefore R. Where foundations do not rest on the underlying rock as will be the case with the luxury bush stands and airport residential area, the site classifies as C2. A joint classification for the site as a whole will therefore be C2.

In accordance with the NHBRC guidelines, for all the proposed units the following foundation system may be considered for residential development:

In areas where excavations are to bedrock level (within the gneiss - not calcrete) site class "R":

Normal

- ☒ Normal construction (strip footing or slab-on-the-ground) foundations.
- ☒ Good site drainage.

Where structures might span both gneiss and dolerite the following foundation system may be considered for residential development:

Modified Normal

- ☒ Lightly reinforced strip footings.
- ☒ Articulation joints at some internal and all external doors.
- ☒ Light reinforcement in masonry.
- ☒ Site drainage and service/plumbing precautions.

Where foundations are not excavated to bedrock level the site will classify as "C2" in which case one or more of the following foundation systems may be considered for residential development:

Stiffened strip footings, Stiffened or Cellular Raft

- ☒ Stiffened strip footings or stiffened or cellular raft with lightly reinforced or articulated masonry.
- ☒ Bearing pressure not to exceed 50kPa.
- ☒ Reinforced floor slabs.
- ☒ Site drainage and service/plumbing precautions.

Soil Raft

- ☒ Removal of in situ material to 1.0m beyond the perimeter of the building and to a depth of 1.5 times the widest foundation or to a competent horizon and replace with inert backfill compacted to 93% MOD AASHTO density at -1% to 2% of optimum moisture content.
- ☒ Normal construction with lightly reinforced strip footings and light reinforcement in masonry.
- ☒ Site drainage and plumbing/service precautions.

Piled or Pier Foundations

- ☒ Reinforced concrete ground beams or solid slabs on piled or pier foundations.
- ☒ Ground slabs with fabric reinforcement.
- ☒ Site drainage and plumbing/service precautions.

Deep Strip Foundations

- ☒ Normal construction with drainage precautions.
- ☒ Founding on a competent layer below the medium sands; on the residual sandstone.

- ∄ Reinforcement in floor slabs.

Compaction of In Situ Soils below Individual Footings

- ∄ Removal of in situ material to a depth and width of 1.5 times the foundation width or to a competent horizon and replace with inert backfill compacted to 93% MOD AASHTO density at –1% to 2% of optimum moisture content.
- ∄ Normal construction with lightly reinforced strip footings and light reinforcement in masonry.
- ∄ Reinforcement in floor slabs.
- ∄ Site drainage and plumbing/service precautions.

9. Conclusions

No overly adverse conditions were encountered during the investigation in terms of the National Department of Housing's Generic Specification (GFSH-2) and no onerous requirements are envisaged for compliance in terms of the NHBRC's Home Building Manual. Founding where reasonably possible should be on bedrock. Where deep soil profiles are encountered which preclude founding on bedrock, cognisance must be taken of the collapsible nature of the soils. Where foundations may cross differing founding strata there may be minor differential movements and any design needs to take this into account.

The observations, recommendations and opinions expressed in this report are based on the project as described with the assumption that geological conditions will not vary drastically from those encountered during the investigation. Although every effort has been made to ensure the accuracy of the information contained within this report, the results of the investigation are based upon fieldwork and laboratory testing only. We cannot be held responsible if localized soil conditions are encountered which are at a variance to those described in the report.

10. References

The report is a compilation of researched published data and field observations gathered during site visits on the 15th of June, and on the 29th and 30th of August 2006.

Data sources include:

- € Brink, A.B.A. 1979. *Engineering Geology of Southern Africa*. Volume 1. Published by Building Publications, Pretoria.
- € JENNINGS JE ET AL (1973). Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa. *The Civil Engineer in South Africa*, January 1973.
- € Kent, L.E. (compiler). *Stratigraphy of South Africa*, Handbook 8, Geol. Survey, South Africa, 1980
- € VAN DER MERWE, D.H. The prediction of Heave from the Plasticity Index and Percentage Clay fraction of Soils, *Trans. SA Inst. Civ. Eng.*, Vol 6, No6, pp 103-107 (1964)
- € Murthy, V.N.S. (2003). *Geotechnical Engineering*, Marcel Dekker, Inc., New York.
- € Franki (1995), *A Guide to Practical Geotechnical Engineering in Southern Africa*.
- € The 1:250 000 Geological Sheet, 2430 Pilgrim's Rest. Published in 1986
- € Digital editions of the 1:50000 Topographical sheet 2430 BD
- € Digital orthophotographs prepared by Fotogramensura
- € *Geotechnical Site Investigations for Housing Developments*, Generic Specification GFSH-2, September 2002
- € *The NHBRC Standards and Guidelines for 1999*.
- € The Council for Geoscience was consulted, but no references or papers concerning the property could be found.

Annexure A – Pit Photos

Photo 1 Pit 1



Photo 2 Pit 2



Photo 3 Pit 3



Photo 4 Pit 4



Photo 5 Pit 5



Photo 6 Pit 6



Photo 7 Pit 7



Photo 8 Pit 8



Photo 9 Pit 9



Photo 10 Pit 10



Photo 11 Pit 11



Photo 12 Pit 12



Photo 13 Pit 13



Photo 14 Pit 14



Photo 15 Pit 15



Photo 16 Pit 16



Photo 17 Pit 17



Photo 18 Pit 18



Photo 19 Pit 19



Photo 20 Pit 20



Annexure B – Pit Profiles

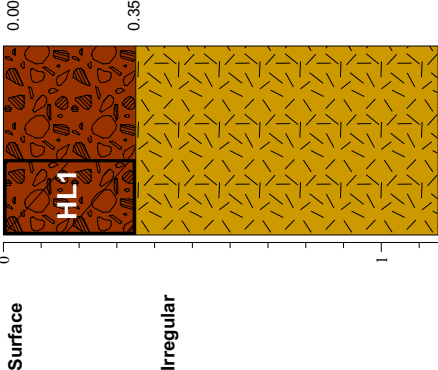
SOIL PROFILE - Happyland

SOIL PROFILE : PIT1
Excavation: CAT416B TLB
Depth of refusal: 1.15m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695515.3 Y: 6312.6

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface		Coarse gravel (20-60mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Coarse gravel with medium to coarse sand matrix, plants and grass roots upto 5-10cm depth, gravel consists of predominately sub-rounded quartz pebbles.
		Gneiss	Dry	Dark yellowish orange	Very soft	Residual	Weathered	Foliated.



SOIL PROFILE - Happyland

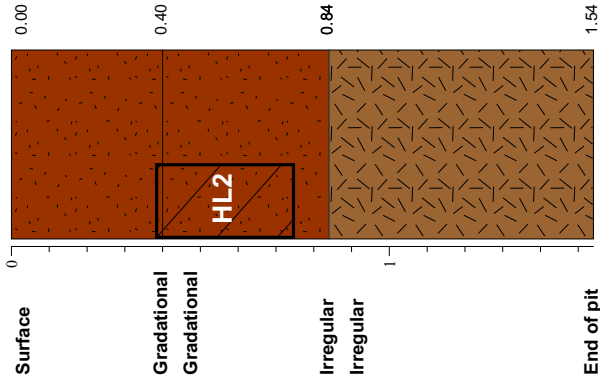
SOIL PROFILE : PIT2
Excavation: CAT416B TLB
Depth of refusal: 1.54m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695615.9 Y: 5992.1

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		with plant/grass roots
Gradational Gradational		Medium sand (0.2-0.6mm)	Slightly moist	Dark brown	Firm	Hillwash - fine colluvium		Dark brown to light brown in colour, similar to topsoil but devoid of plant roots, more clayey. Underlain by a very narrow (1-5cm thick) pebble marke at the base, subrounded quartz pebbles
Irregular Irregular		Gneiss	Dry	Light brown	Very soft	Residual	Weathered to badly weathered	
End of pit								



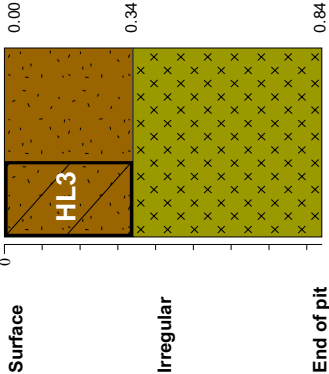
SOIL PROFILE - Happyland

SOIL PROFILE : PIT3
Excavation: CAT416B TLB
Depth of refusal: 0.84m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696547.0 Y: 6710.9

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Medium sand (0.2-0.6mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		Fine grained towards top, becomes medium grained and gritty towards the bottom, sub-angular quartz pebbles (<10cm in diameter) for the bottom of the horizon.
		Dolerite	Dry	Dark olive	Soft	Residual	Weathered	With minor fissures/cracks, breaks off easily with slight blow of a geopick, an approx NW trending dolerite-outcrop was found adjacent to the pit.



SOIL PROFILE - Happyland

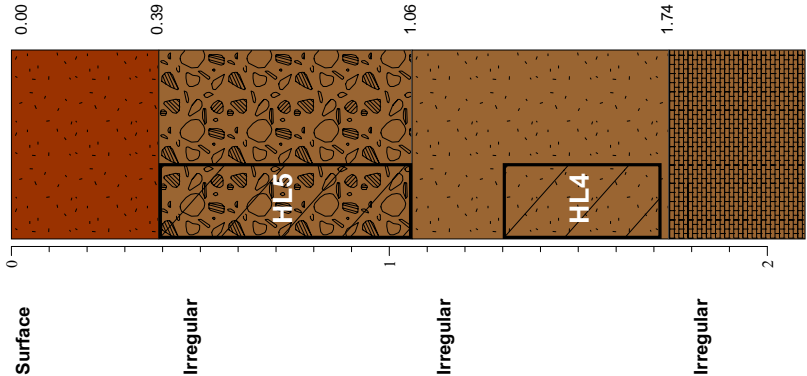
SOIL PROFILE : PIT4
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2697049.8 Y: 6684.1

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Irregular		Medium sand (0.2-0.6mm)	Dry	Dark brown	Soft	Hillwash - fine colluvium		medium to fine grained, slightly gritty and relatively well sorted
Irregular		Coarse gravel (20-60mm)	Dry	Light brown	Firm	Hillwash - fine colluvium		Variable rounded-subrounded quartz pebbles up to > 100mm thick supported by coarse sand to sandy gravel matrix, also with sub-angular dolerite clasts.
Irregular		Fine sand (0.06-0.2mm)	Slightly moist	Light brown	Soft	Hillwash - fine colluvium		
Irregular		Calcrete	Slightly moist	Light brown	Soft	Pedogenic - cemented		With calcrete nodules supported by a fine grained sand matrix, becoming increasingly more solid towards the base.



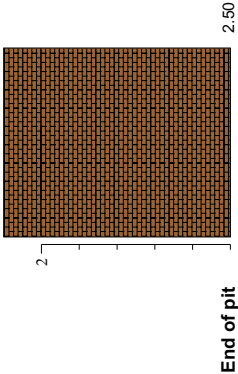
SOIL PROFILE - Happyland

SOIL PROFILE : PIT4
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2697049.8 Y: 6684.1

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Calcrete	Slightly moist	Light brown	Soft	Pedogenic - cemented		With calcrete nodules supported by a fine grained sand matrix, becoming increasingly more solid towards the base.



SOIL PROFILE - Happyland

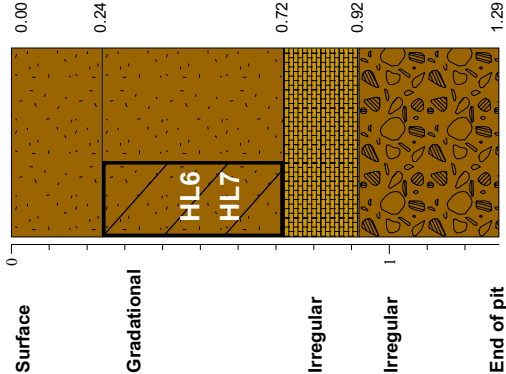
SOIL PROFILE : PIT5
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696741.1 Y: 7283.7

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Gradational		Medium sand (0.2-0.6mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		Medium grained sand with plant roots.
		Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		Coarse grained, gritty sand, thin and sparse plant roots present.
Irregular		Calcrete	Dry	Dark yellowish orange	Soft	Pedogenic - cemented		Calcrete and ferricrete nodules of variable sizes, supported by a medium to coarse grained sand matrix, becomes more solid towards base.
Irregular		Coarse gravel (20-60mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		Pebble Marker, with 20-50mm sub-angular dolerite pebble supported by a coarse grained, gritty sand matrix
End of pit								



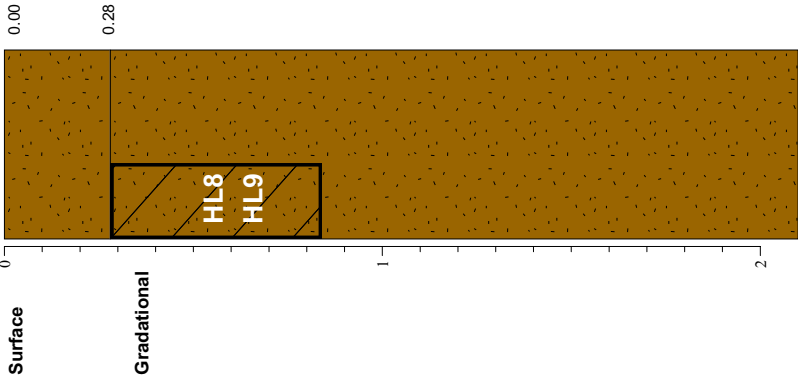
SOIL PROFILE - Happyland

SOIL PROFILE : PIT6
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696320.8 Y: 7534.9

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		Coarse grained gritty sand with plant roots.
		Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Stiff	Residual		Poorly sorted with variable sub-angular clasts of different sizes (mainly qtz pebbles), grades into a light brown colour towards the base.



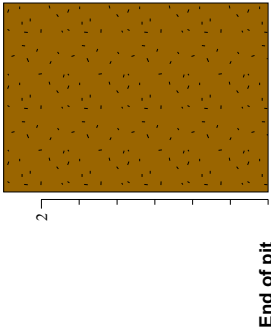
SOIL PROFILE - Happyland

SOIL PROFILE : PIT6
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696320.8 Y: 7534.9

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Stiff	Residual		Poorly sorted with variable sub-angular clasts of different sizes (mainly qtz pebbles), grades into a light brown colour towards the base.



SOIL PROFILE - Happyland

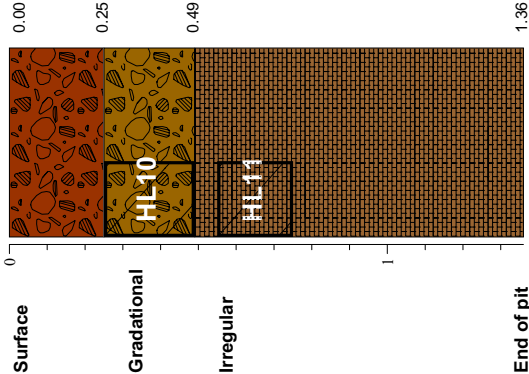
SOIL PROFILE : PIT7
Excavation: CAT416B TLB
Depth of refusal: 1.36m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696253.8 Y: 8059.1

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Gradational		Medium gravel (6-20mm)	Dry	Dark brown	Stiff	Hillwash - fine colluvium		Becomes coarse towards the base with quartz pebbles ~20mm.
Irregular	HL-10 HL-11	Coarse gravel (20-60mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Sandy gravel with quartz pebbles up to ~60mm loosely supported by fine sand, poorly sorted.
End of pit		Calcrete	Dry	Light brown	Soft	Pedogenic - cemented		Irregularly distributed calcrete nodules supported by fine-medium sand matrix, irregular interstitial calcrete nodules.



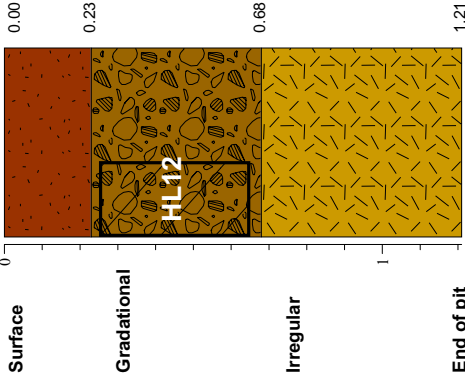
SOIL PROFILE - Happyland

SOIL PROFILE : PIT8
Excavation: CAT416B TLB
Depth of refusal: 1.21m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695860.0 Y: 8165.0

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Fine sand (0.06-0.2mm)	Dry	Dark brown	Soft	Hillwash - fine colluvium		Fine grained sand which coarsens towards the base, relatively well sorted.
		Coarse gravel (20-60mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Sandy-gravel consists of reworked/transported gneiss pebbles of variable sizes, poorly sorted.
		Gneiss	Dry	Dark yellowish orange	Hard	Residual	Weathered	Becomes harder towards the base.



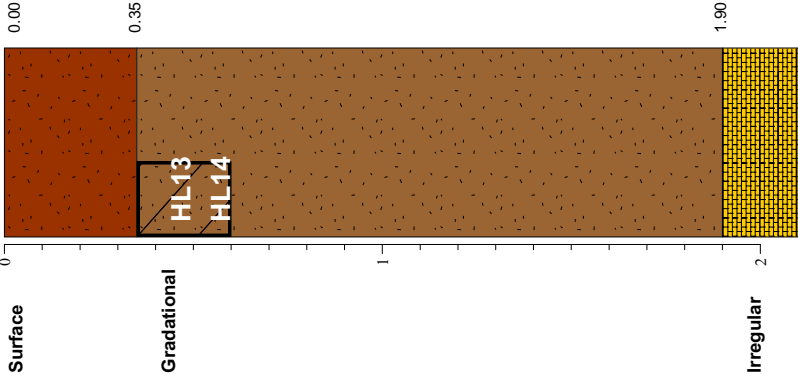
SOIL PROFILE - Happyland

SOIL PROFILE : PIT9
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696516.3 Y: 9714.6

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Relatively well sorted gritty sand.
		Medium sand (0.2-0.6mm)	Dry	Light brown	Stiff	Hillwash - fine colluvium		Relatively well sorted sand with pinhole structures distributed through the zone, coarsens towards the base with angular-sub-angular qartz pebbles.
		Calcrete	Dry	Light yellowish orange	Soft	Pedogenic - cemented		Cemented medium sand with minor calcrete nodules.



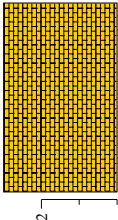
SOIL PROFILE - Happyland

SOIL PROFILE : PIT9
Excavation: CAT416B TLB
Depth of refusal: Depth Limit

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsI): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696516.3 Y: 9714.6

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Calcrete	Dry	Light yellowish orange	Soft	Pedogenic - cemented		Cemented medium sand with minor calcrete nodules.



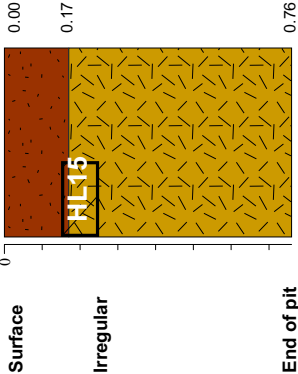
SOIL PROFILE - Happyland

SOIL PROFILE : PIT10
Excavation: CAT416B TLB
Depth of refusal: 0.76m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696293.2 Y: 9056.3

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Medium sand (0.2-0.6mm)	Dry	Dark brown	Stiff	Hillwash - fine colluvium		Medium grained, gritty sand, poorly sorted.
		Gneiss	Dry	Dark yellowish orange	Soft	Residual		Granular textured with angular quartz-feldspar minerals, top most part is slightly reworked and characterized by sub rounded quartz pebbles ~20-50mm.



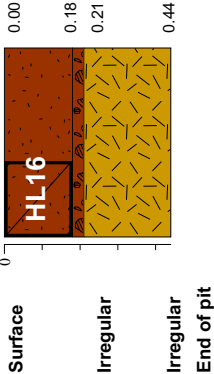
SOIL PROFILE - Happyland

SOIL PROFILE : PIT11
Excavation: CAT416B TLB
Depth of refusal: 0.44m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695555.4 Y: 7225.0

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface		Medium sand (0.2-0.6mm)	Dry	Dark brown	Soft	Hillwash - fine colluvium		Loose, well sorted sand.
Irregular		Coarse gravel (20-60mm)	Dry	Dark brown	Soft	Hillwash - fine colluvium	Weathered	Pebble Marker. poorly sorted, variable sizes of quartz pebbles (sub-rounded) held in a medium grained sand matrix.
Irregular		Gneiss	Dry	Dark yellowish orange	Hard	Residual		Granular Biotite gneiss which increasingly becomes more solid to the base.
End of pit								



SOIL PROFILE - Happyland

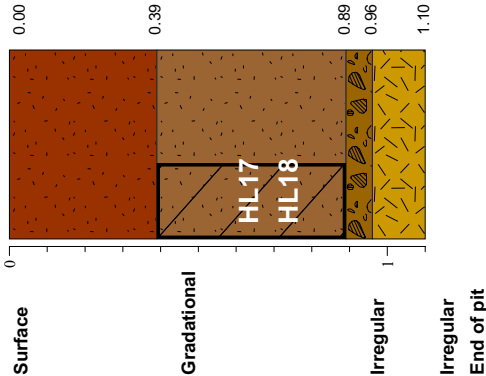
SOIL PROFILE : PIT12
Excavation: CAT416B TLB
Depth of refusal: 1.10m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (ams!): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696190.4 Y: 7010.0

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Gradational		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Relatively well sorted, with pin hole structures irregularly distributed.
		Coarse sand (0.6-2mm)	Dry	Light brown	Stiff	Hillwash - fine colluvium		Poorly sorted gritty sand.
Irregular		Coarse gravel (20-60mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Pebble Marker, consists of quartz pebbles of variables~up to 50mm (sub-rounded and sub-angular).
Irregular		Gneiss	Dry	Dark yellowish orange	Hard	Residual		Becoming harder towards the base.
End of pit								



SOIL PROFILE - Happyland

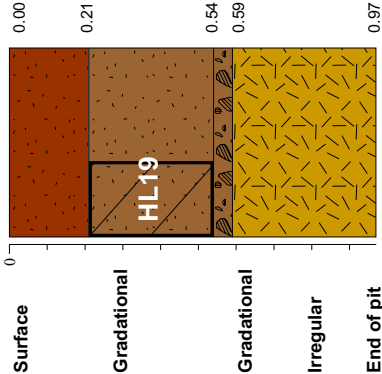
SOIL PROFILE : PIT13
Excavation: CAT416B TLB
Depth of refusal: 0.97m

Geologist : J.P. Hattingh
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695667.9 Y: 6742.4

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Gradational		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		well sorted, intact
Gradational		Coarse sand (0.6-2mm)	Dry	Light brown	Stiff	Hillwash - fine colluvium		poorly sorted gritty sand which coarsens towards the base
Irregular		Coarse gravel (20-60mm)	Dry	Light brown	Stiff	Hillwash - fine colluvium		
End of pit		Gneiss	Dry	Dark yellowish orange	Hard	Residual	Weathered	Becomes harder towards the base.



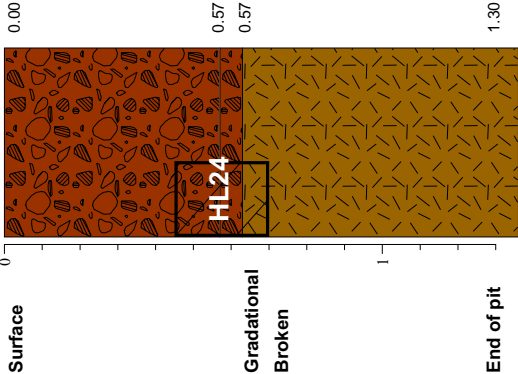
SOIL PROFILE - Happyland

SOIL PROFILE : PIT14
Excavation: CAT416B TLB
Depth of refusal: 1.30m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696030.7 Y: 8758.7

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
		Coarse gravel (20-60mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Sub-angular to sub-rounded amphibolite and dolerite clasts/pebbles supported by medium sand matrix
		Medium gravel (6-20mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		
		Gneiss	Dry	Dark reddish brown	Hard	Residual	Weathered	Becomes increasingly solid towards base.



SOIL PROFILE - Happyland

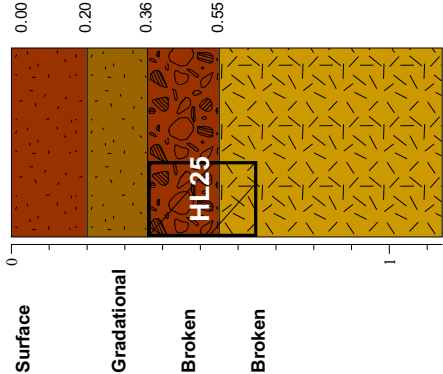
SOIL PROFILE : PIT15
Excavation: CAT416B TLB
Depth of refusal: 1.14m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695868.7 Y: 6969.8

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Relatively well sorted with plant roots, with minor pin-hole structures, numerous plant roots within this zone.
Gradational		Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Firm	Hillwash - fine colluvium		
Broken		Coarse gravel (20-60mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Sub-angular to sub-rounded qaurtz pebbles ~30mm in diameter, held in a sandy matrix: Pebble Marker.
Broken		Gneiss	Dry	Light reddish brown	Hard	Residual	Weathered to badly weathered	Top most part is highly weathered, granular, and becomes more solid towards base.



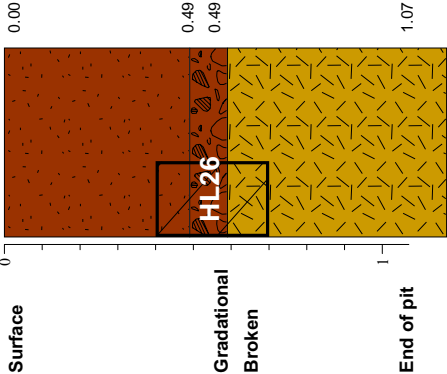
SOIL PROFILE - Happyland

SOIL PROFILE : PIT16
Excavation: CAT416B TLB
Depth of refusal: 1.07m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695659.5 Y: 7574.6

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
								
		Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Relatively well sorted gritty sand, with minor pin-hole structures, plant roots present.
		Coarse gravel (20-60mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Weathered gneiss with quartz pebbles (sub-rounded ~30mm in diameter): Pebble Marker (poorly developed).
		Gneiss	Dry	Light reddish brown	Hard	Residual	Weathered	Becomes more solid at base.



SOIL PROFILE - Happyland

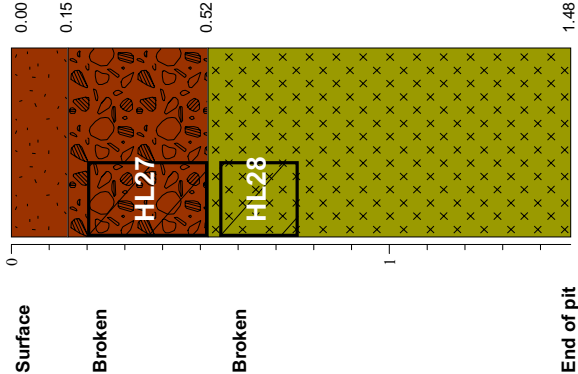
SOIL PROFILE : PIT17
Excavation: CAT416B TLB
Depth of refusal: 1.48m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696195.6 Y: 6723.3

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Broken	HL27	Medium sand (0.2-0.6mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Gritty medium sand with plant roots.
Broken	HL28	Coarse gravel (20-60mm)	Dry	Dark brown	Firm	Hillwash - fine colluvium		Sub-rounded quartz pebbles upto 50mm in diameter, supported by a gritty sand matrix
		Dolerite	Dry	Dark olive	Hard	Residual	Badly weathered	Becomes more solid towards base.
End of pit								



SOIL PROFILE - Happyland

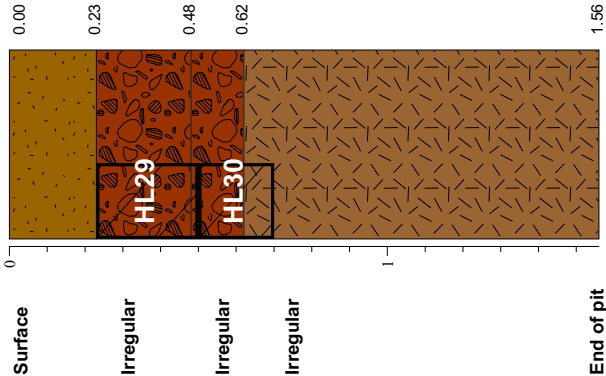
SOIL PROFILE : PIT18
Excavation: CAT416B TLB
Depth of refusal: 1.56m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695310.0 Y: 5886.4

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Irregular	HL29	Coarse sand (0.6-2mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Poorly sorted gritty sand, with plant roots.
Irregular	HL30	Coarse gravel (20-60mm)	Dry	Dusky red	Stiff	Hillwash - fine colluvium		Consists of sub-rounded quartz pebbles 30-50mm in diameter, supported by a medium gritty sand.
Irregular		Medium gravel (6-20mm)	Dry	Dusky red	Stiff	Hillwash - fine colluvium		Poorly sorted medium gravel with quartz clasts of various sizes.
		Gneiss	Dry	Light brown	Hard	Residual	Weathered	Biotite gneiss cut by irregular dolerite veins.
End of pit								



SOIL PROFILE - Happyland

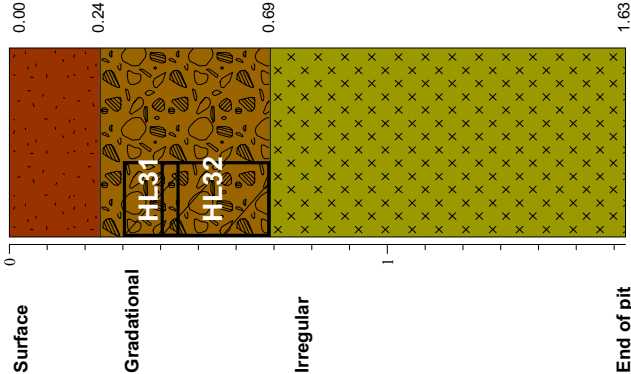
SOIL PROFILE : PIT19
Excavation: CAT416B TLB
Depth of refusal: 1.63m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2695838.9 Y: 6044.1

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface								
Gradational	HL-31	Medium sand (0.2-0.6mm)	Dry	Dark brown	Stiff	Hillwash - fine colluvium		Relatively well sorted with sparse pin-hole structures, plant roots present.
Irregular	HL-32	Coarse gravel (20-60mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Poorly sorted, sandy-gritty gravel, with sub-rounded quartz clasts (0.6-0.8cm in diameter).
End of pit		Dolerite	Dry	Dark olive	Hard	Hillwash - fine colluvium	Weathered to badly weathered	Highly weathered fine grained dolerite.



