

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR THE AMENDMENT APPLICATION:

DOORNVALLEI PHASE ONE (Extension 5 and 6)

Portion 107 (a portion of portion 104) of the farm Doornkloof 391 JR

Gaut: 006/15-16/0001

Prepared for:



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Table of contents

1. INTRODUCTION AND BACKGROUND	4
2. MOTIVATION FOR THE PROPOSED AMENDMENT	5
3. SITE ATTRIBUTES	8
3.1 Environmental Sensitivities	8
3.2 Fauna.....	9
3.3 Flora	9
4. ENGINEERING AND OTHER SERVICES	9
4.1 Water	9
4.2 Sewer	9
4.3 Stormwater.....	10
4.4 Roads.....	10
4.5 Electricity	10
5. IMPACT ASSESSMENT	10
5.1 Methodology Used.....	11
5.2 Criteria for Rating of Impacts	12
5.3 Assessment of Impacts.....	13
5.3.1 Construction phase	13
5.3.2 Operational phase	15
6. ADVANTAGES AND DISADVANTAGES OF THE PROPOSED AMENDMENT	16
7. AMENDMENTS TO THE EMPR	17

List of figures

Figure 1: Locality of the site.....	4
Figure 2: Approved layout.....	5
Figure 3: Proposed layout.....	7

List of tables

Table 1: Explanation of the methodology variables	11
Table 2: Criteria for rating of impacts	12
Table 3: Potential impacts during construction phase	13
Table 4: Potential impacts during the operational phase	15

List of annexures

Annexure 1: Environmental Authorisation	19
Annexure 2: Town Planning Motivation	20
Annexure 3: Comments from Council for Geoscience	21
Annexure 4: Flora and Fauna Study	22
Annexure 5: GLS Report	23
Annexure 6: Services Report (Roads and Stormwater)	24
Annexure 7: Letter from GeoPower (Electricity)	25
Annexure 8: Amended EMPR	26

1. INTRODUCTION AND BACKGROUND

M&T Development has submitted an application to the Gauteng Department of Agriculture and Rural Development, the competent authority, for the amendment of the Environmental Authorisation (EA), referenced Gaut: 002/05-06/2218. The amendment application has been issued with reference number Gaut: 006/15-16/0001. The initial EA was issued on 09 June 2008 following a successful appeal to the MEC and allowed for the development of a low density township ('Res 1') and the upgrading of a road, see **Annexure 1**.

The applicant therefore seeks to change the proposed development from a low density, full title township to a medium density, sectional title township. The proposed change is informed by the current development context and will be in support of a mixed housing typology in the area.



Figure 2: Locality of the site

2. MOTIVATION FOR THE PROPOSED AMENDMENT

The approval allowed for the development of a low density township as well as the upgrading of the road, refer to **Figure 2** for the approved layout. At the time of application, areas adjacent to the site had been developed mainly to low density residential units. The application then sought to follow the housing development trend as it provided the type of housing which was sought after at the time.

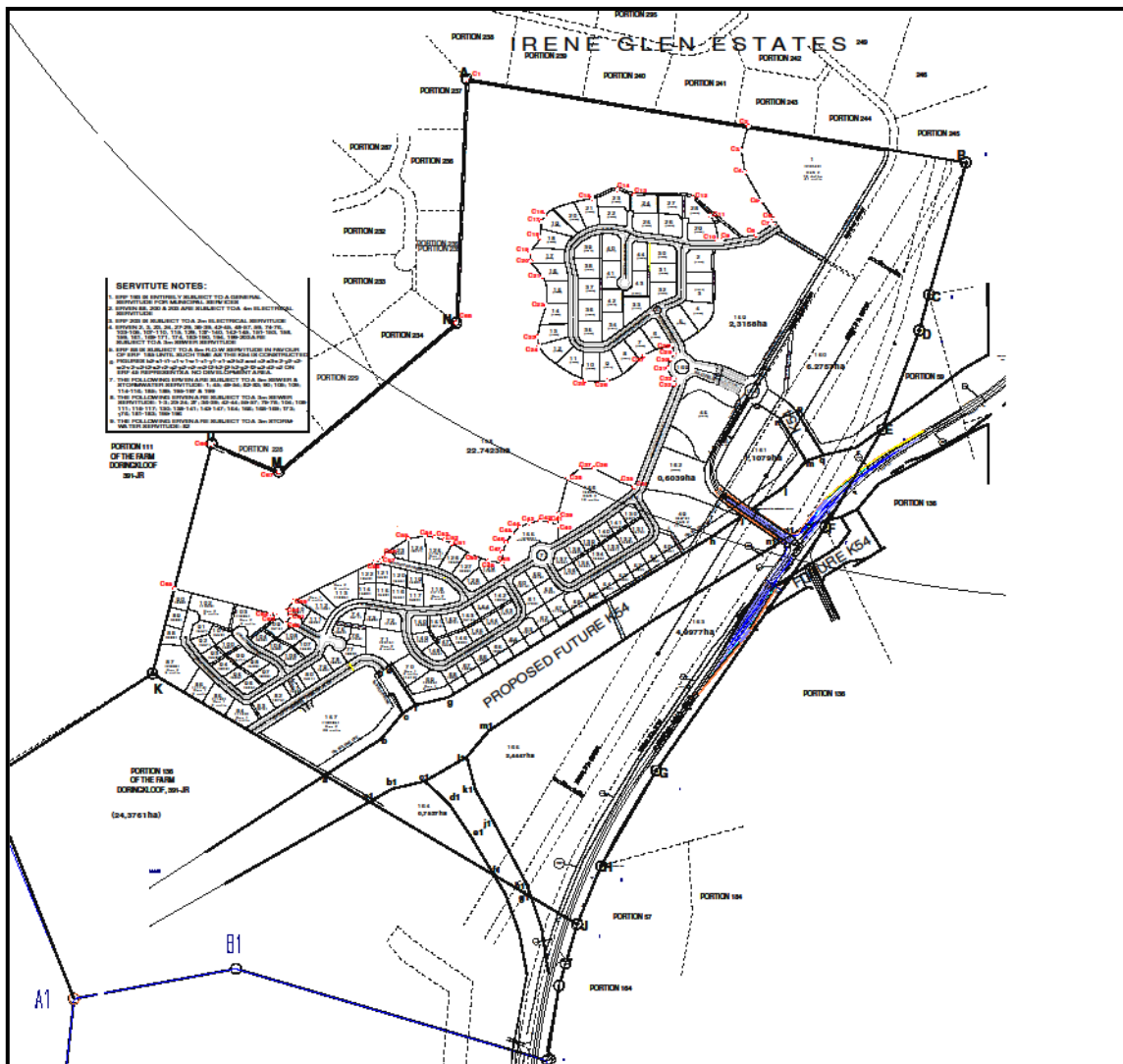


Figure 2: Approved layout

The proposed township takes into account the urban development trends in the area and aims to provide viable residential areas that are appealing to the current market. The demand for medium and high density residential units has increased in recent times with the influx of people into newly urbanised areas. The proposed development will allow for the integration of different income groups in housing developments, which is aligned with government policy.

Growth in this segment of the residential market has been extremely price sensitive and demand has undoubtedly been the strongest within the middle income market. Where full title ownership generally implies final construction costs in the order of R2 to R3 million per residential unit, the supply of group-housing opportunities can be introduced to the market at much lower costs.

It must be noted that this application is for the Phase 1 development. Phase 2, which is on a portion of the site, is subject to environmental sensitivities and restrictions which will be addressed in the future. The detailed Town Planning Motivation is attached as **Annexure 2**.

Although the development density will be increased the extent or footprint of construction has not been increased. The increase in the number of units to be constructed in the area adjacent to the alignment of the Provincial Road K54 is considered to represent a move towards a more optimal utilisation of the property. A development density of 27 units per hectare is still considered low to medium density and will complement the existing character of the area. According to the town planning memorandum; phase1 will entail the development a "Residential 2" township of two stories on one erf and allocation of one erf for Public Open Space on extension 5 and "Residential 2" township of two stories on two erven on extension 6.

The Geotechnical conditions on site vary from suitable for residential construction to areas that are not suitable for any construction. The layout of the site was designed according to among others, these geotechnical zones. **Figure 3** below shows the proposed layout plan (proposed amendment).

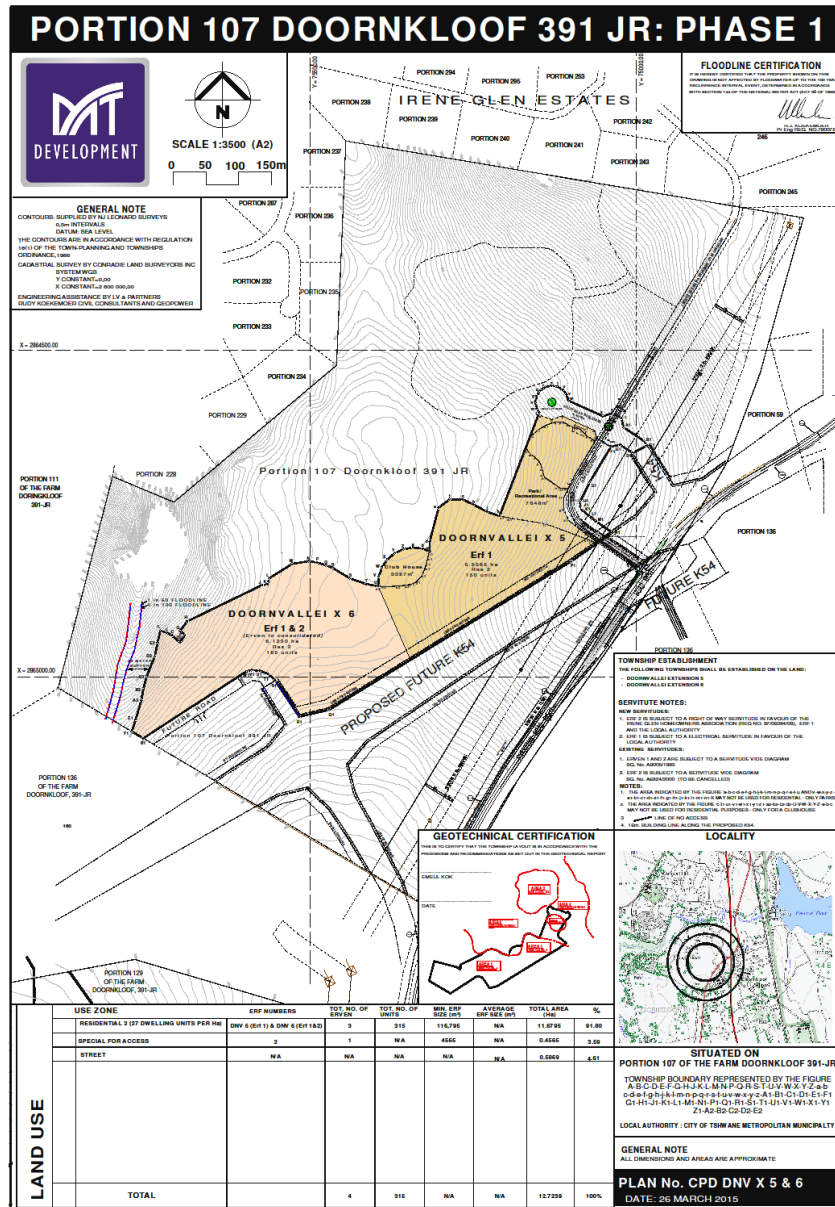


Figure 3: Proposed layout

It is important to restate that the development of the township has been passed into two phases. The current application is only for Phase 1 which is made up of Extensions 5 and 6. This phase utilises part of the footprint of the approved development.

3. SITE ATTRIBUTES

3.1 Environmental Sensitivities

The site is situated on a summit with gentle to moderate slopes. An ecological assessment was conducted recently and shows that although parts of the site are sensitive, the area for the proposed development is not affected by any sensitive areas (See Figure 4 and Annexure 4).

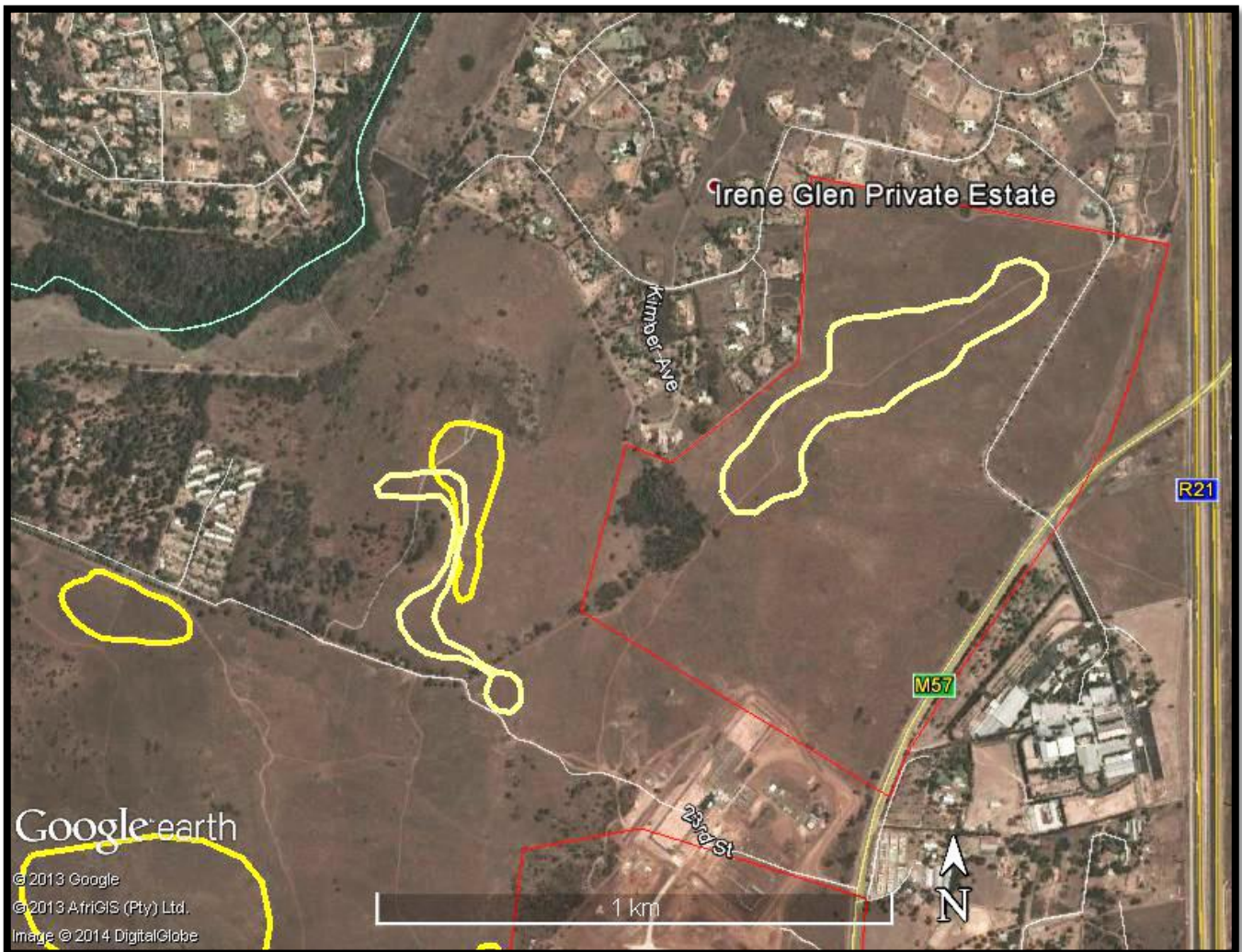


Figure 4: Map of Doornkloof Portion 107 (outlined in red). The light yellow indicates a confirmed habitat of the beetle *Ichnestoma stobbiai*

3.2 Fauna

The Red listed beetle *Ichneutoma stobbiai* was found on a part of the site. However the area proposed for Phase one of the development is outside of the area in which the beetle were found.

3.3 Flora

The ecological report notes that there are indigenous and diverse grassland with few trees and patch of exotic trees in the south-western part of the site. A large patch of exotic trees, mainly alien invasive Australian *Acacia* species, Red data plant species *Boophone disticha* and *Hypoxis hemerocallidea* were found on site and are concentrated on the rocky outcrops on the western portion of the site. It should be noted that the exotic species, alien invasive species and red data species mentioned herein fall outside the area of the proposed development. Given the above and the fact that this amendment affects an area already approved for development, there are minimal environmental implications anticipated in the development of the Phase one township.

4. ENGINEERING AND OTHER SERVICES

4.1 Water

According to the GLS report (a report developed by municipal engineers) there is an existing Rand Water pipeline adjacent to the site. Subject to the necessary upgrades and a new pipeline located within the power line servitude and the road reserve there is capacity for the township. The engineering report is attached as **Annexure 5**.

4.2 Sewer

There is an existing bulk sewer line along the spruit to the north of site which the capacity, subject to certain upgrades to accommodate the development. Because the site drains in two directions, two connection points, one to the east and the other on the western side through the existing development will be installed, see **Annexure 5**.

4.3 Stormwater

Stormwater generated on this property will be conveyed via an internal pipe system to a point more or less at the south side near the roundabout on the main access road and then to an existing storm waste channel adjacent to the R21, see **Annexure 6**.

4.4 Roads

The access road to the township is to be upgraded. This road upgrade was part of the initial authorisation, refer to **Annexure 1 and 6**.

4.5 Electricity

The proposed township is situated within the supply area of the Cornwall Hill primary substation which has a firm capacity of 40MVA, upgradable to 80MVA. There is adequate spare capacity available on the 11kV bus of the Cornwall Hill substation to supply electricity on a sustainable basis to the proposed development as per the engineer's report attached as **Annexure 7**.

5. IMPACT ASSESSMENT

The assessment of impacts resulting from the proposed amendment involved the identification of the environmental aspects and then applying the assessment criteria to determine their significance. The assessment included the construction and post construction phases of the project. Given that the development would be permanent no assessment of decommissioning was undertaken. Maintenance of infrastructure is addressed under the operational phase.

The amendment application pertains to the change in scope which includes some impacts which were not taken into account in the initial environmental authorisation process. In particular, the amendment seeks to change the nature of development from a mixed use to residential development. The development footprint (site) remains the same as well as most of the development parameters.

Therefore, the impact assessment focuses on those changes which have been brought about by the changes in the nature of development. It does not repeat the assessment of impacts if they do not substantially deviate from those assessed in the initial application

process. However, those impacts deemed important to consider or state are included in the assessment.

5. 1 Methodology Used

The potential environmental impacts associated with the project were evaluated according to the nature, extent, duration, intensity, probability and significance rating of the impacts as explained below.