SOIL PROFILE - Happyland

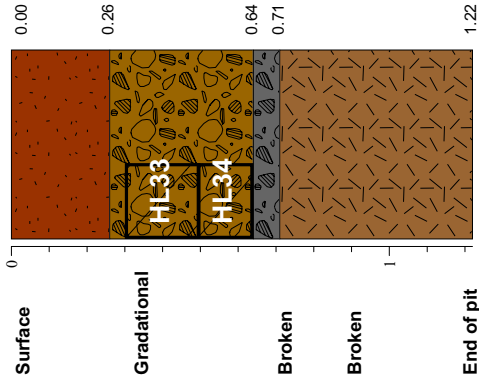
SOIL PROFILE : PIT20
Excavation: CAT416B TLB
Depth of refusal: 1.22m

Geologist : Z. Dube
Depth of water: Not intersected
Water table (amsl): NA

Datum, Co-ord System: WGS84; LO 31
X: 2696463.9 Y: 6225.2

Scale 1 : 20

Contact	Sample #	Lithology	Moisture	Colour	Consistency	Origin	Weathering	Comments
Surface		Medium sand (0.2-0.6mm)	Dry	Dark brown	Stiff	Hillwash - fine colluvium		Gritty medium sand, with plant roots, relatively well sorted.
Gradational	HL-33	Medium gravel (6-20mm)	Dry	Dark reddish brown	Stiff	Hillwash - fine colluvium		Poorly sorted sandy gravel, becomes more coarser towards the base ~0.60mm in diameter.
Broken	HL-34	Coarse gravel (20-60mm)	Dry	Dark grey	Stiff	Hillwash - fine colluvium		Mix of quartz, amphibolite pebbles (sub-angular-sub-rounded ~30-50mm in diameter).
Broken		Gneiss	Dry	Light brown	Hard	Residual	Badly weathered	Highly weathered gneiss, granular, more solid towards base.
End of pit								



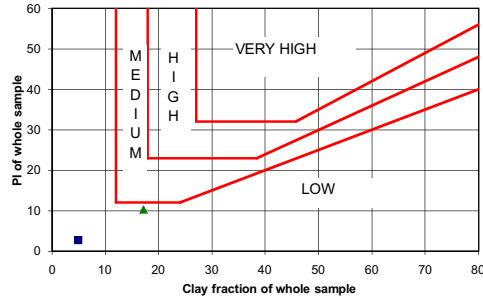
Annexure C – Geotechnical Soil Sampling Results

PARTICLE SIZE ANALYSIS

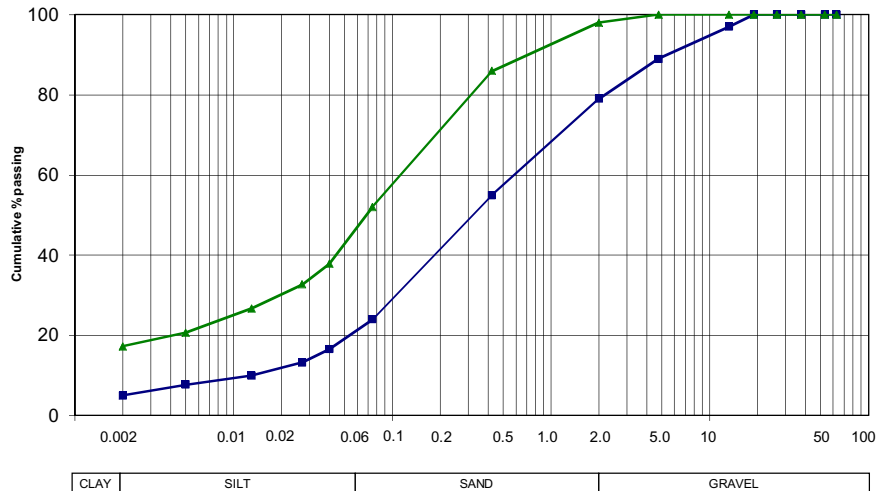
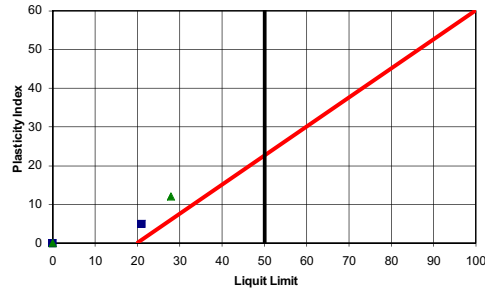
Sample No.	27489	27490
Soillab sample no.	S07-0588-01	S07-0588-02
Depth (m)		
Position	HL 1	HL 2
Material	DARK BROWN	DARK BROWN
Description	QUARTZITE	QUARTZITE
	GRAVELLY SAND	SILTY SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	97	100
4.75 mm	89	100
2.00 mm	79	98
0.425 mm	55	86
0.075 mm	24	52
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	17	38
0.027 mm	13	33
0.013 mm	10	27
0.005 mm	8	21
0.002 mm	5	17
% Clay	5	17
% Silt	16	29
% Sand	58	52
% Gravel	21	2
ATTERBERG LIMITS		
Liquid Limit	21	28
Plasticity Index	5	12
Linear Shrinkage (%)	2.5	5.0
Grading Modulus	1.42	0.64
Classification	A-2-4 (0)	A-6 (4)
Unified Classification	SC & SM	CL
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

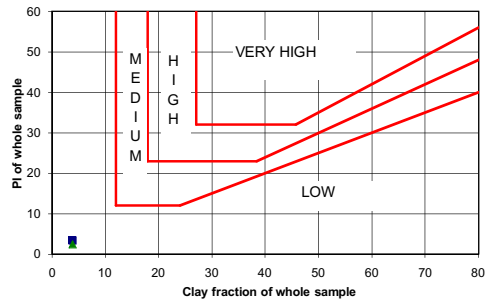


PARTICLE SIZE ANALYSIS

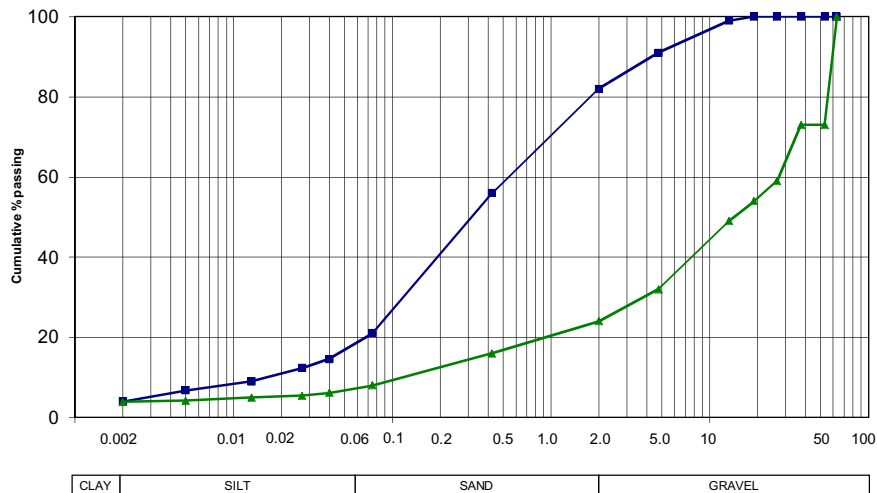
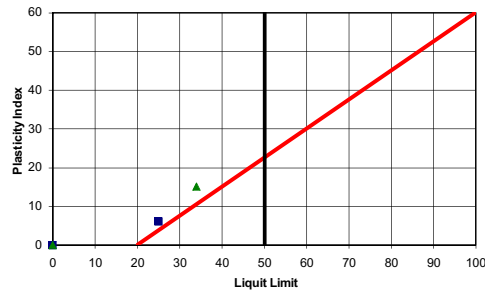
Sample No.	27491	27492
Soillab sample no.	S07-0588-03	S07-0588-05
Depth (m)		
Position	HL 3	HL 5
Material Description	DARK BROWN SHALE GRAVELLY SAND	DARK BROWN QUARTZITE SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	73
37.5 mm	100	73
26.5 mm	100	59
19.0 mm	100	54
13.2 mm	99	49
4.75 mm	91	32
2.00 mm	82	24
0.425 mm	56	16
0.075 mm	21	8
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	15	6
0.027 mm	12	5
0.013 mm	9	5
0.005 mm	7	4
0.002 mm	4	4
% Clay	4	4
% Silt	14	3
% Sand	64	17
% Gravel	18	76
ATTERBERG LIMITS		
Liquid Limit	25	34
Plasticity Index	6	15
Linear Shrinkage (%)	3.0	6.5
Grading Modulus	1.41	2.52
Classification	A-2-4 (0)	A-2-6 (0)
Unified Classification	SC & SM	GP & GC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

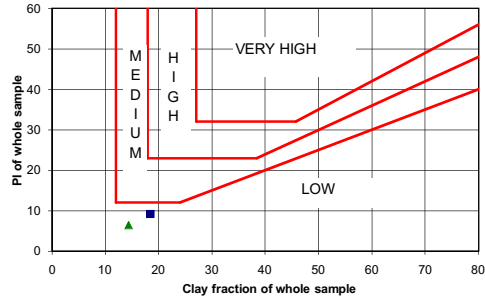


PARTICLE SIZE ANALYSIS

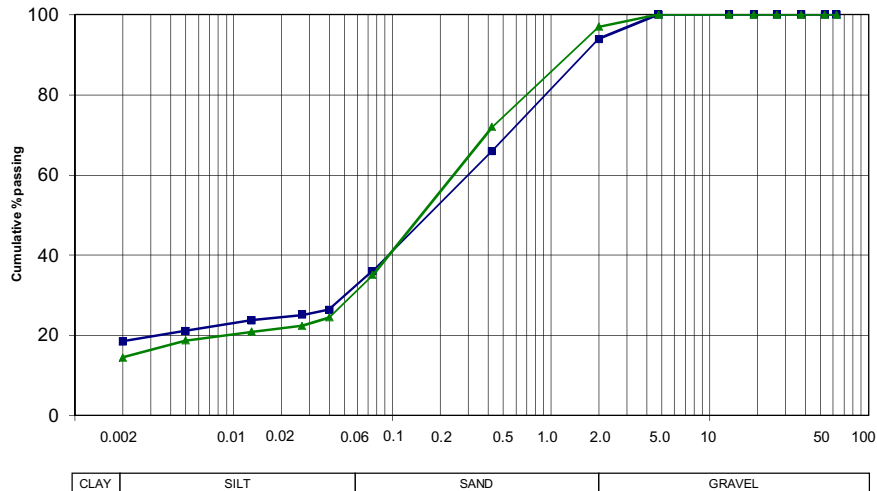
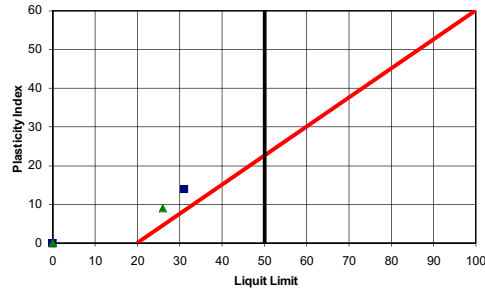
Sample No.	27493	27494
Soillab sample no.	S07-0588-06	S07-0588-07
Depth (m)		
Position	HL 6	HL 7
Material	DUSKY RED	DUSKY RED
Description	W/GRANITE	QUARTZITE
	CLAYEY	SILTY
	SAND	SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	100	100
2.00 mm	94	97
0.425 mm	66	72
0.075 mm	36	35
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	26	24
0.027 mm	25	22
0.013 mm	24	21
0.005 mm	21	19
0.002 mm	18	14
% Clay	18	14
% Silt	13	16
% Sand	62	67
% Gravel	6	3
ATTERBERG LIMITS		
Liquid Limit	31	26
Plasticity Index	14	9
Linear Shrinkage (%)	7.0	4.5
Grading Modulus	1.04	0.96
Classification	A-6 (1)	A-2-4 (0)
Unified Classification	SC	SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

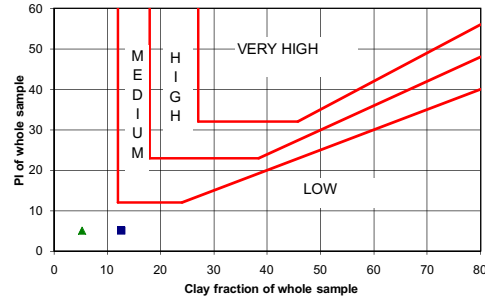


PARTICLE SIZE ANALYSIS

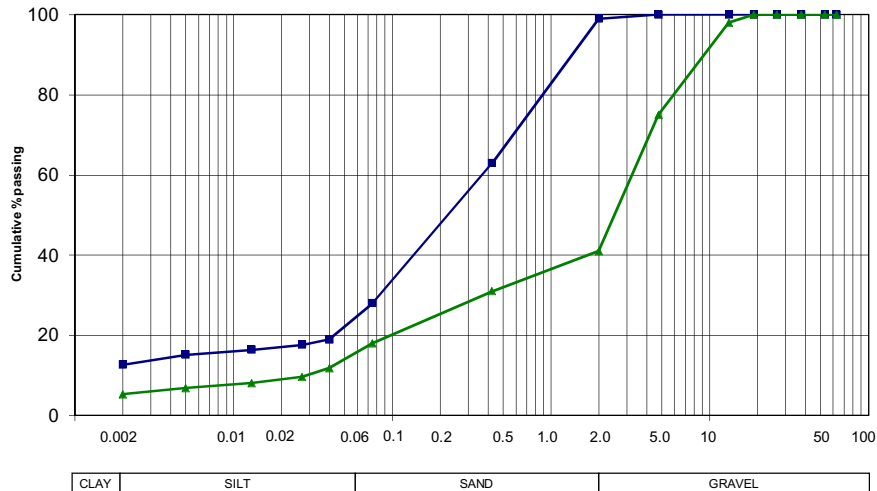
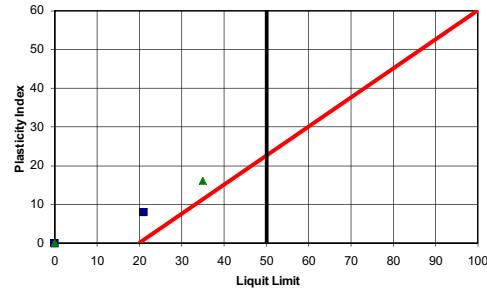
Sample No.	27495	27496
Soillab sample no.	S07-0588-08	S07-0588-10
Depth (m)		
Position	HL 8	HL 10
Material Description	DUSKY RED CLAYEY SAND	DARK BROWN QUARTZITE SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	98
4.75 mm	100	75
2.00 mm	99	41
0.425 mm	63	31
0.075 mm	28	18
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	19	12
0.027 mm	18	10
0.013 mm	16	8
0.005 mm	15	7
0.002 mm	13	5
% Clay	13	5
% Silt	12	10
% Sand	75	26
% Gravel	1	59
ATTERBERG LIMITS		
Liquid Limit	21	35
Plasticity Index	8	16
Linear Shrinkage (%)	3.5	8.0
Grading Modulus	1.10	2.10
Classification	A-2-4 (0)	A-2-4 (0)
Unified Classification	SC	SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12



POTENTIAL EXPANSIVENESS



PLASTICITY CHART

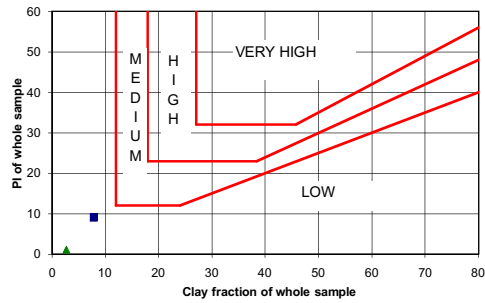


PARTICLE SIZE ANALYSIS

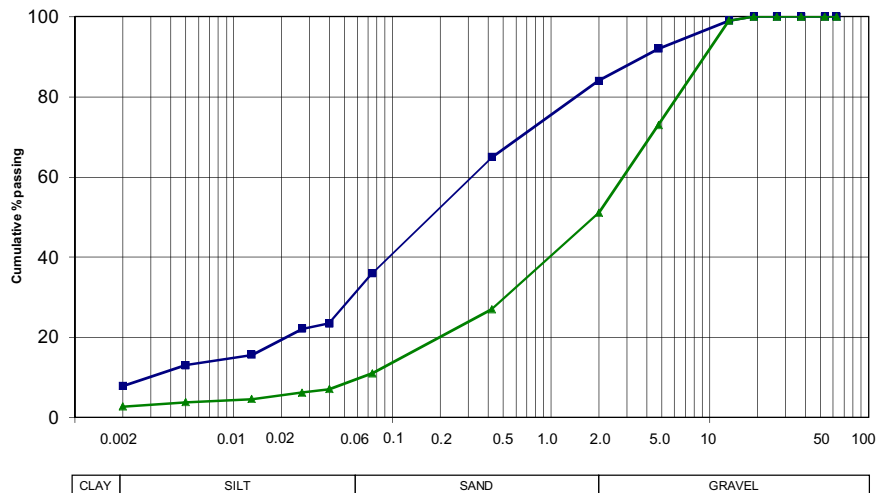
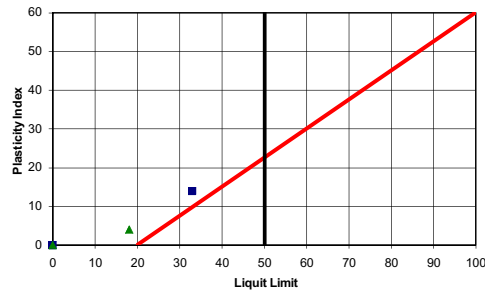
Sample No.	27497	27498
Soillab sample no.	S07-0588-11	S07-0588-12
Depth (m)		
Position	HL 11	HL 12
Material	LIGHT BROWN	DUSKY RED
Description	CALCRETE	FERRICRETE
	SILTY SAND	SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	99	99
4.75 mm	92	73
2.00 mm	84	51
0.425 mm	65	27
0.075 mm	36	11
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	23	7
0.027 mm	22	6
0.013 mm	16	5
0.005 mm	13	4
0.002 mm	8	3
% Clay	8	3
% Silt	23	7
% Sand	53	42
% Gravel	16	49
ATTERBERG LIMITS		
Liquid Limit	33	18
Plasticity Index	14	4
Linear Shrinkage (%)	7.0	1.5
Grading Modulus	1.15	2.11
Classification	A-6 (1)	A-1-b (0)
Unified Classification	SC	SP & SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

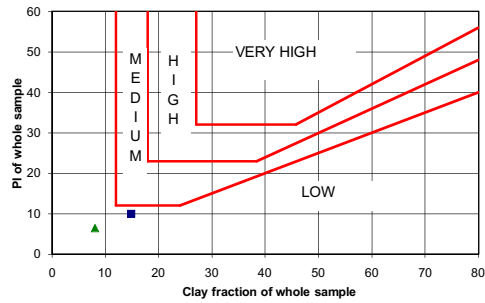


PARTICLE SIZE ANALYSIS

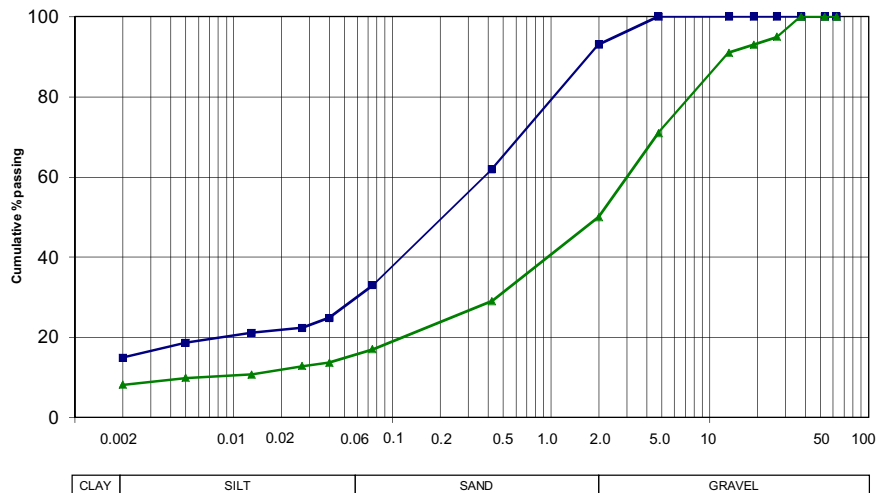
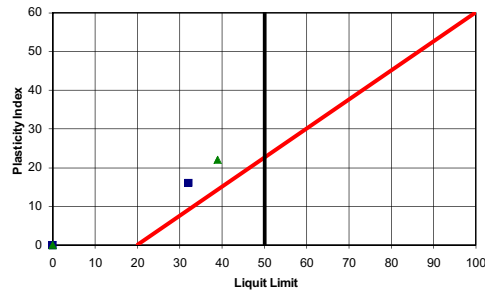
Sample No.	27499	27500
Soillab sample no.	S07-0588-13	S07-0588-15
Depth (m)		
Position	HL 13	HL 15
Material Description	DARK BROWN W/GRANITE CLAYEY SAND	DARK BROWN FERRICRETE SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	95
19.0 mm	100	93
13.2 mm	100	91
4.75 mm	100	71
2.00 mm	93	50
0.425 mm	62	29
0.075 mm	33	17
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	25	14
0.027 mm	22	13
0.013 mm	21	11
0.005 mm	19	10
0.002 mm	15	8
% Clay	15	8
% Silt	15	7
% Sand	64	34
% Gravel	7	50
ATTERBERG LIMITS		
Liquid Limit	32	39
Plasticity Index	16	22
Linear Shrinkage (%)	8.0	10.0
Grading Modulus	1.12	2.04
Classification	A-2-6 (1)	A-2-6 (0)
Unified Classification	SC	SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12



POTENTIAL EXPANSIVENESS



PLASTICITY CHART

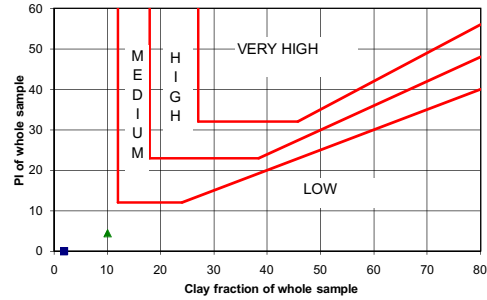


PARTICLE SIZE ANALYSIS

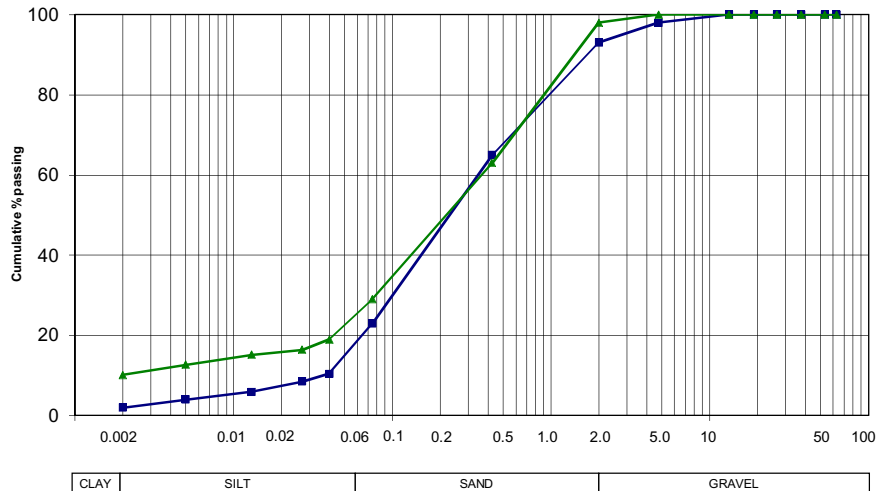
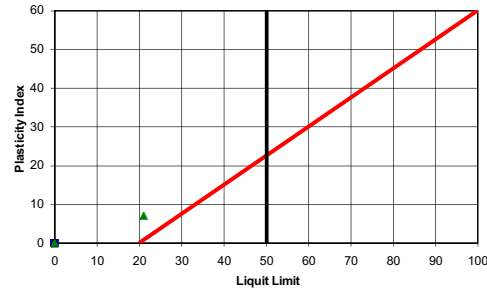
Sample No.	27501	27502
Soillab sample no.	S07-0588-16	S07-0588-17
Depth (m)		
Position	HL 16	HL 17
Material	DAKR GREY	DARK BROWN
Description	QUARTZITE	
	SILTY SAND	SILTY SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	98	100
2.00 mm	93	98
0.425 mm	65	63
0.075 mm	23	29
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	10	19
0.027 mm	8	16
0.013 mm	6	15
0.005 mm	4	13
0.002 mm	2	10
% Clay	2	10
% Silt	16	15
% Sand	75	73
% Gravel	7	2
ATTERBERG LIMITS		
Liquid Limit		21
Plasticity Index	NP	7
Linear Shrinkage (%)	0.0	3.0
Grading Modulus	1.19	1.10
Classification	A-2-4 (0)	A-2-4 (0)
Unified Classification	SC	SC & SM
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

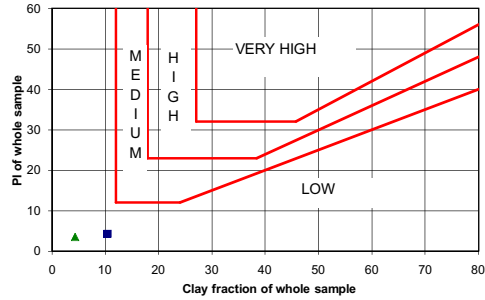


PARTICLE SIZE ANALYSIS

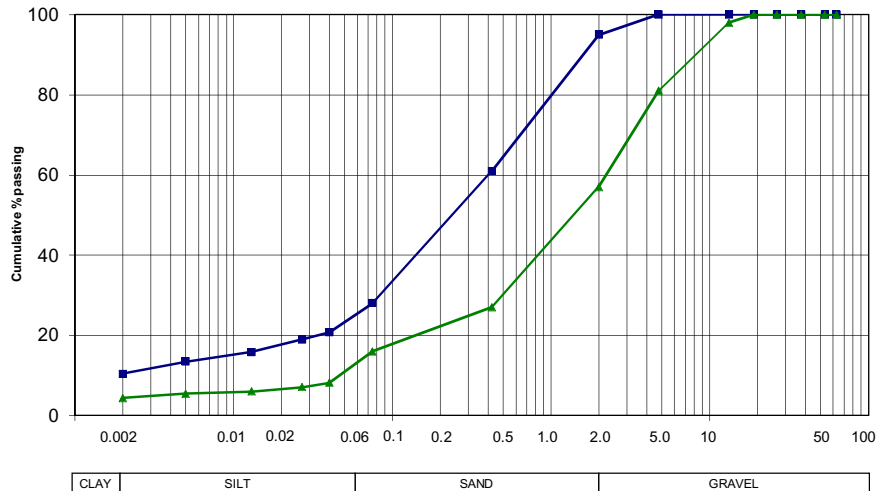
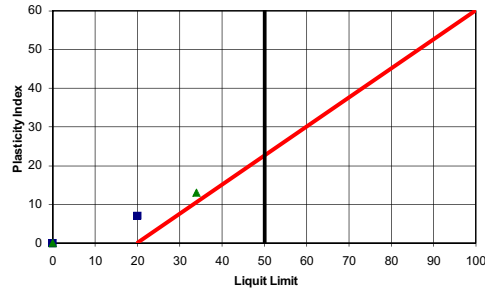
Sample No.	27503	27504
Soillab sample no.	S07-0588-19	S07-0588-20
Depth (m)		
Position	HL 19	HL 24
Material	DARK BROWN	PALE RED
Description	QUARTZITE	
	SILTY SAND	GRAVELLY SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	98
4.75 mm	100	81
2.00 mm	95	57
0.425 mm	61	27
0.075 mm	28	16
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	21	8
0.027 mm	19	7
0.013 mm	16	6
0.005 mm	13	5
0.002 mm	10	4
% Clay	10	4
% Silt	15	8
% Sand	70	44
% Gravel	5	43
ATTERBERG LIMITS		
Liquid Limit	20	34
Plasticity Index	7	13
Linear Shrinkage (%)	2.5	6.0
Grading Modulus	1.16	2.00
Classification	A-2-4 (0)	A-2-6 (0)
Unified Classification	SC & SM	SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

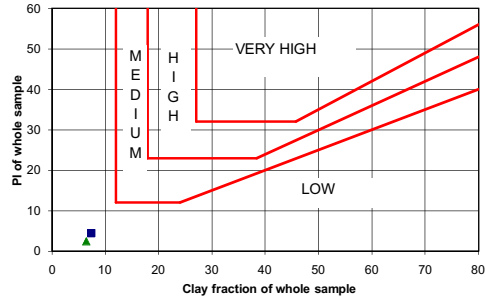


PARTICLE SIZE ANALYSIS

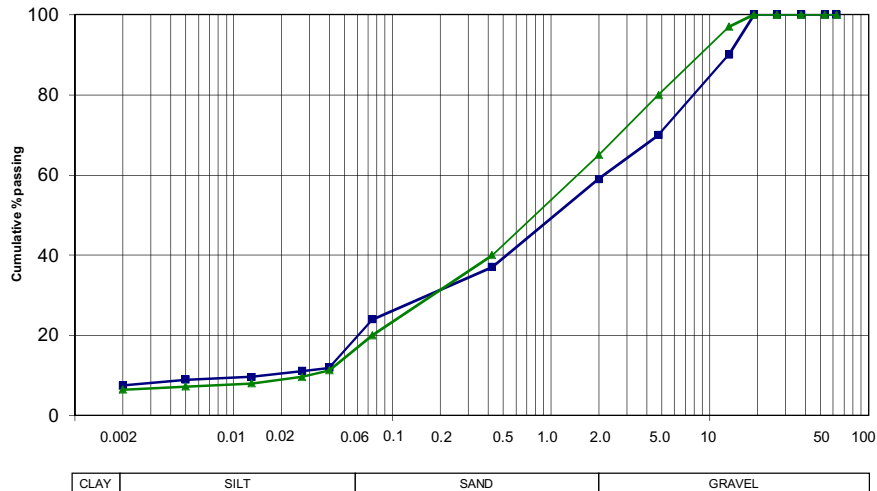
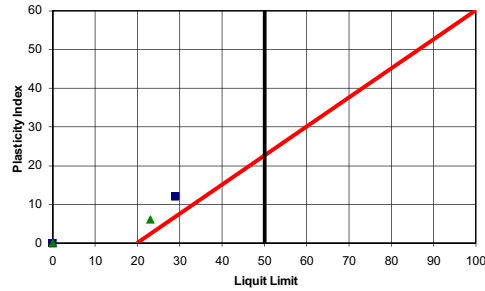
Sample No.	27505	27506
Soillab sample no.	S07-0588-21	S07-0588-22
Depth (m)		
Position	HL 25	HL 26
Material	PALE RED	DARK BROWN
Description	CHERT	QUARTZITE
	SANDY GRAVEL	GRAVELLY SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	90	97
4.75 mm	70	80
2.00 mm	59	65
0.425 mm	37	40
0.075 mm	24	20
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	12	11
0.027 mm	11	10
0.013 mm	10	8
0.005 mm	9	7
0.002 mm	7	6
% Clay	7	6
% Silt	11	10
% Sand	40	49
% Gravel	41	35
ATTERBERG LIMITS		
Liquid Limit	29	23
Plasticity Index	12	6
Linear Shrinkage (%)	6.0	2.5
Grading Modulus	1.80	1.75
Classification	A-2-6 (0)	A-1-b (0)
Unified Classification	SC	SC & SM
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