Table 1: Explanation of the methodology variables

<ul style="list-style-type: none"> • Nature: classification of whether the impact is positive or negative, direct or indirect.
<ul style="list-style-type: none"> • Extent: spatial scale of impact and classified as: <ul style="list-style-type: none"> ○ Site: the impacted area is the whole or significant portion of the site (1). ○ Local: Within a radius of 2 km of the construction site (2). ○ Regional: impacted area extends to the immediate, surrounding and neighbouring properties. ○ National: the impact can be considered to be of national significance.
<ul style="list-style-type: none"> • Duration: Indicates the lifetime of the impact and is classified as: <ul style="list-style-type: none"> ○ Short term: The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase. ○ Medium term: The impact will last for the period of the construction phase, where after it will be entirely negated. ○ Long term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory. ○ Permanent: Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
<ul style="list-style-type: none"> • Intensity: Describes whether an impact is destructive or benign; <ul style="list-style-type: none"> ○ Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected. ○ Moderate: Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way. ○ High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease. ○ Very High: Natural, cultural and social functions and processes are altered to extent that they permanently cease.
<ul style="list-style-type: none"> • Probability: Describes the likelihood of an impact actually occurring: <ul style="list-style-type: none"> ○ Improbable: Likelihood of the impact materialising is very low ○ Possible: The impact may occur ○ Highly Probable: Most likely that the impact will occur ○ Definite: Impact will certainly occur

- **Significance:** Based on the above criteria the significance of issues was determined. The total number of points scored for each impact indicates the level of significance of the impact, and is rated as:
 - **Low:** the impacts are less important.
 - **Medium:** the impacts are important and require attention; mitigation is required to reduce the negative impacts.
 - **High:** the impacts are of great importance. Mitigation is therefore crucial.
- **Cumulative:** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
- **Mitigation:** Mitigation for significant issues is incorporated into the EMP.

5.2 Criteria for Rating of Impacts

Table 2: Criteria for rating of impacts

Criteria for the rating of impacts				
Criteria	Description			
Extent	National	Regional	Local	Site
Duration	Permanent	Long-term	Medium-term	Short-term
Intensity	Very high	High	Moderate	Low
Probability	Definite	Highly probable	Possible	Improbable
Points allocation	4	3	2	1
Significance Rating of classified impacts				
Impact	P			
Low	4-6	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.		
Medium	7-9	Mitigation is possible with additional design and construction inputs.		
High	10-12	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.		
Very high	13-16	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.		
Status	Perceived effect of the impact			
Positive (+)	Beneficial impact			
Negative (-)	Adverse impact			

Negative impacts are shown with a (-) while positive ones are indicated as (+)

5.3 Assessment of Impacts

As the assessment relates to the amendment application, the identification and assessment of impacts focuses only on 'new' impacts or those considered different to those assessed during the initial application process. Therefore, this assessment must be read in conjunction with the assessments undertaken during the initial application process.

Pre-construction impacts are similar to those that would have resulted from the implementation of the authorised activity. Therefore, except where emphasis is placed on particular impacts, no additional assessment was done for the amendment application.

5.3.1 Construction phase

Table 3: Potential impacts during construction phase

Potential aspect/impact	Significance before mitigation	Mitigation and Management Measures	Significance after mitigation
Socio-economic impacts			
In-migration and effect on social dynamics		<ul style="list-style-type: none"> No accommodation of construction workers permitted on site during; Appoint as many workers from the local community Implement proper screaming and code of conduct for workers; Utilise established communication channels with community for awareness and information sharing. 	
Safety and security		<ul style="list-style-type: none"> Safety Officer to be appointed to monitor safety conditions on site Signage and use of safety equipment and PPE on site; Only appropriately trained staff to handle chemicals and/or hazardous material on site Construction site to be secured/fenced-off. Access to be controlled. No illegal squatting in the vicinity to be allowed. 	

Employment generation and decrease in unemployment		No mitigation required, however, endeavour to use local construction companies/subcontractors as far as possible	Positive
Visual impact due to construction and site management		<ul style="list-style-type: none"> • Use proper screens and boundary wall to screen construction areas; • Ensure construction site is neat and tidy; • Effective waste management 	
Traffic congestion		<ul style="list-style-type: none"> • Construction vehicles' movement beyond site boundaries to be limited during peak hour traffic; • Access to the site must through the extension of Perdeblom Street; • Roads upgrade to be phased to avoid restrictions on through traffic at a time. 	
Noise from construction and disruptions in the quality of living		<ul style="list-style-type: none"> • Limit construction process to working hours as per the EMPr; • Install proper signage for awareness and to warn public of construction activities; • Identify and utilise dedicated routes for construction vehicles; • All earth moving vehicles and equipment to be regularly maintained. 	
Dust and emissions nuisance		<ul style="list-style-type: none"> • Dust suppression measures implemented as per EMPr provisions; • Loads to be covered to avoid loss of material during transportation; • Dust and mud to be controlled at vehicle exit/entry points; • All earth moving vehicles and equipment to be regularly maintained 	
Biophysical impacts			
Geotechnical impacts		<ul style="list-style-type: none"> • Construction to be in accordance with the approval of the Council for Geoscience and the NHRBC 	

		<ul style="list-style-type: none"> • Founding conditions for individual structures must be confirmed by a qualified structural engineer; • Ponding of water of water and leakage of underground pipes be avoided. Regular monitoring and immediate response to incidents. 	
		<ul style="list-style-type: none"> • 	

5.3.2 Operational phase

Table 4: Potential impacts during the operational phase

Potential aspect/impact	Significance before mitigation	Mitigation and Management Measures	Significance after mitigation
Increased housing stock and densification of the area		<ul style="list-style-type: none"> • Different housing typologies to be provided; • Effective use of infrastructure; 	Positive
Increased population and demand on services		<ul style="list-style-type: none"> • Provision of infrastructure services as determined by the local authority; • 	
In-migration/new households and effect on social dynamics		<ul style="list-style-type: none"> • Integration of 'new' community into existing community structures 	
Improved infrastructure services		<ul style="list-style-type: none"> • New infrastructure such as sewer, water, stormwater and roads provided and upgraded as per the requirements of the municipality 	Positive
Altered land use patterns and visual character		<ul style="list-style-type: none"> • Township establishment to be approved by the local authority to ensure compatibility with planning instruments; • Architectural designs to be aligned with the character of the area; 	Positive

		<ul style="list-style-type: none"> • Use of internally focussed lighting to prevent light pollution; • Height of units to remain at 3-storeys as per the initial approval; • Use of open space to enhance internal quality of the environment. 	
Increased generation of domestic waste		<ul style="list-style-type: none"> • Waste to be collected and disposed of at registered waste disposal site; • Waste recycling by residents to be encouraged by the HOA 	
Increased vehicular traffic in the area		<ul style="list-style-type: none"> • Upgraded intersections and roads infrastructure to accommodate resultant traffic; • Public transport infrastructure provided within or next to the township. 	
Energy demand		<ul style="list-style-type: none"> • Renewable energy options and/or alternatives Dust suppression measures implemented as per EMPr provisions; 	
Geotechnical impacts		<ul style="list-style-type: none"> • HOA to be appraised of the dangers of and possible formation of sinkholes. This information to be passed on to occupiers. • Ponding of surface and leakage of underground pipes or swimming pools to be avoided. Regular monitoring and immediate response to identified incidences. 	

6. ADVANTAGES AND DISADVANTAGES OF THE PROPOSED AMENDMENT

Some of the main advantages associated with the proposed amendment include the following:

- The proposed densification will result in effective use of land within the urban fabric thereby contributing to optimal utilisation of infrastructure services while contributing to the avoidance of urban sprawl;
- Different housing typologies proposed will result in integrated development with an element of Inclusionary Housing which is in line with or is in support of government /housing policy;
- The proposed development presents opportunities and infrastructure which is needed and desirable and will support the development and growth of the node.

- The provision of residential units at a slightly higher development density will only slightly influence the impact of development on the sensitive environment surrounding the development area.
- A concept known as clutter and space development is applied and considered appropriate in the case of this development in order to ensure that development does not encroach onto sensitive environmental areas.
- Decrease in environmental footprint with part of the site being left as an open space.

The proposed development has few disadvantages as identified below:

- Increase in vehicular traffic given the increase in number of residential units anticipated in a medium density development. The increase will not, however, be significant given that the environmental footprint of the development has decreased as the area set aside for Phase 1 development has been reduced.
- Increase in stormwater runoff as a result of paved surface. A stormwater management plan is being prepared to address this.
- The increase in stormwater runoff may lead to more water reaching the doline rock beneath, therefore possibly causing sinkholes.

7. AMENDMENTS TO THE EMPr

As the nature of the major impacts likely to result from the proposed amendments are similar to those that might have resulted from the approved land uses. A few amendments/additions have been made to the EMPr attached herewith as **Annexure 8**.

Annexure 1: Environmental Authorisation



AGRICULTURE, CONSERVATION AND ENVIRONMENT

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PER FACSIMILE & REGISTERED MAIL

Dear Sir

APPEAL IN RESPECT OF PROJECT REFERENCE GAUT 002/05-06/2218, THE PROPOSED TOWNSHIP DEVELOPMENT AND UPGRADING OF ROAD ON PORTION 107 OF THE FARM DOORNKLOOF 391 JR

Your appeal dated 15 December 2007 and supplementary information dated 03 April 2008 refers.

The said appeal was lodged in terms of Section 35 of the Environment Conservation Act, 1989 (Act 73 of 1989) ("ECA") against the Department's decision to refuse authorisation for the development on Portion 107 of the farm Doornkloof 391 JR, which falls under the jurisdiction of the Kungwini Local Municipality.

I have considered the said appeal and in reaching my decision, I have taken into account the following information:

- a. The contents of the project file;
- b. The appeal documentation;
- c. The Department's response thereto;
- d. Comments/input from the specialist; and
- e. Your statement in response to comments from the specialist

The documents before me indicate that:

1. The larger part of the broader area within which this site is located is either confirmed habitat or has suitable habitat for the *Ichneustoma stobbiai* species.
2. The bulk of the application site has environmental sensitivities which include non perennial rivers bordering the subject property, class 3 ridge and dolomite.
3. The proposed site is located adjacent to Smuts Koppie.
4. There is need for creation of an open and uninterrupted area for ecological processes to persist within and around the Smuts Koppie area.


After a careful review of the evidence presented, I am of the view that:

- i. The approach taken by the Department seems to have been limited to *inter alia*, the site-specific merits/impacts of the activity. Such an approach fails to consider the potential of creating a balance between development and environmental protection within the broader area,
- ii. The decision of the Department is silent on the proposal submitted in the scoping report as well the Environmental Management Plan (EMP) submitted as part of the application information. The proposal indicates that development may only take place in this area if a continuous and interlinked open space area is created for ecological process,
- iii. The submission which proposes to reserve 22.74ha of the subject site as well as 34.16ha (a total of 56.90ha) is aligned with the suggestions by the specialist that at least 80ha of habitat land be conserved in the area as a 'reserve' in order for the Fruit Chaffer Beetle to subsist with development.
- iv. Should all the sites/properties adjacent to or in proximity of the Smuts Koppie area be subject to the same restrictions, adequate conservation area will be created for long term survival of the beetle and associated habitat.
- v. Some of the environmental sensitivities including the rocky highveld grassland and the *Eragrostis* grass species have also been accommodated in the proposal mentioned in iii above.

Having considered the above, I am convinced that limited development on the subject site may proceed if the bulk of the environmental sensitivities are accommodated within the site and in adjacent related properties. In this regard, it is my decision to reverse the decision of the Head of Department and to allow limited development to proceed on this site subject to compliance with conditions below.

- a) The 'Conservation area' identified in Plan No. Beetle5 (Rietvlei_107) as well as the attached plan showing the conservation area on Portions 107 and 129 of the farm Doornkloof 391JR must be defined via GP coordinates and fenced off.
- b) The 204.2m corridor linking the conservation area on Portion 107 of the Farm Doornkloof 391 JR with the Smuts Koppie area must be left open to allow for uninterrupted movement of the beetle. Fencing may only be considered if recommended by an Entomologist.
- c) The 'conservation servitude' must be registered in favour of an appropriate Conservation body. SANBI or the municipality may be approached as possible holder of such servitude.
- d) Appropriate mechanisms must be instituted to ensure that the Home Owners Association assumes responsibility for the maintenance of the conservation area within Portion 107.
- e) Alignment of K54 does not form part of this decision as it subject to different EIA application
- f) The layout plan with properly demarcated conservation area and the amended EMP incorporating the mitigation measures recommended in the EMP by Galago Environmental as well as confirmation that the servitude will be registered against the two properties must be submitted to the HOD for confirmation and record keeping prior to the proclamation of the township.

Yours faithfully


MEC E.K. Mosunkutu
Agriculture, Conservation and Environment

Date: 09-06-08

cc: J. du G. Harrison (Curator of Coleoptera)

Fax (012) 322 7939

Annexure 2: Town Planning Motivation



MOTIVATING MEMORANDUM DOORNVALLEI EXTENSION 5

**APPLICATION IN TERMS OF SECTION SECTION 96(1) OF THE TOWN-
PLANNING AND TOWNSHIP ORDINANCE, 1986 (ORDINANCE 15 of 1986)
FOR THE ESTABLISHMENT OF THE TOWNSHIP DOORNVALLEI EXTENSION 5
ON A PART OF PORTION 107 OF THE FARM DOORKLOOF No. 391 JR,
PROVINCE GAUTENG**

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14 April 2015

TABLE OF CONTENTS

1. INTRODUCTION

- 1.1 BACKGROUND
- 1.2 PURPOSE OF THE APPLICATION

2. LEGAL INFORMATION

- 2.1 PROPERTY DESCRIPTION
- 2.2 PROPERTY SIZE
- 2.3 REGISTERED OWNERS AND TITLE DEED INFORMATION
- 2.4 AUTHORISATION TO ACT
- 2.5 MORTGAGE BONDS
- 2.6 MINERAL RIGHTS
- 2.7 TOWNSHIP NAME
- 2.8 MUNICIPAL JURISDICTION
- 2.9 SERVITUDES
- 2.10 TOWN PLANNING STATUS
- 2.11 ENVIRONMENTAL STATUS

3. LOCALITY, ZONING AND LAND-USE

- 3.1 LOCALITY
- 3.2 CURRENT ZONING
- 3.3 SURROUNDING ZONING
- 3.4 LAND-USE
- 3.5 SURROUNDING LAND-USE

4. PHYSICAL FEATURES

- 4.1 TOPOGRAPHY
- 4.2 FLOODLINES
- 4.3 SOIL CONDITIONS

5. PROPOSED DEVELOPMENT AND LAND USE CONTROL MEASURES

- 5.1 ZONING AND LAND USE PARAMETERS
- 5.2 TOWNSHIP DESIGN
- 5.3 TOWNSHIP ACCESS

6. SPECIALIST STUDIES IN SUPPORT OF DEVELOPMENT PROPOSAL

- 6.1 ENGINEERING SERVICES
- 6.2 TRAFFIC ENGINEERING
- 6.3 ENVIRONMENTAL IMPACT ASSESSMENT

7. MOTIVATION IN SUPPORT OF THE APPLICATION

- 7.1 NEED AND DESIRABILITY
- 7.2 INSTITUTIONAL POLICIES
 - 7.2.1 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 2013 (SPLUMA).
 - 7.2.2 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK
 - 7.2.3 CITY OF TSHWANE METROPOLITAN SPATIAL DEVELOPMENT FRAMEWORK.
 - 7.2.4 CITY OF TSHWANE REGIONAL SPATIAL DEVELOPMENT FRAMEWORK: REGION 4

8. CONCLUSION.

1. INTRODUCTION

Application is hereby made for the establishment of a township on a part of Portion 107 of the farm Doornkloof No. 391 JR, Gauteng Province, in terms of Section 96(1) of the Town Planning and Townships Ordinance (Ordinance 15 of 1986).

The township shall be known as Doornvallei Extension 5 and shall consist of erven and streets as indicated in the table below:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	TOTAL AREA	%
Residential 2	1	1	150	5.5565 ha	84.19
Special for Access	2	1	N/A	0.4565 ha	6.92
Streets	N/A	N/A	N/A	0.5869 ha	8.89
TOTAL		2	150	6.5999 ha	100.00

1.1 BACKGROUND

It should be noted that the subject property was previously located within the jurisdiction of the Kungwini Local Municipality. Prior to the integration of large areas of the aforementioned municipal area into the boundaries of the City of Tshwane Metropolitan Municipality an application to establish the township **Doornvallei Proper** on Portion 107 of the Farm Doornkloof 391 JR was submitted to and approved by the Kungwini Local Municipality. The township proposed the development of a low density “full title residential estate” with a number of limited “grouphousing” opportunities. Subsequent to the approval of the aforementioned application, an application to divide Doornvallei Proper into two townships were also approved. This allowed for the establishment of the townships Doornvallei Extension 1 and 2.

Subsequent to the integration of the subject property into the boundaries of the City of Tshwane Metropolitan Municipality (CTMM) the general administration of these applications became the responsibility of the CTMM. Extension of time has been granted in respect of Doornvallei Extension 1, in terms of the provisions of the Ordinance, by the CTMM. The application in respect of Extension 2 has lapsed.

1.2 PURPOSE OF THE APPLICATION

The application that is herewith submitted differs considerably and materially from any previously proposed development concept presented and approved in respect of the subject property (namely Doornvallei Extension 1). The township area has been significantly reduced whilst the land-use proposed to take place on the property has been altered from full title low density residential development to medium density sectional

title residential use.

In light of the fact that the amendments proposed to the township is considered to be material in nature an application is submitted in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) and the application is therefore considered to represent a *de novo* application.

Following from the above it is confirmed that his application seeks to facilitate the process of establishing a township on a part of Portion 107 of the farm Doornkloof 391-JR in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986). The purpose of this memorandum is to provide all required information and details in order to inform the consideration of the proposal to establish such a township and furthermore ensures compliance with the provisions of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986).

2. LEGAL INFORMATION

2.1 PROPERTY DESCRIPTION

The township stands to be established on a part of the land formally registered as Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province. Portion 107 of the Farm Doornkloof 391 JR is forthwith referred to as the “site of application” of the “subject property”.

2.2 PROPERTY SIZE

Portion 107 of the farm Doornkloof 391-JR measures 73.4481 ha in extent. The township Doornvallei Extension 5 will be situated on only a part of the property, with the township area measuring 6.5999 ha in extent. The proposed development therefore occupies less than 10% of the larger landholding on which it will be established.

2.3 REGISTERED OWNERS AND TITLE DEED INFORMATION

Portion 107 of the Farm Doornkloof 391 JR is registered in the name of JR 209 Investments (Pty) Ltd. (2000/020447/07) vide Deed of Transfer T 118682/2006. The company JR 209 investments (Pty) Ltd. trades as M&T Development.

A copy of the title deed is included in this application under **Annexure I**.

2.4 AUTHORITY TO ACT

Jan Willem Lotz, Pr. Plan 1465/2011, has been authorised by the owner of the property to act on the company's behalf. A copy of the signed Company Resolution and Power of Attorney is included under **Annexure J**.

2.5 MORTGAGE BONDS

There is currently no bond registered over Portion 107 of the farm Doornkloof 391-JR. Please refer to the Title Deed 118682/2006.

2.6 MINERAL RIGHTS

Deed of Transfer T118682/2006 does not contain or refer to any title conditions with regard to mineral rights over or on the property. Therefore, the site of application is not subject to or entitled to any mineral rights.