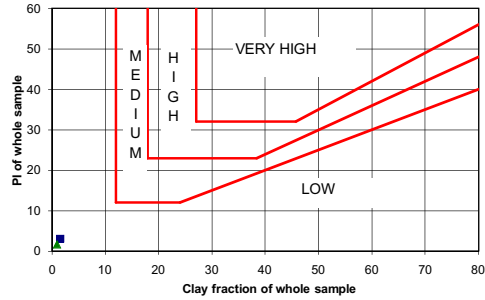


PARTICLE SIZE ANALYSIS

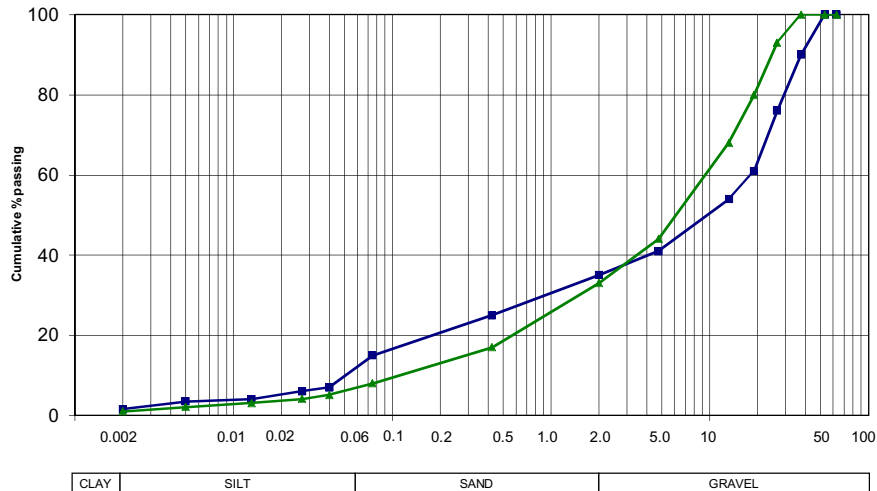
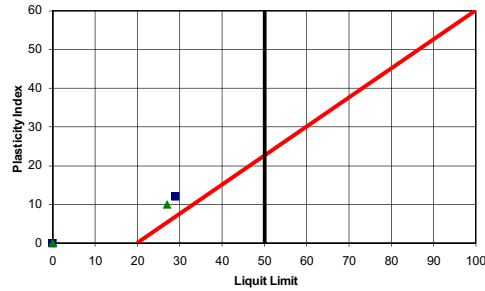
Sample No.	27507	27508
Soillab sample no.	S07-0588-23	S07-0588-24
Depth (m)		
Position	HL 27	HL 28
Material	PALE RED QUARTZ	DARK BROWN SHALE
Description	SANDY GRAVEL	SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	90	100
26.5 mm	76	93
19.0 mm	61	80
13.2 mm	54	68
4.75 mm	41	44
2.00 mm	35	33
0.425 mm	25	17
0.075 mm	15	8
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	7	5
0.027 mm	6	4
0.013 mm	4	3
0.005 mm	4	2
0.002 mm	2	1
% Clay	2	1
% Silt	10	6
% Sand	23	26
% Gravel	65	67
ATTERBERG LIMITS		
Liquid Limit	29	27
Plasticity Index	12	10
Linear Shrinkage (%)	6.0	5.0
Grading Modulus	2.25	2.42
Classification	A-2-6 (0)	A-2-4 (0)
Unified Classification	GC	GP & GC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

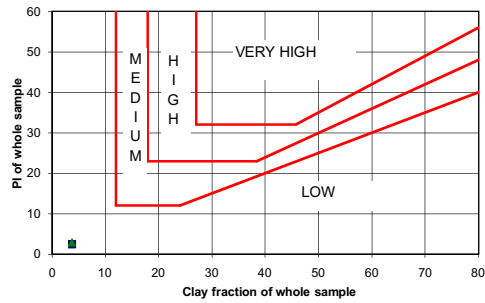


PARTICLE SIZE ANALYSIS

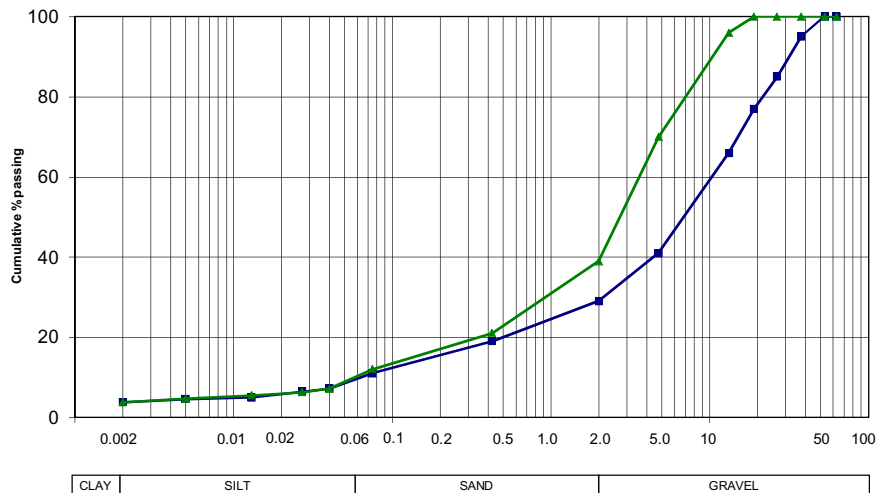
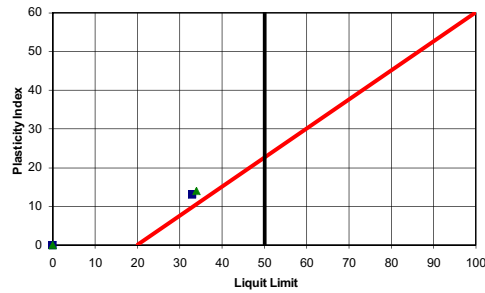
Sample No.	27509	27510
Soillab sample no.	S07-0588-25	S07-0588-26
Depth (m)		
Position	HL 29	HL 30
Material	DUSKY RED	DUSKY RED
Description	CHERT	SHALE
	SANDY GRAVEL	SANDY GRAVEL
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	95	100
26.5 mm	85	100
19.0 mm	77	100
13.2 mm	66	96
4.75 mm	41	70
2.00 mm	29	39
0.425 mm	19	21
0.075 mm	11	12
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	7	7
0.027 mm	6	6
0.013 mm	5	5
0.005 mm	5	5
0.002 mm	4	4
% Clay	4	4
% Silt	6	6
% Sand	20	29
% Gravel	71	61
ATTERBERG LIMITS		
Liquid Limit	33	34
Plasticity Index	13	14
Linear Shrinkage (%)	6.5	7.0
Grading Modulus	2.41	2.28
Classification	A-2-6 (0)	A-2-6 (0)
Unified Classification	GP & GC	SP & SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART

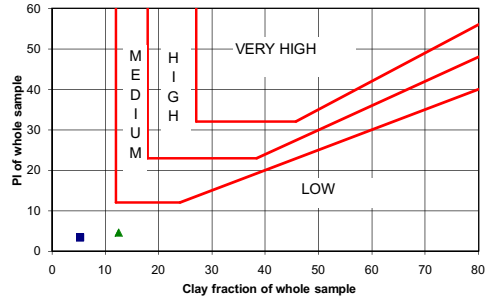


PARTICLE SIZE ANALYSIS

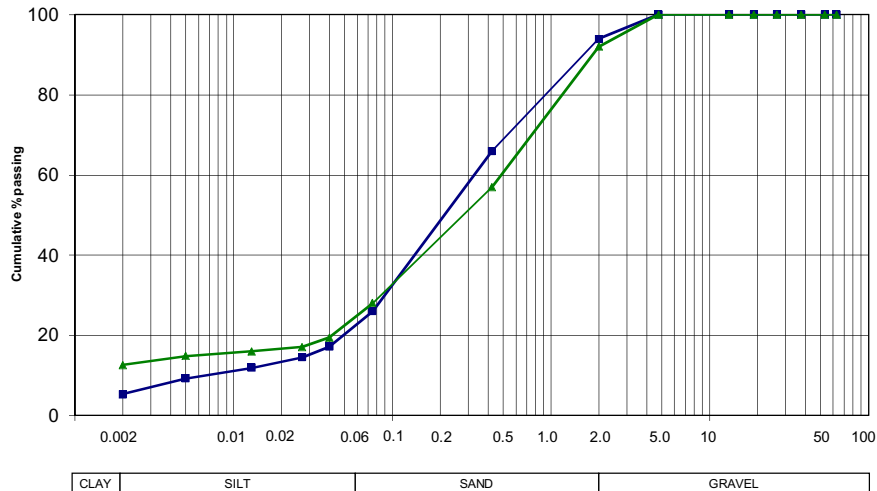
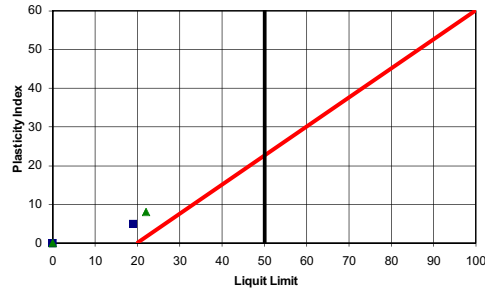
Sample No.	27511	27512
Soillab sample no.	S07-0588-27	S07-0588-29
Depth (m)		
Position	HL 31	HL 33
Material	DARK BROWN	DUSKY RED
Description	W/GRANITE	S/GRANITE
	SILTY SAND	CLAYEY SAND
Moisture (%)		
SG		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	100	100
2.00 mm	94	92
0.425 mm	66	57
0.075 mm	26	28
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	17	19
0.027 mm	15	17
0.013 mm	12	16
0.005 mm	9	15
0.002 mm	5	13
% Clay	5	13
% Silt	17	12
% Sand	72	68
% Gravel	6	8
ATTERBERG LIMITS		
Liquid Limit	19	22
Plasticity Index	5	8
Linear Shrinkage (%)	1.5	3.5
Grading Modulus	1.14	1.23
Classification	A-2-4 (0)	A-2-4 (0)
Unified Classification	SC & SM	SC
Chart Reference		

PROJECT : HAPPYLAND
JOB No. : S07-0588
DATE : 2007-06-12

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



CLIENT : ROCK & STOCK INVESTMENTS
PROJECT : HAPPYLAND
PROJECT NO. : S07-0588
DATE : 2007-06-08

CONDUCTIVITY

Soillab No	Sample No	pH	Conductivity (S/m ⁻¹)
S07-0588-02	HL 2	6.59	0.0596
S07-0588-03	HL 3	6.73	0.0176
S07-0588-04	HL 4	6.49	0.0840
S07-0588-18	HL 18	6.80	0.0173
S07-0588-20	HL 24	6.67	0.0209
S07-0588-21	HL 25	6.61	0.0214
S07-0588-24	HL 28	6.66	0.0396
S07-0588-25	HL 29	6.97	0.0079
S07-0588-28	HL 32	7.08	0.0077
S07-0588-30	HL 34	6.95	0.0194

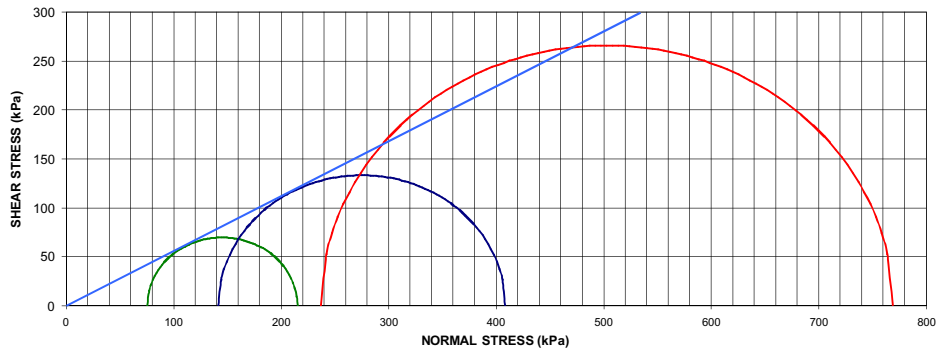
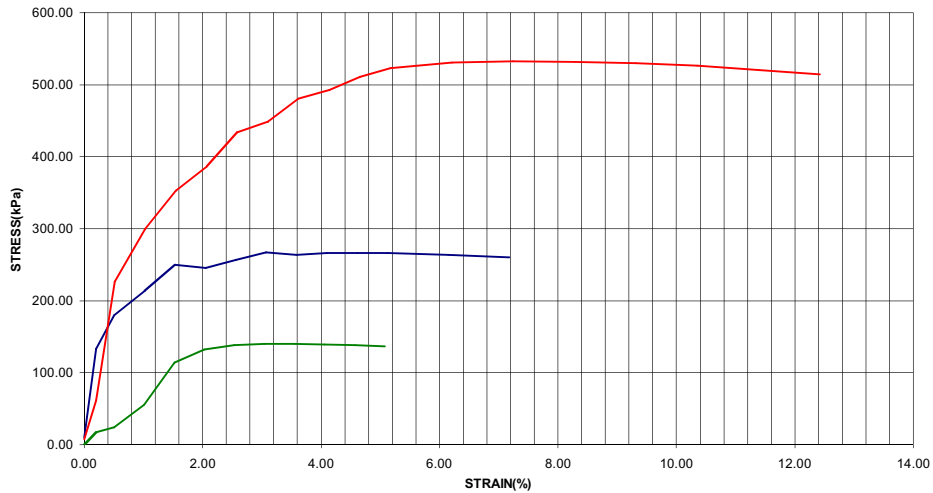
CONSOLIDATED UNDRAINED TRIAXIAL TEST

CLIENT: ROCK & STOCK

PROJECT: HAPPYLAND

SAMPLE	HL 9	NORMAL STRESS (kPa)	100	200	400
DEPTH(M)		INITIAL DRY DENSITY (kg/m³)	1705	1705	1705
MOISTURE STATE	SATURATED	CHOSEN MOISTURE CONTENT (%)	13.1	13.1	13.1
SAMPLE STATE	REMOULDED TO 100% INITIAL D.D & CMOISTURE CONTENT AFTER TEST (%)		15.8	14.9	13.3
RATE OF COMPRESSION(mm/m) : 0.5900		COHESION (kPa)		0.0	
SOILLAB SAMPLE No.: S07-0588-09		ANGLE OF INTERNAL FRICTION (degrees)		31.6	

STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)
0.0	19.0	0.0	-0.2	0.0	18.6	0.0	9.9	0.0	18.2	0.0	7.6
0.2	19.0	0.0	16.8	0.2	18.6	0.7	133.0	0.2	18.3	4.8	61.0
0.5	19.1	0.0	24.0	0.5	18.7	7.6	179.6	0.5	18.3	10.3	226.4
1.0	19.2	-6.2	55.1	1.0	18.8	19.3	213.3	1.0	18.4	18.6	299.5
1.5	19.3	7.6	113.6	1.5	18.9	28.3	249.2	1.6	18.5	31.0	352.1
2.0	19.4	14.5	131.7	2.1	19.0	40.7	245.6	2.1	18.6	44.8	386.4
2.5	19.5	20.0	138.0	2.6	19.1	48.3	256.4	2.6	18.7	58.6	433.4
3.0	19.6	24.8	140.0	3.1	19.2	58.6	267.1	3.1	18.8	73.8	448.7
3.6	19.7	31.0	139.8	3.6	19.3	66.9	263.4	3.6	18.9	87.6	480.4
4.1	19.8	34.5	139.1	4.1	19.4	72.4	265.7	4.1	19.0	100.0	492.1
4.6	19.9	38.6	137.8	4.6	19.5	79.3	266.1	4.7	19.1	113.8	510.3
5.1	20.0	41.4	136.0	5.1	19.6	85.5	266.4	5.2	19.2	127.6	523.1
				6.2	19.8	95.2	263.2	6.2	19.4	148.2	530.1
				7.2	20.0	102.7	260.0	7.2	19.6	163.4	532.4
								8.3	19.9	186.9	531.1
								9.3	20.1	196.5	529.7
								10.4	20.3	204.8	526.6
								11.4	20.6	213.1	520.1
								12.4	20.8	218.6	513.7
								13.5	21.1	-98.6	2.5
								14.5	21.3	-98.6	2.1
								15.5	21.6	-98.6	1.7
								16.6	21.8	-98.6	1.3
								17.6	22.1	-98.6	0.9
								18.6	22.4	-98.6	0.5
								19.7	22.7	-98.6	0.2



Note:

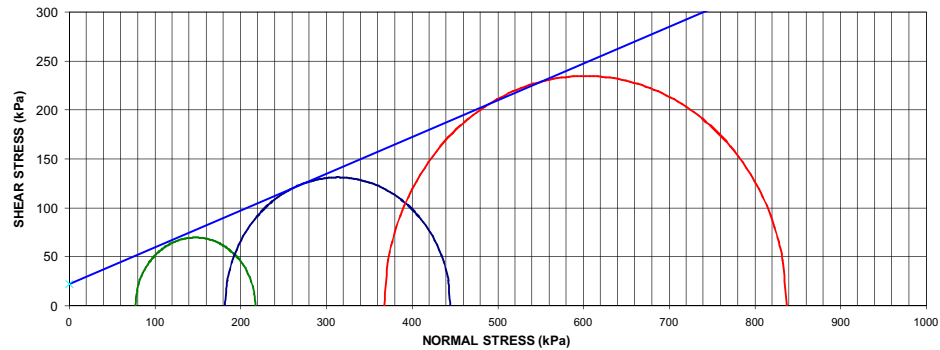
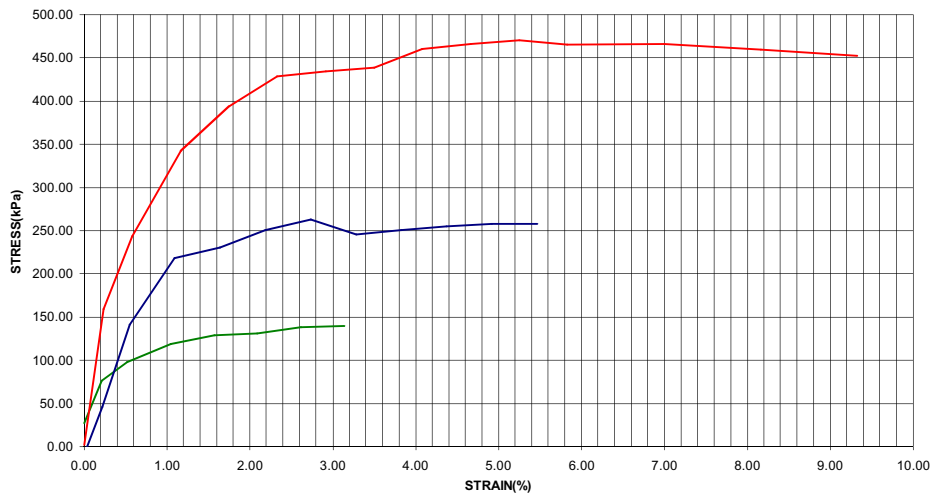
CONSOLIDATED UNDRAINED TRIAXIAL TEST

CLIENT: ROCK & STOCK

PROJECT: HAPPY LAND

SAMPLE	HL 14	NORMAL STRESS (kPa)	100	200	400
DEPTH(M)		INITIAL DRY DENSITY (kg/m³)	1310	1514	1570
MOISTURE STATE	SATURATED	INITIAL MOISTURE CONTENT (%)	7.2	7.2	7.2
SAMPLE STATE	UNDISTURBED	MOISTURE CONTENT AFTER TEST (%)	15.4	15.4	15.4
RATE OF COMPRESSION(mm/m) : 0.5900		COHESION (kPa)		22.3	
SOILLAB SAMPLE No.: S07-0588-14		ANGLE OF INTERNAL FRICTION (degrees)		20.6	

STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)
0.0	17.8	0.0	27.2	0.0	17.9	0.0	-8.5	0.0	18.6	0.0	2.0
0.2	17.8	8.3	76.4	0.2	17.9	0.7	45.9	0.2	18.7	1.4	158.9
0.5	17.9	9.7	98.0	0.5	18.0	1.4	140.7	0.6	18.7	4.8	243.0
1.0	18.0	13.8	119.0	1.1	18.1	5.5	218.0	1.2	18.9	7.6	341.7
1.6	18.1	16.5	129.1	1.6	18.2	10.3	230.0	1.7	19.0	13.1	394.0
2.1	18.2	19.3	130.9	2.2	18.3	13.1	250.2	2.3	19.1	16.5	428.5
2.6	18.3	22.1	138.1	2.7	18.4	17.9	262.9	2.9	19.2	20.0	434.2
3.1	18.4	22.8	139.8	3.3	18.5	20.7	245.6	3.5	19.3	23.4	438.5
				3.8	18.6	22.8	250.3	4.1	19.4	26.9	460.2
				4.4	18.7	26.2	255.0	4.7	19.5	29.6	466.0
				4.9	18.8	27.6	257.5	5.2	19.7	32.4	469.9
				5.5	18.9	31.7	257.9	5.8	19.8	35.2	465.3
								7.0	20.0	39.3	465.9
								8.2	20.3	42.1	459.7
								9.3	20.6	44.1	451.9



Note: 200kPa RECYCLED FROM 100kPa, 400kPa RECYCLED FROM 200kPa

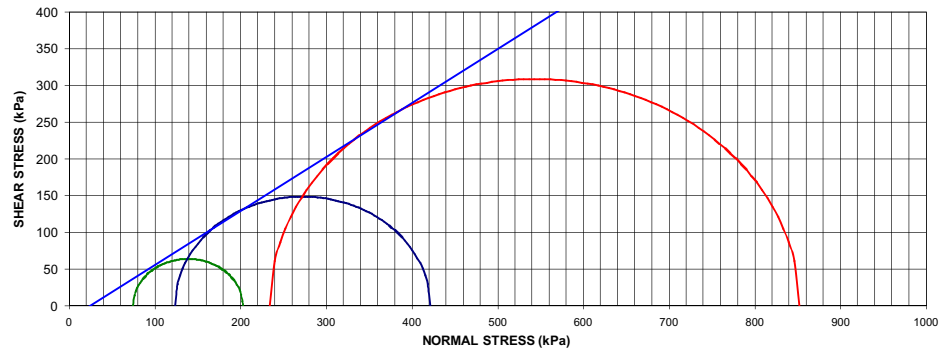
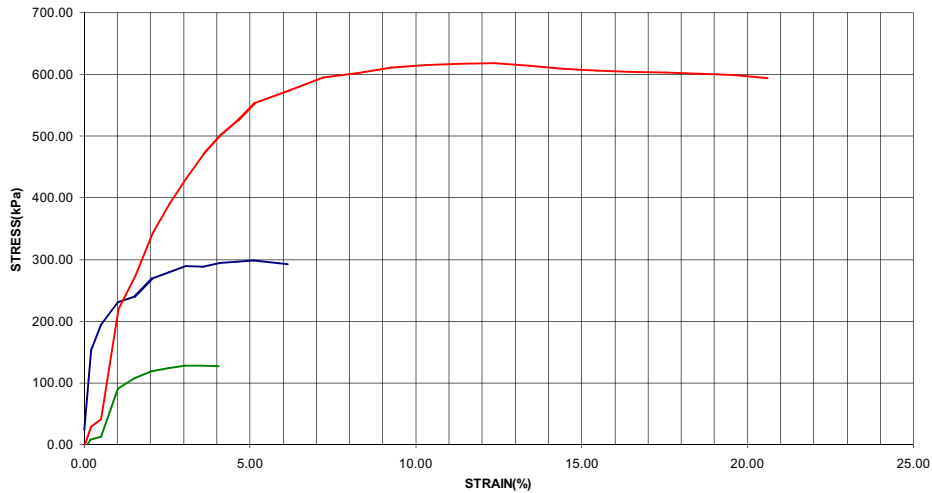
CONSOLIDATED UNDRAINED TRIAXIAL TEST

CLIENT: ROCK & STOCK

PROJECT: HAPPYLAND

SAMPLE	HL 18	NORMAL STRESS (kPa)	100	200	400
DEPTH(M)		INITIAL DRY DENSITY (kg/m³)	1750	1750	1750
MOISTURE STATE	SATURATED	INITIAL MOISTURE CONTENT (%)	8.0	8.0	8.0
SAMPLE STATE	REMOULDED TO 100% INITIAL D.D & CMOISTURE CONTENT AFTER TEST (%)		15.1	14.4	12.6
RATE OF COMPRESSION(mm/m) : 0.5900		COHESION (kPa)		-17.8	
SOILLAB SAMPLE No.: S07-0588-18		ANGLE OF INTERNAL FRICTION (degrees)		36.3	

STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)
0.0	19.1	0.0	-8.5	0.0	18.7	0.0	22.9	0.0	18.4	0.0	-3.2
0.2	19.1	0.0	8.0	0.2	18.7	0.7	153.3	0.2	18.4	0.0	28.6
0.5	19.2	0.0	13.0	0.5	18.8	6.9	194.3	0.5	18.5	0.7	41.6
1.0	19.3	6.2	90.8	1.0	18.9	15.2	230.9	1.0	18.6	4.8	219.9
1.5	19.4	9.7	108.0	1.5	19.0	26.2	239.7	1.5	18.7	12.4	272.6
2.0	19.5	13.8	118.6	2.0	19.1	35.2	269.0	2.1	18.8	21.4	342.7
2.5	19.6	20.0	123.6	2.6	19.2	42.1	279.1	2.6	18.9	31.0	389.8
3.0	19.7	25.5	128.2	3.1	19.3	49.0	289.2	3.1	19.0	42.7	431.8
3.5	19.8	26.9	127.4	3.6	19.4	57.9	288.1	3.6	19.1	53.8	470.3
4.1	19.9	28.3	126.6	4.1	19.5	64.8	294.0	4.1	19.2	62.1	501.3
				4.6	19.6	71.0	296.0	4.6	19.3	74.5	525.6
				5.1	19.7	76.5	297.9	5.2	19.4	82.7	553.3
				6.1	19.9	90.3	292.6	6.2	19.6	96.5	573.5
								7.2	19.8	111.7	595.0
								8.2	20.1	124.8	601.8
								9.3	20.3	137.9	610.7
								10.3	20.5	148.9	614.5
								11.3	20.8	158.6	616.5
								12.4	21.0	166.2	618.3
								13.4	21.3	172.4	613.6
								14.4	21.5	179.3	609.0
								15.5	21.8	184.8	605.7
								16.5	22.0	186.9	603.8
								17.5	22.3	190.3	603.2
								18.6	22.6	193.1	601.0
								19.6	22.9	195.8	598.7
								20.6	23.2	198.6	593.4



Note:

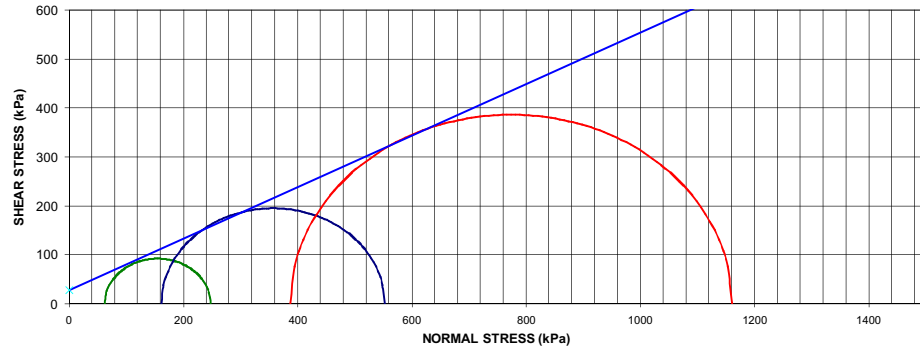
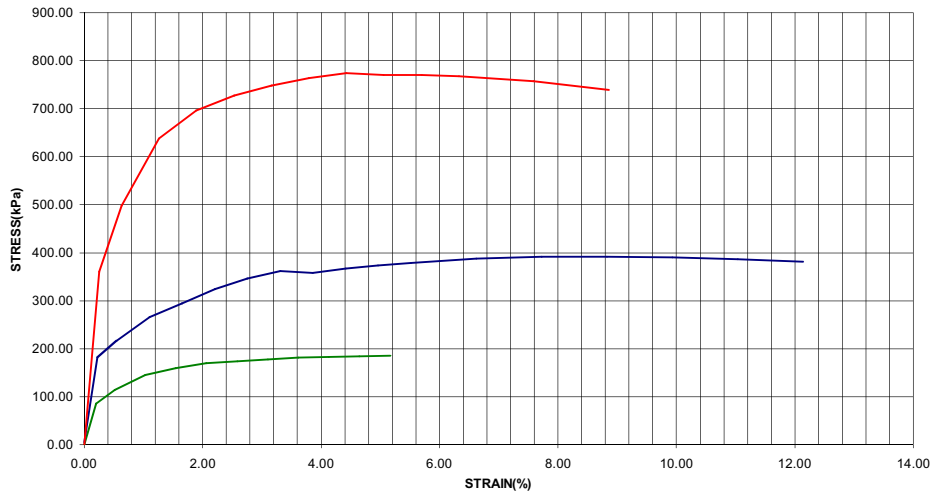
CONSOLIDATED UNDRAINED TRIAXIAL TEST

CLIENT: ROCK & STOCK

PROJECT: HAPPYLAND

SAMPLE	HL 32	NORMAL STRESS (kPa)	100	200	400
DEPTH(M)		INITIAL DRY DENSITY (kg/m³)	1415	1571	1633
MOISTURE STATE	SATURATED	INITIAL MOISTURE CONTENT (%)	4.0	4.0	4.0
SAMPLE STATE	UNDISTURBED	MOISTURE CONTENT AFTER TEST (%)	12.0	12.0	12.0
RATE OF COMPRESSION(mm/m) : 0.5900		COHESION (kPa)		28.9	
SOILLAB SAMPLE No.: S07-0588-28		ANGLE OF INTERNAL FRICTION (degrees)		27.7	

STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)
0.0	18.3	0.0	-0.5	0.0	18.8	0.0	4.5	0.0	21.1	0.0	-1.5
0.2	18.3	8.3	84.8	0.2	18.8	0.7	180.8	0.3	21.1	0.7	360.0
0.5	18.4	11.0	113.7	0.6	18.9	2.1	216.8	0.6	21.2	2.1	497.3
1.0	18.5	15.2	144.7	1.1	19.0	6.2	266.1	1.3	21.3	4.8	638.1
1.6	18.6	19.3	159.6	1.7	19.1	11.7	294.7	1.9	21.5	6.2	696.2
2.1	18.7	23.4	169.0	2.2	19.2	14.5	323.4	2.5	21.6	7.6	727.6
2.6	18.8	26.2	173.2	2.8	19.3	19.3	346.1	3.2	21.8	10.3	747.6
3.1	18.9	29.0	177.3	3.3	19.4	20.7	361.0	3.8	21.9	11.7	762.8
3.6	19.0	32.4	181.3	3.9	19.6	24.1	358.0	4.4	22.0	13.1	773.5
4.1	19.1	33.8	182.8	4.4	19.7	26.9	366.6	5.1	22.2	13.8	769.7
4.7	19.2	35.9	184.2	5.0	19.8	28.3	373.3	5.7	22.3	14.5	770.0
5.2	19.3	37.9	185.5	5.5	19.9	30.3	378.0	6.3	22.5	15.2	767.5
				6.6	20.1	33.8	387.3	7.6	22.8	15.9	756.7
				7.7	20.4	35.2	391.1	8.9	23.1	17.2	739.2
				8.8	20.6	38.6	391.2				
				9.9	20.9	40.0	389.5				
				11.0	21.1	40.7	386.1				
				12.1	21.4	40.7	380.9				



Note: 200kPa RECYCLED FROM 100kPa, 400kPa RECYCLED FROM 200kPa

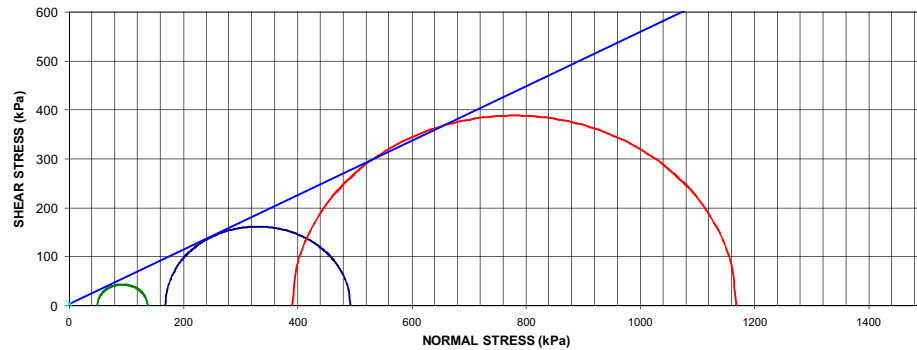
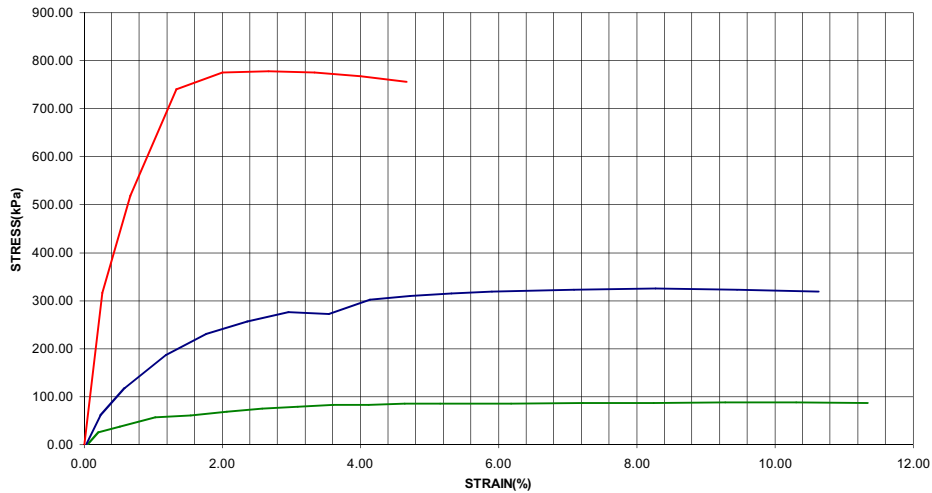
CONSOLIDATED UNDRAINED TRIAXIAL TEST

CLIENT: ROCK & STOCK

PROJECT: HAPPYLAND

SAMPLE	HL 34	NORMAL STRESS (kPa)	100	200	400
DEPTH(M)		INITIAL DRY DENSITY (kg/m³)	1453	1601	1682
MOISTURE STATE	SATURATED	INITIAL MOISTURE CONTENT (%)	4.2	4.2	4.2
SAMPLE STATE	UNDISTURBED	MOISTURE CONTENT AFTER TEST (%)	11.5	11.5	11.5
RATE OF COMPRESSION(mm/m) : 0.5900		COHESION (kPa)		4.2	
SOILLAB SAMPLE No.: S07-0588-30		ANGLE OF INTERNAL FRICTION (degrees)		29.1	

STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)	STRAIN %E	AREA (cm²)	PORE PRESSURE (kPa)	DEVIATOR STRESS (kPa)
0.0	18.4	0.0	-7.6	0.0	20.0	0.0	-8.5	0.0	22.0	0.0	-1.8
0.2	18.4	2.8	26.1	0.2	20.1	0.7	60.2	0.3	22.0	3.4	316.5
0.5	18.5	4.1	37.2	0.6	20.2	1.4	118.3	0.7	22.1	4.8	517.8
1.0	18.6	9.7	57.1	1.2	20.3	4.8	186.8	1.3	22.3	7.6	740.5
1.5	18.7	12.4	61.1	1.8	20.4	10.3	231.0	2.0	22.4	9.0	774.9
2.1	18.8	16.5	68.8	2.4	20.5	14.5	256.6	2.7	22.6	9.7	777.9
2.6	18.9	21.4	75.2	3.0	20.6	17.2	276.5	3.3	22.7	9.7	775.1
3.1	19.0	24.8	79.4	3.5	20.8	20.0	271.9	4.0	22.9	9.7	766.8
3.6	19.1	27.6	82.2	4.1	20.9	24.1	302.3	4.7	23.0	10.3	755.9
4.1	19.2	30.3	83.3	4.7	21.0	24.1	309.5				
4.6	19.3	33.1	84.8	5.3	21.2	25.5	314.6				
5.2	19.4	36.5	85.5	5.9	21.3	27.6	318.2				
6.2	19.6	40.0	85.5	7.1	21.6	31.0	322.9				
7.2	19.8	44.1	86.3	8.3	21.8	32.4	324.7				
8.2	20.1	45.5	87.1	9.5	22.1	34.5	322.8				
9.3	20.3	46.9	87.8	10.6	22.4	35.9	318.2				
10.3	20.5	51.0	88.1								
11.3	20.8	52.4	86.7								



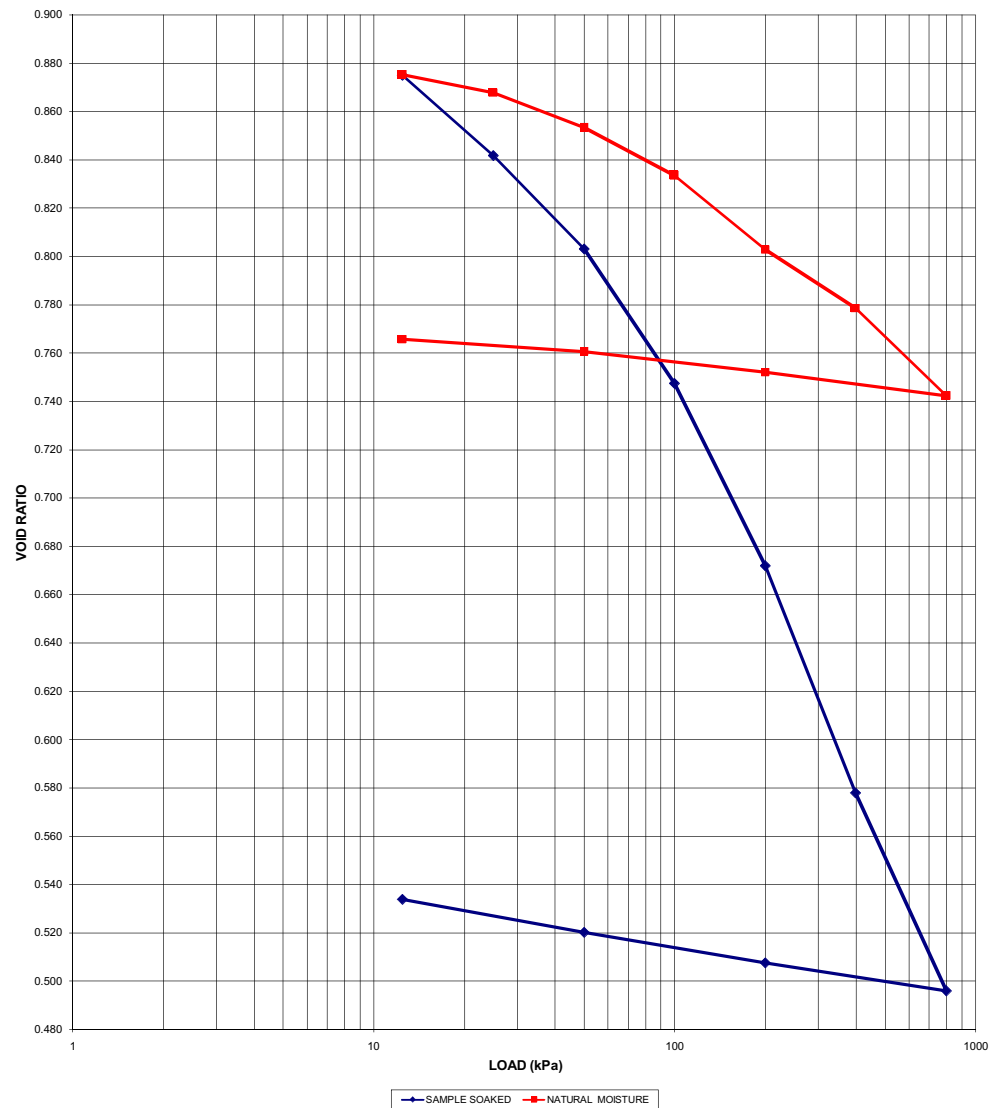
Note: 200kPa RECYCLED FROM 100kPa, 400kPa RECYCLED FROM 200kPa

DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1391
SAMPLE NO:	HL 4	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED9.5NATURAL MOISTURE10.3</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>19.08.3</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.3	RELATIVE DENSITY:	2.622
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.885
SOILLAB SAMPLE No.:	S07-0588-04	VOID RATIO AFTER SOAKING:	0.898
		SATURATION (%)	93.2

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.30	19.44	19.20	18.86	18.46	17.89	17.12	16.16	15.32	15.44	15.57	15.71
VOID RATIO	0.885	0.898	0.875	0.842	0.803	0.747	0.672	0.578	0.496	0.507	0.520	0.534

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.40	19.30	19.22	19.07	18.87	18.56	18.31	17.93	18.03	18.12	18.17
VOID RATIO	0.885	0.875	0.868	0.853	0.833	0.803	0.779	0.742	0.752	0.760	0.766

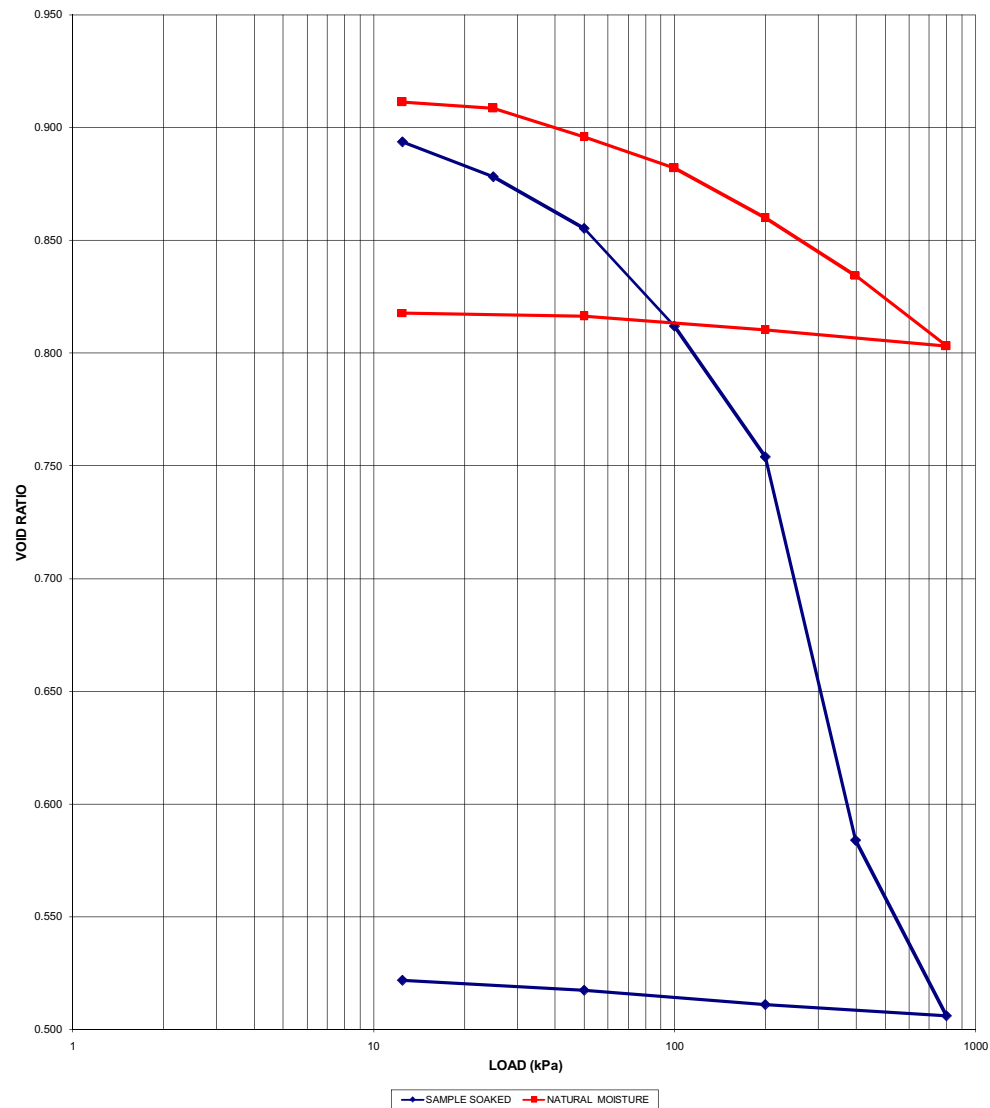


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1414
SAMPLE NO:	HL 6	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED7.9NATURAL MOISTURE8.6</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>16.25.1</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.4	RELATIVE DENSITY:	2.712
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.918
SOILLAB SAMPLE No.:	S07-0588-06	VOID RATIO AFTER SOAKING:	0.918
		SATURATION (%)	84.4

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.40	19.40	19.15	19.00	18.76	18.33	17.74	16.02	15.23	15.28	15.35	15.39
VOID RATIO	0.918	0.918	0.894	0.878	0.855	0.812	0.754	0.584	0.506	0.511	0.517	0.522

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.50	19.43	19.40	19.27	19.13	18.91	18.65	18.33	18.40	18.46	18.48
VOID RATIO	0.918	0.911	0.908	0.896	0.882	0.860	0.834	0.803	0.810	0.816	0.818

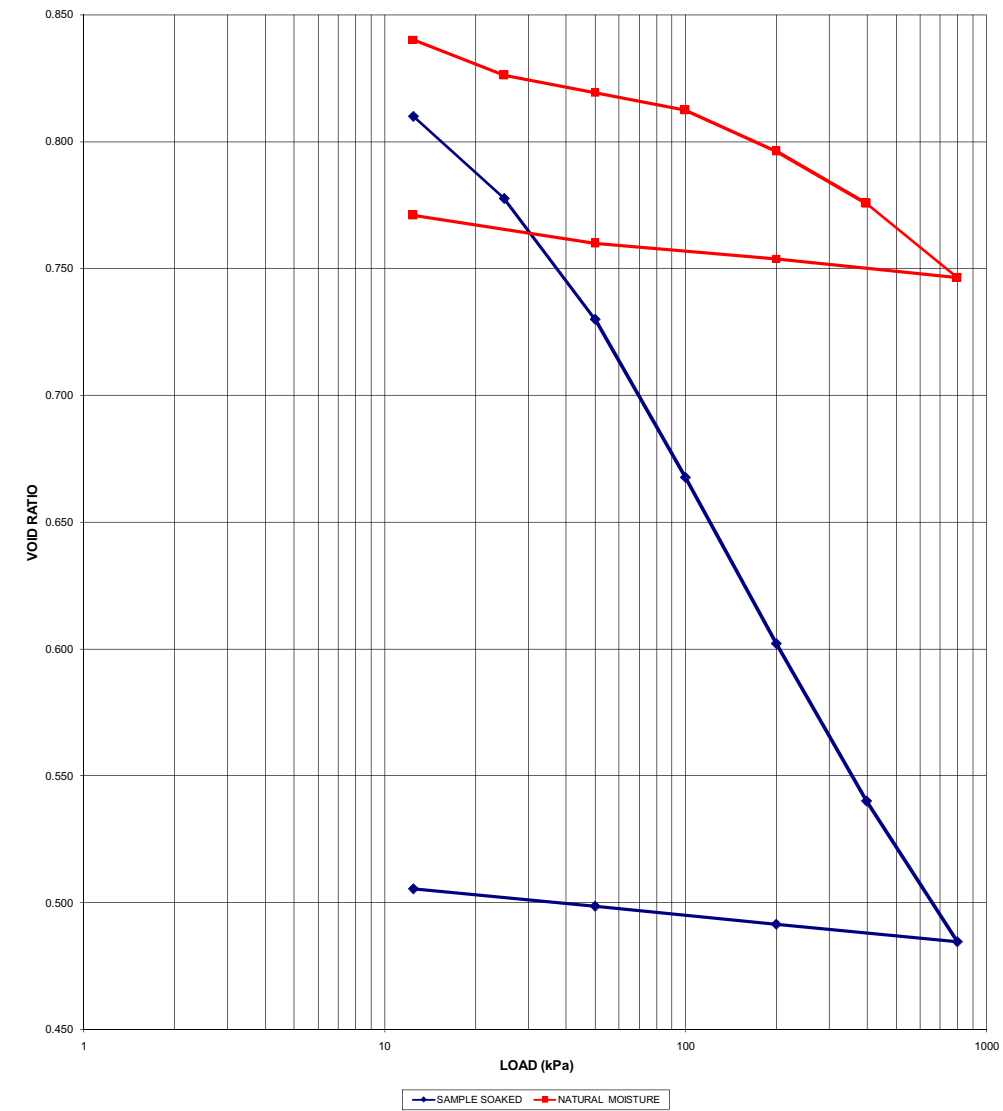


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1464
SAMPLE NO:	HL 8	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED5.3NATURAL MOISTURE5.8</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>15.03.2</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.3	RELATIVE DENSITY:	2.701
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.845
SOILLAB SAMPLE No.:	S07-0588-08	VOID RATIO AFTER SOAKING:	0.847
		SATURATION (%)	80.3

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.30	19.32	18.93	18.60	18.10	17.45	16.76	16.11	15.53	15.60	15.68	15.75
VOID RATIO	0.845	0.847	0.810	0.777	0.730	0.668	0.602	0.540	0.484	0.491	0.499	0.505

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.10	19.05	18.91	18.84	18.76	18.60	18.38	18.08	18.16	18.22	18.33
VOID RATIO	0.845	0.840	0.826	0.819	0.812	0.796	0.775	0.746	0.754	0.760	0.771

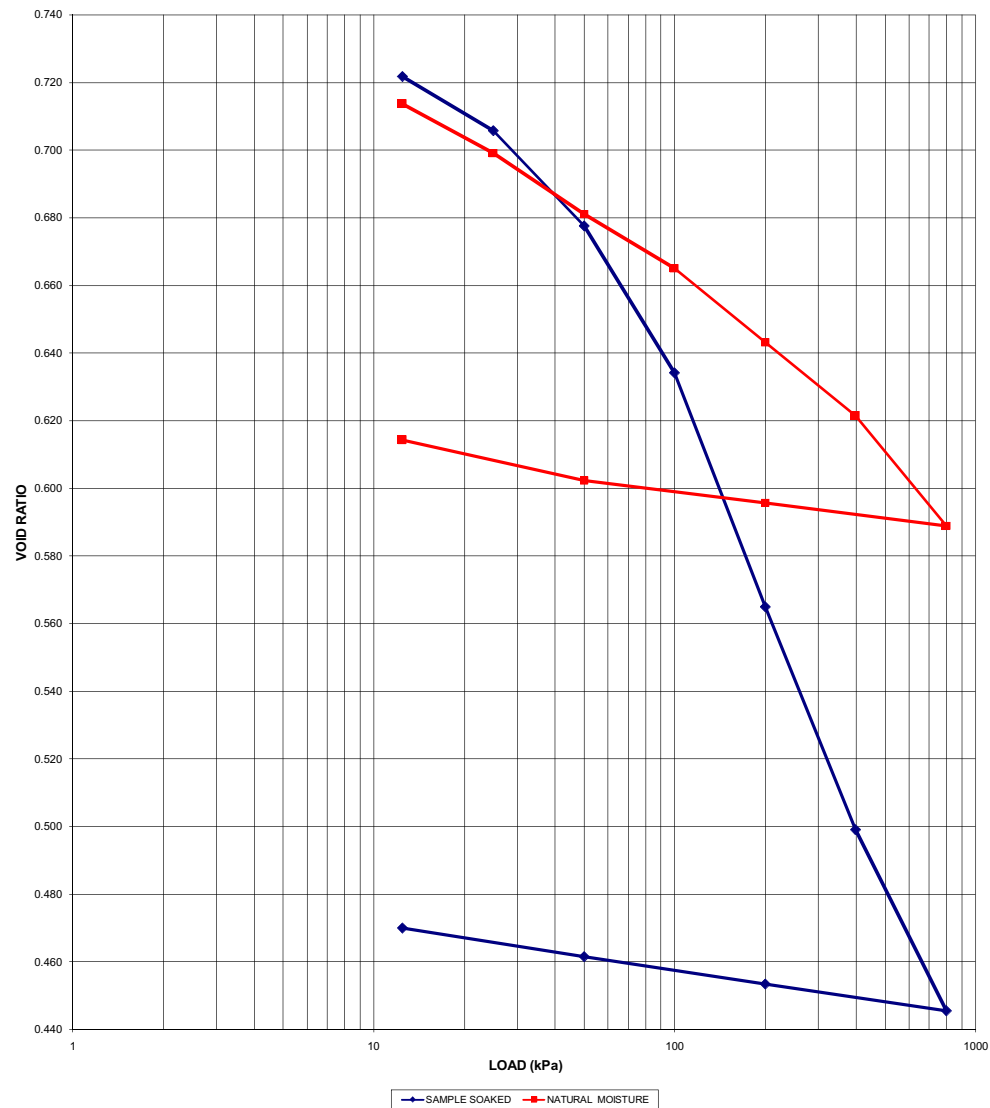


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1524
SAMPLE NO:	HL 13	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED8.0NATURAL MOISTURE7.0</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>16.15.4</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.5	RELATIVE DENSITY:	2.636
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.729
SOILLAB SAMPLE No.:	S07-0588-13	VOID RATIO AFTER SOAKING:	0.733
		SATURATION (%)	90.2

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.50	19.54	19.41	19.23	18.92	18.43	17.65	16.90	16.30	16.39	16.48	16.57
VOID RATIO	0.729	0.733	0.722	0.706	0.678	0.634	0.565	0.499	0.445	0.453	0.462	0.470

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.80	19.62	19.45	19.25	19.06	18.81	18.56	18.19	18.27	18.35	18.48
VOID RATIO	0.729	0.714	0.699	0.681	0.665	0.643	0.621	0.589	0.596	0.602	0.614

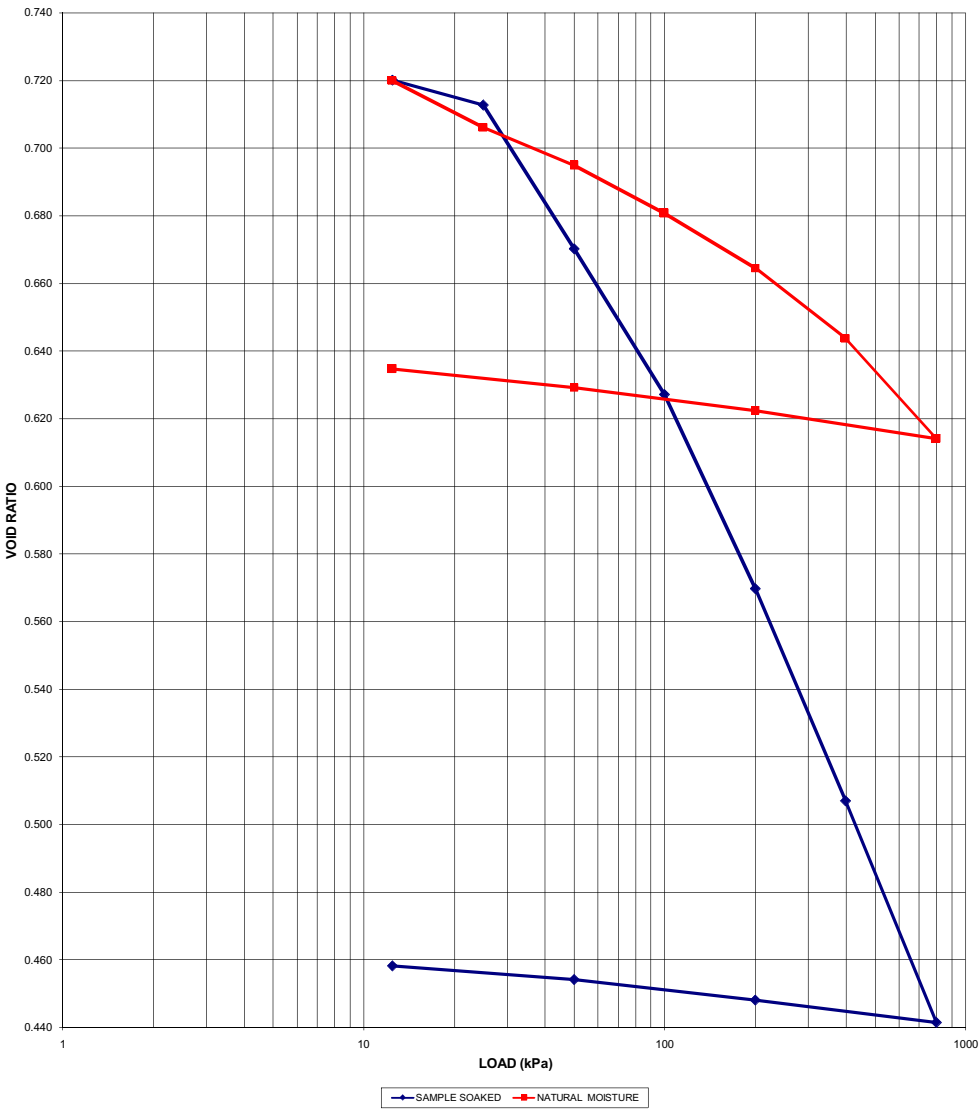


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1543
SAMPLE NO:	HL 17	INITIAL MOISTURE CONTENT (%):	<div><div>SAMPLE SOAKED</div><div>NATURAL MOISTURE</div></div> 4.74.8
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%):	<div><div>SAMPLE SOAKED</div><div>NATURAL MOISTURE</div></div> 14.83.2
INITIAL HEIGHT OF SAMPLE (mm):	19.6	RELATIVE DENSITY:	2.669
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.730
SOILLAB SAMPLE No.:	S07-0588-17	VOID RATIO AFTER SOAKING:	0.730
		SATURATION (%)	86.5

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.60	19.60	19.49	19.41	18.93	18.44	17.79	17.08	16.33	16.41	16.48	16.52
VOID RATIO	0.730	0.730	0.720	0.713	0.670	0.627	0.570	0.507	0.441	0.448	0.454	0.458

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.30	19.19	19.04	18.91	18.76	18.58	18.34	18.01	18.10	18.18	18.24
VOID RATIO	0.729	0.720	0.706	0.695	0.681	0.665	0.644	0.614	0.622	0.629	0.635

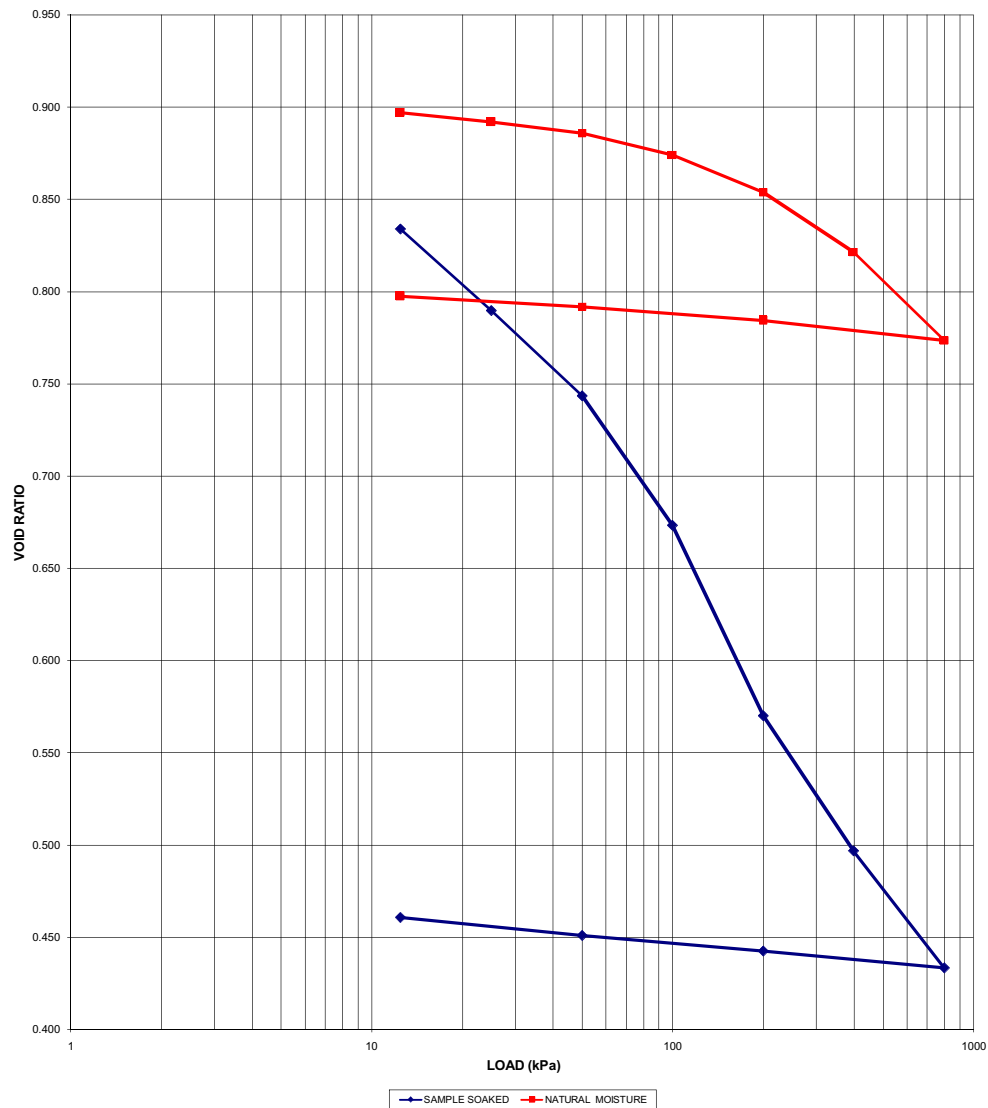


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1419
SAMPLE NO:	HL 31	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED2.8NATURAL MOISTURE6.3</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>16.016.4</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.5	RELATIVE DENSITY:	2.703
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.905
SOILLAB SAMPLE No.:	S07-0588-27	VOID RATIO AFTER SOAKING:	0.885
		SATURATION (%)	94.1