In addition to the above should it be noted that in terms of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) the mineral rights are held by the state. As a result of the aforementioned the Department of Minerals and Energy will need to consent to the establishment of the township.

2.7 TOWNSHIP NAME

Confirmation has been received from the City of Tshwane that the township shall be known as Doornvallei Extension 5. The mentioned confirmation is attached to this application as **Annexure H**.

2.8 MUNICIPAL JURISDICTION

Portion 107 of the Farm Doornkloof 391 JR is located within the boundaries of the City of Tshwane Metropolitan Municipality.

2.9 RESTRICTIVE CONDITIONS AND SERVITUDES

The following conditions contained within the Title Deed 118682/2006 do affect the township:

Condition A(k) *BY notarial deed K 3595/1986 S dated 19 AUGUST, 1986, the within mentioned property is*

subject to a perpetual servitude for electrical purposes indicated by the reference line a B x on diagram S.G. A9005/1985 in favour of the Town Council of Verwoerdburg as will more fully appear from reference to the said notarial deed of servitude.

Condition B *By Virtue of notarial deed K2210/2002S dated 14 FEBRUARY, 2001, the within-mentioned property is subject to a servitude for perpetual right of way and exclusive use in favour of portion 302 (a portion of portion 106) of the farm Doornkloof 391, which servitude area is indicated by the letters ABCDEFGHJKLMNPQRSTUVWXYZ on diagram S.G.No.6824/2000 = 7325 square meters, together with ancillary rights, as will more fully appear from the said notarial deed.*

No other conditions or servitudes affect the use of land within the township and are therefore not considered restrictive in as far as this application is concerned.

2.10 TOWN PLANNING STATUS

The site of application is currently zoned as “Agricultural”. In terms of the Tshwane Town Planning Scheme, 2008 the property may only be utilised for “agricultural” purposes, a farm stall, and one dwelling house.

The Tshwane Town Planning Scheme defines “agriculture” as follows:

Means land and buildings used for any bona fide farming activities which may include market gardens, game farming, cattle, goats and sheep farming, bee farming, bird feeding, plant nursery, plantations, aquaculture, mushroom production, forestry and orchards, and activities normally regarded as incidental thereto, excluding abattoirs, cattle feeding lots, poultry farming, pig farming, animal boarding place.

2.11 ENVIRONMENTAL STATUS

As mentioned within the paragraphs above a township, referred to as Doornvallei Proper, was previously approved by the Kungwini Local Municipality in respect of the subject property. The approval of the application was underpinned and supported by a decision by the Gauteng Department of Agriculture, Conservation and Environment.

The abovementioned decision was issued by the office of the MEC on the 9th of June 2008 and contained numerous conditions that needed to be complied with. The most important consideration is however the fact that the proposed development concept was authorised and could have been proceeded with should the

developer have decided to do so.

The environmental authorisation was issued in respect of the layout plan indicative of the previous development proposal and therefore an application to amend the existing authorisation will be submitted to the Gauteng Department of Agriculture and Rural Development for consideration.

3. LOCALITY, ZONING AND LAND-USE

3.1 LOCALITY

As mentioned in the paragraphs above the proposed township is located within the jurisdiction of the City of Tshwane Metropolitan Municipality. Furthermore, Portion 107 of the farm Doornkloof 391 JR is located within the City of Tshwane's administrative Region 4 which includes the larger south-western extent of the municipal jurisdiction. The Irene area is one of the established neighbourhoods located within Region 4 and from a geographic perspective the "site of application" is located directly adjacent to existing residential development. The "site of application" is located directly south of the Irene Glen Estate as well as Cornwall Hill Residential Estate.

The R21 Freeway (Albertina Sisulu Freeway) is situated approximately 300 meters to the east of the property with the provincial road M57 (Goede Hoop Road) providing access to the property from its existing alignment directly south of the "site of application". Goede Hoop Road intersects with Nellmapius Road to the north of the property which road in turn connects with the R21 Freeway, enabling national, provincial and regional connectivity. The locality of the "site of application" is indicated in the figure below:

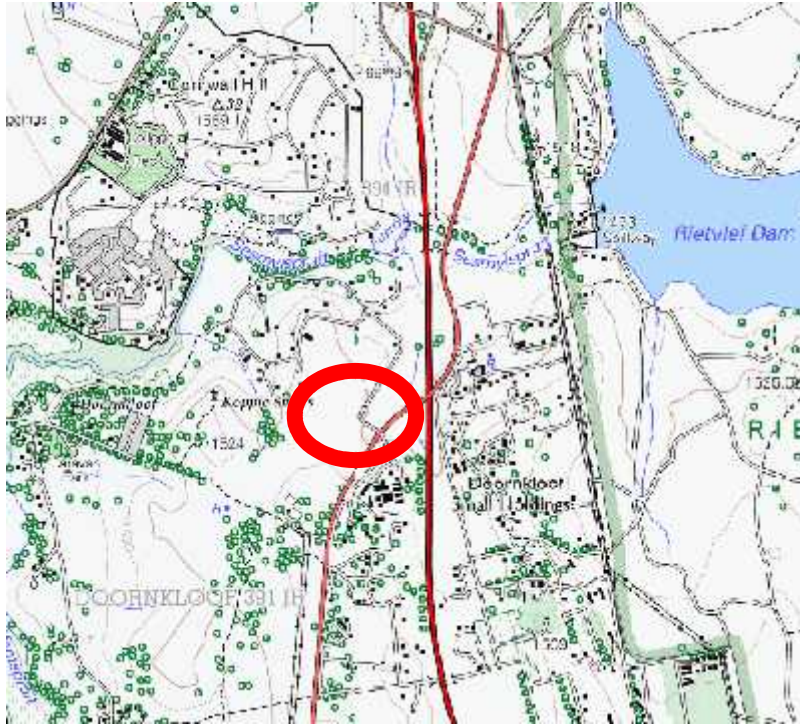


Figure 1: Locality

3.2 CURRENT ZONING

In terms of the Tshwane Town-Planning Scheme, 2008 the farm portion is currently zoned “Agricultural”. The Zoning Certificate is attached as **Annexure D**.

3.3 SURROUNDING ZONING

The property surrounding the site of application is zoned primarily as “undetermined” as can be seen from the Zoning Map attached to this application (**Annexure E**).

3.4 LAND USE

The property is currently vacant and is therefore not utilised for any specific use.

3.5 SURROUNDING LAND USE

The properties to the north of the site of application is predominantly utilised for the purpose of low density residential housing. The properties to the south of the site is largely undeveloped except for the Rietvlei Electrical Infeed Station located directly south of the site of application. The character of the surrounding area can be described as rural residential in nature. The St. George’s Hotel is located directly east of the site of application.

3.6 TOPOGRAPHY

The topography of the larger Portion 107 of the farm Doornkloof 391 JR is characterised by a prominent watershed crossing through the centre of the property in a north-western / south-eastern direction. The watershed results in the northern extent of the property sloping in a north-eastern direction and the southern extent of the property sloping in a north-western direction. The portion of land therefore has more than one catchment area and consequently more than one “low point”.

The proposed township, Doornvallei Extension 5, is however located to the east of the watershed referred to above, implying that the slope of the township area does not change direction or fluctuate. The township area slopes consistently in a north-eastern direction with the highest point of the township being on the western boundary of the township at a height of 1516 meters above mean sea level and the lowest point being on the southern boundary at a height of approximately 1498 meters above mean sea level. The slope of the township was calculated as approximately 5.42%.

3.7 FLOOD LINES

Portion 107 of the Farm Doornkloof 391 JR is affected by a floodline traversing the property in the most western extent of the property as indicated on the Layout Plan CPD DNV x 5 TS/1. Since the floodline is regarded as a non-perennial watercourse or drainage line no development will take place within 32 meters from the position of the 1:100 year floodline.

Considering the position of the township boundaries of the township Doornvallei Extension 5 it can clearly be seen and therefore deduced from the Layout Plan that the township area is not affected by the floodline referred to within the paragraphs above as a result of the location of the township in relation to the alignment of the floodline. The aforementioned statement has been investigated in detail by the Civil Engineering consultant forming part of the project team and confirmed as such by means of the formal verification of the Layout Plan.

In light of the above it can therefore be confirmed that the township Doornvallei Extension 5 is not affected by floodwater up to the 50 and 100 year recurrence interval event as determined in accordance with Section 144 of the National Water Act (Act 36 of 1998).

3.8 SOIL CONDITIONS

A Geotechnical Investigation in respect of the land on which the township stands to be established was carried out by Dolomite Technology (Pty) Ltd during 2007. The report “Dolomite Stability and Engineering Geological Material Investigation for Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province”, dated May 2007 was submitted to the Council for Geoscience for comments. The aforementioned Council supported the establishment of a township on the property previously.

In order to ensure that the current development proposal is still acceptable to the Council for Geoscience a Layout Plan indicating the location of Doornvallei Extension 5 as well as the proposed land-uses were resubmitted to the said Council for consideration. Within the correspondence it is confirmed that the land-use, considered to be a Residential 2 type of development, is located within “Area 1” and that such an area is characterised mainly by Inherent Risk Class 4 conditions. In light of the fact that the proposed density of 27 dwelling units per hectare is in line with the densities stipulated in SANS 1936-1:2012 the Layout Plan indicating the proposed development concept has been vetted by the Council for Geoscience.

4. PROPOSED DEVELOPMENT AND CONTROL MEASURES

4.1 ZONING AND LAND USE PARAMETERS

The proposed development will consist of two erven. These erven will make provision for the following proposed land use rights:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	AVERAGE ERF SIZE	TOTAL AREA	%
Residential 2	1	1	150	N/A	5.5565 ha	84.19
Special for Access	2	1	N/A	N/A	0.4565 ha	6.92
Streets	N/A	N/A	N/A	N/A	0.5869 ha	8.89
TOTAL		2	150	N/A	6.5999 ha	100.00

The following parameters will be made applicable to Erf 1:

- Development Density: 27 units per hectare;
- Height: 2 Storeys;
- Coverage: 50%

All other development controls will be in accordance with the Conditions of Establishment which has been attached to this application.

4.2 TOWNSHIP DESIGN

The township consists of erven and streets as indicated in accordance with the Layout Plan CPD DNV X 5 TS/1. The proposed Layout Plan indicates the particulars pertaining to the design of the township is attached hereto under **Annexure C**.

The following pertinent considerations informed the conceptualisation of the Layout Plan:

- The future alignment of the proposed Provincial Road K54 traverses Portion 107 of the Farm Doornkloof 391 JR. The exact alignment of the road has been determined and influences the use of the subject property. The alignment of the said road forms the southern boundary of the township and no direct access will be obtained from the Provincial Road;
- The current access to the property and the future access from proposed Provincial Road K54 is not similar. The Layout Plan has been designed in such a way to make provision for the fact that access will temporarily be obtained from Road M57 until such time as the Provincial Road K54 is constructed. The access from Provincial Road K54 is considered the ultimate / final access solution. Erf 2 makes provision for the interim access road and is therefore zoned as special for “access”. Once the permanent access from Road K54 is available the Erf can be rezoned and utilised for alternative purposes. The road reserve for the road connecting the township and the access position to the Road K54 has been indicated in its final position on the Layout Plan and has been zoned as “Street”.
- The residential erf (Erf 1) measures 5.5ha and makes provision for 150 units. The internal layout and design of the housing complex will be dealt with in detail on a separate Site Development Plan. It is proposed that all 150 dwelling units will be constructed in unison. The erf makes provision for two recreational areas:
 - The area in the south-western extent of Erf 1, indicated by the figure A-B-C-D-E-F-G-H-J-p1-q1-r1-s1-t1-u1-v1-w1-x1-y1-A, will be set aside as an area containing a clubhouse and associated recreational facilities.
 - The area in the northern extent of the township, indicated by the figure v-w-x-y-z-a1-b1-c1-d1-e1-f1-g1-h1-j1-k1-l1-m1-n1-R, will be set aside as a park for the use and enjoyment of all residents within the development.

4.3 TOWNSHIP ACCESS

Access to the township will be provided from the provincial road M57 also known as Goede Hoop Road. An existing access position allows for access to the Irene Glen Residential “Estate” and it is proposed that the same access be utilised to provide access to Doornvallei Extension 5 subject thereto that certain upgrades to the existing access road is implemented. The details of the upgrades will be specified within the Roads and Stormwater services report.

5. SPECIALIST STUDIES IN SUPPORT OF THE DEVELOPMENT PROPOSAL

5.1 ENGINEERING SERVICES

In order to investigate how the township will be incorporated into the local municipal service network preliminary services reports are in the process of being compiled by the following engineering consultancies:

- Roads and Stormwater: Rudi Koekemoer Civil Consultancy;
- Water and Sanitation: LV and Partners;
- Electricity: Geopower

The service report will inter alia address the provision of internal and external engineering services for the new township. All the relevant engineering services (water and sewer, roads and stormwater and electricity) will be discussed in these reports and the reports will be submitted to Council in due course.

In as far as the provision of water and sanitation services are concerned it should be noted that the engineering consultancy GLS has also been appointed to provide recommendations in respect of the integration of the proposed township into the municipal service network. The completed report will be submitted to the City of Tshwane as soon as such has been received.

5.2 TRAFFIC ENGINEERING

In light of the fact that the application for township establishment proposed the ultimate construction of 150 residential structures a Traffic Impact Assessment is required. In order to attend to the aforementioned the consultancy Koleko Solutions has been appointed to complete a Traffic Impact Assessment for the new proposed development. The assessment will be submitted to the City of Tshwane as soon as such has been completed.

5.3 ENVIRONMENTAL IMPACT ASSESSMENT

As a result of the fact that the development concept is in the process of being amended an application for

amendment of the existing authorisation will be submitted to the office of the Gauteng Department of Agriculture and Rural Development in order to secure an authorisation specifically authorising the newly proposed development concept.

6. MOTIVATION IN SUPPORT OF THE APPLICATION

6.1 NEED AND DESIRABILITY

As mentioned within the introductory paragraphs the proposed site of application is located within the south of the City of Tshwane's Region 4, within the Irene and surrounding area, which is generally characterised by relatively low density residential housing and associated facilities.

The Irene and surrounding area is located very strategically in close proximity to both the N1 and R21 Freeways which roads has emerged as the two primary structuring elements of the Gauteng development region. Whilst the N1 Freeway is already considered to be a fully-fledged development corridor the R21 Freeway is largely still in the process of transforming into a corridor. Intensified growth in support of the evolution and spatial entrenchment of these development corridors is strongly supported and promoted by all institutional planning documents and is considered the logical expansion of growth within the province.

Large tracts of land is currently still undeveloped on either side of the R21 freeway and offers an opportunity to consider the systematic intensification of the urban form within these larger corridor areas. It is held that Portion 107 of the Farm Doornkloof 391 JR is located within an area that is very closely associated with the spatial formation of the R21 development corridor and offers the potential to support higher intensity growth through the implementation of densification efforts.

In addition to the above, Portion 107 of the Farm Doornkloof 391 JR is located directly adjacent to the existing residential development Irene Glen Residential Estate. Irene Glen Estate is in turn situated directly adjacent to the Cornwall Hill Residential Estate. The development of Portion 107 can therefore not be considered to represent anything else than a natural extension of the existing urban settlements from the north into a southern direction.

The fact that the property is located adjacent to exiting urban development and is seen a natural expansion of urban growth places the onus on urban planners to consider the appropriate utilisation of the property within the context of existing low density residential development to the north and planned higher density residential development towards the south. The need to consider the existing character of the surrounding area is considered of paramount importance whilst aligning the development concept with institutional planning of the greenfields areas to the south is also required. In this particular instance it is argued that an appropriate

development concept should promote spatial transition between existing development and planned development respectively to the north and south.

As mentioned the original development concept was underpinned by the proposal to provide full title residential erven. From a spatial planning perspective the development concept could be considered to be representative of a low density development concept. Considering the need to implement a mechanism to introduce spatial transition in as far as density is concerned a low density development would not necessarily be the most appropriate mechanism.

Through the submission of this application it is proposed to increase the development density from a full title residential concept to a sectional title grouphousing concept being constructed at a density of 27 units per hectare. The increase in density implies that an increased number of dwelling units can be accommodated on the portion of land forming the subject of the application. It should be noted that although the development density will be increased the extent or footprint of construction has not been increased. The increase in the number of units to be constructed in the area adjacent to the alignment of the Provincial Road K54 is considered to represent a move towards a more optimal utilisation of the property which allows for the maximisation of the development potential of the property. A development density of 27 units per hectare is still considered low to medium density and will complement the existing character of the area whilst allowing for an ever slight transition of development density from the minimal development densities of the residential developments to the north of the property towards the undeveloped greenfield properties in the most southern extremities of the City of Tshwane's Region 4, which has been earmarked for more intensified development utilisation.

The provision of residential units at a slightly higher development density will not in any way influence the impact of development on the sensitive environment surrounding the development area. A concept known as clutter and space development is applied and considered appropriate in the case of this development in order to ensure that development does not encroach onto sensitive environmental areas. The development footprint proposed in terms of the previous concept will not be increased at all.

In order to further consider the most appropriate development type the concept of need was taken into account. From experience it can be confirmed that although economic growth has generally slowed down over the last number of years, a continuous supply and take-up of residential opportunities within the Irene and surrounding area has continued to take place. The continuous take-up of residential opportunities within the southern extents of the City of Tshwane, specifically including the Irene and surrounding area, has been fuelled by an undeniable need and demand for residential developments within highly strategic locations. Growth in this segment of the residential market has however been extremely price sensitive and demand has undoubtedly been the strongest within the middle income market. Where full title ownership generally implies

final construction costs in the order of R2 to R3 million per residential opportunity the supply of grouphousing opportunities can be introduced into the market at much lower cost. In order to ensure a dynamic and sustainable urban environment a wider range of development types and opportunities should be introduced into a geographic area and it is considered appropriate that the development concept of Doornvallei Extension 5 shall seek to achieve such broadening of tenure types. The fact that there is a demand for grouphousing developments, correctly priced, within the Irene area is undeniable.

6.2 INSTITUTIONAL POLICIES

6.2.1 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 2013.

The purpose of the Spatial Planning and Land Use Management Act, 16 of 2013 (SPLUMA) is to inter alia provide a framework for spatial planning and land use management within the Republic. The framework for spatial planning provided by SPLUMA is underpinned by a number of distinct development principles.

Chapter 2 of the Act provides an overview of the principles that should guide development:

- **PRINCIPLE 7(b) - THE PRINCIPLE OF SPATIAL SUSTAINABILITY;**

Principle 7(b) promotes the concept of sustainable spatial growth where the value and importance of agricultural land, environmental sensitive resources and the demand for development is planned and provided in a harmonious and balanced manner. The concept of sustainability is furthermore heavily dependent upon maximising the efficiency of infrastructure and preventing the occurrence of urban sprawl. The subject property presents a natural expansion of an existing area at a density which allows for limited intensification and densification. The fact that the development takes place adjacent to an existing urban area implies that existing infrastructure can be maximised and the increase in density counteracts the concept of urban sprawl.