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.50	19.30	18.77	18.32	17.85	17.13	16.07	15.32	14.67	14.77	14.85	14.95
VOID RATIO	0.905	0.885	0.834	0.790	0.743	0.673	0.570	0.497	0.433	0.443	0.451	0.460

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.40	19.32	19.26	19.20	19.08	18.88	18.55	18.06	18.17	18.25	18.30
VOID RATIO	0.905	0.897	0.892	0.886	0.874	0.854	0.821	0.773	0.784	0.792	0.797

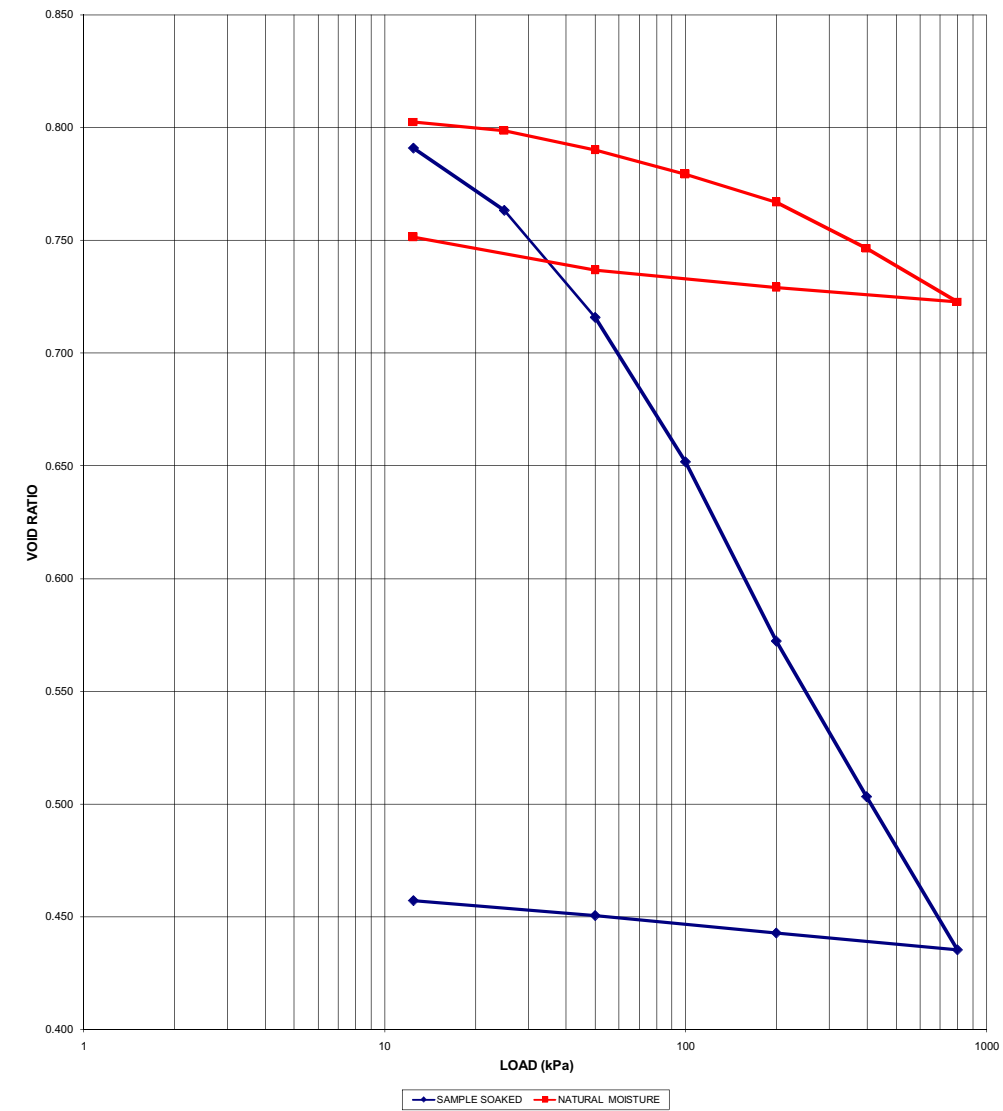


DOUBLE CONSOLIDATION TEST

PROJECT:	HAPPYLAND	INITIAL DRY DENSITY (kg/m³):	1479
SAMPLE NO:	HL 33	INITIAL MOISTURE CONTENT (%):	<div>SAMPLE SOAKED5.9NATURAL MOISTURE7.2</div>
DEPTH (m):	-	MOISTURE CONTENT AFTER TEST (%)	<div>15.62.7</div>
INITIAL HEIGHT OF SAMPLE (mm):	19.1	RELATIVE DENSITY:	2.678
SAMPLE STATE:	UNDISTURBED	INITIAL VOID RATIO:	0.810
SOILLAB SAMPLE No.:	S07-0588-29	VOID RATIO AFTER SOAKING:	0.813
		SATURATION (%)	91.2

LOAD (kPa):	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.10	19.13	18.90	18.61	18.10	17.43	16.59	15.86	15.14	15.22	15.31	15.38
VOID RATIO	0.810	0.813	0.791	0.763	0.716	0.652	0.572	0.503	0.435	0.443	0.451	0.457

LOAD (kPa):	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm):	19.50	19.42	19.38	19.28	19.17	19.03	18.81	18.56	18.63	18.71	18.87
VOID RATIO	0.810	0.802	0.799	0.790	0.779	0.767	0.746	0.723	0.729	0.737	0.751



APPENDIX 5: ECOLOGICAL REPORT

Report:

SENSITIVE AREAS ON HAPPYLAND 241-KT

Submitted to:

Pieter de Lange of Triviron

Prepared by:

Jenny Newenham of Biovista Conservation Consultancy

Date:

April 2007

1. Introduction

The Developers of the proposed Happyland Development have appointed Triviron, to provide environmental guidelines for the planning of the proposed development. The property is located close to the town of Hoedspruit, in the south east of Limpopo Province, South Africa.

The intention of the Developer is to establish a township on the northern side of the Sand River. The initial concept is to include:

- Approx. 100 residential units along the river
- A fly-in with residential units and hangars.
- A light industrial area to the west of the property.
- A small commercial / retail area towards the east of the development
- A conventional residential-urban area more-or-less along the tar road area of the property (to the north).

This report will give a preliminary indication of sensitive areas on the property, which will be used for the purposes of planning.

2. Study Area

The proposed Happyland Development is located on the remainder of the Farm Happyland 241-KT, close to the town of Hoedspruit, Limpopo, South Africa. The entrance to the farm is merely a few kilometres to the west of Hoedspruit, along the R527. The Sand River, a non-perennial system that may historically have been perennial, dissects the property.

The Happyland's farm is found within the Acocks Veld Type: Arid Lowveld (11). This veld type typically comprises of *Combretum apiculatum* (Red bushwillow), *Acacia nigrescens* (Knob thorn) and *Sclerocarya birrea caffra* (Marula). This savannah ecosystem has significant area under formal conservation protection e.g. Kruger National Park. This and the fact that the bushveld is said to be a resilient ecosystem (ability to recover from disturbance) are some of the factors contributing to the belief that it is not considered a threatened environment.

The farm has had some agricultural development in the past, as is evident by the reasonably homogenous, bush-encroached habitat to the west of the property (old lands) and various stands of bush encroachment in the rest of the northern portion, most likely attributed to overgrazing from cattle. These stands are dominated by *Dichrostachys cinerea* (sickle bush).

3. Objectives

The main aim of this study was to get a preliminary idea of the ecological conditions of the site so that the development can be planned appropriately. The main objectives included:

- Identify any areas that are considered geologically sensitive.
- Identify any sensitive areas with reference to the vegetation.
- Identify any sensitive areas, pertaining to the fauna of the area.

4. Methodology

The following methods were used in order to acquire the required information:

- Desktop study of relevant literature
- Drive the proposed development site
- Walk areas of the proposed development site

- Reference to the 1: 5000 Happyland aerial photograph
- GPS areas of concern
- Take photographs of sites concerned.

5. Discussion

In order to limit compromising the ecological integrity of the area, there are a few areas that should be flagged in the planning of the development. As mentioned previously this Arid Lowveld vegetation type is not considered a threatened ecosystem, however there are some areas that are considered more sensitive than others. This section highlights those particular areas, which mainly comprise of the riparian zone and certain clumps of vegetation as these areas encompass habitat and food resources for other organisms.

General proposed zonation

With reference to the rough schematic sketch (figure 1), that includes the river and the main road network of the property, the property has been zoned into 4 Zones:

- **Least sensitive Zone:** Mainly *Dichrostachys* veld – been impacted upon during previous land-use practices.
- **Least sensitive Zone:** Dominated by typical bushveld vegetation such as *Combretum apiculatum*, *Acacia* sp, *Sclerocarya birrea* and other *Combretum* sp. The only sensitive areas are the very tall trees 10m + of assorted species and the dead *Combretum imberbe* (Leadwoods).
- **Intermediate – Sensitive Zone:** Riparian zones of the Sand River and small non-perennial drainage lines. These areas are sensitive because it is in these areas that the most biodiversity can be situated. The ecological implications are that the plant diversity is greatest, which in turn provides a variety of habitat for the fauna, food for different species and shelter to different organisms. In addition to this the vegetation helps to stabilise the banks of the drainage lines, thus reducing the erosion potential.
- **Sensitive Zone:** mainly steep riparian areas. Similarly to the previous zone, this is where the biodiversity is concentrated, but these areas have steep banks – almost vertical in areas, which make them even more susceptible to erosion and collapse, especially close to the edge.

Flora

The following specific areas within the afore mentioned zones, are considered to be sensitive:

- **HL 1** (S24.36556°; E030.93779 °): Clump of *Schotias* on the riverbank, burrows beneath, amongst the roots. Important, for bank stabilisation, food and habitat for organisms.
- **HL 2** (S24.37796°; E030.93573 °): *Acacia* sp in association with other species – biologically diverse clump.
- **HL 3** (S24.37699°; E030.93310 °): Knobwood and associated species, biologically diverse clump.
- **HL 4** (S24.37673°; E030.93163 °): A tree clump that is biologically diverse and important for food and habitat (Weeping Boer-Bean and *Spirostachys africanus* (Tambotie).
- **HL 5** (S24.36938°; E030.92332 °): Tree clump in the riparian zone including: Marulas and Leadwood
- **HL 6** (S24.36967°; E030.92129 °): *Spirostachys* in small drainage line.
- **HL 7** (S24.37006°; E030.92075 °): *Schotias* etc - clump

- **HL 8** (S24.37401°; E030.90977 °): ? Species, possibly *Spirostachys*
- **HL 9** (S24.37405°; E030.90915 °): Tree clump, although it is small, it is biologically diverse, especially compared to the surrounding vegetation that has been encroached upon, thus providing refuge for more specialised faunal species. (*Acacia*, *Euclea*, *Schotia* etc).
- **HL 10**(S24.37413°; E030.90886 °): Tree clump – small but as for HL 9.
- **HL 11**(S24.37328°; E030.91056 °): Tree clump incl. Leadwood and *Acacia* sp.
- **HL 12** (S24.37266°; E030.91116 °): Tree clump incl. Leadwood and *Acacia* sp, *Scotia*, *Grewia*, *Lonchocarpus*. Valuable source of food and shelter especially for birds and small mammals.
- **HL 13**(S24.36771°; E030.91890 °): *Combretum* clump
- **HL 14**(S24.36929°; E030.93650 °): Tree clump incl. *Schotia*, *Spirostachys*, *Lonchocarpus* & *Diospyros*. Valuable source of food and shelter especially for birds and small mammals
- Individual **Marula** & **Weeping Boer Bean** (*Schotia brachypetala*) trees that are 8m and higher in any of the zones. These big trees are important to genetic diversity of the respective species as well as being valuable habitat and especially food resources to different organisms.
- All other **tree species** that are **greater than 10m** in height – in particular: Leadwoods, Knobthorns, Apple Leaf (formerly *Lonchocarpus capassa*). These large specimens are important genetically for each of the respective species and they are also important habitats for a variety of organisms, especially reptiles, small mammals and birds.
- All **big large** (c. 7m and higher) **dead trees** in particular the Leadwoods. These trees, despite being dead, provide habitat for a number of organisms, in particular reptiles (lizards, geckoes and skinks mainly) and nest sites for a variety of birds (e.g. wood peckers, and a variety of raptors).
- The list of relevant (to this site) **protected tree species** under the National Forests Act, 1988 (Act no. 84 of 1988), is summarized in the table below. The act states that “no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or to both a fine and imprisonment”.

As with all the above-mentioned areas it is acceptable to incorporate the identified sites in the plans but avoid removal.

Table 1: Trees that occur / may occur on the Happyland property that are on the lists of protected trees.

Scientific Name	Common Name	Relevant legislation
<i>Azelia quanzensis</i>	Pod Mahogany (207)	Schedule A Protected trees in Forest Act

<i>Balanites maughammi</i>	Torchwood (251)	Schedule A Protected trees in Forest Act
<i>Combretum imberbe</i>	Leadwood (539)	Schedule A Protected trees in Forest Act
<i>Pittosporum viridiflorum</i>	Cheesewood (139)	Schedule A Protected trees in Forest Act
<i>Pterocarpus angolensis</i>	Wild Teak (236)	Schedule A Protected trees in Forest Act
<i>Sclerocarya birrea caffra</i>	Marula (360)	Schedule A Protected trees in Forest Act
<i>Spirostachys africana</i>	Tambotie	Schedule 11 Protected plants (section 69 (1) (a))
<i>Berchemia zeyheri</i>	Red ivory	Schedule 11 Protected plants (section 69 (1) (a))
<i>Adenium species</i>	Impala Lilies	Schedule 11 Protected plants (section 69 (1) (a))
<i>Olea species</i>	Olive trees	Schedule 11 Protected plants (section 69 (1) (a))
<i>Stapelia species</i>	Stapeliads	Schedule 11 Protected plants (section 69 (1) (a))

Fauna

The only possible Red data Species that may be found on the property include:

- Bat Hawk (Rare): Breeds & roosts in tall trees
- Martial Eagle (Vulnerable): All terrestrial habitats except montane grasslands and the interior of evergreen forests.
- Bateleur (Vulnerable): any woodland / savannah – prefers tall leafy trees in which to place nests.
- Thickbilled cuckoo (Rare): Woodland & forest edges – dependent on the survival of woodland in the eastern Transvaal lowveld and its host Redbilled Helmetshrike.
- Ground hornbills (Vulnerable): Breeds in holes in trees – especially old dead trees, and forages in grassland / savannah woodland.
- African rock python (Vulnerable): variety of habitats including moist areas, it is a very good climber.
- Honey badger (near threatened): Savannah – generalist carnivore.
- Schreiber's long fingered bat (near threatened): Savannah woodland, insectivore.
- Welwitsch's bat (near threatened): savannah, insectivore roosts in shrubs & trees
- Rusty bat (near threatened): savannah, riparian woodland, insectivore.
- Pangolin (Vulnerable): variety incl. savannah woodland, ant / termite niche

In addition to these species there are some organisms that are protected by provincial legislation.

Table 2: Protected fauna

Scientific Name	Common Name	Relevant legislation
Mammals		
<i>Otolemur crassicaudatus</i>	Bushbaby	Schedule 2 Protected game (section 4(1)(b))

<i>Galago moholi</i>	Lesser Bushbaby	Schedule 2 Protected game (section 4(1)(b))
<i>Mellivora capensis</i>	Honey Badger	Schedule 2 Protected game (section 4(1)(b))
<i>Manis temminckii</i>	Pangolin	Schedule 2 Protected game (section 4(1)(b))
<i>Orycteropus afer</i>	Antbear	Schedule 2 Protected game (section 4(1)(b))
<i>Raphicerus campestris</i>	Steenbok	Schedule 2 Protected game (section 4(1)(b))
Birds		
All birds except those exuded in other schedules (34 species)		Schedule 2 Protected game (section 4(1)(b))
Reptiles		
All retiles except water and rock leguans, & all snake species.		Schedule 2 Protected game (section 4(1)(b))
Invertebrates		
<i>Ceratogyrus</i> spp., <i>Harpactira</i> spp. & <i>Pterinochilus</i>	Baboon Spider Genera	Schedule 7 Invertebrates (section 35 (1))

6. Conclusion

The proposed Happyland development is located in the Arid Lowveld, which is not a threatened ecosystem, never the less there are a few areas that are considered to be sensitive or potentially sensitive. The area has been allocated a rough zonation, consisting of 4 different zones, namely: Least sensitive, Low sensitivity, Intermediate to sensitive and Sensitive. The most sensitive areas are those located along the Sand River, the bush clumps, the very tall trees and the old dead leadwoods. The riparian and bush clumps are the most biologically diverse areas, providing habitat, shelter and food resources for different organisms, hence their rating as sensitive.

There are a few taxa that are either protected or are Red Data species (both flora & fauna) that may / may not occur on the property. The habitats of these species have been taken into consideration in this general assessment, and therefore no further deliberation needs to be made when planning the layout of the development.

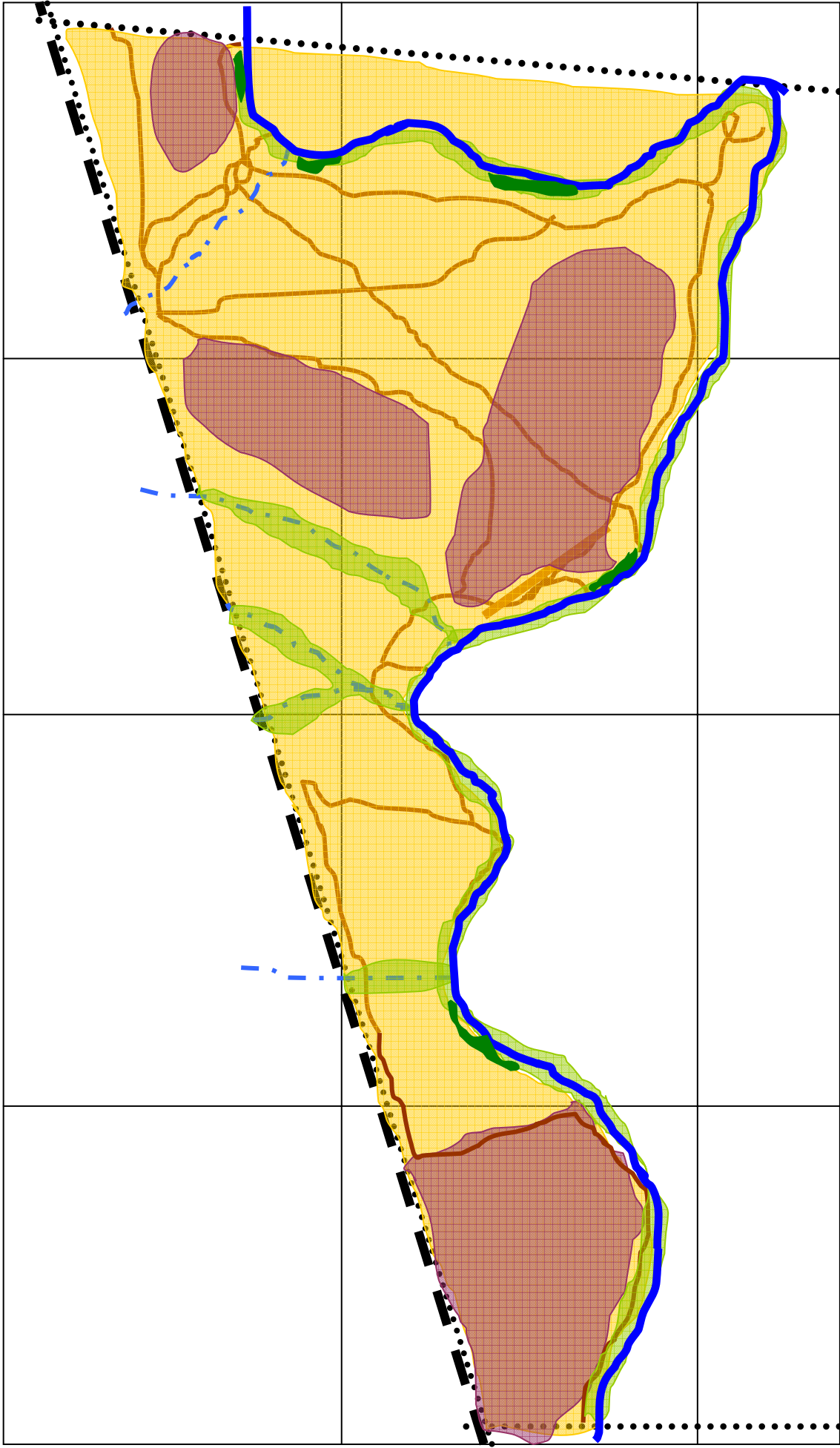












Figure 1: A schematic diagram (not to scale), indicating the proposed zonation of the northern portion of Happyland Farm, which is under consideration for a development.

LEGEND	
	Sand River
	Tar road
	Dirt roads
	Airstrip
	Fence lines
	Non-perennial drainage lines
	Least sensitive Zone
	Low sensitivity Zone
	Intermediate - Sensitive Zone
	Sensitive zone

APPENDIX 6: HERITAGE IMPACT ASSESSMENT



2007

ZANSPRUIT ECO-ESTATE HIA



Stephan Gaigher

AINP

8/24/2007



AINP

Archaeo-Info Northern Province

PO Box 147

Bendorpark

0713

TEL/FAX: +27 (15) 296 1944

E-mail: sgaigher@telkomsa.net

Heritage Impact Assessment

Heritage Impact Assessment for the Proposed
Eco-Estate on the Farm Happyland, Limpopo
Province.

PREPARED BY:

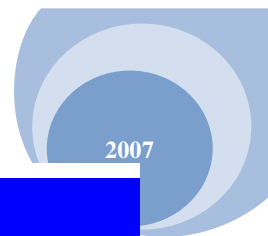
Archaeo-Info Northern Province

PREPARED FOR:

Triviron EAP (Pty) Ltd

August 2007





Credit Sheet

Project Director

Stephan Gaigher (BA Hons, Archaeology, UP)

Principal Investigator for AINP

Member of ASAPA (# 057)

Tel.: (015) 963 8409

Cell.: 083 324 2714

E-mail: stephan@lajuma.com

Fieldworker

Eric N. Mathoho (BA, Archaeology, Univen)

Fieldworker for AINP

Member of ASAPA

Report Author

Stephan Gaigher

Disclaimer; Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. AINP and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

SIGNED OF BY: STEPHAN GAIGHER

.....

Management Summary

Site name and location: Proposed Eco-Estate on the Farm Happyland , Limpopo Province.

Magisterial district: Mopani District Municipality

Developer: Suger Creek Trading 33 (Pty) Ltd, t/a Zandspruit Estates

Consultant: AINP, PO Box 147, Bendorpark, Polokwane, 0713, South Africa

Date development was mooted: June 2007

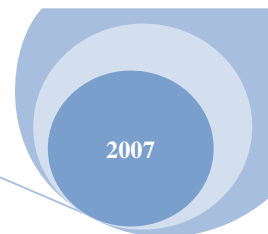
Date of Report: 24 August 2007

Proposed date of commencement of development: September 2007

Findings: A second phase investigation of the site identified on the farm Happyland 241 KT is recommended. Further steps required for mitigation will be forthcoming from the second phase recommendations.

Table of Contents

AINP	2
Archaeo-Info Northern Province.....	2
PO Box 147	2
Credit Sheet	3
Management Summary.....	4
Table of Contents	5
List of Figures, Tables & Appendices.....	7
Introduction.....	8
Proposed Project	8
Project Area	8
Methodology.....	9
Inventory	9
Site Surveying	9
Survey Sampling	9
Systematic Survey Sampling	10
Judgemental Survey Sampling	10
Assessment.....	10
Site Evaluation	10
Significance Criteria	10
Assessing Impacts	11
Resource Inventory	16
Zandspruit Eco-Estate	16
ZEE 001	16
ZEE 002.....	16
ZEE 003.....	16
Resource Evaluation	16
Zandspruit Eco-Estate	16



ZEE 001.....	16
Impact Identification and Assessment.....	18
Zandspruit Eco-Estate	18
ZEE 001.....	18
ZEE 002.....	18
ZEE 003.....	19
Resource Management Recommendations.....	19
Zandspruit Eco-Estate	19
References Cited	21

List of Figures, Tables & Appendices

Table 1.	Site significance (Pre-Contact).....	11
Table 2.	Site significance (Post-Contact).....	11
Table 3.	Pre-contact site characteristics.....	12
Table 4.	Post-contact site characteristics.....	12
Appendix A	Photographs.....	18
	Photo 1 – Surface of site at ZEE 001	
	Photo 2 – Artefacts retrieved from site ZEE 001	
	Photo 3 – Dilapidated structures at site ZEE 002	
	Photo 4 – Occupational structure at site ZEE 003	
Appendix B	Criteria for Pre-Contact Site Evaluation.....	20
Appendix C	Criteria for Post-Contact Site Evaluation.....	23
Appendix D	Criteria for Site Evaluation.....	25
Appendix E	Location Maps.....	27

Heritage Impact Assessment

Proposed Eco-Estate on the Farm Happyland , Limpopo Province.

Introduction

Archaeo-Info Northern Province (AINP) was contracted by Triviron EAP (Pty) Ltd. to conduct a Heritage Impact Assessment (HIA) on the Proposed Eco-Estate on the Farm Happyland 241 KT, Limpopo Province .

This HIA forms part of the Environmental Impact Assessment (EIA) as required by the Environmental Conservation Act (ECA) 73 of 1989, the Minerals & Petroleum Resources Development Act, 28 of 2002 and the Development Facilitation Act (DFA), 67 of 1995. The HIA is performed in accordance with section 38 of the National Heritage Resources Act (NHRA), 25 of 1999 and is intended for submission to the South African Heritage Resources Agency (SAHRA).

Qualified personnel from AINP conducted the assessment. The team comprised a Principal Investigator with a minimum of an Honours degree in an applicable science as well as at least five years of field experience in heritage management assisted by a fieldworker with at least a BA degree in an applicable science. All of our employees are also registered members of the Association of South African Professional Archaeologists (ASAPA).

A member of AINP performed the assessment on 03 August 2007.

The extent of the proposed development sites were determined as well as the extent of the areas to be affected by secondary activities (access route, construction camp, etc.) during the development. The sites were plotted using a Global Positioning System (GPS) and photographed digitally. The sites were surveyed on foot and by vehicle.

All results will be relayed in this report, firstly outlining the methodology used and then the results and recommendations for the identified resources.

Proposed Project

Sugar Creek Trading 33 (Pty) Ltd, t/a Zandspruit Estates is proposing the establishment of a residential, commercial and retail development with associated infrastructure to be referred to as the Zandspruit Estates. The proposed project entails a residential, commercial and retail establishment consisting of 130 luxury bush stands, 230 "Residential1" town stands, a retirement village, 37 airport stands, 140 residential 1 beginner stands, an equestrian stand, offices, retail (shop), a hotel, 9 multi-story & clusters "Residential 3" stands, a landing strip and associated infrastructure.

After researching the National Archive records as well as the SAHRA records it was determined that no previous archaeological or historical studies have been performed in the demarcated study area.

The project was tabled during June 2007 and the developer intends to commence construction as soon as possible after receipt of the ROD from the Department of Environmental Affairs

Project Area

The proposed site for development is situated on the farm Happyland 241 KT and encompasses approximately 948 hectares. The farm is situated approximately 1km out of the town of Hoedspruit on the southern side of the R527 road. The southern boundary of the development is demarcated by the Sandspruit river. The whole farm is situated on an alluvial plain with sandy soil being predominant (See Appendix D: Location Map).

Fine and hot weather conditions were experienced during the field investigations.

Methodology

Inventory

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984*).

Site Surveying

Site surveying is the process by which archaeological sites are located and identified on the ground. Archaeological site surveys often involve both surface inspection and subsurface testing. For the purposes of heritage investigations, *archaeological sites* refers to any site with heritage potential (i.e. historic sites, cultural sites, rock art sites etc.).

A systematic surface inspection involves a foot traverse along pre-defined linear transects which are spaced at systematic intervals across the survey area. This approach is designed to achieve representative areal coverage. Alternatively, an archaeological site survey may involve a non-systematic or random walk across the survey area. Subsurface testing is an integral part of archaeological site survey. The purpose of subsurface testing, commonly called "shovel testing", is to:

- (a) assist in the location of archaeological sites which are buried or obscured from the surveyor's view, and
- (b) help determine the horizontal and vertical dimensions and internal structure of a site.

In this respect, subsurface testing should not be confused with evaluative testing, which is a considerably more intensive method of assessing site significance (*King, Thomas F., 1978*).

Once a site is located, subsurface testing is conducted to record horizontal extent, depth of the cultural matrix, and degree of internal stratification. Because subsurface testing, like any form of site excavation, is destructive it should be conducted only when necessary and in moderation.

Subsurface testing is usually accomplished by shovel, although augers and core samplers are also used where conditions are suitable. Shovel test units averaging 40 square cm are generally appropriate, and are excavated to a sterile stratum (i.e. C Horizon, alluvial till, etc.). Depending on the site survey strategy, subsurface testing is conducted systematically or randomly across the survey area. Other considerations such as test unit location, frequency, depth and interval spacing will also depend on the survey design as well as various biophysical factors. (*Lightfoot, Keng G. 1989*).

Survey Sampling

Site survey involves the complete or partial inspection of a proposed project area for the purpose of locating archaeological or other heritage sites. Since there are many possible approaches to field survey, it is important to consider the biophysical conditions and archaeological site potential of the survey area in designing the survey strategy.

Ideally, the archaeological site inventory should be based on intensive survey of every portion of the impact area, as maximum areal coverage will provide the most comprehensive understanding of archaeological and other heritage resource density and distribution. However, in many cases the size of the project area may render a complete survey impractical because of time and cost considerations.