- **PRINCIPLE 7(c)- THE PRINCIPLE OF EFFICIENCY;**

Principle 7(c) emphasises that planning should promote overall efficiency through inter alia the optimisation of existing resources and infrastructure. It furthermore promotes administrative efficiency and decision making. The existing Irene area is relatively well serviced and although upgrades to the existing municipal services network will be required sufficient capacity to accommodate this new development does exist. The fact that this development is adjacent to existing urban development strongly supports the notion of optimising existing infrastructure.

- **PRINCIPLE 7(d)- THE PRINCIPLE OF SPATIAL RESILIENCE;**

Principle 7(d) promotes spatial resilience by means of allowing for flexibility in spatial plans, policies and land use management systems are accommodated in order to ensure sustainable livelihoods in communities. The area in which the subject property is situated is starting to systematically transform from an area with an predominant rural residential character area into a more urbanised and structured environment. The RSDF for Region 4 is sufficiently flexible in order to guide such transformation in a structured manner.

- **PRINCIPLE 7(e)- THE PRINCIPLE OF GOOD ADMINISTRATION;**

Principle 7(e) promotes the principle that the application of planning should take place in an integrated manner and be guided by a spatial planning and a land-use management system as embodied in the Act. Good administration should additionally allow for integration and cooperation among state departments in as far the preparation of Spatial Development Frameworks are concerned as well as the fact that all planning processes should be underpinned by transparent public participation processes. In light of the fact that the City of Tshwane undertook a detailed process of compiling its suite of Spatial Development Frameworks and further that all the actions and processes occurred strictly in accordance with the ruling legislation it is accepted that good administration guided that preparation of the Spatial Development Framework applicable to Region 4.

6.2.2 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK.

The purpose of the Gauteng Spatial Development Framework (GSDF) is to communicate a shared future spatial vision and structure for the Province. The GSDF is clear and unambiguous about the fact that growth and development within the province should be strategically guided and directed and not purely just a consequence of spontaneous and organic growth. The GSDF provides an overarching spatial vision for the Province and hence provides guidance and influences the Tshwane Metropolitan Spatial Development Framework with specific regards to the location and nature of the physical development.

Within the Tshwane MSDF the following key consideration contained within the GSDF are identified and highlighted due to its importance:

- Contained urban growth;
- Resource based economic development (resulting in the identification of the economic core);
- Re-direction of urban growth (stabilise/limit growth in economically non-viable areas, achieve growth on the land within the economic growth sphere);
- Protection of rural areas and enhancement of tourism and agricultural related activities;

- Increased access and mobility.

The primary structuring elements identified within the GSDF are those of:

- Urban mixed-use activity nodes;
- Open space and green system;
- Public transit and movement routes;
- Urban corridors and activity spines.

In addition to the above the GSDF sets out to guide and structure growth, in a balanced manner, towards the notion of a “sustainable city”. Within the GSDF the notion of a “sustainable city” is explained as the focus on achieving a life-enhancing urban environments for all individuals, in which acceptable standards of living are met without compromising the ecological, cultural, social, economic, security or legal pre-conditions necessary for continued viability.

In order for South African cities to achieve the status of a “sustainable city” a number of development principles need to be achieved, which include:

- A more compact urban form that discourages dispersed low-density urban sprawl;
- The promotion of a diverse combination of land-uses that enables a greater intensity of mixed-use development;
- A more complex urban system that spawns opportunity through diversity of activity patterns and brings associated economic and employment opportunities through integrated development;
- The integration of the historically marginalised areas into the mainstream of urban life by correcting the spatial patterns of the urban environment;
- Optimising the utilisation of existing service infrastructure and social amenities particularly where space capacity exists;
- Enabling accessibility to affordable and efficient means of public and private transportation;
- Furthering the development of employment opportunities and residential areas in close proximity to or integrated with each other;
- Promoting physical development based on ecological sound principles that bring the natural environment and the urban system into a mutually reinforcing and integrated relationship; and
- Understanding the open space system of a city-region as an integral part of the city-region’s morphology, economic makeup and a defining element of urban quality.

The township Doornvallei Extension 5 supports the principles stated above in light of the fact that the development concept aims to move away from the typical low density development concepts

characteristic of the surrounding area. Through the increase in development density the concept promotes a higher intensity development proposal whilst still acknowledging the importance of the sensitive environment within which the development is located.

6.2.3 CITY OF TSHWANE METROPOLITAN SPATIAL DEVELOPMENT FRAMEWORK

The vision of the City of Tshwane is to become the African Capital City of Excellence. In order to achieve this vision seven objectives have been identified that should be achieved. Two of the strategic objectives have a influence on spatial planning and development, namely strategic objective 2 and 3.

Strategic objective 2 calls for economic growth, development and job creation. The aforementioned is achieved by means of the provision of strategic direction around infrastructure provision, guiding developers and investors to appropriate locations and rural development programmes.

Strategic objective 3 envisages the creation of sustainable communities with clean, healthy and safe environments. In order to achieve this objective there is a need to restructure the spatial inefficient city through compaction, densification and transport orientated development, promote sustainable use of land resources and growth management.

Following from the above the spatial policy promoted within the Municipal Spatial Development Framework, namely the application of the concept of “growth management” is explained. The application of the concept is required in order to ensure efficient, optimal and sustainable development of the physical environment.

Growth management is underpinned by the concept of “smart growth” which principle seeks to guide development in such a manner to ensure that resources and services are optimised in order to meet demand. The application of the concept of growth management is achieved by means of implementing specific spatial planning “tools” that have the ability to influence and direct growth. One such tool is the identification of an urban edge. The use of this tool as part of the concept of growth management allows for the conservation of valuable environmental and agricultural areas whilst also promoting the use of existing infrastructure through (1) redevelopment, (2) infill development and (3) densification within the urban edge in order to achieve sustainable development.

The application of the urban edge furthermore also encourages the agglomeration of economies within the edge, encouraging scattered secondary or emerging nodes to develop into consolidated primary nodes as opposed to leapfrog development.

Within the MSDF the statement is made that due to the high cost of providing bulk infrastructure in low density areas, urban sprawl should be discouraged. It is imperative that available infrastructure within the nodes are used optimally. The aforementioned situation requires densification and intensification of land uses through compaction and infill developments.

Emphasis is furthermore placed on the implementation of the concept of Transit-orientated development in order to optimise the potential of infrastructure capacity.

Following from the above the MSDF continues to elaborate on the spatial tools and mechanisms that should be implemented to ensure that sufficient direction is provided to enable the existing fragmented, inequitable and inefficient urban form to be restructured to allow for a more equitable, efficient and environmentally and financially sustainable dispensation in line with institutional policies and legislation. The functional integration of our city will be achieved by means of the implementation of the following principles:

- Higher density urban development;
- Greater mixing of compatible land-uses; and
- Focussed concentration of high-density residential land-uses and intensification of non-residential land-uses in nodes, around transit stations and along activity corridors.

In light of the fact that it is the intention to increase the density of the development concept proposed in respect of Doornvallei Extension 5 it is important to consider the perceived benefits that increase density brings about. Within the MSDF the following advantages are listed:

- Minimise / reduce the footprint of the city;
- Prevent the destruction of valuable agricultural land;
- Reduce the pressure for the development of open spaces and environmental sensitive land due to the optimal use of available land; providing choice in terms of housing typologies;
- Improve the viability of public transport;
- Improve the efficiency of urban areas – increased convenience for the residents of the city in terms of improved access to goods, services and job opportunities as well as a reduction in travelling times, cost and distances;
- Improve use of service infrastructure;
- Increase the marketability of the city; and
- Reduce inequality.

6.2.4 CITY OF TSHWANE REGIONAL SPATIAL DEVELOPMENT FRAMEWORK: REGION 4

Within the RSDF it is stated that the structure of the eastern part of Region 4, within which the subject property is located, is defined by a grid of integrated roads, nodes, linkages and open space systems.

The urban fabric within this grid is based on an integrated lattice on which densification and intensification of development can take place in an integrated manner. A set of linear systems form the framework of the urban development lattice and relays urban energy from the traversing highways to lower order roads where it can be converted into physical development and economic growth.

A system of activity nodes is located onto the development lattice to provide thrust to development occurring in a linear fashion along highways and other linear activity systems. One of these linear structuring elements is the R21 highway between Tshwane and Ekurhuleni. The R21 development corridor is supported by van Ryneveld Avenue in the west and Goedehoop Road in the east as well as the Olievenhoutbosch Road.

The proposed Provincial Road K54 is located directly to the south of the site of application. The road is classified as a mobility spine in terms of the RSDF and defined as “an arterial along which through traffic flows with minimal interruption”.

In light of the status, location and influence of the proposed Provincial Road K54 on the spatial dynamics of the local area the landholdings on either side of the alignment of the road has been identified as a linear corridor as can be seen on the extract below:



Figure 2: Region 4 SDF

A linear zone refer to high intensity areas that are located adjacent to major roads. These roads usually carry high volumes of traffic to areas such as zones of concentration and transit promotion zones and therefore also encourages the feasibility of public transport on these routes.

7. CONCLUSION.

Application is hereby made for the establish of the township Doornvallei Extension 5 in terms of Section 96(1) of the Town Planning and Townships Ordinance (Ordinance 15 of 1986) on a part of Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province.

The purpose of this application is to establish a township consisting of the following erven and streets:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	AVERAGE ERF SIZE	TOTAL AREA	%
Residential 2	1	1	150	N/A	5.5565 ha	84.19
Special for Access	2	1	N/A	N/A	0.4565 ha	6.92
Streets	N/A	N/A	N/A	N/A	0.5869 ha	8.89

TOTAL		2	150	N/A	6.5999 ha	100.00
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The application will promote harmonious development within the local development context and will contribute to the endeavour to intensify and integrate a fragmented urban pattern by means of the compaction of the city. The application will therefore strengthen the urban fibre of the local area. The site of application has great potential to be developed as explained in the memorandum above.

The application complies with current planning policies and principles and should be favourably considered by the Municipality.



MOTIVATING MEMORANDUM DOORVALLEI EXTENSION 6

**APPLICATION IN TERMS OF SECTION SECTION 96(1) OF THE TOWN-
PLANNING AND TOWNSHIP ORDINANCE, 1986 (ORDINANCE 15 of 1986)
FOR THE ESTABLISHMENT OF THE TOWNSHIP DOORVALLEI EXTENSION 6
ON A PART OF PORTION 107 OF THE FARM DOORKLOOF No. 391 JR,
PROVINCE GAUTENG**

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14 April 2015

TABLE OF CONTENTS

1. INTRODUCTION

- 1.1 BACKGROUND
- 1.2 PURPOSE OF THE APPLICATION

2. LEGAL INFORMATION

- 2.1 PROPERTY DESCRIPTION
- 2.2 PROPERTY SIZE
- 2.3 REGISTERED OWNERS AND TITLE DEED INFORMATION
- 2.4 AUTHORISATION TO ACT
- 2.5 MORTGAGE BONDS
- 2.6 MINERAL RIGHTS
- 2.7 TOWNSHIP NAME
- 2.8 MUNICIPAL JURISDICTION
- 2.9 SERVITUDES
- 2.10 TOWN PLANNING STATUS
- 2.11 ENVIRONMENTAL STATUS

3. LOCALITY, ZONING AND LAND-USE

- 3.1 LOCALITY
- 3.2 CURRENT ZONING
- 3.3 SURROUNDING ZONING
- 3.4 LAND-USE
- 3.5 SURROUNDING LAND-USE

4. PHYSICAL FEATURES

- 4.1 TOPOGRAPHY
- 4.2 FLOODLINES
- 4.3 SOIL CONDITIONS

5. PROPOSED DEVELOPMENT AND LAND USE CONTROL MEASURES

- 5.1 ZONING AND LAND USE PARAMETERS
- 5.2 TOWNSHIP DESIGN
- 5.3 TOWNSHIP ACCESS

6. SPECIALIST STUDIES IN SUPPORT OF DEVELOPMENT PROPOSAL

- 6.1 ENGINEERING SERVICES
- 6.2 TRAFFIC ENGINEERING
- 6.3 ENVIRONMENTAL IMPACT ASSESSMENT

7. MOTIVATION IN SUPPORT OF THE APPLICATION

- 7.1 NEED AND DESIRABILITY
- 7.2 INSTITUTIONAL POLICIES
 - 7.2.1 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 2013 (SPLUMA).
 - 7.2.2 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK
 - 7.2.3 CITY OF TSHWANE METROPOLITAN SPATIAL DEVELOPMENT FRAMEWORK.
 - 7.2.4 CITY OF TSHWANE REGIONAL SPATIAL DEVELOPMENT FRAMEWORK: REGION 4

8. CONCLUSION.

1. INTRODUCTION

Application is hereby made for the establishment of a township on a part of Portion 107 of the farm Doornkloof No. 391 JR, Gauteng Province, in terms of Section 96(1) of the Town Planning and Townships Ordinance (Ordinance 15 of 1986).

The township shall be known as Doornvallei Extension 6 and shall consist of erven and streets as indicated in the table below:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	TOTAL AREA	%
Residential 2	1 & 2	2	165	6.1233 ha	100.00
TOTAL		2	165	6.1233 ha	100.00

1.1 BACKGROUND

It should be noted that the subject property was previously located within the jurisdiction of the Kungwini Local Municipality. Prior to the integration of large areas of the aforementioned municipal area into the boundaries of the City of Tshwane Metropolitan Municipality an application to establish the township **Doornvallei Proper** on Portion 107 of the Farm Doornkloof 391 JR was submitted to and approved by the Kungwini Local Municipality. The township proposed the development of a low density “full title residential estate” with a number of limited “grouphousing” opportunities. Subsequent to the approval of the aforementioned application, an application to divide Doornvallei Proper into two townships were also approved. This allowed for the establishment of the townships Doornvallei Extension 1 and 2.

Subsequent to the integration of the subject property into the boundaries of the City of Tshwane Metropolitan Municipality (CTMM) the general administration of these applications became the responsibility of the CTMM. Extension of time has been granted in respect of Doornvallei Extension 1, in terms of the provisions of the Ordinance, by the CTMM. The application in respect of Extension 2 has lapsed.

1.2 PURPOSE OF THE APPLICATION

The application that is herewith submitted differs considerably and materially from any previously proposed development concept presented and approved in respect of the subject property (namely Doornvallei Extension 1). The township area has been significantly reduced whilst the land-use proposed to take place on the property has been altered from full title low density residential development to medium density sectional title residential use.

In light of the fact that the amendments proposed to the township is considered to be material in nature an application is submitted in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) and the application is therefore considered to represent a *de novo* application.

Following from the above it is confirmed that his application seeks to facilitate the process of establishing a township on a part of Portion 107 of the farm Doornkloof 391-JR in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986). The purpose of this memorandum is to provide all required information and details in order to inform the consideration of the proposal to establish such a township and furthermore ensures compliance with the provisions of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986).

2. LEGAL INFORMATION

2.1 PROPERTY DESCRIPTION

The township stands to be established on a part of the land formally registered as Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province. Portion 107 of the Farm Doornkloof 391 JR is forthwith referred to as the “site of application” of the “subject property”.

2.2 PROPERTY SIZE

Portion 107 of the farm Doornkloof 391-JR measures 73.4481 ha in extent. The township Doornvallei Extension 6 will be situated on only a part of the property, with the township area measuring 6.1233 ha in extent. The proposed development therefore occupies less than 10% of the larger landholding on which it will be established.

2.3 REGISTERED OWNERS AND TITLE DEED INFORMATION

Portion 107 of the Farm Doornkloof 391 JR is registered in the name of JR 209 Investments (Pty) Ltd. (2000/020447/07) vide Deed of Transfer T 118682/2006. The company JR 209 investments (Pty) Ltd. trades as M&T Development.

A copy of the title deed is included in this application under **Annexure I**.

2.4 AUHORISATION TO ACT

Jan Willem Lotz, Pr. Plan 1465/2011, has been authorised by the owner of the property to act on the company's behalf. A copy of the signed Company Resolution and Power of Attorney is included under **Annexure J**.

2.5 MORTGAGE BONDS

There is currently no bond registered over Portion 107 of the farm Doornkloof 391-JR. Please refer to the Title Deed 118682/2006.

2.6 MINERAL RIGHTS

Deed of Transfer T118682/2006 does not contain or refer to any title conditions with regard to mineral rights over or on the property. Therefore, the site of application is not subject to or entitled to any mineral rights. In addition to the above should it be noted that in terms of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) the mineral rights are held by the state. As a result of the aforementioned the Department of Minerals and Energy will need to consent to the establishment of the township.

2.7 TOWNSHIP NAME

Confirmation has been received from the City of Tshwane that the township shall be known as Doornvallei Extension 6. The mentioned confirmation is attached to this application as **Annexure H**.

2.8 MUNICIPAL JURISDICTION

Portion 107 of the Farm Doornkloof 391 JR is located within the boundaries of the City of Tshwane Metropolitan Municipality.

2.9 RESTRICTIVE CONDITIONS AND SERVITUDES

No existing servitudes or other conditions contained within the Title Deed of the subject property affects the use of land within the township and are therefore not considered restrictive in as far as this application is concerned.

2.10 TOWN PLANNING STATUS

The site of application is currently zoned as "Agricultural". In terms of the Tshwane Town Planning Scheme,

2008 the property may only be utilised for “agricultural” purposes, a farm stall, and one dwelling house.

The Tshwane Town Planning Scheme defines “agriculture” as follows:

Means land and buildings used for any bona fide farming activities which may include market gardens, game farming, cattle, goats and sheep farming, bee farming, bird feeding, plant nursery, plantations, aquaculture, mushroom production, forestry and orchards, and activities normally regarded as incidental thereto, excluding abattoirs, cattle feeding lots, poultry farming, pig farming, animal boarding place.

2.11 ENVIRONMENTAL STATUS

As mentioned within the paragraphs above a township, referred to as Doornvallei Proper, was previously approved by the Kungwini Local Municipality in respect of the subject property. The approval of the application was underpinned and supported by a decision by the Gauteng Department of Agriculture, Conservation and Environment.

The abovementioned decision was issued by the office of the MEC on the 9th of June 2008 and contained numerous conditions that needed to be complied with. The most important consideration is however the fact that the proposed development concept was authorised and could have been proceeded with should the developer have decided to do so.

The environmental authorisation was issued in respect of the layout plan indicative of the previous development proposal and therefore an application to amend the existing authorisation will be submitted to the Gauteng Department of Agriculture and Rural Development for consideration.

3. LOCALITY, ZONING AND LAND-USE

3.1 LOCALITY

As mentioned in the paragraphs above the proposed township is located within the jurisdiction of the City of Tshwane Metropolitan Municipality. Furthermore, Portion 107 of the farm Doornkloof 391 JR is located within the City of Tshwane’s administrative Region 4 which includes the larger south-western extent of the municipal jurisdiction. The Irene area is one of the established neighbourhoods located within Region 4 and from a geographic perspective the “site of application” is located directly adjacent to existing residential development. The “site of application” is located directly south of the Irene Glen Estate as well as Cornwall Hill Residential Estate.

The R21 Freeway (Albertina Sisulu Freeway) is situated approximately 300 meters to the east of the property with the provincial road M57 (Goede Hoop Road) providing access to the property from its existing alignment directly south of the “site of application”. Goede Hoop Road intersects with Nellmapius Road to the north of the property which road in turn connects with the R21 Freeway, enabling national, provincial and regional connectivity. The locality of the “site of application” is indicated in the figure below:

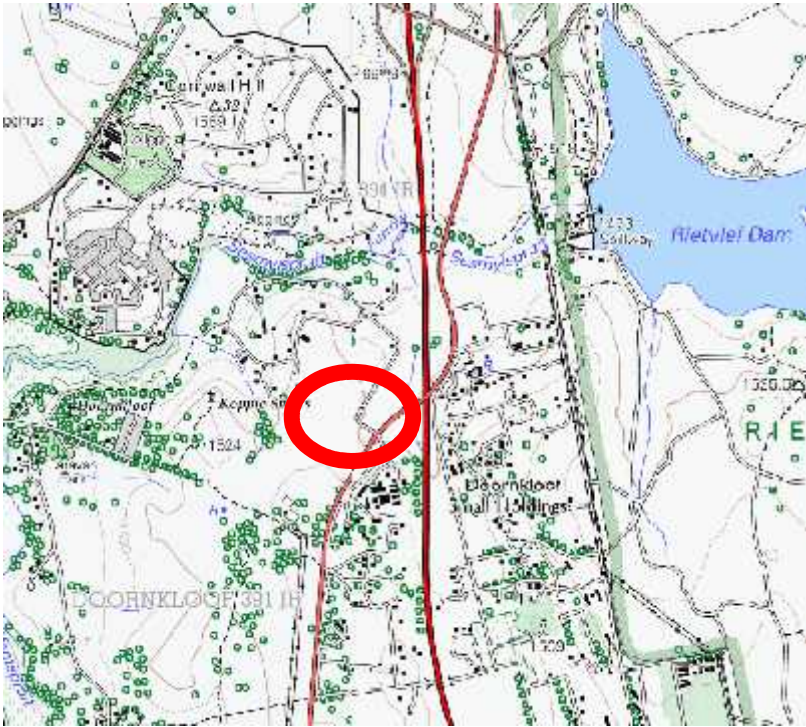


Figure 1: Locality

3.2 CURRENT ZONING

In terms of the Tshwane Town-Planning Scheme, 2008 the farm portion is currently zoned “Agricultural”. The Zoning Certificate is attached as **Annexure D**.

3.3 SURROUNDING ZONING

The property surrounding the site of application is zoned primarily as “undetermined” as can be seen from the Zoning Map attached to this application (**Annexure E**).

3.4 LAND USE

The property is currently vacant and is therefore not utilised for any specific use.

3.5 SURROUNDING LAND USE

The properties to the north of the site of application is predominantly utilised for the purpose of low density residential housing. The properties to the south of the site is largely undeveloped except for the Rietvlei Electrical Infeed Station located directly south of the site of application. The character of the surrounding area can be described as rural residential in nature. The St. George's Hotel is located directly east of the site of application.

3.6 TOPOGRAPHY

The topography of the larger Portion 107 of the farm Doornkloof 391 JR is characterised by a prominent watershed crossing through the centre of the property in a north-western / south-eastern direction. The watershed results in the northern extent of the property sloping in a north-eastern direction and the southern extent of the property sloping in a north-western direction. The portion of land therefore has more than one catchment area and consequently more than one "low point".

The proposed township, Doornvallei Extension 6, is however located to the south-west of the watershed referred to above, implying that the slope of the township area does not change direction or fluctuate. The township area slopes consistently in a south-western direction with the highest point of the township being on the eastern boundary of the township at a height of 1516 meters above mean sea level and the lowest point being on the southern boundary at a height of approximately 1502 meters above mean sea level. The slope of the township was calculated as approximately 5%.

3.7 FLOOD LINES

Portion 107 of the Farm Doornkloof 391 JR is affected by a floodline traversing the property in the most western extent of the property as indicated on the Layout Plan CPD DNV x 6 TS/1. Since the floodline is regarded as a non-perennial watercourse or drainage line no development will take place within 32 meters from the position of the 1:100 year floodline.

Considering the position of the township boundaries of the township Doornvallei Extension 6 it can clearly be seen and therefore deduced from the Layout Plan that the township area is not affected by the floodline referred to within the paragraphs above as a result of the location of the township in relation to the alignment of the floodline. The aforementioned statement has been investigated in detail by the Civil Engineering consultant forming part of the project team and confirmed as such by means of the formal verification of the Layout Plan.

In light of the above it can therefore be confirmed that the township Doornvallei Extension 6 is not affected by floodwater up to the 50 and 100 year recurrence interval event as determined in accordance with Section 144 of the National Water Act (Act 36 of 1998).

3.8 SOIL CONDITIONS

A Geotechnical Investigation in respect of the land on which the township stands to be established was carried out by Dolomite Technology (Pty) Ltd during 2007. The report “Dolomite Stability and Engineering Geological Material Investigation for Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province”, dated May 2007 was submitted to the Council for Geoscience for comments. The aforementioned Council supported the establishment of a township on the property previously.

In order to ensure that the current development proposal is still acceptable to the Council for Geoscience a Layout Plan indicating the location of Doornvallei Extension 6 as well as the proposed land-uses were resubmitted to the said Council for consideration. Within the correspondence it is confirmed that the land-use, considered to be a Residential 2 type of development, is located within “Area 1” and that such an area is characterised mainly by Inherent Risk Class 4 conditions. In light of the fact that the proposed density of 27 dwelling units per hectare is in line with the densities stipulated in SANS 1936-1:2012 the Layout Plan indicating the proposed development concept has been vetted by the Council for Geoscience.

4. PROPOSED DEVELOPMENT AND CONTROL MEASURES

4.1 ZONING AND LAND USE PARAMETERS

The proposed development will consist of two erven. These erven will make provision for the following proposed land use rights:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	AVERAGE ERF SIZE	TOTAL AREA	%
Residential 2	1 and 2	2	165	N/A	6.1233 ha	100.00
TOTAL		2	150	N/A	6.1233 ha	100.00

The following parameters will be made applicable to Erf 1 and 2 :

- Development Density: 27 units per hectare;
- Height: 2 Storeys;

- Coverage: 50%

All other development controls will be in accordance with the Conditions of Establishment which has been attached to this application.

4.2 TOWNSHIP DESIGN

The township consists of erven and streets as indicated in accordance with the Layout Plan CPD DNV X 6 TS/1. The proposed Layout Plan indicates the particulars pertaining to the design of the township is attached hereto under **Annexure C**.

The following pertinent considerations informed the conceptualisation of the Layout Plan:

- The future alignment of the proposed Provincial Road K54 traverses Portion 107 of the Farm Doornkloof 391 JR. The exact alignment of the road has been determined and influences the use of the subject property. The alignment of the said road forms the southern boundary of the township and no direct access will be obtained from the Provincial Road;
- Erven 1 and 2 will be consolidated in order to provide for one consolidated development area;
- The consolidated erf resulting from the above will be notarially tied with Erf 1 Doornvallei Extension 5;
- The current access to the property and the future access from proposed Provincial Road K54 is not similar. The Layout Plan has been designed in such a way to make provision for the fact that access will temporarily be obtained from Road M57 until such time as the Provincial Road K54 is constructed.
- Erf 1 measures 2.3ha and Erf 2 measures 3.7ha in combination therefore allowing for a development area of 6.1233 ha. At a development density of 27 dwelling units per hectare approximately 165 units can be constructed. The internal layout and design of the housing complex will be dealt with in detail on a separate Site Development Plan. It is proposed than all 165 dwelling units will be constructed in unison. In light of the notarial toe that will be registered the township will benefit from two recreational areas included within the boundaries of Doornvallei Extension 5, namely:
 - The area in the south-western extent of Erf 1 Doornvallei Extension 5, indicated by the figure A-B-C-D-E-F-G-H-J-p1-q1-r1-s1-t1-u1-v1-w1-x1-y1-A, will be set aside as an area containing a clubhouse and associated recreational facilities.
 - The area in the northern extent of the Doornvallei Extension 5, indicated by the figure v-w-x-y-z-a1-b1-c1-d1-e1-f1-g1-h1-j1-k1-l1-m1-n1-R, will be set aside as a park for the use and enjoyment of all residents within the development.

4.3 TOWNSHIP ACCESS

Access to the township will be obtained from Doornvallei Extension 5 which township will in turn obtain access from the provincial road M57 also known as Goede Hoop Road. As mentioned above the erven within the township will be notarially tied with the erven within Doornvallei Extension 5. An existing access position allows for access to the Irene Glen Residential “Estate” and it is proposed that the same access be utilised to provide access to Doornvallei Extension 5 and 6 subject thereto that certain upgrades to the existing access road is implemented. The details of the upgrades will be specified within the Roads and Stormwater services report.

5. SPECIALIST STUDIES IN SUPPORT OF THE DEVELOPMENT PROPOSAL

5.1 ENGINEERING SERVICES

In order to investigate how the township will be incorporated into the local municipal service network preliminary services reports are in the process of being compiled by the following engineering consultancies:

- Roads and Stormwater: Rudi Koekemoer Civil Consultancy;
- Water and Sanitation: LV and Partners;
- Electricity: Geopower

The service report will inter alia address the provision of internal and external engineering services for the new township. All the relevant engineering services (water and sewer, roads and stormwater and electricity) will be discussed in these reports and the reports will be submitted to Council in due course.

In as far as the provision of water and sanitation services are concerned it should be noted that the engineering consultancy GLS has also been appointed to provide recommendations in respect of the integration of the proposed township into the municipal service network. The completed report will be submitted to the City of Tshwane as soon as such has been received.

5.2 TRAFFIC ENGINEERING

In light of the fact that the application for township establishment proposed the ultimate construction of 165 residential structures a Traffic Impact Assessment is required. In order to attend to the aforementioned the consultancy Koleko Solutions has been appointed to complete a Traffic Impact Assessment for the new proposed development. The assessment will be submitted to the City of Tshwane as soon as such has been completed.

5.3 ENVIRONMENTAL IMPACT ASSESSMENT

As a result of the fact that the development concept is in the process of being amended an application for amendment of the existing authorisation will be submitted to the office of the Gauteng Department of Agriculture and Rural Development in order to secure an authorisation specifically authorising the newly proposed development concept.

6. MOTIVATION IN SUPPORT OF THE APPLICATION

6.1 NEED AND DESIRABILITY

As mentioned within the introductory paragraphs the proposed site of application is located within the south of the City of Tshwane's Region 4, within the Irene and surrounding area, which is generally characterised by relatively low density residential housing and associated facilities.

The Irene and surrounding area is located very strategically in close proximity to both the N1 and R21 Freeways which roads has emerged as the two primary structuring elements of the Gauteng development region. Whilst the N1 Freeway is already considered to be a fully-fledged development corridor the R21 Freeway is largely still in the process of transforming into a corridor. Intensified growth in support of the evolution and spatial entrenchment of these development corridors is strongly supported and promoted by all institutional planning documents and is considered the logical expansion of growth within the province.

Large tracts of land is currently still undeveloped on either side of the R21 freeway and offers an opportunity to consider the systematic intensification of the urban form within these larger corridor areas. It is held that Portion 107 of the Farm Doornkloof 391 JR is located within an area that is very closely associated with the spatial formation of the R21 development corridor and offers the potential to support higher intensity growth through the implementation of densification efforts.

In addition to the above, Portion 107 of the Farm Doornkloof 391 JR is located directly adjacent to the existing residential development Irene Glen Residential Estate. Irene Glen Estate is in turn situated directly adjacent to the Cornwall Hill Residential Estate. The development of Portion 107 can therefore not be considered to represent anything else than a natural extension of the existing urban settlements from the north into a southern direction.

The fact that the property is located adjacent to exiting urban development and is seen a natural expansion of urban growth places the onus on urban planners to consider the appropriate utilisation of the property within the context of existing low density residential development to the north and planned higher density residential

development towards the south. The need to consider the existing character of the surrounding area is considered of paramount importance whilst aligning the development concept with institutional planning of the greenfields areas to the south is also required. In this particular instance it is argued that an appropriate development concept should promote spatial transition between existing development and planned development respectively to the north and south.

As mentioned the original development concept was underpinned by the proposal to provide full title residential erven. From a spatial planning perspective the development concept could be considered to be representative of a low density development concept. Considering the need to implement a mechanism to introduce spatial transition in as far as density is concerned a low density development would not necessarily be the most appropriate mechanism.

Through the submission of this application it is proposed to increase the development density from a full title residential concept to a sectional title grouphousing concept being constructed at a density of 27 units per hectare. The increase in density implies that an increased number of dwelling units can be accommodated on the portion of land forming the subject of the application. It should be noted that although the development density will be increased the extent or footprint of construction has not been increased. The increase in the number of units to be constructed in the area adjacent to the alignment of the Provincial Road K54 is considered to represent a move towards a more optimal utilisation of the property which allows for the maximisation of the development potential of the property. A development density of 27 units per hectare is still considered low to medium density and will complement the existing character of the area whilst allowing for an ever slight transition of development density from the minimal development densities of the residential developments to the north of the property towards the undeveloped greenfield properties in the most southern extremities of the City of Tshwane's Region 4, which has been earmarked for more intensified development utilisation.

The provision of residential units at a slightly higher development density will not in any way influence the impact of development on the sensitive environment surrounding the development area. A concept known as clutter and space development is applied and considered appropriate in the case of this development in order to ensure that development does not encroach onto sensitive environmental areas. The development footprint proposed in terms of the previous concept will not be increased at all.

In order to further consider the most appropriate development type the concept of need was taken into account. From experience it can be confirmed that although economic growth has generally slowed down over the last number of years, a continuous supply and take-up of residential opportunities within the Irene and surrounding area has continued to take place. The continuous take-up of residential opportunities within the southern extents of the City of Tshwane, specifically including the Irene and surrounding area, has been fuelled

by an undeniable need and demand for residential developments within highly strategic locations. Growth in this segment of the residential market has however been extremely price sensitive and demand has undoubtedly been the strongest within the middle income market. Where full title ownership generally implies final construction costs in the order of R2 to R3 million per residential opportunity the supply of grouphousing opportunities can be introduced into the market at much lower cost. In order to ensure a dynamic and sustainable urban environment a wider range of development types and opportunities should be introduced into a geographic area and it is considered appropriate that the development concept of Doornvallei Extension 6 shall seek to achieve such broadening of tenure types. The fact that there is a demand for grouphousing developments, correctly priced, within the Irene area is undeniable.

6.2 INSTITUTIONAL POLICIES

6.2.1 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, 2013.

The purpose of the Spatial Planning and Land Use Management Act, 16 of 2013 (SPLUMA) is to inter alia provide a framework for spatial planning and land use management within the Republic. The framework for spatial planning provided by SPLUMA is underpinned by a number of distinct development principles.

Chapter 2 of the Act provides an overview of the principles that should guide development:

- **PRINCIPLE 7(b) - THE PRINCIPLE OF SPATIAL SUSTAINABILITY;**

Principle 7(b) promotes the concept of sustainable spatial growth where the value and importance of agricultural land, environmental sensitive resources and the demand for development is planned and provided in a harmonious and balanced manner. The concept of sustainability is furthermore heavily dependent upon maximising the efficiency of infrastructure and preventing the occurrence of urban sprawl. The subject property presents a natural expansion of an existing area at a density which allows for limited intensification and densification. The fact that the development takes place adjacent to an existing urban area implies that existing infrastructure can be maximised and the increase in density counteracts the concept of urban sprawl.

- **PRINCIPLE 7(c)- THE PRINCIPLE OF EFFICIENCY;**

Principle 7(c) emphasises that planning should promote overall efficiency through inter alia the optimisation of existing resources and infrastructure. It furthermore promotes administrative efficiency and decision making. The existing Irene area is relatively well serviced and although upgrades to the existing municipal services network will be required sufficient capacity to accommodate this new development does exist. The fact that this development is adjacent to existing urban development strongly supports the notion of optimising existing infrastructure.

- **PRINCIPLE 7(d)- THE PRINCIPLE OF SPATIAL RESILIENCE;**

Principle 7(d) promotes spatial resilience by means of allowing for flexibility in spatial plans, policies and land use management systems are accommodated in order to ensure sustainable livelihoods in communities. The area in which the subject property is situated is starting to systematically transform from an area with an predominant rural residential character area into a more urbanised and structured environment. The RSDF for Region 4 is sufficiently flexible in order to guide such transformation in a structured manner.

- **PRINCIPLE 7(e)- THE PRINCIPLE OF GOOD ADMINISTRATION;**

Principle 7(e) promotes the principle that the application of planning should take place in an integrated manner and be guided by a spatial planning and a land-use management system as embodied in the Act. Good administration should additionally allow for integration and cooperation among state departments in as far the preparation of Spatial Development Frameworks are concerned as well as the fact that all planning processes should be underpinned by transparent public participation processes. In light of the fact that the City of Tshwane undertook a detailed process of compiling its suite of Spatial Development Frameworks and further that all the actions and processes occurred strictly in accordance with the ruling legislation it is accepted that good administration guided that preparation of the Spatial Development Framework applicable to Region 4.

6.2.2 GAUTENG SPATIAL DEVELOPMENT FRAMEWORK.

The purpose of the Gauteng Spatial Development Framework (GSDF) is to communicate a shared future spatial vision and structure for the Province. The GSDF is clear and unambiguous about the fact that growth and development within the province should be strategically guided and directed and not purely just a consequence of spontaneous and organic growth. The GSDF provides an overarching spatial vision for the Province and hence provides guidance and influences the Tshwane Metropolitan Spatial Development Framework with specific regards to the location and nature of the physical development.

Within the Tshwane MSDF the following key consideration contained within the GSDF are identified and highlighted due to its importance:

- Contained urban growth;
- Resource based economic development (resulting in the identification of the economic core);
- Re-direction of urban growth (stabilise/limit growth in economically non-viable areas, achieve growth on the land within the economic growth sphere);
- Protection of rural areas and enhancement of tourism and agricultural related activities;

- Increased access and mobility.

The primary structuring elements identified within the GSDF are those of:

- Urban mixed-use activity nodes;
- Open space and green system;
- Public transit and movement routes;
- Urban corridors and activity spines.

In addition to the above the GSDF sets out to guide and structure growth, in a balanced manner, towards the notion of a “sustainable city”. Within the GSDF the notion of a “sustainable city” is explained as the focus on achieving a life-enhancing urban environments for all individuals, in which acceptable standards of living are met without compromising the ecological, cultural, social, economic, security or legal pre-conditions necessary for continued viability.