In some situations it may be practical to intensively survey only a sample of the entire project area. Sample selection is approached systematically, based on accepted statistical sampling procedures, or judgementally, relying primarily on subjective criteria (*Butler, W., 1984*).

Systematic Survey Sampling

A systematic sample survey is designed to locate a representative sample of archaeological or heritage resources within the project area. A statistically valid sample will allow predictions to be made regarding total resource density, distribution and variability. In systematic sample surveys it may be necessary to exempt certain areas from intensive inspection owing to excessive slope, water bodies, landslides, land ownership, land use or other factors. These areas must be explicitly defined. Areas characterized by an absence of road access or dense vegetation should not be exempted. (Dunnell, R.C., Dancey W.S. 1983).

Judgemental Survey Sampling

Under certain circumstances, it is appropriate to survey a sample of the project area based entirely on professional judgement regarding the location of sites. Only those areas which can reasonably be expected to contain archaeological or heritage sites are surveyed.

However, a sufficient understanding of the cultural and biophysical factors which influenced or accounted for the distribution of these sites over the landscape is essential. Careful consideration must be given to ethnographic patterns of settlement, land use and resource exploitation; the kinds and distribution of aboriginal food sources; and restrictions on site location imposed by physical terrain, climatic regimes, soil chemistry or other factors. A judgemental sample survey is not desirable if statistically valid estimates of total heritage resource density and variability are required (McManamon F.P. 1984).

Assessment

Assessment studies are only required where conflicts have been identified between heritage resources and a proposed development. These studies require an evaluation of the heritage resource to be impacted, as well as an assessment of project impacts. The purpose of the assessment is to provide recommendations as to the most appropriate manner in which the resource may be managed in light of the identified impacts. Management options may include alteration of proposed development plans to avoid resource impact, mitigative studies directed at retrieving resource values prior to impact, or compensation for the unavoidable loss of resource values.

It is especially important to utilize specialists at this stage of assessment. The evaluation of any archaeological resource should be performed by professionally qualified individuals.

Site Evaluation

Techniques utilized in evaluating the significance of a heritage site include systematic surface collecting and evaluative testing. Systematic surface collection is employed wherever archaeological remains are evident on the ground surface. However, where these sites contain buried deposits, some degree of evaluative testing is also required.

Systematic surface collection from archaeological sites should be limited, insofar as possible, to a representative sample of materials. Unless a site is exceptionally small and limited to the surface, no attempt should be made at this stage to collect all or even a major portion of the materials. Intensive surface collecting should be reserved for full scale data recovery if mitigative studies are required. Site significance is determined following an analysis of the surface collected and/or excavated materials (Miller, C.L. II, 1989).

Significance Criteria

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be taken into account when evaluating heritage resources. For any site, explicit criteria are used to measure these values. Checklists of criteria for evaluating pre-contact and post-contact archaeological sites are provided in Appendix B and Appendix C. These checklists are not intended to be exhaustive or inflexible. Innovative approaches to site evaluation which emphasize quantitative analysis and objectivity are encouraged. The process used to derive a measure of relative site significance must be rigorously documented, particularly the system for ranking or weighting various evaluatory criteria.

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information which, if properly recovered, will enhance understanding of Southern African human history is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population (*Smith, L. D. 1977*).

Assessing Impacts

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

- (a) destruction or alteration of all or part of a heritage site;
- (b) isolation of a site from its natural setting; and
- (c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined in Appendix D:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. (Zubrow, Ezra B.A., 1984).

Impact Effect	Score
Magnitude	0-4
Severity	0-4
Duration	0-4
Range	0-4
Frequency	0-4
Diversity	0-4
Cumulative effect	0-4
Rate of change	0-4
Total score:	0-32

Impact severity table.

Impacts will be defined along the following parameters;

Effect	Score
No effect on site	0
Insignificant impact on site	1-5

Significant impact on site	6-16
Major destruction of site and attributes	17-24
Total destruction of sites and attributes	25-32

The study area was surveyed using standard archaeological surveying methods. The area was surveyed using directional parameters supplied by the GPS and surveyed by foot. This technique has proven to result in the maximum coverage of an area. This action is defined as;

'an archaeologist being present in the course of the carrying-out of the development works (which may include conservation works), so as to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works' (DAHGI 1999a, 28).

Standard archaeological documentation formats were employed in the description of sites. Using standard site documentation forms as comparable medium, it enabled the surveyors to evaluate the relative importance of sites found. Furthermore GPS (Global Positioning System) readings of all finds and sites were taken. This information was then plotted using a **eTrex Legend** GPS (WGS 84- datum).

Indicators such as surface finds, plant growth anomalies, local information and topography were used in identifying sites of possible archaeological importance. Test probes were done at intervals to determine sub-surface occurrence of archaeological material. The importance of sites was assessed by comparisons with published information as well as comparative collections.

Test excavation is that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development. It may also be referred to as archaeological testing' (DAHGI 1999a, 27).

'Test excavation should not be confused with, or referred to as, archaeological assessment which is the overall process of assessing the archaeological impact of development. Test excavation is one of the techniques in carrying out archaeological assessment which may also include, as appropriate, documentary research, fieldwalking, examination of upstanding or visible features or structures, examination of aerial photographs, satellite or other remote sensing imagery, geophysical survey, and topographical assessment' (DAHGI 1999b, 18).

All sites or possible sites found were classified using a hierarchical system wherein sites are assessed using a scale of zero to four according their importance. These categories are as follows;

Degree of significance	Justification	Score
Exceptional significance	Rare or outstanding, high degree of intactness. Can be interpreted easily.	13 - 16
High significance	High degree of original fabric. Demonstrates a key element of item's significance. Alterations do not detract from significance.	9 - 12
Moderate significance	Altered or modified elements. Element with little heritage value, but which contribute to the overall significance.	5 - 8
Little significance	Alterations detract from significance. One of many. Alterations detract from significance.	1 - 4

Intrusive	Damaging to the item's heritage significance.	0
-----------	---	---

Table 1. Site significance table for pre-contact sites.

Degree of significance	Justification	Score
Exceptional significance	Rare or outstanding, high degree of intactness. Can be interpreted easily.	24 – 29
High significance	High degree of original fabric. Demonstrates a key element of item's significance. Alterations do not detract from significance.	13 – 18
Moderate significance	Altered or modified elements. Element with little heritage value, but which contribute to the overall significance.	7 – 12
Little significance	Alterations detract from significance. One of many. Alterations detract from significance.	1 – 6
Intrusive	Damaging to the item's heritage significance.	0

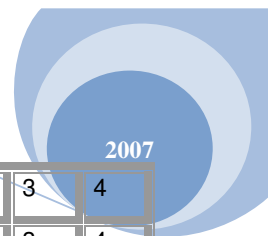
Table 2. Site significance table for post contact sites.

The qualitative value of a site's significance will be calculated by tabling its significance characteristics (as outlined in appendix B & C) on a sliding value scale and determining an accumulative value for the specific site. Two tables will be used;

Site significance characteristics slide scale (Pre-Contact Criteria)					
Scientific Significance	0	1	2	3	4
Public Significance	0	1	2	3	4
Ethnic Significance	0	1	2	3	4
Economic Significance	0	1	2	3	4
Total Score					

Table 3. Pre-contact site criteria (0- no value, 4- highest value)

Site significance characteristics slide scale (Post-Contact Criteria)					
Scientific Significance	0	1	2	3	4
Historic Significance	0	1	2	3	4
Public Significance	0	1	2	3	4
Other Significance	0	1	2	3	4



Ethnic Significance	0	1	2	3	4
Economic Significance	0	1	2	3	4
Total Score					

Table 4. Post-contact site criteria (0- no value, 4- highest value)

The values calculated (as specified in appendix B&C) are attributed to a category within the site significance table to provide the site with a quantifiable significance value. This will only be done for identified sites. Should an area under investigation not show any evidence of human activity this will be stated and no further qualifying will be done.

This information will be contained in a report that will strive to;

Review the purpose, approach, methodology and reporting of archaeological assessment and monitoring and propose guidelines on how to adequately address four key questions:

- i. What is the research value and potential of the archaeological remains?
- ii. What will the impact of development be?
- iii. What types of mitigation (by design modification or further investigation) would be appropriate to mitigate the impact of development and/or make a useful contribution to knowledge?
- iv. What will be the likely cost and timescale of any further investigation, analysis and reporting, given the nature of the archaeology and the type and extent of further work required?

Resource Inventory

This section will contain the results of the heritage site inventory. Any identified sites will be indicated on the accompanying map plotted using the OziExplorer Geographis Information System (GIS).

Zandspruit Eco-Estate

ZEE 001

GPS Location: 24,37192° S

30,92655° E

This site was located on the eastern side of the existing landing strip along the middle of the runway. The site is poorly defined on the surface and only the occurrence of a few ash concentrations as well as numerous potshards gives any indication of the locality of the site. After intensive investigations it seems that the site is located over an area of roughly 50m x 200m reaching from the edge of the existing runway 50m to the east and 200m along the length of the runway. It is quite likely that the construction of the existing airstrip could have contributed to damage to the site as well as causing heightened erosion from runoff from the compacted airstrip.

Several potshards (some with identifiable decoration) as well as several animal bones (eco-facts), upper and lower grinding stones as well as polishing stones were identified over the area of the site.

ZEE 002

GPS Location: 24,37021° S

30,91827° E

This site is located in the western section of the farm. A number of brick and concrete buildings as well as several concrete slabs are found over an area of approximately 50m x 100m. Although the buildings seem to be of different ages none of them showed indications of being more than 40 years old. None of the buildings are currently being inhabited on a permanent basis.

ZEE 003

GPS Location: 24° 21' 38" S

30° 56' 29" E

This is the location of the Happyland farm homestead. Three brick and cement buildings are located here with two of the structures being occupational and the third a shed. Several smaller structures are also scattered over the approximately 1ha area. The houses are all built in the classic late colonial style with wide veranda's and corrugated iron roofs.

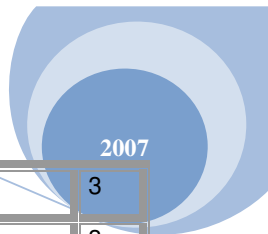
Resource Evaluation

Zandspruit Eco-Estate

ZEE 001

Preliminary investigation of the site and its attributes suggests that it falls within the Letaba Early Iron Age (EIA) sequence. This places the site within the sub-section of pre-contact sites. The following table, for the determination of site significance of pre-contact sites, will illustrate its relevant importance (as set out in the previous chapter);

Site significance characteristics slide scale (Pre-Contact Criteria)	
Scientific Significance	4



Public Significance	3
Ethnic Significance	3
Economic Significance	2
Total Score	12

This score (12) places the site within the category of Pre-contact sites with **high significance**. This signifies that the site scores both high in scientific as well as public importance and that it is worth protecting as there is much to be learned from this site. Although not unique it is rare and of significant scientific importance.

ZEE 002

This site is clearly from the recent history of the farm, <40 years of age which placed it within the post-contact phase but also places it outside the jurisdiction and protection of the National Heritage Resources Act.

Site significance characteristics slide scale (Post-Contact Criteria)	
Scientific Significance	0
Historic Significance	0
Public Significance	1
Other Significance	1
Ethnic Significance	0
Economic Significance	1
Total Score	3

This site has little or no significance in terms of cultural heritage and therefore does not warrant protection or mitigation.

ZEE 003

Interviews with several people gave a wide variety of estimates for the age of the buildings located here. Estimates vary from over 100 years to 60 years of age. It does however seem clear that these buildings are at least more than sixty years old (no physical proof of this could be found however). This places them under the protection of the National Heritage Resource Act (NHRA). The sites are also definitely from the post-contact phase;

Site significance characteristics slide scale (Post-Contact Criteria)	
Scientific Significance	1
Historic Significance	2
Public Significance	2
Other Significance	2
Ethnic Significance	1



Economic Significance	2
Total Score	10

This site therefore has moderate heritage significance and is protected under the NHRA. Should the developer decide to demolish these structures, a permit for destruction will have to be obtained from the SAHRA.

Impact Identification and Assessment

Zandspruit Eco-Estate

ZEE 001

Every type of development will have a different, detrimental effect on associated archaeological sites within the same area. For this reason it is important that we evaluate the specific effects that the proposed development will have on the identified site in order that decisions regarding mitigatory measures can be formulated accordingly.

The following table (as outlined in the previous chapter) will determine the total effect of the proposed development on the identified site. For the purpose of this evaluation we will take the construction of the new runway as the main threat to the site and will evaluate the activities associated with this.

Impact Effect	Score
Magnitude	3
Severity	4
Duration	2
Range	4
Frequency	1
Diversity	4
Cumulative effect	4
Rate of change	4
Total score:	26

Impact severity table

The evaluation of the anticipated impacts on the identified site falls within the category of **Total Destruction of the Site**. The construction of the new runway and its associated actions will lead directly to the obliteration of the site identified. Should any part of the site be left intact, the secondary effects of elevated erosion, human activity and increased vehicular activity will seriously endanger the remains of the site.

ZEE 002

Impact Effect	Score
Magnitude	3
Severity	3

Duration	2
Range	3
Frequency	1
Diversity	4
Cumulative effect	4
Rate of change	4
Total score:	24

Should the developer decide to demolish these structures, a permit will not be needed as they do not fall under the protection of the NHRA. Cognizance should however be taken of the possibility of unmarked graves in the area.

ZEE 003

Impact Effect	Score
Magnitude	3
Severity	4
Duration	2
Range	4
Frequency	1
Diversity	4
Cumulative effect	4
Rate of change	4
Total score:	26

This site falls within the scope of the protection offered by the NHRA and should the developer decide to demolish any of the structures thereupon a permit for destruction should first be obtained from SAHRA. The issuing of such a permit could be incumbent on mitigation work on the site. At the time of writing this report it was unclear if the developer intends demolishing these structures. Once again cognizance should be taken of the possibility of unmarked graves within the construction area.

Resource Management Recommendations

Zandspruit Eco-Estate

Due to the sensitive nature of the site identified at ZEE 001, combined with the destructive nature of the development proposed a second phase of investigation is recommended. This will entail the following action;

- A site visit with representatives of SAHRA Limpopo and if possible SAHRA National Office.
- Discussion of the relevance of the heritage practitioner's evaluation of the significance of the site.
- Discussions concerning the importance of the site versus the public benefit from the development.

- Determining the mitigatory measures that will be imposed by SAHRA for satisfactory mitigation of the site.
- Compilation of a report setting out the necessary steps for the client.
- Submission of report to client and SAHRA provincial.

The site at ZEE 002 does not entail a site of any heritage importance and provided care is taken of unmarked graves in the area, construction here can continue. It is recommended that the social consultant on the project tries to identify the previous occupants of these structures and determines if any unmarked graves are located in the vicinity.

The buildings at site at ZEE 003 are old enough to be classified as historic structures and enjoy protection from the NHRA. Should the developer decide to demolish, alter or remove any part of it from its original position, a permit will have to be obtained from SAHRA. It is the recommendation of AINP that these structures rather be incorporated within the development as a possible site museum for the site at ZEE 001. This will add to the historic significance of the development and give a unique angle on the areas history.

References Cited

1. Aldenderfer, Mark S., and Carolyn A. Hale-Pierce
1984 The Small-Scale Archaeological Survey Revisited. *American Archeology* 4(1):4-5.

2. Butler, William
1984 Cultural Resource Management: The No-Collection Strategy in Archaeology. *American Antiquity* 44(4):795-799.

3. Deacon, J. 1996. *Archaeology for Planners, Developers and Local Authorities*. National Monuments Council. Publication no. PO21E.

4. Deacon, J. 1997. *Report: Workshop on Standards for the Assessment of Significance and Research Priorities for Contract Archaeology*. In: Newsletter No. 49, Sept.1998. South African Association of Archaeology.

5. Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy
1984 *A Retrospective Assessment of Archaeological Survey Contracts In Massachusetts, 1970-1979*. Massachusetts Historical Commission, Survey and Planning Grant 1980. 3 volumes.

6. Dunnell, Robert C., and William S. Dancey
1983 The Siteless Survey: A Regional Scale Data Collection Strategy. In: *Advances in Archaeological Method and Theory* 6:267-287. M.B. Schiffer, ed.

7. Evers, T.M. 1983. *Oori or Moloko? The origins of the Sotho/Tswana on the evidence of the Iron Age of the Transvaal*. S. Afr. J. Sci. 79(7): 261-264.

8. Hall, M.1987. *The changing past: Farmers, kings and traders in Southern Africa, 200-1860*. Cape Town: David Phillip.

9. Hall, S.L. 1981. *Iron Age sequence and settlement in the Rooiberg, Thabazimbi area*. Unpublished MA thesis, University of the Witwatersrand.

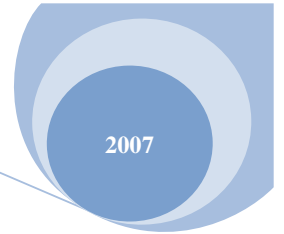
10. Huffman, T.N. 1989. "Zimbabwe ruins and Venda prehistory." *The Digging Stick*, 6(3), 11.

11. King, Thomas F.
1978 *The Archaeological Survey: Its Methods and Uses*. Interagency Archaeological Services, Department of the Interior, Washington, D.C.

12. Lightfoot, Kent G.
1989 A Defense of Shovel Test Sampling: A Reply to Shott. *American Antiquity* 54(2):413-416.

13. Maggs, T.M. O'C. 1976a. *Iron Age communities of the southern Highveld*. Pietermaritzburg: Natal Museum.

14. McManamon, F.P.
1984 Discovering Sites Unseen. In *Advances in Archaeological Method and Theory* 8:223-292, edited by



15. M.B. Schiffer, Academic Press, New York.
16. Miller, C. L., II 1989 Evaluating the Effectiveness of Archaeological Surveys. *Ontario Archaeology* 49:3-12.
17. Loubser, J.H.N. 1994. *Ndebele Archaeology of the Pietersburg Area*. Navors. Nas. Mus., Bloemfontein. Volume 10, Part 2: 62-147.
18. Pistorius, J.C.C. 1992. *Molokwane, an Iron Age Bakwena Village*. Johannesburg: Perskor Printers.
19. Schiffer, Michael B., Alan P. Sullivan, and Timothy C. Klinger
1978 The Design of Archaeological Surveys. *World Archaeology* 10:1-28.
20. Smith, L.D. 1977 *Archeological Sampling Procedures For Large Land Areas: A Statistically Based Approach*. USDA Forest Service, Albuquerque.
21. Stayt, H. 1931. *The Bavenda*. London: Oxford University Press.
22. Zubrow, Ezra B.A. 1984 Small-Scale Surveys: A Problem For Quality Control. *American Archeology* 4(1):16-27.



2007

APPENDIX A

PHOTOGRAPHS



Photo 1. Surface of site ZEE 001.



Photo 2. Artefacts recovered from site ZEE 001



Photo 3. Dilapidated structures at sit ZEE 002



Photo 4. One of the occupational structures at ZEE 003

APPENDIX B

Pre-Contact Criteria

Scientific Significance

(a) Does the site contain evidence which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms
- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

(b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

(c) Does the site contain evidence which can make important contributions to paleoenvironmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

(d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

Public Significance

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site
- technical and economic feasibility of restoration and development for public use
- visibility of cultural features and their ability to be easily interpreted
- accessibility to the public
- opportunities for protection against vandalism
- representativeness and uniqueness of the site

- aesthetics of the local setting
- proximity to established recreation areas
- present and potential land use
- land ownership and administration
- legal and jurisdictional status
- local community attitude toward development

(b) Does the site receive visitation or use by tourists, local residents or school groups?

Ethnic Significance

(a) Does the site presently have traditional, social or religious importance to a particular group or community?

- ethnographic or ethno-historic reference
- documented local community recognition or, and concern for, the site

Economic Significance

(a) What value of user-benefits may be placed on the site?

- visitors' willingness-to-pay
- visitors' travel costs

APPENDIX C

Post-Contact Criteria

Scientific Significance

- (a) Does the site contain evidence which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?
- (b) Does the site contain evidence which can make important contributions to other scientific disciplines or industry?

Historic Significance

- (a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?
- (b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?
- (c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?
- (d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

Public Significance

- (a) Does the site have potential for public use in an interpretive, educational or recreational capacity?
 - visibility and accessibility to the public
 - ability of the site to be easily interpreted
 - opportunities for protection against vandalism
 - economic and engineering feasibility of reconstruction, restoration and maintenance
 - representativeness and uniqueness of the site
 - proximity to established recreation areas
 - compatibility with surrounding zoning regulations or land use
 - land ownership and administration
 - local community attitude toward site preservation, development or destruction
 - present use of site
- (b) Does the site receive visitation or use by tourists, local residents or school groups?

Ethnic Significance

- (a) Does the site presently have traditional, social or religious importance to a particular group or community?

Economic Significance

- (a) What value of user-benefits may be placed on the site?
 - visitors' willingness-to-pay
 - visitors' travel costs
 - Integrity and Condition
- (a) Does the site occupy its original location?
- (b) Has the site undergone structural alterations? If so, to what degree has the site maintained its original structure?

- (c) Does the original site retain most of its original materials?
- (d) Has the site been disturbed by either natural or artificial means?

Other

- (a) Is the site a commonly acknowledged landmark?
- (b) Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
- (c) Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
- (d) Is the site representative of a particular architectural style or pattern?

APPENDIX D

Indicators for Assessing Impact

Magnitude

The amount of physical alteration or destruction which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity

The irreversibility of an impact. Adverse impacts which result in a totally irreversible and irretrievable loss of heritage value are of the highest severity.

Duration

The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range

The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency

The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or ongoing nature.

Diversity

The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect

A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change

The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

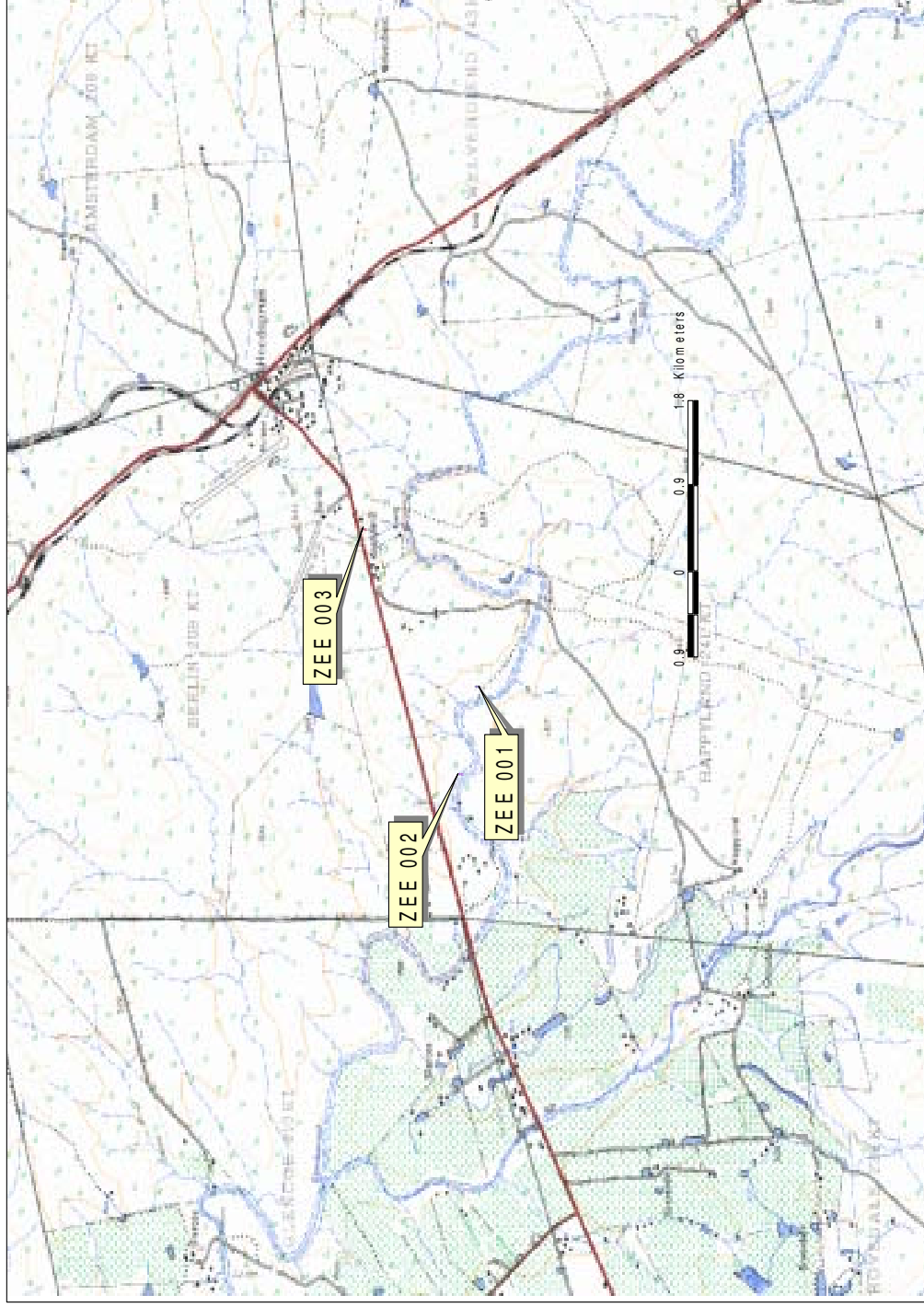
APPENDIX E

Location Maps



Aerial Photograph of Proposed Site for Development

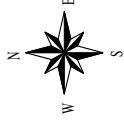
Proposed Zandspruit Estates



24 August 2007

Compiled by AINP
Compiled for
Triviron
EAP (Pty) Ltd.

1:50 000 Topo Map
Reference: 2430 DA



Compiled using
ArcView GIS 3.2 a



AINP
GIS by S. Gaigher

APPENDIX 7: COPIES OF COMMENTS RECEIVED FROM REGISTERED I&APS

Pieter De Lange

From: Rudolph Jansen [rjansen@lhr.org.za]
Sent: 02 August 2007 03:15 PM
To: pieter@triviron.co.za; nicholas@triviron.co.za
Cc: paul@lhr.org.za
Subject: Zandspruit Estates - Happyland241 KT - Hoedspruit

Dear sirs

We act for the Moletele Land Claimants, as represented by the Chair of their Land Claims Committee, Mr Thandios Mashile. We also act for the traditional chief of this community, Nk Luxon Abuti Chiloane.

They wish to be registered as Interested and Affected parties in the above proposed development as advertised 20 July 2007 in the local newspaper of Hoedspruit.

The land earmarked for the development is subject to a land claim as proclaimed in GG 26663, notice 1665 of 2004 and GG27470, notice 536 of 2005.

The land cannot be developed without the requisite notices being given to the Land Claims Commission.

You can use our physical address at IDASA Democracy Centre, 357 Visagie Street, Pretoria as physical and postal address, or you can communicate with us via the fax number given below or my email below or the email of Mr Paul Slabbert, being paul@lhr.org.za

You can quote myself or Mr Slabbert as reference

Yours sincerely

Rudolph Jansen
National Director
Lawyers for Human Rights
rjansen@lhr.org.za
Tel: 27-12-320 2943
Fax: 27-12-320 7681
Cell: 27-83-264 8029

No virus found in this incoming message.

Checked by AVG Free Edition.

Version: 7.5.476 / Virus Database: 269.11.6/938 - Release Date: 2007/08/05 04:16 PM

PRETORIA LAW CLINIC

Kutlwanong Democracy Centre

357 Visagie Street (corner Prinsloo)
Pretoria 0002, SOUTH AFRICA

Tel: +27 (0) 12 320 2943/5

Fax: +27 (0) 12 320 7681

E-mail: rjansen@lhr.org.za

Website: <http://www.lhr.org.za>



LAWYERS FOR HUMAN RIGHTS

NPO Registration No: 027-928-NPO

8 August 2007

Mr P. de Lange / Mr N. Arnott
Triviron EAP (Pty.) Ltd.

PER FAX: (012) 367 0624
(1 PAGE)

Dear Sirs;

ZANDSPRUIT ESTATES: HAPPY LAND NO241 KT, DISTRICT HOEDSPRUIT

The above development and the newspaper advertisement of 20 July 2007 refers.

Our Law Clinic acts for the Moletale Land Claims Committee as well as the Chief of the Moletale Community, Chief Luxon Chilcane.

The land on which the proposed development is to take place, is subject to a land claim instituted by our clients.

For this reason they have a very material interest in the matter and wish to be registered as interested and affected parties.

Kindly register them accordingly per our above address details.

You can correspond with us by fax or by e-mail: rjansen@lhr.org.za, or paul@lhr.org.za. The reference will be myself or Paul Slabbert.

Yours sincerely,

ADV C.R. JANSEN
NATIONAL DIRECTOR

Yolanda Bothma

From: Ockie Struwig [ostruwig@telkomsa.net]
Sent: 20 August 2007 10:00 AM
To: nicolas@triviron.co.za
Cc: admin@triviron.co.za
Subject: Happyland-Zandspruit-Triviron.doc



Die Gereformeerde Kerk Hoedspruit

Posbus 594
HOEDSPRUIT
1380

Predikant: Ds. Ockie Struwig
Tel/faks: 015-793 2406
ostruwig@telkomsa.net

20 Augustus 2007

Triviron EAP (Pty) Ltd
Posbus 177
WOODLANDS
0072

Tel: (012) 367 0625
Faks: (012) 367 0624
nicolas@triviron.co.za
admin@triviron.co.za

Is. Ontwikkeling op die restant van die plaas Happyland no. 241-KT: Zandspruit Estates

As geregistreerde "I&AP" wil ons graag die volgende onder u aandag bring om op te neem in die omgewingsimpakstudie. Hierdie sake is na ons mening van kardinale belang en vereis hoë prioriteit.

1. Estetika

- Met die plasing van 136 "Beginner stands" op die grens van die kerk erf, en die bou van kleiner en groter wooneenhede, gaan die uitsig na die Drakensberge (Mariepskop) totaal en al geskend word.
- Hierdie uitsig was onverhinderd tot op datum.
- Hierdie uitsig het 'n groot impak het op die estetiese waarde van die kerk eiendom wat uit die aard van die saak ook die markwaarde van die eiendom beïnvloed.
 - Ons maak dus beswaar teen die plasing van die "beginner stands" direk teen die kerk se heining.
 - Ons maak die voorstel dat daar 'n ongereguleerde natuurlike buffer zone van ten minste 70meter gehandhaaf word aan teen alle grense van die kerk se erf.
 - Aangesien die topografie van so aard is dat die landskap dalend is, weg van die kerk af, behoort so 'n zone die estetiese uitsig te beskerm.