In order for South African cities to achieve the status of a “sustainable city” a number of development principles need to be achieved, which include:

- A more compact urban form that discourages dispersed low-density urban sprawl;
- The promotion of a diverse combination of land-uses that enables a greater intensity of mixed-use development;
- A more complex urban system that spawns opportunity through diversity of activity patterns and brings associated economic and employment opportunities through integrated development;
- The integration of the historically marginalised areas into the mainstream of urban life by correcting the spatial patterns of the urban environment;
- Optimising the utilisation of existing service infrastructure and social amenities particularly where space capacity exists;
- Enabling accessibility to affordable and efficient means of public and private transportation;
- Furthering the development of employment opportunities and residential areas in close proximity to or integrated with each other;
- Promoting physical development based on ecological sound principles that bring the natural environment and the urban system into a mutually reinforcing and integrated relationship; and
- Understanding the open space system of a city-region as an integral part of the city-region’s morphology, economic makeup and a defining element of urban quality.

The township Doornvallei Extension 6 supports the principles stated above in light of the fact that the development concept aims to move away from the typical low density development concepts

characteristic of the surrounding area. Through the increase in development density the concept promotes a higher intensity development proposal whilst still acknowledging the importance of the sensitive environment within which the development is located.

6.2.3 CITY OF TSHWANE METROPOLITAN SPATIAL DEVELOPMENT FRAMEWORK

The vision of the City of Tshwane is to become the African Capital City of Excellence. In order to achieve this vision seven objectives have been identified that should be achieved. Two of the strategic objectives have a influence on spatial planning and development, namely strategic objective 2 and 3.

Strategic objective 2 calls for economic growth, development and job creation. The aforementioned is achieved by means of the provision of strategic direction around infrastructure provision, guiding developers and investors to appropriate locations and rural development programmes.

Strategic objective 3 envisages the creation of sustainable communities with clean, healthy and safe environments. In order to achieve this objective there is a need to restructure the spatial inefficient city through compaction, densification and transport orientated development, promote sustainable use of land resources and growth management.

Following from the above the spatial policy promoted within the Municipal Spatial Development Framework, namely the application of the concept of “growth management” is explained. The application of the concept is required in order to ensure efficient, optimal and sustainable development of the physical environment.

Growth management is underpinned by the concept of “smart growth” which principle seeks to guide development in such a manner to ensure that resources and services are optimised in order to meet demand. The application of the concept of growth management is achieved by means of implementing specific spatial planning “tools” that have the ability to influence and direct growth. One such tool is the identification of an urban edge. The use of this tool as part of the concept of growth management allows for the conservation of valuable environmental and agricultural areas whilst also promoting the use of existing infrastructure through (1) redevelopment, (2) infill development and (3) densification within the urban edge in order to achieve sustainable development.

The application of the urban edge furthermore also encourages the agglomeration of economies within the edge, encouraging scattered secondary or emerging nodes to develop into consolidated primary nodes as opposed to leapfrog development.

Within the MSDF the statement is made that due to the high cost of providing bulk infrastructure in low density areas, urban sprawl should be discouraged. It is imperative that available infrastructure within the nodes are used optimally. The aforementioned situation requires densification and intensification of land uses through compaction and infill developments.

Emphasis is furthermore placed on the implementation of the concept of Transit-orientated development in order to optimise the potential of infrastructure capacity.

Following from the above the MSDF continues to elaborate on the spatial tools and mechanisms that should be implemented to ensure that sufficient direction is provided to enable the existing fragmented, inequitable and inefficient urban form to be restructured to allow for a more equitable, efficient and environmentally and financially sustainable dispensation in line with institutional policies and legislation. The functional integration of our city will be achieved by means of the implementation of the following principles:

- Higher density urban development;
- Greater mixing of compatible land-uses; and
- Focussed concentration of high-density residential land-uses and intensification of non-residential land-uses in nodes, around transit stations and along activity corridors.

In light of the fact that it is the intention to increase the density of the development concept proposed in respect of Doornvallei Extension 6 it is important to consider the perceived benefits that increase density brings about. Within the MSDF the following advantages are listed:

- Minimise / reduce the footprint of the city;
- Prevent the destruction of valuable agricultural land;
- Reduce the pressure for the development of open spaces and environmental sensitive land due to the optimal use of available land; providing choice in terms of housing typologies;
- Improve the viability of public transport;
- Improve the efficiency of urban areas – increased convenience for the residents of the city in terms of improved access to goods, services and job opportunities as well as a reduction in travelling times, cost and distances;
- Improve use of service infrastructure;

- Increase the marketability of the city; and
- Reduce inequality.

6.2.4 CITY OF TSHWANE REGIONAL SPATIAL DEVELOPMENT FRAMEWORK: REGION 4

Within the RSDF it is stated that the structure of the eastern part of Region 4, within which the subject property is located, is defined by a grid of integrated roads, nodes, linkages and open space systems.

The urban fabric within this grid is based on an integrated lattice on which densification and intensification of development can take place in an integrated manner. A set of linear systems form the framework of the urban development lattice and relays urban energy from the traversing highways to lower order roads where it can be converted into physical development and economic growth.

A system of activity nodes is located onto the development lattice to provide thrust to development occurring in a liner fashion along highways and other linear activity systems. One of these linear structuring elements is the R21 highway between Tshwane and Ekurhuleni. The R21 development corridor is supported by van Ryneveld Avenue in the west and Goedehoop Road in the east as well as the Olievenhoutbosch Road.

The proposed Provincial Road K54 is located directly to the south of the site of application. The road is classified as a mobility spine in terms of the RSDF and defined as “an arterial along which through traffic flows with minimal interruption”.

In light of the status, location and influence of the proposed Provincial Road K54 on the spatial dynamics of the local area the landholdings on either side of the alignment of the road has been identified as a linear corridor as can be seen on the extract below:



Figure 2: Region 4 SDF

A linear zone refer to high intensity areas that are located adjacent to major roads. These roads usually carry high volumes of traffic to areas such as zones of concentration and transit promotion zones and therefore also encourages the feasibility of public transport on these routes.

7. CONCLUSION.

Application is hereby made for the establish of the township Doornvallei Extension 6 in terms of Section 96(1) of the Town Planning and Townships Ordinance (Ordinance 15 of 1986) on a part of Portion 107 of the Farm Doornkloof 391 JR, Gauteng Province.

The purpose of this application is to establish a township consisting of the following erven and streets:

USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	AVERAGE ERF SIZE	TOTAL AREA	%
Residential 2	1 and 2	2	165	N/A	6.1233 ha	100.00
TOTAL		2	150	N/A	6.1233 ha	100.00

The application will promote harmonious development within the local development context and will contribute to the endeavour to intensify and integrate a fragmented urban pattern by means of the

compaction of the city. The application will therefore strengthen the urban fibre of the local area. The site of application has great potential to be developed as explained in the memorandum above.

The application complies with current planning policies and principles and should be favourably considered by the Municipality.

Annexure 3: Comments from Council for Geoscience

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Private Bag X112, Pretoria 0001, South Africa
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Council for Geoscience

Our Reference: F893.5
Portion 107 Doornkloof 391JR
Doornvallei
Enquiries: T Oosthuizen
Tel: 012 841 1160
Fax: 086 615 6682
Email: toosthuizen@geoscience.org.za
No. of Pages: 2

25 March 2015

Tshwane Metropolitan Municipality
Department Roads and Stormwater: Geology Section
Centurion Offices
P O Box 14013
Lyttelton
0140

Attention: Deputy Director: Geological and Geotechnical Engineering Management
Mrs. Ashika Sudu

By Email: ashikas@tshwane.gov.za

The Deputy Manager: Regional Spatial Planning
Mrs. Pat de Vos

By Email: patdv@tshwane.gov.za

Dear Madam,

PROPOSED DOORNVALLEI EXTENSION 5

The firm M&T Development submitted the proposed township layout plan of Doornvallei Extension 5 to this office for co-signing on 25 March 2015.

This area was investigated by Dolomite Technology (Pty) Ltd (DT) who approached this office in May 2007 on behalf of M&T Development to comment on the site for township establishment. Their report "Dolomite Stability and Engineering Geological Material Investigation for Portion 107 of the Farm Doornkloof 391-JR, Gauteng Province", dated May 2007 was submitted for comments. This Office has supported Township establishment of Doornvallei in a letter dated 22 November 2007 (ref.

F893 Por 107). This office also supported NHBRC enrolment of Portion 107 of the Farm Doornkloof 391-JR in a letter dated 19 February 2009 (ref. F893.4).

The township layout plan, Plan No. CPD DNV X5/1, dated 18 March 2015 indicates that a Residential 2 type development is proposed for Doornvallei Extension 5. This area is situated in Area 1, as described in the report by DT. Our letter reference F893.4 indicated the following regarding Area 1: *"We are in agreement that the delineated Area 1 is characterized mainly by Inherent Risk Class 4 conditions and that Residential 1 stands of no less than 550 m square should be considered."*

This office takes note that the development density recommended was prior to the publication of SANS 1936-1:2012. This office has no objection to co-sign the proposed township layout plan of Doornvallei Extension 5, conditional to the following:

- a) Footprint drilling or supplementary might be required, especially on the boundary line next to Area 4, where highly variable and poor conditions were encountered;
- b) Densities should be in line with those stipulated in SANS 1936-1:2012;
- c) Overall compliance with SANS 1936 (2012).

This letter reflects the Council for Geoscience's view and approach to development on dolomite at this time, as reflected by the above date. These comments may not be viewed as open-ended. If a property changes ownership or land-use changes are made, the comment may in part or wholly no longer apply. This Office should be informed of such changes and the Competent Person responsible for the dolomite stability investigation should be given the opportunity to indicate the influence such changes could have on the overall stability.

If you have any further queries, please do not hesitate to contact this office.

Yours faithfully,



A C OOSTHUIZEN

Engineering Geologist

For Mr. M. Manyepao

Acting Manager Engineering Geology Competency

CC (1): Geo Buro Geotechnical Surveys

CC (2): M&T Development

Attention: Mr. SP Kok

Attention: Mr. PW Kruger

By email: spkok@telkomsa.net

By email: pw.kruger@m-t.co.za

Annexure 4: Fauna and Flora Study

ECOLOGICAL FAUNA AND FLORA HABITAT SURVEY

STRAWBERRY FARM AREA:

Doornkloof Ptn 107, Doornkloof Ptn 129, Rietvlei 6,
Rietvlei 7, Strawberry Farm Phase 1 and Strawberry
Farm Phase 2, Gauteng Province



Top left: Succulent, *Lithops leslei* (bottom), Photo: Reinier Terblanche.

Top right: Beetle, *Ichnestoma stobbiai*, Photo: Peter Webb.

Bottom left: Orchid *Habenaria kraenzliniana*, Photo: Reinier Terblanche.

Bottom right: Butterfly, *Kedestes nerva*, Photo Reinier Terblanche.

MARCH 2014

COMPILED BY:

Reinier F. Terblanche

(M.Sc. *Cum Laude*; Pr.Sci.Nat, Reg. No. 400244/05)

TABLE OF CONTENTS

1. INTRODUCTION	3
2. STUDY AREA	4
3. METHODS	5
4. RESULTS	9
5. DISCUSSION	33
6. TOWARDS ENVIRONMENTAL MANAGEMENT AND PLANNING	49
7. CONCLUSION	51
8. REFERENCES	54
10. APPENDIX 1: LIST OF PLANT SPECIES	63
11. APPENDIX 2: LIST OF MAMMAL SPECIES	78
12. APPENDIX 3: LIST OF BIRD SPECIES	80
13. APPENDIX 4: LIST OF REPTILE SPECIES	82
14. APPENDIX 5: LIST OF FROG SPECIES	83
15. APPENDIX 1: LIST OF BUTTERFLY SPECIES	84

1 INTRODUCTION

An ecological habitat survey of flora and fauna was required for the Strawberry Farm Area: Doornkloof Ptn 107, Doornkloof Ptn 129, Rietvlei 6, Rietvlei 7, Strawberry Farm Phase 1 and Strawberry Farm Phase 2, southeast of Irene in the Gauteng Province, at which developments are proposed. This Strawberry Farm area is elsewhere referred to as the study area and the units such as Doornkloof Ptn 107 are referred to as sites. The survey focused on the possibility that fauna or flora of conservation concern, which include threatened species, known to occur in Gauteng Province are likely to occur within the study area or not.

A main purpose of the current habitat survey is to review and consolidate findings on the fauna and flora at the whole area, because of uncertainties that remained and reasons listed beneath. A number of reports have in the past been submitted for some areas overlapping with the present study area, of which the author submitted some. The present survey and integration of findings to existing available knowledge are owing to:

- 1) Uncertainties in the actual sizes of suitable habitats and actual presence of some species of conservation concern,
- 2) Extents of potential habitat that in case of doubt are often extensive as a pre-caution,
- 3) More recent and more objective reviews of the extinction risks of species (according to IUCN categories and criteria). There have for example been significant changes and improvements in the extinction risks of plants (Raimondo *et al.*, 2009 and updated versions), butterflies (Mecenero *et al.*, 2013),
- 4) New taxonomical and biological information on organisms such as *Ichneustoma stobbiai*,
- 5) Recent improved and updated versions of key biodiversity issues and species of special conservation concern by GDARD (2012),
- 6) Possible increase in degradation in much of the study area, i.e. the area is not a reserve and management of habitats in the area remains obscure. More consolidated information may address neglect of the area in terms of conservation management and,
- 7) The area appears to become increasingly isolated and improved information could afford decision making, the latter being overdue.

1.1 OBJECTIVES OF THE HABITAT STUDY

The objectives of the habitat study are to provide:

- A detailed fauna and flora habitat survey;
- A detailed habitat survey of possible threatened or localised plant species, vertebrates and invertebrates;
- Literature surveys that are integrated with the findings of the habitat survey;
- An evaluation of the sensitivity of habitats that in particular relate to current status of threatened species and conspicuous key biodiversity aspects;
- Identification of potential ecological impacts on fauna and flora that could occur as a result of the development; and

1.2 SCOPE OF STUDY

- A survey consisting of several visits to investigate key elements of habitats on the site, relevant to the conservation of fauna and flora;
- Recording of any sightings and signs of existing fauna and flora;
- Recording of possible significant biological interactions of importance to conserve habitats of species;
- The selective and careful collecting of voucher specimens of invertebrates where deemed necessary;
- Literature studies and integration of existing knowledge with the findings of the surveys in the field;

2 STUDY AREA

The study area is south-east of Irene in the Gauteng Province. More specifically the site is situated in an area south of Irene Glen Private Estate, west of the M57 and/or R21, east of the M18 route and north of Olifantsfontein.

Study area and sites are situated at the Grassland Biome (Mucina & Rutherford 2006). Grassland Biome at the study area is represented by Carletonville Dolomite Grassland vegetation type (Mucina & Rutherford 2006). Distribution: In South Africa the Carletonville Dolomite Grassland is found in North West, Gauteng and marginally into the Free State Province. The Carletonville Dolomite Grassland ranges from the region of Potchefstroom to Ventersdorp and Carletonville extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in the Gauteng Province. Altitude ranges from 1360-1620 m, but largely 1500-1560 m (Mucina & Rutherford 2006).

Vegetation and landscape features: Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Mucina & Rutherford 2006). Geology and soils: This area occurs almost exclusively on the dolomites of the Malmani Subgroup (Transvaal Supergroup). Climate: Warm-temperate, summer-rainfall region, with overall mean annual precipitation of 560 mm. High summer temperatures. Severe frequent frost occurs in winter (Mucina & Rutherford 2006).

Important taxa of the Carletonville Dolomite Grassland listed by Mucina & Rutherford (2006): Graminoids: *Aristida congesta*, *Brachiaria serrata*, *Cynodon dactylon*, *Digitaria tricholaenoides*, *Diheteropogon amplexans*, *Eragrostis chloromelas*, *Eragrostis racemosa*, *Heteropogon contortus*, *Loudetia simplex*, *Schizachyrium sanguineum*, *Setaria sphacelata*, *Themeda triandra*, *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon schirensis*, *Aristida canescens*, *Aristida diffusa*, *Bewisia biflora*, *Bulbostylis burchellii*, *Cymbopogon caesius*, *Cymbopogon pospischilii*, *Elionurus muticus*, *Eragrostis curvula*, *Eragrostis gummiflua*, *Eragrostis plana*, *Eustachys paspaloides*, *Hyparrhenia hirta*, *Melinis nerviglumis*, *Melinis repens* subsp. *repens*, *Monocymbium cerasiiforme*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*, *Tristachya leucothrix*, *Tristachya rehmannii*. Herbs: *Acalypha angustata*, *Barleria macrostegia*, *Chamaecrista mimosoides*, *Chamaesyce inaequilatera*, *Crabbea angustifolia*, *Dianthus mooiensis*, *Dicoma anomala*, *Helichrysum caespitium*, *Helichrysum miconiifolium*, *Helichrysum nudifolium* var. *nudifolium*, *Ipomoea ommaneyi*, *Justicia anagalloides*, *Kohautia amatymbica*, *Kyphocarpa angustifolia*, *Ophrestia oblongifolia*, *Pollichia campestris*, *Senecio coronatus*, *Vernonia oligocephala*. Geophytic herbs: *Boophone disticha*, *Habenaria mossii*. Low Shrubs: *Anthospermum rigidulum* subsp. *pumilum*, *Indigofera comosa*, *Pygmaeothamnus zeyheri* var. *rogersii*, *Searsia magalismsontana*, *Tylosema esculentum*, *Ziziphus zeyheriana*. Geoxylic Suffrutices: *Elephantorrhiza elephantina*, *Parinari capensis* subsp. *capensis*. Endemic taxon: *Delosperma davyi*.

Note: Many, but not all of the above plant species are present at the site and the endemic taxon of the Carletonville Dolomite Grassland *Delosperma davyi* does not appear to be present in the study area.

A tributary of the Hennops River, the Kaalspruit runs through the southern part of the study area and forms the boundaries between Strawberry Farm Phase 2, Strawberry Farm Phase 1 and Rietvlei 6 sites.

3 METHODS

A desktop study comprised not only an initial phase, but also it was used throughout the study to accommodate and integrate all the data that become available during the field observations.

Surveys by R.F. Terblanche took place on 22 October 2013, 25 October 2013, 26 October 2013, October 2013, 1 November 2013, 19 November 2013, 21 December 2013, January 2014, 22 February 2014 and 5 March 2014 to note key elements of habitats on the site, relevant to the conservation of fauna and flora. Numerous surveys in the larger area and on the sites in the past from 2004 – 2011 have also been taken into account. The main purpose of the site visits was ultimately to serve as a habitat survey that concentrated on the possible presence or not of threatened species and other species of high conservation priority.

The following sections highlight the materials and methods applicable to different aspects that were observed.

3.1 HABITAT CHARACTERISTICS AND VEGETATION

The habitat was investigated by noting habitat structure (rockiness, slope, plant structure/physiognomy) as well as floristic composition. Voucher specimens of plant species were only taken where the taxonomy was in doubt and where the plant specimens were of significant relevance for invertebrate conservation. Field guides such as those by Germishuizen (2003), Manning (2003), Manning (2009), Van Oudtshoorn (1999), Van Wyk (2000), Van Wyk & Malan (1998) and Van Wyk & Van Wyk (1997) were used to confirm the taxonomy of the species. Works on specific plant groups (often genera) such as those by Goldblatt (1986), Goldblatt & Manning (1998), Jacobsen (1983), McMurtry, Grobler, Grobler & Burns (2008), Smit (2008), Van Jaarsveld (2006) and Van Wyk & Smith (2003) were also consulted to confirm the identification of species. In this case no plant specimens were needed to be collected as voucher specimens or to be send to a herbarium for identification. For the most recent treatise of scientific plant names and broad distributions, Germishuizen, Meyer & Steenkamp (2006) were followed to compile the lists of species.

3.2 MAMMALS

Mammals were noted as sight records by day. For the identification of species and observation of diagnostic characteristics Smithers (1986), Skinner & Chimimba (2005), Cillié, Oberprieler and Joubert (2004) and Apps (2000) are consulted. Sites have been walked, covering as many habitats as possible. Signs of the presence of mammal species, such as calls of animals, animal

tracks (spoor), burrows, runways, nests and faeces were recorded. Walker (1996), Stuart & Stuart (2000) and Liebenberg (1990) were consulted for additional information and for the identification of spoor and signs. Trapping was not done since it proved not necessary in the case of this study. Habitat characteristics were also surveyed to note potential occurrences of mammals. Many mammals can be identified from field sightings but, with a few exceptions bats, rodents and shrews can only be reliably identified in the hand, and even then some species needs examination of skulls, or even chromosomes (Apps, 2000).

3.3 BIRDS

Birds were noted as sight records, mainly with the aid of binoculars (10x30). Nearby bird calls of which the observer was sure of the identity were also recorded. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques Ryan (2001) is followed. For information on identification, biogeography and ecology Barnes (2000), Hockey, Dean & Ryan, P.G. (2005), Cillié, Oberprieler & Joubert (2004), Tarboton & Erasmus (1998) and Chittenden (2007) were consulted. Ringing of birds fell beyond the scope of this survey and was not deemed necessary. Sites have been walked, covering as many habitats as possible. Signs of the presence of bird species such as spoor and nests have additionally been recorded. Habitat characteristics were surveyed to note potential occurrences of birds.

3.4 REPTILES

Reptiles were noted as sight records in the field. Binoculars (10x30) can also be used for identifying reptiles of which some are wary. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques, Branch (1998), Marais (2004), Alexander & Marais (2007) and Cillié, Oberprieler and Joubert (2004) were followed. Sites were walked, covering as many habitats as possible. Smaller reptiles are sometimes collected for identification, but this practice was not necessary in the case of this study. Habitat characteristics were surveyed to note potential occurrences of reptiles.

3.5 AMPHIBIANS

Frogs and toads are noted as sight records in the field or by their calls. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques Carruthers (2001), Du Preez (1996), Conradie, Du Preez, Smith & Weldon (2006) and the recent complete guide by Du Preez & Carruthers (2009) are consulted. CD's with frog calls by Carruthers

(2001) and Du Preez & Carruthers (2009) are used to identify species by their calls when applicable. Sites are walked, covering as many habitats as possible. Smaller frogs are often collected by pitfall traps put out for epigeal invertebrates (on the soil), but this practice falls beyond the scope of this survey. Habitat characteristics are also surveyed to note potential occurrences of amphibians.

3.6 BUTTERFLIES

Butterflies were noted as sight records or voucher specimens. Voucher specimens are mostly taken of those species of which the taxa warrant collecting due to taxonomic difficulties or in the cases where species can look similar in the veldt. Many butterflies use only one species or a limited number of plant species as host plants for their larvae. Myrmecophilous (ant-loving) butterflies such as the *Aloeides*, *Chrysoritis*, *Erikssonia*, *Lepidochrysops* and *Orachrysops* species (Lepidoptera: Lycaenidae), which live in association with a specific ant species, require a unique ecosystem for their survival (Deutschländer & Bredenkamp, 1999; Terblanche, Morghental & Cilliers, 2003; Edge, Cilliers & Terblanche, 2008; Gardiner & Terblanche, 2010). Known food plants of butterflies were therefore also recorded. After the visits to the site and the identification of the butterflies found there, a list was also compiled of butterflies that will most probably be found in the area in all the other seasons because of suitable habitat. The emphasis is on a habitat survey.

3.7 FRUIT CHAFER BEETLES

Different habitat types in the areas were explored for any sensitive or special fruit chafer species. Selection of methods to find fruit chafers depends on the different types of habitat present and the species that may be present. Fruit bait traps would probably not be successful for capturing *Ichnestoma* species in a grassland patch (Holm & Marais 1992). Possible chafer beetles of high conservation priority were noted as sight records accompanied by the collecting of voucher specimens with grass nets or containers where deemed necessary.

3.8 MYGALOMORPH SPIDERS AND ROCK SCORPIONS

Relatively homogenous habitat / vegetation areas were identified and explored to identify any sensitive or special species. Selected stones that were lifted to search for Arachnids were put

back very carefully resulting in the least disturbance possible. The area was searched for possible signs of trap door spiders or other mygalomorph spiders (for example traces of wafer-lids, cork-lids or silk-lined burrows). Investigations by brushing the soil surface with a small broom/paint brush, scraping or digging into the soil with a spade, were made. All the above actions were accompanied by the least disturbance possible.

3.9 LIMITATIONS

For each site visited, it should be emphasized that surveys can by no means result in an exhaustive list of the plants and animals present on the site, because of the time constraints and the focus on species of conservation concern. The on site survey was conducted during October 2013, November 2013, December 2013, January 2014, February 2014 and March 2014 which is an optimal time of the year to find many of the habitat sensitive plant and animal species of high conservation priority. Earlier visits to parts of the study area from 2004 – 2011 also covers a range of different seasonal times of the year and as a consequence ideal surveys. Despite this vast range of visits, *Ichneustoma stobbiai* only emerges for very short periods of few days after good rain at the beginning of the summer so that even then full coverage of their habitat range is often limited. However, because of this vast range of visits a good idea at least the core habitat of *Ichneustoma stobbiai* could be given. Weather conditions during the survey were favourable for recording fauna and flora. The focus of the survey remains a habitat survey that concentrates on the possibility that species of particular conservation priority occur on the site or not. It is unlikely that more surveys would alter the outcome of this study.

4 RESULTS

4.1 HABITAT AND VEGETATION CHARACTERISTICS

Table 4.1 Outline of main landscape and habitat characteristics of the study area.

HABITAT FEATURE	DESCRIPTION
Topography	The study area and sites proposed for the developments is in an undulating area with moderate to gentle slopes.
Rockiness	Rocky ridges are present at Doornkloof 107, Doornkloof 129 and Rietvlei 7.
Presence of wetlands	A perennial river (active channel) which is a tributary of the Sesmyspruit and riparian zone are present north eastern boundary of Strawberry Farm Phase 2 and the western boundary of Strawberry Farm Phase 1. A non-perennial river (streambed) runs from the informal settlement at Strawberry Farm Phase 1 to join the Olifantspruit at Strawberry Farm Phase 2. A quarry surrounded by exotic trees is present at Strawberry Farm Phase 2.
Broad overview of vegetation	<p>As a general trend vegetation ranges from pristine grassland to very disturbed areas in the southern parts of the study area. Few indigenous trees or small clumps of trees are present at the grassland of Doornkloof 107 though a patch of exotic trees are also present at the south western parts of Doornkloof 107. Large patches of exotic trees that interrupt the grassland in many parts of the study area consist mainly of exotic <i>Eucalyptus camaldulensis</i> (red gum) and alien invasive Australian <i>Acacia</i> species. At the southern parts of the study area these infestation of the riparian zone and many parts of the site by exotic tree species are considerable.</p> <p>Remaining grassland patches at the site are obviously diverse in indigenous grass species and herbaceous species. Vegetation at much the central and southern parts of the study area largely transformed owing to the presence of buildings, clearings, roads, numerous dirt tracks, cultivated fields, informal settlements and informal dumping.</p> <p>These disturbed areas contain, apart from the mentioned exotic patches of trees, numerous alien invasive weeds that include <i>Campuloclinium</i> (Pompom Weed), <i>Schkuhria</i> (dwarf marigold), <i>Tagetes</i> (khaki weed), <i>Bidens</i> (black jacks), <i>Cosmos</i> (cosmos), <i>Conyza</i> (flea banes), <i>Datura</i> (thorn-apples), and exotic <i>Verbena</i> species (purple tops).</p> <p>Riparian zone (distinct vegetation along the river) is mixed woodland consisting of a mixture of alien plant species at large with some indigenous vegetation remaining. Exotic tree species in the riparian zone include <i>Populus x canescens</i> (grey poplar), <i>Melia azedarach</i> (Syringa), <i>Acacia decurrens</i> (Green Wattle),</p>

Signs of disturbances	<p><i>Gleditsia triacanthos</i> (Honey Locust), <i>Eucalyptus camaldulensis</i> (red gum) and the naturalised <i>Salix babylonica</i> (weeping willow). Exotic reed species, <i>Arundo donax</i>, and exotic grass <i>Pennisetum clandestinum</i> are common along the banks of the perennial river at Strawberry Farm Phase 2 and Strawberry Farm Phase 1.</p> <p>Urban edges, informal settlements, cultivated fields, a large substation, pylons, roads, dirt tracks, patches of exotic trees, alien invasive weeds, informal dumping and excavations are all reflections of human impacts in the area.</p>
Connectivity of natural vegetation in the site and between the site and surrounding areas	<p>The entire study area is isolated by urban and industrial developments and a highway (R21). For much of the study area in particular the central and southern parts a natural continuous conservation corridor is doubtful. There is scope for the riparian zone of the Olifantspruit to be an important link in the area and in particular for some areas to serve as stepping stone corridors at the study area.</p>



Photo 1 Doornkloof 107, view of eastern and north-eastern parts of the site.
Photo: 22 February 2014, R.F. Terblanche



Photo 2 Doornkloof 107, view towards substation (to the south).
Photo: 22 February 2014, R.F. Terblanche.



Photo 3 Doornkloof 129, view towards substation (north).
Photo: February 2014, R.F. Terblanche.



Photo 4 Doornkloof 129 with some recent disturbance visible.
Photo: 22 February 2014 R.F. Terblanche.



Photo 5 Rocky outcrop at Rietvlei 7.
Photo: 22 February 2014, R.F. Terblanche



Photo 6 View of eastern side of Rietvlei 7. Grassland and exotic *Eucalyptus* species are visible in the picture.
Photo: 22 February 2014, R.F. Terblanche.



Photo 7 Disturbed grassland at Rietvlei 6.
Photo: 22 February 2014, R.F. Terblanche.



Photo 8 Disturbed grassland with informal settlement in the background at Strawberry Farm Phase 1.
Photo: 22 February 2014 R.F. Terblanche.



Photo 9 Cultivated fields at Strawberry Farm Phase 2.
Photo: 22 February 2014, R.F. Terblanche



Photo 10 *Phragmites australis*, common reed and exotic trees at and near the riparian zone of Strawberry Farm Phase 2.
Photo: 22 February 2014, R.F. Terblanche.



Photo 11 *Lithops lesliei* at the north-eastern parts of Strawberry Farm Phase 2.
Photo: 22 February 2014, R.F. Terblanche.



Photo 12 Flower of *Cleome conrathii*, a near threatened plant species that sometimes occur with another Near Threatened plant species, *Melolobium subspicatum*, on dolomite banks south of Irene.
Photo: 7 March 2014, R.F. Terblanche.



Photo 13 Another Near Threatened plant species in the study area, the orchid, *Habenaria kraenzliniana*.
Photo: 7 March 2014, R.F. Terblanche.



Photo 14 Summer-flowering *Aloe zebrina* occurs at several rocky patches in the study area.
Photo: 22 February 2014, R.F. Terblanche



Photo 15 *Habenaria nyikana*, yet another grassland orchid species that occurs in the study area.
Photo: February 2014, R.F. Terblanche.



Photo 17 *Cynictis penicillata*, Yellow Mongoose, south of Irene. This widespread species is well-adapted to live at the urban edge.

Photo: 26 October 2013, R.F. Terblanche



Photo 18 *Burhinus capensis*, Spotted Thick-knee, at Irene.

Photo: 26 October 2013, R.F. Terblanche.



Photo 19 *Ichnestoma stobbiai*, at the lower slopes of Smuts Koppie, Irene.
Photo: October 2013, Peter Webb.



Photo 20 *Cigaritis mozambica*, Mozambique Bar butterfly, a widespread species at the north eastern parts of South Africa, at Doornkloof, Irene
Photo: 19 November 2013 R.F. Terblanche.

4.2 ASSESSMENT OF PLANT SPECIES OF CONSERVATION CONCERN

Table 4.2 Threatened plant species of the Gauteng Province that are listed in the **Critically Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
Encephalartos middelburgensis	Critically Endangered	No

Table 4.3 Threatened plant species of the Gauteng Province that are listed in the **Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
Aloe peglerae	Endangered	No
Brachystelma discoideum	Endangered	No
Delosperma purpureum	Endangered	No
Frithia humilis	Endangered	No
Habenaria mossii	Endangered	Yes
Holothrix micrantha	Endangered	No

Table 4.4 Threatened plant species of the Gauteng Province that are listed in the **Vulnerable** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
Bowiea volubilis subsp. volubilis	Vulnerable	No
Brachycorythis conica subsp. transvaalensis	Vulnerable	No
Ceropegia decidua subsp. pretoriensis	Vulnerable	No
Cheilanthes deltoidea subsp. silicicola	Vulnerable	Yes
Cineraria longipes	Vulnerable	No
Cucumis humifructus	Vulnerable	No
Delosperma gautengense	Vulnerable	No
Dioscorea sylvatica	Vulnerable	No

Encephalartos lanatus	Vulnerable	No
Eulophia coddii	Vulnerable	No
Khadia beswickii	Vulnerable	No
Melolobium subspicatum	Vulnerable	No*
Prunus africana	Vulnerable	No

* *Melolobium subspicatum* is present in the study area but not at one of the sites.

Table 4.5 Near Threatened plant species of the Gauteng Province. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
Alepidea attenuata	Near Threatened	No
Adromischus umbraticola subsp. umbraticola	Near Threatened	No
Argyrobium campicola	Near Threatened	No
Argyrobium megarrhizum	Near Threatened	No
Ceropegia turricula	Near Threatened	No
Cineraria austrotransvaalensis	Near Threatened	No
Cleome conrathii	Near Threatened	Yes
Delosperma leendertziae	Near Threatened	No
Drimia sanguinea	Near Threatened	No
Gladiolus robertsoniae	Near Threatened	No
Habenaria barbertoni	Near Threatened	No
Habenaria bicolor	Near Threatened	No
Habenaria kraenzliniana	Near Threatened	Yes
Holothrix randii	Near Threatened	No
Kniphofia typhoides	Near Threatened	No
Lithops leslei subsp. leslei	Near	Yes

	Threatened	
Nerine gracilis	Near Threatened	No
Searsia gracillima var. gracillima	Near Threatened	No
Stenostelma umbelluliferum	Near Threatened	No
Trachyandra erythrorrhiza	Near Threatened	No

Table 4.6 Least Concern (= not threatened) plant species of the Gauteng Province that are however of particular conservation concern and listed in the **Rare** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
Blepharis uniflora	Rare	No
Frithia pulchra	Rare	No
Gladiolus pole-evansii	Rare	No
Gnaphalium nelsonii	Rare	No

Table 4.7 Not threatened plant species of the Gauteng Province which are however of particular conservation concern and listed in the **Declining** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
Boophone disticha	Declining	Yes
Callilepis leptophylla	Declining	Yes
Crinum bulbispermum	Declining	No
Crinum macowanii	Declining	No
Drimia altissima	Declining	No
Eucomis autumnalis	Declining	No
Gunnera perpensa	Declining	No
Hypoxis hemerocallidea	Declining	Yes
Ilex mitis	Declining	No

Table 4.8 Plant species of the Gauteng Province of which the conservation status is uncertain owing to a lack of information and which are listed in the **Data Deficient** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
Lepidium mossii	Data Deficient	No

Table 4.9 Some of the tree species of the Gauteng Province which are not threatened but listed as **Protected Species** under the National Forests Act No. 84 of 1998, Section 51(1). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Conservation status	Resident at the site
Acacia erioloba	Protected	No
Boscia albitrunca	Protected	No
Combretum imberbe	Protected	No
Sclerocarya birrea	Protected	No

4.3 ASSESSMENT OF VERTEBRATE SPECIES OF CONSERVATION CONCERN

4.3.1 Mammals of particular high conservation priority

Table 4.10 Threatened mammal species of the Gauteng Province. Literature sources: Friedman & Daly, (2004), Skinner & Chimimba (2005), Wilson & Reeder (2005). Furthermore golden mole species that are rare and being reported from the adjacent Free State and Limpopo Provinces have also been included.

Species	Red Listed Status	Recorded at site during survey	Likely to be found based on habitat assessment
Chrysospalax villosus Rough-haired golden mole	Vulnerable	No	No
Cloeotis percivali Short-eared Trident Bat	Vulnerable/ Near-threatened	No	No
Diceros bicornis Black rhinoceros	Critically Endangered	No	No
Lycaon pictus African wild dog	Endangered	No	No
Loxodonta africana African elephant	Vulnerable	No	No
Mystromys albicaudatus White-tailed mouse	Endangered	No	No
Neamblysomus julianae Juliana's Golden Mole	Critically Endangered	No	No
Panthera leo Lion	Vulnerable	No	No
Rhinolophus blasii Blasi's Horseshoe Bat	Vulnerable	No	No

Table 4.11 Near threatened mammal species known to occur in the Gauteng Province, Free State Province and North-West Province. Literature sources: Skinner & Chimimba (2005).