2. Privaatheid

- Met die plasing van 136 "Beginner stands" op die grens van die kerk erf, en die bou van kleiner en groter wooneenhede, gaan die privaatheid van die inwoners van die pastorie van die Gereformeerde Kerk Hoedspruit totaal en al geskend word.
- Hierdie privaatheid was nog altyd in takt aangesien die plaas Happyland No. 241, tot op datum privaat grond was en daar geen menslike aktiwiteite teenaan of naby die pastorie woning was nie.
 - Ons maak dus beswaar teen die plasing van die "beginner stands" direk teen die kerk se heining.
 - Ons maak die voorstel dat daar 'n *ongerepte natuurlike buffer zone* van ten minste 70meter gehandhaaf word aan teen alle grense van die kerk se erf.
 - Aangesien die topografie van so aard is dat die landskap dalend is, weg van die kerk af, behoort so 'n zone die privaatheid te beskerm.
 - Ons maak verder die voorstel dat daar 'n soliede muur opgerig word op die buffer zone, naaste aan die nuwe wooneenhede, om ook 'n klank buffer te skep sodat geraas nie die privaatheid verder versteur nie.

3. Voertuig verkeer

- Soos met enige ontwikkeling verhoog die voertuig verkeer noodwendig ook.
- Ons dring dus daarop aan dat die baie gevaarlike T-aansluiting tussen Drakensig en die Hoedspruit-Orghstad pad omskep word in 'n *uitgerekte "drie-rigting-stop"*, sodat die verkeer wat die kerkgronde verlaat met veiligheid by die pad kan aansluit.
 - Inbegrepe by die drie-rigting-stop is ook nuwe "rumblestrips" sodat die verkeer van 120km/h afgebring kan word na 60km/h.

4. Sekuriteit

Ons dring daarop aan dat alle nodige maatskappelijke voorsorgmaatreëls getref en met ons as I&AP gekommunikeer word om die sekuriteitsrisiko tydens die ontwikkeling van die Zandspruit Estate tot die minimum te beperk.

Die pastorie woning word daagliks besoek, die predikant beweeg in en uit gedurende die dag en nag en daarom kan hierdie ontwikkeling 'n groot impak op die sekuriteit van die predikant en sy gesin hê.

Hierdie sake is voorlopig al. Ons behou hiermee die reg om indien nodig nog sake onder u aandag te bring solank as wat die kanale daarvoor bestaan.

Met dank

Ockie Struwig (VDM)

From the desk of Flip SMIT

Maruleng Ward Council 11

Fax coversheet

For attention: Mr. P de Lange
Company: Triviron EAP (Pty) Ltd
Fax no.: 012 367 0624

From: Flip Smit
Fax no: 0866697834

Date: 24 October 2007
Number of pages: 2.
(incl. cover)

Philippus Smit
Postbus 446, Plaza Jonkerspruit,
Hoedspruit,
0380, South Africa
Telephone h +27 (0) 15 7955 011
Facsimile h +27 (0) 866697834
Mobile: +27 (0) 82 62 06225
Facsimile w +27 (0) 15 7955 010

HAPPYLANDS - HOEDSPRUIT - Ref: 16/1/7/2 - M22.

Dear Sir

Please find attached my comments on the scoping document. I am responding as a committee member of Maruleng Municipality - Ward Council 11.

As we have never provided input into such a document, I apologise in advance if my comments or requests are not that clear.

Comments/Questions:

- I think in general this seems to be an excellent development, providing something unique and also catering for first time buyers, which surely has huge problems being able to find reasonably priced accommodation in Hoedspruit.
- Retail & Commercial. I see mention is made of retail centre. My question relate to the fact that Hoedspruit currently has an over supply of retail space (the Pick and Pay centre have many empty shops). I am not privy to data on growth in Hoedspruit, nor the development plan in Hoedspruit. So the questions relates to these two facts :
 - On what data or assumptions do you work that support that there will be a demand for retail and commercial space in Hoedspruit for this development
 - What are currently the oversupply situation of retail and commercial space in Hoedspruit (total retail space vs. are rented)
- Specify motivation. There are a few comments made about being able to make available certain community projects to the municipality. However, these are just suggestions and not fixed. If possible, I request that a firm offer be made, for consideration by the relevant authorities for a certain period of time. So, for instance, in stead of indicating that there is a potential for making land available for a fire station, specify

Indien die lewer nie die gespesifiseerde ontvangs van die konfidensiële faksimile is nie, word u hieroor inligting die enige verspreiding of kopieëring van hierdie kommunikasie streng beperk word. Indien u nie die gespesifiseerde ontvangs is nie, kan want ons aansluiting onmiddellik per telefoon. Hierdie klousure.

REGISTRATION & COMMENT FORM

PROPOSED RESIDENTIAL/COMMERCIAL/RETAIL DEVELOPMENT: SITUATED ON THE REMAINDER OF THE FARM
 HAPPYLAND NO. 241-KT: ZANDSPRUIT ESTATES
 LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM'S REFERENCE NO.:
 16/1/02-M22

PLEASE COMPLETE AND RETURN THIS FORM SO THAT TRIVIRON EAP (PTY) LTD MAY HAVE YOUR FULL
 CONTACT DETAILS FOR OUR INTERESTED & AFFECTED PARTIES (I&AP) DATABASE

CLOSING DATE FOR COMMENTS: 30 AUGUST 2007

TO: TRIVIRON EAP (PTY) LTD

FAX: 012 367 0624

DATE:

Full Name:

Representing:

Position:

Physical address:

Postal address:

Postal code:

Telephone:

E-mail:

JACQUELINE PRESTON

OWNER

288 RAPTORS VIEW

HOEDSPRUIT

P.O. Box 1571

HOEDSPRUIT

1380

015-743-0032

prestonj@iafrica.com

Cell:

083-540-9274

Fax:

086-512-8890

COMMENTS (Comments can also be supplemented by any other written submission)

MY PROPERTY ON RAPTORS VIEW FACES TOWARDS
 THE PROPOSED DEVELOPMENT
 PLEASE KEEP ME UPDATED ON ISSUES WHICH
 WILL AFFECT MY RIGHTS TO PRIVACY / LIGHT
 POLLUTION ETC.

OTHER I&APs YOU FEEL WE SHOULD CONTACT (Please indicate name and relevant contact details)

NAME	TEL	FAX	EMAIL

ENVIRONMENTAL CONSULTANT CONTACT DETAILS

Triviron EAP (Pty) Ltd
 P.O. Box 177
 WOODLANDS
 0072

Tel: (012) 367 0625
 Fax: (012) 367 0624
 Email: nicholas@triviron.co.za /
 sam@triviron.co.za



REGISTRATION & COMMENT FORM

PROPOSED RESIDENTIAL/COMMERCIAL/RETAIL DEVELOPMENT: SITUATED ON THE REMAINDER OF THE FARM
HAPPYLAND NO. 241-KT: ZANDSPRUIT ESTATES
LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM'S REFERENCE NO:
16/17/2-M22

PLEASE COMPLETE AND RETURN THIS FORM SO THAT TRIVIRON EAP (PTY) LTD MAY HAVE YOUR FULL
CONTACT DETAILS FOR OUR INTERESTED & AFFECTED PARTIES (I&AP) DATABASE

CLOSING DATE FOR COMMENTS: 20 AUGUST 2007

TO: TRIVIRON EAP (PTY) LTD	FAX: 012 367 0624	DATE:
----------------------------	-------------------	-------

Full Name:	MASHILE THANDLOS		
Representing:	MOLETELE COMMUNAL PROPERTY ASSOCIATION		
Position:	CHAIRPERSON		
Physical address:	BUFFELSHOEK VILLAGE, ALERHOCK 1360		
Postal address:	BOX 1476		
	ALCORN HOCK		
Postal code:	1360	Cell:	0827403797
Telephone:	015 795 0159	Fax:	015 793 1689
E-mail:	mashile2t@yahoo.com		

COMMENTS (Comments can also be supplemented by any other written submission)

I STRONGLY OBJECT/COPSE THE DEVELOPMENTS ON
THE FARM. THIS FARM IS PRESENTLY IN THE LAND
COURT AS THE PREVIOUS OWNER DISPUTED OUR CLAIM
ON IT. IT CAN NOT BE DEVELOPED UNTIL THE LAND
COURT CLEARS IT UP. OUR CLAIM ON IT STILL
STANDS. WE WERE EVEN NOT CONSULTED
THE LAND COURT WILL GIVE DIRECTION

OTHER I&APs YOU FEEL WE SHOULD CONTACT (Please indicate name and relevant contact details)

NAME	TEL	FAX	EMAIL
ADV R JANSEN	083 264 829		
N. MOKONO	015 287 0800	015 237 0811	

ENVIRONMENTAL CONSULTANT CONTACT DETAILS

Triviron EAP (Pty) Ltd
P.O. Box 177
WOODLANDS
0072

Tel: 012 367 0625
Fax: 012 367 0624
Email: nicholas@triviron.co.za /
admin@triviron.co.za



REGISTRATION & COMMENT FORM

PROPOSED RESIDENTIAL/COMMERCIAL/RETAIL DEVELOPMENT: SITUATED ON THE REMAINDER OF THE FARM
 HAPPYLAND NO. 241-KT: ZANDSPRUIT ESTATES
 LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM'S REFERENCE NO.
 15/1/7/2-M22

PLEASE COMPLETE AND RETURN THIS FORM SO THAT TRIVIRON EAP (PTY) LTD MAY HAVE YOUR FULL
 CONTACT DETAILS FOR OUR INTERESTED & AFFECTED PARTIES (I&AP) DATABASE

CLOSING DATE FOR COMMENTS: 20 AUGUST 2007

TO: TRIVIRON EAP (PTY) LTD FAX: 012 357 0824 DATE: 2/8/2007

Full Name:

Representing:

Position:

Physical address:

Postal address:

Postal code:

Telephone:

E-mail:

FRED BERNARD

FARM GLENCOE ZANDSPRUIT

BOX 1091
 ZANDSPRUIT
 1380

Cell:

Fax:

0835644177

COMMENTS (Comments can also be supplemented by any other written submission)

I have an interest in the
 land adjacent to the proposed
 development, and would like
 to be informed of progress
 and developments in the project

OTHER I&APs YOU FEEL WE SHOULD CONTACT (Please indicate name and relevant contact details)

NAME:

TEL:

FAX:

EMAIL:

ENVIRONMENTAL CONSULTANT CONTACT DETAILS

Triviron EAP (Pty) Ltd

P.O. Box 177

WOODLANDS

0072

Tel: (012) 367 0625

Fax: (012) 367 0624

Email: nicholas@triviron.co.za /
 admin@triviron.co.za



REGISTRATION & COMMENT FORM

PROPOSED RESIDENTIAL/COMMERCIAL/RETAIL DEVELOPMENT: SITUATED ON THE REMAINDER OF THE FARM
HAPPYLAND NO. 241-KT: ZANDSPRUIT ESTATES
LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM'S REFERENCE NO.:
18/1702-M22

PLEASE COMPLETE AND RETURN THIS FORM SO THAT TRIVIRON EAP (PTY) LTD MAY HAVE YOUR FULL
CONTACT DETAILS FOR OUR INTERESTED & AFFECTED PARTIES (I&AP) DATABASE

CLOSING DATE FOR COMMENTS: 20 AUGUST 2007

TO: TRIVIRON EAP (PTY) LTD

FAX: 012 367 0624

DATE: 17-08-2007

Full Name:

Representing

Position:

Physical address:

Postal address:

Postal code:

Telephone:

E-mail:

FRANK RIJNDERS

WELVERDIEND HOME OWNERS ASSOCIATION

BOARD OF DIRECTORS

WELVERDIEND GAME RESERVE

STAND 5 HOEDSPRUIT, 1380

P.O. BOX 1930

HOEDSPRUIT

1380

See cell

Cell:

072 4348459

Fax:

0866162865

frabar@radioactivewifi.co.za

COMMENTS (Comments can also be supplemented by any other written submission)

OTHER I&APs YOU FEEL WE SHOULD CONTACT (Please indicate name and relevant contact details)

NAME	TEL	FAX	EMAIL

ENVIRONMENTAL CONSULTANT CONTACT DETAILS

Triviron EAP (Pty) Ltd
P.O. Box 177
WOODLANDS
0072

Tel: 012 367 0625
Fax: 012 367 0624
Email: nicholas@triviron.co.za /
admin@triviron.co.za



C.F. RIJNDERS

REGISTRATION & COMMENT FORM

PROPOSED RESIDENTIAL/COMMERCIAL/RETAIL DEVELOPMENT: SITUATED ON THE REMAINDER OF THE FARM
HAPPYLAND NO. 241-KT: ZANDSPRUIT ESTATES

LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM'S REFERENCE NO.:
16/17/2-422

PLEASE COMPLETE AND RETURN THIS FORM SO THAT TRIVIRON EAP (PTY) LTD MAY HAVE YOUR FULL
CONTACT DETAILS FOR OUR INTERESTED & AFFECTED PARTIES (I&AP) DATABASE

CLOSING DATE FOR COMMENTS: 20 AUGUST 2007

TO: TRIVIRON EAP (PTY) LTD

FAX: 012 367 0624

DATE:

Full Name:

Representing:

Position:

Physical address:

Postal address:

Postal code:

Telephone:

E-mail:

STANLEY WATT
RAITORS VIEU HOME OWNERS ASSOCIATION
FINANCE DIRECTOR
UNIT 18 MAROELA PARK
55 KARDOE STREET HOEDSPRUIT
P O Box 1502
HOEDSPRUIT
1380
015 793 0267
Cell: 083 268 6687
Fax: 0866 840 514
rvbca@nwcc.co.za

COMMENTS (Comments can also be supplemented by any other written submissions)

OTHER I&APs YOU FEEL WE SHOULD CONTACT (Please indicate name and relevant contact details)

NAME	TEL	FAX	EMAIL

ENVIRONMENTAL CONSULTANT CONTACT DETAILS

Triviron EAP (Pty) Ltd
P.O. Box 177
WOODLANDS
0072

Tel: (012) 367 0625
Fax: (012) 367 0624
Email: nicholas@triviron.co.za /
admin@triviron.co.za



PLEASE CONFIRM RECEIPT OF REG FORM
VIA EMAIL OR FAX. THANK YOU

Nicholas Arnott

From: Nicholas Arnott [nicholas@triviron.co.za]
Sent: 19 September 2007 13:51
To: 'mapeki@ananzi.co.za'; 'mathebulab@mopani.org.za'; 'tim@mopani.gov.za';
 'bestbiere@caa.co.za'; 'boshieop@ldrt.gov.za'; 'vnetshlavha@lp.sahra.org.za';
 'rvhoa@mweb.co.za'; 'riansen@lhr.org.za'; 'mashilezt@yahoo.com'; 'prestone@iafrica.com';
 'frabar@radioactivewifi.co.za'; 'ostruwig@telkomsa.net'
Cc: 'pieter@triviron.co.za'
Subject: EIA: Proposed Development of Zandspruit Estates on the Remainder of the Farm Happyland
 241-KT (Reference Number: 16/1/7/2-M22)

19 September 2007

Dear Interested and Affected Party,

**RE: ENVIRONMENTAL IMPACT ASSESSMENT: PROPOSED DEVELOPMENT OF ZANDSPRUIT ESTATES ON THE
 REMAINDER OF THE FARM HAPPYLAND 241-KT: HOEDSPRUIT; MARULENG LOCAL MUNICIPALITY
 WITHIN MOPANI DISTRICT MUNICIPALITY, LIMPOPO PROVINCE (REFERENCE NUMBER: 16/1/7/2-M22)**

We are pleased to report that, since our previous correspondence, much progress has been made on the Environmental Impact Assessment (EIA) process for the proposed Zandspruit Estates development. The relevant baseline specialist investigations have been completed and the Draft Environmental Impact Report have been completed. This letters serves to advise you of the next steps in the EIA process.

The Draft Scoping Report contains a description of the proposed activity and identified alternatives, a description of the baseline characteristics off the affected environment and details regarding the potential environmental effects that the proposed project will have on the environment, as well as potential effects of the environment on the proposed project. The report is now available for comment by stakeholders.

A period of 30 days, from **21 September 2007 to 22 October 2007** is available for public comment on this Draft Scoping Report. Thereafter the report will be updated and submitted for consideration to and a decision by the competent authority of the EIA, the Limpopo Department of Economic Development, Environment & Tourism (LDEDET). LDEDET will review the information contained in the Scoping Report and either instruct Triviron EAP (Pty) Ltd to continue with the Environmental Impact Assessment or submit additional information to the Department.

Your comment on the Draft Scoping Report is valued and may be submitted by writing a letter, by email, by facsimile or any other additional written submissions. The Draft Scoping Report will be available electronically from the office's of Triviron EAP (Pty) Ltd, should you wish to request a copy. In addition a printed copy is also available for your review at the following public places:

Offices of Triviron EAP (Pty) Ltd	PDC 120 ELAND STREET HOEDSPRUIT 1380
Offices of Sugar Creek Trading 33 (Pty) Ltd	Suite 3 Khayagelo Village Hoedspruit
Maruleng Municipality	64 Springbok Street Hoedspruit 1380

Comments on the Draft Scoping Report can be submitted to:

TRIVIRON EAP (PTY) LTD.

2007/11/05

Contact Persons: Mr. P De Lange / Mr. N Arnott / Ms. Y Bothma

P.O. Box 177

WOODLANDS

0072

Tel: (012) 367 0625 Fax: (012) 367 0624

e-mail: pieter@triviron.co.za, nicholas@triviron.co.za, admin@triviron.co.za

In closing, the Environmental Impact Assessment Team would like to express its sincere thanks and appreciation to all stakeholders that have registered as Interested and Affected Parties, attended meetings and provide input and comments by other means. Please contact Triviron EAP (Pty) Ltd if you require any further information at this stage.

Yours Sincerely

Nicholas Arnott



TRIVIRON EAP (Pty) Ltd.

Tel +27 (0)12 367 0625

Fax +27 (0)12 367 0624

Email nicholas@triviron.co.za

Mobile 072 375 4809

Environmental Assessment Practitioners

P.O. Box 177

WOODLANDS

0072

Reg. No. (2506/007050/07)

APPENDIX 8: ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENTAL MANAGEMENT PLAN

**PROPOSED DEVELOPMENT OF ZANDSPRUIT ESTATES ON THE
REMAINDER OF THE FARM HAPPYLAND 241-KT: HOEDSPRUIT; MARULENG
LOCAL MUNICIPALITY WITHIN MOPANI DISTRICT MUNICIPALITY, LIMPOPO
PROVINCE**

LIMPOPO PROVINCIAL GOVERNMENT DEPT. OF ECONOMIC DEVELOPMENT,
ENVIRONMENT & TOURISM: REFERENCE NUMBER: 16/1/7/2-M22

Prepared on behalf of

THE APPLICANT: SUGAR CREEK TRADING 33 (PTY) LTD T/ZANDSPRUIT ESTATES

P.O. Box 1018
HOEDSPRUIT
1380

Tel: (015) 793 1421
Fax: (015) 793 0363

For review and approval by

LIMPOPO DEPT. OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

Private Bag X9484
POLOKWANE
0700

Tel: (015) 291 4347
Fax: (015) 295 5015

MARCH 2008

A Report Compiled By

TRIVIRON EAP (PTY) LTD

P.O. Box 177
WOODLANDS
0072

Tel: (012) 367 0625
Fax: (012) 367 0624
E-mail: pieter@triviron.co.za



triviron
ENVIRONMENTAL

tel: (012) 367 0625
fax: (012) 367 0624

e-mail:

kim@triviron.co.za
pieter@triviron.co.za

P.O. Box 177
WOODLANDS
0072

Studio 4
Open Window Art Academy
410 Rigel Avenue
Erasmusrand
0181

Environmental
Management

Landscape
Architecture

Directors:

K.M.C Read BL (Pret)
P. De Lange BL (Pret)
Pr. LArch

**Triviron EAP
(Pty)Ltd. Reg. No.
2006/007050/07**

TABLE OF CONTENTS

TABLE OF CONTENTS.....	I
LIST OF TABLES	II
LIST OF ABBREVIATIONS.....	II
1. INTRODUCTION	1
1.1 Legislative Requirements.....	1
1.2 Aspects of Activity Covered in EMP	2
1.3 Objectives of the EMP	3
2. ROLES AND RESPONSIBILITIES	3
2.1 Developer	3
2.2 Environmental Consultant	4
2.3 Contractor	4
2.4 Environmental Control Officer (ECO).....	5
2.5 Environmental Liaison Officer (ELO).....	5
2.6 Competent Authority	5
3. ENVIRONMENTAL MANAGEMENT PLAN	6
3.1 Failure to comply with the EMP	6
3.2 Planning Phase EMP	7
3.3 Pre-Construction EMP.....	9
3.4 Construction Phase EMP	13
ANNEXURE 1: DECLARATION OF UNDERSTANDING - DEVELOPER.....	27
ANNEXURE 2: DECLARATION OF UNDERSTANDING - CONTRACTOR.....	28
ANNEXURE 3: PRO FORMA: PROTECTION OF THE ENVIRONMENT.....	29

LIST OF TABLES

Table 1: Details of the Environmental Assessment Practitioner	2
Table 2: Key of Responsible Parties relevant to EMP implementation	6

LIST OF ABBREVIATIONS

EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
ELO	Environmental Liaison Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EM	Environmental Manager
EMP	Environmental Management Plan - A plan or programme that seeks to achieve a required end state and describes how activities that have or could have an adverse impact on the environment, will be mitigated, controlled, and monitored.
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
NEMA	National Environmental Management Act (Act 107 of 1998), as amended
PM	Project Manager

1. INTRODUCTION

Triviron EAP (Pty) Ltd. was appointed by Sugar Creek Trading 33 (Pty) Ltd t/a Zandspruit Estates (the Applicant) as the independent Environmental Assessment Practitioners (EAPs), in accordance to Regulation 17 of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 199), to manage an application for environmental authorisation (subject to a Scoping process and Environmental Impact Assessment (EIA) in terms of the Environmental Impact Assessment Regulations - Government Notice No. R.385 of 21 April 2006) for the proposed establishment of Zandspruit Estates on the Remainder of the Farm Happyland No. 241-KT.

This Draft Environmental Management Plan (EMP) has been compiled as the culmination of the findings and conclusions of the Environmental Impact Assessment (EIA) that was undertaken by Triviron EAP (Pty) Ltd. The EMP aims to address the potential environmental impacts of the construction and operational phases of the proposed Zandspruit Estate that were identified in the Environmental Impact Report (EIR). This is done by including the mitigation, control and monitoring measures suggested by:

- the specialist consultants involved in the EIA;
- the professional consultant team responsible for planning the proposed development; and
- input received from interested and affected parties (I&APs) and other relevant stakeholders involved during the EIA process.

In addition to the above, generic EMP items relevant to the construction phase of a development of this nature were also incorporated. The EMP serves as a stand-alone document to be disseminated to and used by contractors, managers, operators and others involved in the construction and/or operational phases of the development.

1.1 Legislative Requirements

Regulation 34 of the Environmental Impact Assessment Regulations (Government Notice R. 385 of 21 April 2006) promulgated in terms of chapter 5 of the National Environmental Management Act (NEMA) (Act 107 of 1998) specifies the content of draft environmental management plans. This draft EMP has been compiled in accordance with these requirements, as well as incorporating the principles of Integrated Environmental Management (IEM) as set out in NEMA.

As per the requirements of NEMA and the Environmental Impact Assessment Regulations, 2006 the following information is pertinent with regards to the Environmental Assessment Practitioner (EAP) that has compiled this draft EMP for the proposed development:

Table 1: Details of the Environmental Assessment Practitioner

Environmental Assessment Practitioner	Triviron EAP (Pty) Ltd.
Contact Person	Mr P. De Lange
Physical Address	Studio 4A, Open Window Art Academy 410 Rigel Avenue Erasmustrand
Postal Address	P.O. Box 177, Woodlands
Postal code	0072
Telephone	(012) 367 0625
Fax	(012) 367 0624
E-Mail	pieter@triviron.co.za / nicholas@triviron.co.za
EAP Qualifications & Relevant Experience	Mr. P. De Lange BL(Pret) Pr. LArch, Registered Professional Landscape Architect with the South African Council for the Landscape Architectural Profession (SACLAP) Member Number 20124 with 14 years of experience in Environmental Management. Mr. N. Arnott B.Sc (Hons) Environmental & Geographical Sciences

1.2 Aspects of Activity Covered in EMP

Due regard must be given to environmental protection during the entire project. In order to achieve this, a number of aspects of the proposed activity are covered in the EMP to ensure that the developer maintains adequate control over the project in order to:

- Minimise the extent of impact during construction;
- Ensure appropriate restoration of areas affected by construction; and
- Prevent long-term environmental degradation during operation.

The aspects of the proposed activity that are covered in the EMP include contractor crew camps and lay down areas, visual impacts, air, ground and water pollution, potential impacts on fauna and flora, waste management, social impacts, impacts on cultural-historical resources, safety and security, and operation.

1.3 Objectives of the EMP

The objective of the EMP is to reduce or mitigate environmental consequences resulting from the construction and operation of the Zandspruit Estate, to limit impacts as far as possible and to take all necessary steps to ensure that:

- Appropriate pollution control and other environmental protection measures are taken, in accordance with all applicable laws and regulations;
- The degree of impact on the environment should be such that the environment is not degraded beyond current environmental conditions;
- Rehabilitation and protection of the natural environment will be secured during the construction and operational phases of the project; and
- Social environmental conditions will be addressed, to make sure that the minimal negative impacts are associated with the life cycles of the project.

The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactory prevented or mitigated, corrective action will have to be taken. The document should, therefore, be seen as a guideline that will assist in minimising the potential environmental impact of activities.

- **Definition of mitigation measures**

Mitigation seeks to find better ways of doing things, by the implementation of practical measures to reduce, limit, and eliminate adverse impacts or enhance project benefits and protect public and individual rights.

2. ROLES AND RESPONSIBILITIES

Compliance with the EMP must be regarded as the overall objective to ensure environmental protection during construction and operation of the proposed development. Therefore supervision and monitoring are fundamental to the successful implementation of an EMP. In light of this, to facilitate implementation and monitoring of, and compliance with all the EMP items listed, the following roles and responsibilities are applicable:

2.1 Developer

The developer remains ultimately responsible for ensuring that the development is implemented according to the requirements of the EMP. Although the developer appoints specific role players to perform functions on his/her behalf, this responsibility is delegated. The developer is responsible for ensuring that sufficient resources (time, financial, human, equipment, etc.) are available to the other role players (e.g. the ECO, ELO and contractor) to efficiently perform their tasks in terms of the EMP. The developer is liable for restoring the environment in the event of negligence leading to damage to the environment. The developer must ensure that the EMP is included in the tender documentation so that the contractor who is appointed is bound to the conditions of the EMP.

In addition to the above, the developer must:

- Undertake to ensure overall compliance with all conditions specified by the competent authority, and all items of the EMP;
- Will be required to sign the **Declaration of Understanding** - Attached as Annexure 1 to the EMP;
- Must ensure that the EMP is included in the tender documentation so that the Contractor who is appointed is bound to the conditions of the EMP;
- Liable for restoring the environment in the event of negligence by the Contractor, leading to damage to the environment; and
- Appoint an Environmental Control Officer (ECO) to oversee the implementation of the EMP.

2.2 Environmental Consultant

The appointed environmental consultant must compile/revise the EMP, as necessary, to the satisfaction of the competent authority so as to facilitate the approval of the EMP by the competent authority. Copies of the EMP must be provided to all parties concerned so as to facilitate availability of EMP at the offices of the Contractor and on site.

2.3 Contractor

The contractor, as the developer's agent on site, is bound to the EMP conditions through his/her contract with the developer, and is responsible for ensuring that he adheres to all the conditions of the EMP. The contractor must thoroughly familiarise him/herself with the EMP requirements before construction begins and must request clarification on any aspect of these documents, should they be unclear. The contractor must ensure that he/she has provided sufficient budget for complying with all EMP conditions at the tender stage. The contractor must comply with all orders (whether verbal or written) given by the ECO, project manager or site engineer in terms of the EMP.

In addition to the above, the contractor:

- Will be appointed on the understanding that all work to be carried out will be done in compliance with: SABS 1200 A or SABS 1200 AA (as applicable) as well as the requirements of the EMP and the Occupational Health and Safety Act, 1993.
- Will be required to sign both the **Declaration of Understanding** – Contractor attached as Annexure 2 to the EMP and the Proforma : Protection of the Environment attached as Annexure 3 to the EMP.
- Know the contents and implications of the EMP and apply it according to the programme.
- Must take note that compliance with the environmental requirements may entail costs over and above those of the civil requirement – the Contractor shall recognise this and must ensure that he/she has provided sufficient budget for complying with all conditions of the EMP at the tender stage.
- The Contractor must ensure that all personnel on Site (including Sub-contractors and their staff, and suppliers) are familiar with and understand the requirements of the EMP.
- The contractor must appoint an Environmental Liaison Officer (ELO) to assist with day-to-day monitoring of the construction activities.

2.4 Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the developer as an independent monitor of the implementation of the EMP. He/she must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site. The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMP and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO is responsible for:

- Liaison with relevant authorities;
- Liaison with contractors regarding environmental management; and
- Undertaking routine monitoring and appointing a competent person/institution to be responsible for specialist monitoring, if necessary.

The ECO has the right to enter the site and conduct monitoring and auditing at any time, subject to compliance with health and safety requirements applicable to the site. Site inspections must be conducted by the ECO to assess compliance with the EMP. The ECO will be responsible for providing feedback on potential environmental problems associated with the development. In this regard, the ECO:

- Must attend relevant project meetings;
- Liaise with contractors regarding environmental management - The ECO is responsible for informing the contractors of any decisions that are taken concerning environmental management during the construction phase. This would also include informing the contractors of the necessary corrective actions to be taken; and
- Submit monthly environmental audit reports to the authorities. These audit reports must contain information on the contractor and developer's levels of compliance with the EMP. The audit report must also include a description of the general state of the site, with specific reference to sensitive areas and areas of non-conformance. The ECO must indicate suggested corrective action measures to eliminate the cause of the non-conformance incidents.

2.5 Environmental Liaison Officer (ELO)

Any issues raised by the ECO will be routed to the ELO for the contractors' attention. The ELO shall be permanently on site during the construction phase to ensure daily environmental compliance with the EMP and should ideally also be a senior and respected member of the construction crew. Past experience has revealed that, ELO's that can relate to the work force are the most effective for information transfer and ensuring compliance with the EMP.

2.6 Competent Authority

The relevant environmental authority, in this case the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) is required to approve the draft EMP for implementation. In addition LDEDET may specify any other action deemed necessary for the appropriate implementation of the Zandspruit Estates.

Table 2: Key of Responsible Parties relevant to EMP implementation

REFERENCE NUMBER	RESPONSIBLE PARTY
1	Applicant / Developer
2	Environmental Consultant
3	Contractor
4	ECO – Environmental Control Officer
5	ELO – Environmental Liaison Officer
6	Competent Authority

3. ENVIRONMENTAL MANAGEMENT PLAN

3.1 Failure to comply with the EMP

In the event of non-compliance with aspects of the EMP, the following steps, relating to increasing severity of environmental problems, should be implemented. The principle is to keep as many issues within the first few steps as possible.

- **Step 1** - The Developer discusses the problem with the contractor or guilty party, and they work out a solution together. The Developer records the discussion and the solution implemented.
- **Step 2** - The Developer observes a more serious infringement, and notifies the guilty party in writing, with a deadline by which the problem must be rectified. All costs will be borne by the contractor.
- **Step 3** - The Developer shall order the contractor to suspend part, or all, the works. The suspension will be enforced until such time as the offending party(ies), procedure or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all cost will be borne by the contractor.
- **Step 4** - Breach of contract - One of the possible consequences of this is the removal of a contractor and/or equipment from the site and/or the termination of the contract, whether a construction contract or an employment contract. Such measures will not replace any legal proceedings that Developer may institute against the contractor.

3.2 Planning Phase EMP

The following section outlines the proposed management and/or mitigation measures that will be taken to address the environmental impacts that have been identified in the Environmental Impact Report during the planning phase of the proposed development. The intention is to mitigate identified impacts by means of incorporating the necessary elements during the design/planning phase, prior to construction.

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
1. Specialist Recommendations – Ecological Assessment	<p>Incorporate recommendations of the specialist studies undertaken as part of the EIA as far as is practically possible regarding the layout plan for the development. In this regard the following is recommended:</p> <ul style="list-style-type: none"> • Avoid development in the 1:100 year flood lines <p>The following are regarded as sensitive environments:</p> <ul style="list-style-type: none"> • HL 1 (S24.36556°; E030.93779 °): Clump of <i>Scholtias</i> on the riverbank, burrows beneath, amongst the roots. Important, for bank stabilisation, food and habitat for organisms. • HL 2 (S24.37796°; E030.93573 °): <i>Acacia</i> sp in association with other species – biologically diverse clump. • HL 3 (S24.37699°; E030.93310°): Knobwood and associated species, biologically diverse clump. • HL 4 (S24.37673°; E030.93163 °): A tree clump that is biologically diverse and important for food and habitat (Weeping Boer-Bean and <i>Spirostachys africanus</i> (Tamboite). • HL 5 (S24.36938°; E030.92332 °): Tree clump in the riparian zone including: Marulas and Leadwood. • HL 6 (S24.36967°; E030.92129°): <i>Spirostachys</i> in small drainage line. • HL 7 (S24.37006°; E030.92075°): <i>Scholtias</i> etc. – clump. • HL 8 (S24.37401°; E030.90977 °): <i>Spirostachys</i>. • HL 9 (S24.37405°; E030.90915 °): Tree clump, although it is small, it is biologically diverse, 	1	X	X	X	as necessary

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<p>especially compared to the surrounding vegetation that has been encroached upon, thus providing refuge for more specialised faunal species. (Acacia, Euclea, Schotia etc).</p> <ul style="list-style-type: none"> HL 10(S24.37413°; E030.90886 °): Tree clump – small but as for HL 9. HL 11(S24.37328°; E030.91056 °): Tree clump including Leadwood and Acacia sp. HL 12 (S24.37266°; E030.91116 °): Tree clump including Leadwood and Acacia sp, Scotia, Grewia, Lonchocarpus. Valuable source of food and shelter especially for birds and small mammals. HL 13(S24.36771°; E030.91890 °): Combretum clump. HL 14(S24.36929°; E030.93650 °): Tree clump including Schotia, Spirostachys, Lonchocarpus & Diospyros. Valuable source of food and shelter especially for birds and small mammals. Individual Marula & Weeping Boer Bean (Schotia brachypetala) trees that are 8m and higher in any of the zones. These big trees are important to genetic diversity of the respective species as well as being valuable habitat and especially food resources to different organisms. All other tree species that are greater than 10m in height – in particular: Leadwoods, Knobthorns, Apple Leaf (formerly Lonchocarpus capassa). These large specimens are important genetically for each of the respective species and they are also important habitats for a variety of organisms, especially reptiles, small mammals and birds. All big large (c. 7m and higher) dead trees in particular the Leadwoods. These trees, despite being dead, provide habitat for a number of organisms, in particular reptiles (lizards, geckoes and skinks mainly) and nest sites for a variety of birds (e.g. wood peckers, and a variety of raptors). <p>Prior to the commencement of construction, point out and demarcate all ecologically “sensitive” areas to the contractors (e.g. identified bush clumps, species, rivers, streams, drainage lines, wetlands, sensitive soils, steep slopes and areas susceptible to erosion).</p>					
2. Specialist Recommendations	<ul style="list-style-type: none"> Point out and/or demarcate all archaeologically “sensitive” areas to the contractors. 	1	X	X	X	as necessary

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
- Cultural-Historical Assessment						

3.3 Pre-Construction EMP

The following section outlines the proposed management and/or mitigation measures that will be taken to address the environmental impacts that have been identified in the Environmental Impact Report during the pre-construction phase of the proposed development.

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
1. LDEDET Authorisation Conditions	<ul style="list-style-type: none"> Comply with Conditions of Authorisation as issued by LDEDET. 	1	x	x	x	as necessary
2. Other Authorisations and Approvals	<ul style="list-style-type: none"> Obtaining all the necessary authorisations and approvals for the proposed development from the Local Authority. 	1	x			as necessary
3. Contract Documentation	<ul style="list-style-type: none"> The EMP must be made binding to the main contractor as well as the individual contractors. The EMP must be included in the tender documentation for the construction contracts. The contractors must sign in acceptance of the EMP and provide a declaration stating that they understand, accept and will implement the requirements of the EMP. 	1	x			once-off

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
4. Appointment of ECO	<ul style="list-style-type: none"> The Developer must appoint an independent ECO who will monitor the contractor's compliance with the EMP. 	1	x			once-off
5. Appointment and Duties of the ELO	<ul style="list-style-type: none"> The contractor must appoint an ELO. The ELO will be required to monitor the development with a direct hands-on approach, and ensure compliance and co-operation of all personnel. The ELO should preferably be fluent in the employees' languages. 	3	x			once-off
6. Penalty Fines	<ul style="list-style-type: none"> The ECO should reserve the right to impose penalty fines on any contractors for infringement of the specifications of the EMP. The ECO should ensure that the EMP is adhered to. Any deviations highlighted but not rectified timeously and to the satisfaction of the ECO will be subject to the fines referred to; such fines to be mutually agreed with the contractor/s. Proposal: R2 500.00 per fine – whatever party is responsible. Fines to be deducted from specific certificate and placed in an Environmental "kitty" held by the Developer. Utilisation of penalties accrued needs to be discussed and agreed by all parties. Proposals for ways in which this money can be utilised: rectification of damage or problem; enhancement of local environment; upliftment of disadvantaged communities; etc. 	1 4	x	x		as necessary
7. Services Agreement	<ul style="list-style-type: none"> A Services Agreement with the Local Municipality must be entered into before site establishment. This must include the adequate provision of water, sewage and electricity and waste disposal services. 	1	x			once-off
8. Temporary Services	<ul style="list-style-type: none"> Temporary services (electricity, sewage and water) requirements need to be determined and the contractor must submit written procedures for all envisaged temporary services to be installed. 	1 3	x			prior to construction
9. EMP Training	<ul style="list-style-type: none"> All parties involved in the project shall be responsible for ensuring that his/her/its employees are familiar with the requirements (content) of this EMP. The contractor shall familiarise his/her/its employees and sub-contractors with the contents of this EMP. The ECO will conduct a training session with the main contractor to inform them of the site specific EMP before the commencement of construction. Thereafter the main contractor must ensure that a copy of this EMP is made available to his workforce and any sub-contractors and their workforce. 	3	x	x		prior to construction

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<ul style="list-style-type: none"> The Developer / ECO shall require written proof/confirmation from the contractor that EMP training has been done. The contractor shall familiarise his/her/its employees with the contents of this EMP, either in written format or verbally. Where this has been done verbally, persons having received training shall indicate in writing that they have indeed attended a training session and have been notified in detail of the contents and requirements of the EMP. 					
10. Construction Procedures	<ul style="list-style-type: none"> The contractor must submit written procedures for all activities that could be potentially harmful to the environment. Such construction procedures shall include timing of activities, equipment and materials to be used, methods for preparing and cleaning the site both during construction and on completion of the works, disposal of waste and any other information deemed necessary. The contractor and/or labourers shall not commence work on any activity until such time as the construction procedure has been scrutinised and agreed to in writing by the Developer / ECO. Prior to establishment of the site camp(s), the Contractor shall produce a plan showing the positions of all buildings, laydown yards, sanitary facilities and other infrastructure for approval by the ECO. Written procedures and plan must be given to the project manager (PM)/ECO 10 (ten) days prior to construction activity. Proper transport arrangements must be made for employees of the development, including pick-up and drop-off zones. The removal and appropriate management of waste on the site needs to be clarified. Construction activities should be limited to normal working hours. If it is essential that work is to extend into the evenings or over weekends, residents in the area should be timeously informed of the dates and the times of such activities. 	3	x			10 days prior to construction
11. Hours of Operation		3	x	x		continuous
12. Access Roads for Construction	<ul style="list-style-type: none"> Point out the roads that shall be used for construction access to contractors. Where access roads have to be upgraded to make it possible for contractors to gain access to the contract areas, existing (damaged) roads should be upgraded / repaired. 	1 4	x			once-off

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
13. Rehabilitation	<ul style="list-style-type: none"> A comprehensive rehabilitation plan must be compiled. It is recommended that the proposed rehabilitation plan should follow an integrated approach with input from a diverse team with expertise in ecology, landscape architecture and engineering. 	1	x			once-off
14. Contract Areas	<ul style="list-style-type: none"> The ECO must indicate/point out to contractors the areas that they will have in their possession for the duration of the contract (this shall include access roads to be used, construction lay-down areas, materials storage and delivery requirements, contractors' offices, operational demarcation etc.). A material delivery and storage area should be demarcated in co-ordination with the contractor. The boundaries of the site shall be demarcated prior to any work commencing on the site. The site boundary demarcation line shall be removed when the site is disestablished. The perimeter fence must be constructed prior to commencement of infrastructure construction. It must form part of the contractor's agreement that the perimeter fence is to be erected during the site establishment period. The method of demarcating the boundaries shall be determined by the ECO prior to any work being undertaken. The contractor shall demarcate the boundaries of the site in order to restrict the construction activities within the site. The contractor must maintain the demarcation line and ensure that materials used for construction on the site do not blow on or move outside the site and environs. The contractor must ensure that all labour and materials remain within the boundaries of the site, unless otherwise agreed in writing with the ECO. 	3 4	x	x		once-off
15. Contract Workers	<ul style="list-style-type: none"> Specify the conduct of contract workers in worker related management plans and employment contracts. The adjacent property owners must be informed of the construction schedule. A local employment policy should be structured such that jobs are as widely spread within the area as possible. The skill requirements should be communicated to the local community leaders and community based organisations. Contractors and/or the developer should make use of local 	1 3	x	x		as necessary

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<p>recruitment agencies to obtain list of jobseekers. An equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account should be ensured.</p> <ul style="list-style-type: none"> Temporary workers should undergo skills training. This process should also ensure that the skills required could be transferable to other sectors. A skills audit should assist in determining what benefits could accrue to the locals in terms of employment opportunities. In addition training should be considered to lessen the skills disparity. The duration, accreditation and qualifications of the training programmes should be specified. Local communities should be given preference in terms of skills training which should be basic adaptable skills training. 					

3.4 Construction Phase EMP

The following section outlines the proposed management and/or mitigation measures that will be taken to address the environmental impacts that have been identified in the Environmental Impact Report during the construction phase of the proposed development.

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
1. Safety on Site	<ul style="list-style-type: none"> Contractors shall adhere to the prescriptions of the Occupational Health and Safety Act (Act 85 of 1993). The contractor shall familiarise himself/herself and its employees with the contents of the fore mentioned. First aid facilities to be on hand at all times in accordance with the requirements of the 	3		X		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	Occupational Health and Safety Act (Act 85 of 1993). The contractor shall implement adequate and mandatory safety precautions relating to all aspects of the operation. Such safety measures and work procedures/instructions shall be communicated to construction workers. Warning and advisory signage shall be implemented (also with regards to construction vehicle movement along public roads). A contingency plan must be available for emergency situations.					
2. Site Establishment and Construction Camps	<ul style="list-style-type: none"> In the event of the construction camp being established, the contractor must take responsibility for the camp to conform to all contractual aspects and standards applicable. This will include aspects related to fires, ablution, sleeping facilities, storm water management and waste management. No person shall be allowed to stay on the property, unless written prior permission is obtained from the Developer/ECO. The contractor must establish a construction camp in an area as agreed with the ECO if required. The site for the construction camp must not be in an environmentally sensitive area. The area must be properly demarcated prior to establishment to prevent the construction camp from being unnecessarily large. The camp must be properly fenced. The lateral spread of the construction must be monitored on a weekly basis. The Contractor must demarcate and formalise an area for vendors/hawkers servicing the site. Vendors must not be permitted to establish haphazardly. Sufficient waste bins must be provided for this area to cater for waste produced, and these bins are to be emptied regularly and the waste is to be removed to a registered landfill site. The vendor area is to be maintained in a clean and orderly fashion at all times. A designated eating area is to be provided for all labour on site and this area is to be provided with sufficient waste bins which are to be emptied regularly. Eating in other areas of the site should not be permitted. At completion of the construction period, a proper cleaning up operation must be implemented where all structures, materials, waste etc. need to be removed. 	3 4 5		x		once-off
3. Storage and Use of	<ul style="list-style-type: none"> Fuels, oil and lubricants must be stored in a safe, clearly designated area of the construction terrain. 	3		x		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
Fuels, Oil, Cement and Other Chemicals	<p>Bulk fuel storage tanks on the site shall have bunding to hold at least 110% of the volume of the tanks. Bulk fuel storage tanks shall be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution.</p> <ul style="list-style-type: none"> Any spillage must be cleared immediately, by removing contaminated soil and dumping it at a designated waste site. No servicing of vehicles will be allowed, unless approved by the PM/ECO and then only at designated workshop areas. Storage of potentially hazardous materials should be stored on a concrete bunded platform. Mixing of cement - Where cement/concrete, etc. is mixed on site, this shall be done in specified areas on aprons or on protective plastic linings and provision shall be made to contain spillage or overflows onto soils. Residue shall be regarded as waste and be handled accordingly. Use of chemicals - The mixing of any herbicides, solvents, asphalt, sealants, adhesives, paints, chemicals or other noxious materials shall only be undertaken in designated areas on aprons that have spillage control channels and separate storage areas. The mixing of materials will not be permitted in the general areas of the site. All surplus or waste materials are to be removed from the site. All these operations shall only be allowed on site with strict observation of the manufacturers' instructions. 					

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
4. Toilet Facilities	<ul style="list-style-type: none"> The contractor shall be responsible for providing all sanitary arrangements for his labour force. A minimum of one chemical toilet shall be provided per 10 persons. The siting of toilets shall be agreed with the ECO. Waste resulting from the use of chemical toilets shall be disposed of at a suitable location in a manner whereby no pollution/degradation of the environment shall be brought about by such disposal. The construction site is to be maintained in a sanitary condition and all toilet facilities shall be maintained in good order. Abluting anywhere other than in the toilets shall not be permitted. The contractor shall ensure that any chemicals and/or waste from the toilets are not spilled on the ground at any time. Should there be spillage of chemicals and/or waste, the contractor shall be required to place the toilets on a solid base with a sump. 	3 4 5		x		daily monitoring continuous
5. Movement of Construction Personnel, Labourers and Equipment	<ul style="list-style-type: none"> As far as possible, the movement of construction workers should be confined to the work site to avoid any potential for impact from this variable in proximate residential areas. The contractor must ensure that all construction personnel, labourers and equipment remain within the demarcated construction site at all times. Where construction personnel and/or equipment wish to move outside the boundaries of the site, the contractor/ labourers must obtain permission from the Developer/ECO. Do not allow the movement of public within the development site by posting notices at the entrance gates and perimeter fencing/walls. Ensure safe and secure public transport access points for construction personnel and labourers. Ensure that transport modes are available for workers to travel between the construction site, their accommodation facilities, as well as the business area of Mabatlane. 	3		x		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
6. Vehicular Access and Movement of Construction Vehicles	<ul style="list-style-type: none"> All construction activities to be carried out in such a manner so as not to interfere unnecessarily or improperly with the public convenience or access to use and occupation of public or private roads and footpaths or to or of properties. Traffic should be diverted away from any residential areas. The contractor must ensure that all vehicles remain on the demarcated roads at all times. The existing access roads should be used, where possible. Where new access roads are required, they should disturb as limited an area as possible. Provide signage appropriately and adequately at expected problem areas, accesses and crossings. Warning by means of flagging where necessary to be undertaken. Consult with local municipality and key stakeholders regarding traffic schedule, routes, diversions, road closures etc. Proactively inform adjacent property owners and local resident of roads closures and diversions. The movement of articulated construction vehicles, abnormally loaded construction vehicles and construction plant (loaders, graders, backhoes and the like) is to be organised outside peak traffic times. All construction vehicles are to maintain the minimum / maximum speed limits. Roadways in the immediate vicinity of the site will be cleaned of accidentally spilt building materials off construction vehicles servicing the site, on a regular basis. Appropriate precautions should be taken to ensure activities associated with the construction phase of the project, do not pose a danger to passing traffic or cause undue inconvenience to local communities. Construction vehicles shall be maintained in good working order, to reduce the probability of leakage of fuels and lubricants. Drip trays must be made readily available for vehicles that leak and for the vehicles standing overnight. 	3 5		x		continuous
7. Obtaining Water for Construction	<ul style="list-style-type: none"> Point out to contractors where they can obtain water (e.g. water for mixing of cement as well as for drinking). Contractors shall not make use of/collect water from any other source than those pointed 	3 5		x		once-off

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
Purposes	out to them as suitable for use by them.					
8. Fires	<ul style="list-style-type: none"> No fires will be permitted on construction sites without the authority of the ECO, and then only in designated areas. Food cooking shall only be done in areas designated by the ECO. Food cooking should preferably not be done on open fires (alternative means e.g. gas stoves, should be used). Wood for the fire must be supplied by the contractor. No indigenous vegetation may be collected, or used for firewood Adequate precautions will be taken to prevent fires. The existence/availability of on-site equipment for fire fighting must be ensured. All steps will be taken to ensure that the fire hazard on and in the immediate vicinity of the site is reduced to a minimum. Contractors will take immediate steps to extinguish any fire, which breaks out on the site and will comply with all statutory provisions, which may be in force from time to time in relation to fire danger. 	3 4 5		x		continuous
	<ul style="list-style-type: none"> The contractor shall provide a waste management strategy to the ECO and the ECO shall monitor the implementation thereof. Construction camps shall be kept in a neat and tidy condition. All litter arising from the construction camp shall be collected and removed on a continuous basis to avoid build-up. Contractors shall remove all waste generated by themselves during construction and it shall be disposed of at a suitable (registered) solid waste disposal venue – “dumping on site” shall not take place. Waste material shall be collected and stored in designated areas. Stockpiled waste shall not remain on site for longer than a week. The contractor shall not dispose of any waste and/or construction debris by burning or burying. The contractor shall supply waste bins/skips throughout the site at locations where construction personnel or labourers are working. The bins shall be provided with lids and an external closing mechanism to prevent contents from blowing out. Bins shall be emptied on a daily basis and the waste removed to the construction camp where it will be contained in skips until disposed of. 	3 5		X		continuous
	9. Waste Management					

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<ul style="list-style-type: none"> No rubble or discarded building materials must remain on the construction site for more than two weeks. Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site. 					
10. Noise	<ul style="list-style-type: none"> Construction activities may only take place between the hours of 07H00 and 17H00 weekdays and Saturdays from 07H00 to 13H00. Operation is prohibited on Sundays and public holidays. All construction vehicles and plant "resident" on the site must be maintained in good working order and comply with noise abatement regulations. No loud music is allowed on site or in the construction camp. Construction camp workers should be instructed to limit recreation related noise after hours. 	3 5		X		continuous
11. Earthworks	<ul style="list-style-type: none"> All excavation activities for any purpose whatsoever should be preceded by selective stripping and stockpiling of soil in the order of their horizons as found on site, for the purpose of replacement in the appropriate horizon order, after the completion of construction. These activities should include: trenching and foundations, access road construction, site clearance, etc. Replacement and rehabilitation of soils should be progressive with construction and not left until the end. Where at all possible, excavations must not stand open longer than 2 days, and should preferably be opened and closed on the same day. 	3		X		as necessary
12. Dust	<ul style="list-style-type: none"> Contractors will take precautions to limit the production of dust and nuisance caused by dust. The minimum requirement in this regard is regular wetting of the construction camp, work area and any gravel roads used during construction. The dispersal of dust during transfer, loading and unloading of materials will be reduced by: taking account of weather conditions; fitting tarpaulins over trucks, if required; wetting the material to be transported, or work area beforehand. 	3 5		X		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<ul style="list-style-type: none"> Gravel roads should be sprayed with water from a water cart to limit dust generation by construction vehicles The impact of dust generation should be weighed against the impact of water use. Should continuous wetting down require too much water, the option of fewer periods of wetting down should be considered. 					
13. Air Quality	<ul style="list-style-type: none"> Burning of refuse, cement bags, etc. is to be prohibited. The use of poisons e.g. herbicides, insecticides or other noxious substances, must be strictly controlled and used by trained operators in accordance with the manufacturers specifications; The controlled use and/or storage of all materials, fuels and chemicals must be ensured. Construction vehicles and plant "resident" on the site are to be maintained in good working order so as to reduce emissions. 	3 5		X		continuous
14. Soil Management	<ul style="list-style-type: none"> All possible efforts must be made by the contractor to strip topsoil to a maximum depth of 150 mm. Topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions. Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired. Topsoil must not be handled when the moisture content exceeds 12%. Topsoil stockpiles must be kept separate from subsoils. Topsoils susceptible to wind erosion are to be covered during windy periods. The stored topsoil should be protected by berms to ensure that the soil is not washed away during a rainfall event. The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed-bank contained within the topsoil. 	3 5		X		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<ul style="list-style-type: none"> Ground exposure should be minimised wherever possible. Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary must be undertaken. 					
15. Stormwater and erosion control	<ul style="list-style-type: none"> Stormwater shall be diverted away from all construction or site areas in cut-off drains. Measures shall be taken to reduce water velocity at cleared areas. The Contractor shall protect all areas susceptible to erosion and shall take measures, to the approval of the ECO. The Contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible. During construction, areas susceptible to erosion must be protected by installing temporary or permanent drainage works and energy dispersion mechanisms and could include: vegetation, mitre drains (affleuvre), drainage pipes, reno mattresses (biodegradable material, upon which soil and rocks are packed which then keeps it in place to bind the soil), benches (grondwalle), benches consisting of sandbags, gabions, gabion mattresses, scarifying (ripping) area along the natural contours, and packing branches and rocks in small gullies and disturbed areas. 	3 5		X		continuous
16. Clearing of Vegetation	<ul style="list-style-type: none"> The areas needing to be cleared and the degree of clearing required will be determined and demarcated in consultation with the ECO before clearing begins. ECO must be consulted before commencing with removal of exotic trees and / or any other vegetation. The Contractor may not deface, paint or otherwise mark and / or damage natural features / vegetation on the site, unless agreed beforehand with the ECO. Any features / vegetation defaced by the Contractor will be restored to the satisfaction of the ECO. All declared alien invasive species must be eradicated particularly along the river. Consider the selective trimming of branches to allow for free vehicle and pedestrian movement before opting to remove any trees. Destumping shall only occur at the request of the ECO. Where roots can act as erosion protection, 	3 4 5		X		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<ul style="list-style-type: none"> trees should be cut as close as possible to the ground level. During the clearing of woody vegetation no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimised as far as possible. The Contractor shall advise his workers of the penalties associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act No. 71 of 1962) Section 2 (fine R2 000 and/or 12 months imprisonment). Under no circumstances shall any animals be handled, removed, killed or be interfered with by the Contractor, his employees, his subcontractors or his subcontractors' employees. No poaching of fauna and flora shall be tolerated by the Contractor or his personnel on Site or elsewhere. The Contractor and his employees shall not bring any domesticated animals onto the site. The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals. With regards to the usage of herbicides and pesticides, these must be applied by specialists in the applicable field or adequately trained supervisors. The onus shall be on the Contractor/s to ensure that no desirable fauna/flora dies as result of the application of herbicides or pesticides or any other product used by the Contractor/s, the incorrect use of equipment, incorrect equipment or negligence on the part of the Contractor/s or his staff. The Contractor/s shall take all reasonable steps to ensure that weed and pest control is done in optimal weather conditions to ensure maximum effectiveness. All construction activities (with the exemption of those associated with dam construction) should remain outside of the 1:100 year flood lines. Storage of potentially hazardous materials should be above the 1:100-year flood line, or as agreed with the ECO. These materials include fuel, oil, cement, bitumen, etc. The container should be stored on a concrete bunded platform. All construction materials liable to spillage are to be stored in appropriate structures with 					
17. Protection of Fauna		3 5		X		continuous
18. Hydrology						

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<p>impermeable flooring. The application of biocides should be avoided when heavy rainfall is forecast and during windy conditions.</p> <ul style="list-style-type: none"> • Appropriate flow diversion and erosion control structures i.e. earth embankments must be placed where soil may be exposed to high levels of erosion on account of steep slopes and soil structure. • Plant drought resistant grasses on the fairway and green components of the golf courses. • If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the ECO of such discovery. The South African Heritage Resources Agency (SAHRA) or the National Monuments Council shall be contacted such that an archaeological consultant can be appointed to excavate and record the site. Work may only resume once clearance is given in writing by the archaeologist. 					
19. Cultural and/or Archaeological Sites		3 5		X		continuous
20. Visual Impacts	<ul style="list-style-type: none"> • The construction crew campsite must be positioned in order to minimise the visual impact on adjacent landowners. • The unnecessary removal of vegetation during construction must be avoided, as vegetation acts as a screening agent. • Unnecessary earthworks and dumping of material must be avoided. • Keep the construction sites and camps neat, clean and organised. Remove rubble and other building waste off site as soon as possible or place it in a container in order to keep the construction site free from additional unsightly elements. 	3 4 5		X		continuous
21. Labour	<ul style="list-style-type: none"> • Introduce contractual obligations for contractors to use local labour as far as possible. • Develop a strategy to minimise the influx of outsiders to the area • Maximise the use of local labour and service providers where possible by developing a strategy to 	1 3		X		continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
	<p>involve local labour in the construction process.</p> <ul style="list-style-type: none"> Implement agreements to ensure that contractors, subcontractors and suppliers adhere to regulations that manage construction related vehicle use to ensure minimum impact Adherence to speed limits should be enforced. 					
22. Site Clean Up and Rehabilitation	<ul style="list-style-type: none"> Site Clean Up - The contractor shall ensure that all temporary structures, equipment, materials, waste and facilities used for construction activities are removed upon completion of the project. The contractor shall clear and clean the construction site to the satisfaction of the ECO. Rehabilitation - Should any rehabilitation be necessary as a result of activities on site, the contractor in conjunction with the ECO will undertake this rehabilitation. Soils compacted by construction activities shall be ripped to loosen compacted layers and then levelled out – there must be agreement with the ECO on the specifics of this procedure. Topsoil shall be re-spread upon completion of construction activities. 	<p>3 4 5</p>		X		continuous

3.5 Operational Phase EMP

The following section outlines the proposed management and/or mitigation measures that will be taken to address the environmental impacts that have been identified in the Environmental Impact Report during the operational phase of the proposed development.

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
1. Site Management	<ul style="list-style-type: none"> The Developer must appoint a permanent Environmental Manager (EM) who is educated and competent in the conservation practices and conservation principles. A Game Management Plan should be implemented to ensure that the existing game on the subject property meet the carrying capacity of the farm after development has been completed. A Veld / Fire Management Plan should be implemented to ensure that the risk of veld fires is reduced and that appropriate burning regimes are implemented to maintain the proper functioning of ecosystems. 	1 4 5	X		X	as necessary
2. Maintenance	<ul style="list-style-type: none"> Where maintenance activities are to be undertaken, all stipulations of this EMP shall again be applicable. 	1			X	continuous
3. Erosion, sedimentation and flooding	<ul style="list-style-type: none"> The stormwater system, especially the discharge points, must be inspected and damaged areas must be repaired if required. Litter blocking stormwater systems must be removed. 	1			X	continuous
4. Sewage	<ul style="list-style-type: none"> The sewerage system's operation and efficiency must be inspected on a regular basis. The sewage system must be inspected for leakages on a regular and frequent basis and any leakages must be attended to immediately. 	1			X	continuous
5. Waste Management	<ul style="list-style-type: none"> Litterbins should be placed at strategic points within the development, to be determined during the initial design phase and implemented during the operational phase. The development should be kept clean through the removal of litter on a daily basis. This should be included in a maintenance plan for the development. 	1	X		X	continuous

Impact / Activity / Action	Recommended Measures	Responsible Party	Implementation Phase			Frequency of Action
			Planning / Pre-Construction	Construction	Operation	
6. Landscaping	<ul style="list-style-type: none"> No alien plants should be used in the gardens throughout the development. Only indigenous plants should be used for the hotel gardens. Natural veld between the planned developments should not be developed. All alien invasive plant species should be eradicated. 					

ANNEXURE 1: DECLARATION OF UNDERSTANDING - DEVELOPER

DECLARATION OF UNDERSTANDING

I, _____

representing _____

declare that I have read and understood the contents of the Environmental Management Plan for

Contract: _____

I also declare that I am able and shall comply with all legislation pertaining to the nature of work to be done and all things incidental thereto.

I further declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed:

Place:

Date:

Witness 1:

Witness 2:

ANNEXURE 2: DECLARATION OF UNDERSTANDING - CONTRACTOR

DECLARATION OF UNDERSTANDING

I, _____
representing _____

declare that I have read and understood the contents of the Environmental Management Plan for
Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed:

Place:

Date:

Witness 1:

Witness 2:

ANNEXURE 3: PRO FORMA: PROTECTION OF THE ENVIRONMENT**PRO FORMA**Employer:

Contract No:

Contract title:

PROTECTION OF THE ENVIRONMENT

The Contractor will not be given right of access to the Site until this form has been signed

I/ we,.....{Contractor} record as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in-so-far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.
3. I/we have signed the Declaration of Understanding with respect to the Environmental Management Plan
4. I/ we acknowledge and accept the right of the Developer to deduct, should he so wish, from any amounts due to me/ us, such amounts (hereinafter referred to as fines) as the Project Manager (PM) / Environmental Control Officer (ECO) shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:
 - 4.1 The Project Manager (PM) / Environmental Control Officer (ECO), in determining the amount of such fine, shall take into account inter alia, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences
 - 4.2 The Project Manager (PM) / Environmental Control Officer (ECO) shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Project Manager (PM) / Environmental Control Officer (ECO) has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed

Date

CONTRACTOR