Species	Red Listed Status	Recorded at site during survey	Likely to be found based on habitat assessment
Ceratotherium simum White Rhinoceros	Near-threatened	No	No
Manis temminckii Ground Pangolin	Lower risk/ Near threatened	No	No

4.3.2 Birds of particular high conservation priority

Table 4.12 Threatened bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

Species	Common name	Red Listed Status	Recorded at site during survey	Likely to be found breeding on site based on being dependant on site
<i>Aegypius tracheliotos</i>	Lappet-faced Vulture	Vulnerable	No	No
<i>Anthropoides paradiseus</i>	Blue Crane	Vulnerable	No	No
<i>Aquila rapax</i>	Tawny Eagle	Vulnerable	No	No
<i>Ardeotis kori</i>	Kori Bustard	Vulnerable	No	No
<i>Botaurus stellaris</i>	Eurasian Bittern	Critically Endangered	No	No
<i>Buphagus africanus</i>	Yellow-billed Oxpecker	Vulnerable	No	No
<i>Circus ranivorus</i>	African Marsh-Harrier	Vulnerable	No	No
<i>Crex crex</i>	Corn Crane	Vulnerable	No	No
<i>Eupodotis senegalensis</i>	White-bellied Korhaan	Vulnerable	No	No

<i>Gorsachius leuconotus</i>	White-backed Night-heron	Vulnerable	No	No
<i>Gyps africanus</i>	White-backed Vulture	Vulnerable	No	No
<i>Gyps coprotheres</i>	Cape Vulture	Vulnerable	No	No
<i>Neophron percnopterus</i>	Egyptian Vulture	Regionally almost extinct	No	No
<i>Neotis denhami</i>	Denham's Bustard	Vulnerable	No	No
<i>Pelecanus rufescens</i>	Pink-backed Pelican	Vulnerable	No	No
<i>Polemaetus bellicosus</i>	Martial Eagle	Vulnerable	No	No
<i>Rhynchops flavirostris</i>	African Skimmer	Endangered	No	No
<i>Sarothrura ayresi</i>	White-winged Flufftail	Critically Endangered	No	No
<i>Therathopius ecaudatus</i>	Bateleur	Vulnerable (in South Africa)	No	No
<i>Tyto capensis</i>	African Grass-Owl	Vulnerable	No	No

Table 4.13 Near threatened bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

Species	Common name	Red Listed Status	Recorded at site during survey	Likely to be found breeding on site based or being dependant on site
<i>Alcedo semitorquata</i>	Half-collared Kingfisher	Near threatened	No	No*
<i>Anastomus lamelligerus</i>	African Openbill	Near threatened	No	No
<i>Aquila ayresii</i>	Ayres's Hawk-Eagle	Near threatened	No	No
<i>Buphagus erythrorhynchus</i>	Red-Billed Oxpecker	Near threatened	No	No
<i>Charadrius pallidus</i>	Chestnut-banded Plover	Near threatened	No	No
<i>Ciconia nigra</i>	Black Stork	Near threatened	No	No
<i>Circus macrourus</i>	Pallid Harrier	Near threatened	No	No
<i>Falco biarmicus</i>	Lanner Falcon	Near threatened	No	No
<i>Falco peregrinus</i>	Peregrine Falcon	Near threatened	No	No

<i>Glareola nordmanni</i>	Black-winged Pratincole	Near threatened	No	No
<i>Leptoptilos crumeniferus</i>	Marabou Stork	Near threatened	No	No
<i>Mirafraga cheniana</i>	Melodious lark	Near threatened	No	No
<i>Mycteria ibis</i>	Yellow-billed Stork	Near threatened	No	No
<i>Pelecanus onocrotalus</i>	Great White Pelican	Near threatened	No	No
<i>Phoenicopterus minor</i>	Lesser Flamingo	Near threatened	No	No
<i>Phoenicopterus ruber</i>	Greater Flamingo	Near threatened	No	No
<i>Pterocles gutturalis</i>	Yellow-throated Sandgrouse	Near threatened	No	No
<i>Rostratula benghalensis</i>	Greater Painted-snipe	Near threatened	No	No
<i>Sagittarius serpentarius</i>	Secretarybird	Near threatened	No	No
<i>Sterna caspia</i>	Caspian Tern	Near threatened	No	No

* Note that though the Half-Collared Kingfisher, *Alcedo semitorquata*, has been observed in the riparian zone near Irene Market, it has not been found at the riparian zones that runs through the sites in questions.

4.3.3 Reptiles of particular high conservation priority

The following tables list possible presence or absence of threatened reptile or near threatened reptile species in the study area. The Southern African Reptile Conservation Assessment (SARCA) was launched in May 2005 (Branch, Tolley, Cunningham, Bauer, Alexander, Harrison, Turner & Bates, 2006). Its primary aim is to produce a conservation assessment for reptiles of South Africa, Lesotho and Swaziland within the near future (Branch *et al.*, 2006). A full up-dated conservation assessment of reptiles, taking into account the recent IUCN (2001) criteria, can only be used once it becomes available. Alexander & Marais (2007) and Tolley & Burger (2007) give useful indications of present conservation statuses as well as possible red listings of reptile species and subspecies in the near future.

Table 4.14 Threatened reptile species in Gauteng Province. Sources: Alexander & Marais (2007). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Python natalensis</i> Southern African Python	Vulnerable*	No	No	No

* Unlikely to retain this threat classification when reassessed (Alexander & Marais, 2007).

Table 4.15 Near threatened reptile species in Gauteng Province. Sources: Alexander & Marais (2007). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Homoroselaps dorsalis</i> Striped Harlequin Snake	Near threatened	No	No	No

4.4 ASSESSMENT OF INVERTEBRATE SPECIES OF CONSERVATION CONCERN

4.4.1 Butterflies of particular conservation priority

Table 4.16 Threatened (Endangered) butterfly species of the Gauteng Province. Sources: Mecenero *et al.* (2013), Henning, Terblanche & Ball (2009).

Species	Red List Status (Global status)	Recorded at site during survey	Residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
Aloeides dentatis dentatis Roodepoort Copper	Endangered	No	Highly unlikely
Chrysochrysis aureus Golden Opal/ Heidelberg Opal	Endangered	No	Highly unlikely
Lepidochrysops praeterita Highveld Blue	Endangered	No	Highly unlikely
Orachrysops mijburghi Mijburgh's Blue	Endangered	No	Highly unlikely

Table 4.17 Rare butterfly species of the Gauteng Province. Source: Mecenero *et al.* (2013).

Species	Red List Status	Recorded at site during survey	Residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
Colotis celimene amina Lilac Tip	Rare (Low density)	No	Highly unlikely
Lepidochrysops procera Grassland Blue	Rare (Habitat specialist)	No	Highly unlikely
Metisella meninx Marsh Sylph	Rare (Habitat specialist)	No	Highly unlikely
Platylesches dolomitica (Hilltop hopper)	Rare (Low density)	No	Unlikely, but possible

4.4.2 Beetles of particular conservation priority

Table 4.18 Fruit chafer species (Coleoptera: Scarabaeidae: Cetoninae) in the Gauteng Province and Gauteng Province which are of known high conservation priority.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
Ichneustoma stobbiai	Uncertain (Probably endangered)	Yes	Yes	Yes
Trichocephala brincki	Uncertain	No	No	No

4.4.3 Mygalomorph spiders of particular conservation priority

Table 4.19 Baboon spiders species (Araneae: Teraphosidae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
Brachionopus pretoriae	Uncertain	No	No	No

4.4.4 Scorpions of particular conservation priority

Table 4.20 Rock scorpion species (Scorpiones: Ischnuridae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
Hadogenes gracilis	Uncertain	No	No	No
Hadogenes gunningi	Uncertain	No	No	No

5 DISCUSSION

5.1 HABITAT AND VEGETATION CHARACTERISTICS

An outline of the habitat and vegetation characteristics is given in Table 4.1.

5.2 PLANT SPECIES

Extinct, threatened, near threatened and other plant species of high conservation priority in Gauteng Province are listed in Tables 4.2 – 4.9. The presence or not of all the species listed in the tables were investigated during the survey. A number of Threatened and Near Threatened species of plants have been found in certain habitats in the study area of which some fall outside the present sites. These are listed in the maps, Table 5.2 and the Section 7, the Conclusion.

5.3 VERTEBRATES

5.3.1 Mammals

Table 4.10 and Table 4.11 list the possible presence or absence of threatened mammal species and near threatened mammal species at the site. Literature sources that were used are Friedman & Daly (2004), Skinner & Chimimba (2005) and Wilson & Reeder (2005). Because the site falls outside reserves, threatened species such as the black rhinoceros (*Diceros bicornis*) and the African wild dog (*Lycaon pictus*) are obviously not present. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

5.3.2 Birds

Table 4.12 and Table 4.13 list the possible presence or absence of threatened bird species and near threatened bird species at the site. Literature sources that were mainly consulted are Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007). The site does not appear to form part of any habitat of particular importance for any threatened bird species or any bird

species of particular conservation importance. In the case of this study, the presence or not of *Tyto capensis*, African grass-owl, deserves particular reference.

Tyto capensis (African Grass-owl)

Tyto capensis is listed as regionally vulnerable in South Africa (Hockey, Dean & Ryan 2005). *Tyto capensis* (African Grass-owl) is often found as a resident in treeless areas with damp substrata, mainly marshes and vleis (Hockey, Dean & Ryan 2005). This owl favours patches of tall, rank grass, sedges or weeds (Armstrong, 1991). No *Tyto capensis* was recorded on the site, no particular suitable habitat for this owl species has been found at the site and it is unlikely that the African grass-owl will be present.

5.3.3 Reptiles

Table 4.14 and Table 4.15 list the possible presence or absence of threatened and near threatened reptile species on the site. The Southern African Reptile Conservation Assessment (SARCA) was launched in May 2005 (Branch, Tolley, Cunningham, Bauer, Alexander, Harrison, Turner & Bates, 2006). Its primary aim is to produce a conservation assessment for reptiles of South Africa, Lesotho and Swaziland within the near future (Branch *et al.*, 2006). Therefore a full up-dated conservation assessment of reptiles, taking into account the recent IUCN (2001) criteria, will only be available in the near future. While the conservation statuses of reptile species are under revision Alexander & Marais (2007) as well as Tolley & Burger 2007) give useful indications of possible red listings in the near future. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

5.3.4 Amphibians

No frog species that occur in the Gauteng are red listed as threatened species or near threatened species at present. There appears to be no threat to any amphibian species of particular high conservation importance if the site is developed.

5.4 INVERTEBRATES

5.4.1 BUTTERFLIES

Studies about the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Because invertebrates are often less well known the expected presence or not of threatened butterfly species in the Endangered category (Table 4.16) and other high conservation priority species such as Rare butterfly species (Table 4.17) follows.

5.4.1.1 Assessment of threatened butterfly species (Endangered) in the Gauteng Province

Aloeides dentatis dentatis (Roodepoort Copper)

The proposed global red list status for *Aloeides dentatis dentatis* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013). *Aloeides dentatis dentatis* colonies are found where one of its host plants *Hermannia depressa* or *Lotononis eriantha* is present. Larval ant association is with *Lepisiota capensis* (S.F. Henning 1983; S.F. Henning & G.A. Henning 1989). The habitat requirements of *Aloeides dentatis dentatis* are complex and not fully understood yet. See Deutschländer and Bredenkamp (1999) for the description of the vegetation and habitat characteristics of one locality of *Aloeides dentatis* subsp. *dentatis* at Ruimsig, Roodepoort, Gauteng Province. There is not an ideal habitat of *Aloeides dentatis* subsp. *dentatis* on the site and it is unlikely that the butterfly is present at the site.

Chrysoritis aureus (Golden Opal/ Heidelberg Copper)

The proposed global red list status for *Chrysoritis aureus* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013) *Chrysoritis aureus* (Golden Opal/ Heidelberg Copper) is a resident where the larval host plant, *Clusia pulchella* is present. However, the distribution of the butterfly is much more restricted than that of the larval host plant (S.F. Henning 1983; Terblanche, Morgenthal & Cilliers 2003). One of the reasons for the localised

distribution of *Chrysoritis aureus* is that a specific host ant *Crematogaster liengmei* must also be present at the habitat. Fire appears to be an essential factor for the maintenance of suitable habitat (Terblanche, Morgenthal & Cilliers 2003). Research revealed that *Chrysoritis aureus* (Golden Opal/ Heidelberg Copper) has very specific habitat requirements, which include rocky ridges with a steep slope and a southern aspect (Terblanche, Morgenthal & Cilliers 2003). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon is highly unlikely.

Lepidochrysops praeterita (Highveld Blue)

The proposed global red list status for *Lepidochrysops praeterita* according to the most recent IUCN criteria and categories is Endangered (G.A. Henning, Terblanche & Ball, 2009; Mecenero *et al.* 2013). *Lepidochrysops praeterita* is a butterfly that occurs where the larval host plant *Ocimum obovatum* (= *Becium obovatum*) is present (Pringle, G.A. Henning & Ball, 1994), but the distribution of the butterfly is much more restricted than the distribution of the host plant. *Lepidochrysops praeterita* is found on selected rocky ridges and rocky hillsides in parts of Gauteng, the extreme northern Free State and the south-eastern Gauteng Province. No ideal habitat appears to be present for the butterfly on the site. It is unlikely that *Lepidochrysops praeterita* would be present on the site and at the footprint proposed for the development.

Orachrysops mijburghi (Mijburgh's Blue)

The proposed global red status for *Orachrysops mijburghi* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013). *Orachrysops mijburghi* favours grassland depressions where specific *Indigofera* plant species occur (Terblanche & Edge 2007). The Heilbron population of *Orachrysops mijburghi* in the Free State uses *Indigofera evansiana* as a larval host plant (Edge, 2005) while the Suikerbosrand population in Gauteng uses *Indigofera dimidiata* as a larval host plant (Terblanche & Edge 2007). There is no suitable habitat for *Orachrysops mijburghi* on the site and it is unlikely that *Orachrysops mijburghi* would be present on the site.

Conclusion on threatened butterfly species

There appears to be no threat to any red listed butterfly species if the site is developed.

5.4.1.2 Butterfly species that are not threatened but also of high conservation priority

Colotis celimene amina (Lilac tip)

Colotis celimene amina is listed as Rare (Low density) by Mecenero *et al.* (2013). In South Africa *Colotis celimene amina* is present from Pietermaritzburg in the south and northwards into parts of Kwa-Zulu Natal, Gauteng, Limpopo, Mpumalanga and the North West Provinces (Mecenero *et al.* 2013). Reasons for its rarity are poorly understood. It is highly unlikely that *Colotis celimene amina* would be present at the site.

Lepidochrysops procera (Savanna Blue)

Lepidochrysops procera is listed as Rare (Habitat specialist) by Mecenero *et al.* (2013). *Lepidochrysops procera* is endemic to South Africa and found in Gauteng, KwaZulu-Natal, Mpumalanga and North West (Mecenero *et al.* 2013). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

Metisella meninx (Marsh Sylph)

Henning and Henning (1989) in the first South African Red Data Book of butterflies' listed *Metisella meninx* as threatened under the former IUCN category Indeterminate. Even earlier in the 20th century Swanepoel (1953) raised concern about vanishing wetlands leading to habitat loss and loss of populations of *Metisella meninx*. According to the second South African Red Data Book of butterflies (Henning, Terblanche & Ball, 2009) the proposed global red list status of *Metisella meninx* has been Vulnerable. During a recent large scale atlassing project the Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas (Mecenero *et al.* 2013) it was found that more *Metisella meninx* populations are present than thought before. Based on this valid new information, the conservation status of *Metisella meninx* is now regarded as Rare (Habitat specialist) (Mecenero *et al.* 2013). Though *Metisella meninx* is more widespread and less threatened than perceived before, it should be regarded as a localised rare habitat specialist of conservation priority, which is dependent on wetlands with suitable patches of grass at wetlands (Terblanche In prep.). Another important factor to keep in mind for the conservation of *Metisella meninx* is that based on very recent discoveries of new taxa in the group the present *Metisella meninx* is a species complex consisting of at least three taxa (Terblanche In prep., Terblanche & Henning In prep.). The ideal habitat of *Metisella meninx* is treeless marshy areas where *Leersia hexandra* (rice grass) is abundant (Terblanche In prep.).

The larval host plant of *Metisella meninx* is wild rice grass, *Leersia hexandra* (G.A. Henning & Roos, 2001). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely that the marsh sylph butterfly would be present at the site.

Platylesches dolomitica (Hilltop Hopper)

Platylesches dolomitica is listed as Rare (Low density) by Mecenero et al. (2013). Historically the conservation status of *Platylesches dolomitica* was proposed to be Vulnerable (Henning, Terblanche & Ball 2009). However, this butterfly which is easily overlooked has a wider distribution than perceived before. *Platylesches dolomitica* has a patchy distribution and is found on rocky ledges where *Parinari capensis* occurs, between 1300 m and 1800m (Mecenero et al. 2013, Dobson Pers comm.). At the study area, though not totally impossible, it is unlikely that *Platylesches dolomitica* would be present.

5.4.2 FRUIT CHAFER BEETLES

Table 4.18 lists the fruit chafer beetle species (Coleoptera: Scarabaeidae: Cetoniinae) that are of known high conservation priority in the Gauteng Province. At most of the study area no *Ichneustoma stobbiai* or *Trichocephala brincki* were found during the surveys. At most of the study area there appears to be no threat to any of the fruit chafer beetles of particular high conservation priority if the site is developed. At Doornkloof Ptn 107 there is an extant population of *Ichneustoma stobbiai* and outside the sites in question a strong population of *Ichneustoma stobbiai* is found on the lower slopes east of the Irene Market Parking Area.

Ichneustoma stobbiai is an endangered fruit chafer (Scarabaeidae: Cetoniinae) that occurs in small habitat fragments of South Africa (Kryger & Scholtz, 2008). The adults of this species are short-lived and the females are flightless. Thus, the vagility of these beetles is extremely low (Kryger & Scholtz, 2008). The Cetoniinae (Coleoptera: Scarabaeidae) genus *Ichneustoma* Gory & Percheron, 1833 currently comprises 13 described species and is endemic to South Africa. The species *I. stobbiai* Holm, 1992 is thought to occur in a very restricted area in and around Gauteng Province and all habitat patches should be protected (Kryger & Scholtz, 2008; Deschodt, Scholtz & Kryger, 2009). Unlike most cetoniine larvae, the larvae of this species usually occur in dolomitic to cherty, well-drained soils (Deschodt, Scholtz & Kryger, 2009). *Ichneustoma* larvae feed under the soil surface and also pupate under the soil surface in specific grassland areas (Perissinotto, Smith &

Stobbiai, 1999). All the habitat requirements of *Ichnestoma stobbiai* in these grassland patches are not fully understood yet, but it is normally a rocky area (dolomite to chert: see Deschodt, Scholtz & Kryger, 2009), consisting of grassland with a variety of indigenous grass species. From personal experience few trees occur in such patches, with species diverse grassland that are well developed in terms of succession. Rocks, often well-embedded in the soil, are scattered throughout such areas. There would be a threat to the rare and localised fruit chafer beetle, *Ichnestoma stobbiai* if the development at northern parts of the study area destroys its habitat.

5.4.3 MYGALOMOPH SPIDERS

Table 4.19 lists the baboon spider species (Araneae: Teraphosidae) that are of known high conservation priority in the Gauteng Province. The assessment of the conservation status of baboon spiders in South Africa is in process but as a pre-caution the species listed in Table 4.18 has been included. None of the above baboon spider species were found on the site, or are likely to be resident at the site. There appears to be no threat to the baboon spider species of high conservation significance if the study site is developed.

5.4.4 SCORPIONS

Table 4.20 lists the rock scorpion species (Scorpiones: Ischnuridae) that are of known high conservation priority in the Gauteng Province. There appears to be no threat to the rock scorpion species of high conservation priority if the study site is developed.



Figure 1 Map of sites in the study area (outlined in red) and core areas that are highly sensitive (outlined in yellow). These highly sensitive areas contain significant populations of Threatened or Near Threatened plant or animal species.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).



Figure 2 Map of Doornkloof Ptn 107 (outlined in red) and core areas that are highly sensitive (outlined in yellow). These highly sensitive areas contain significant populations of Near Threatened or Threatened plant or animal species. The light yellow outline at Doornkloof Ptn 107 indicates a confirmed habitat of the beetle *Ichnestoma stobbiai* but which does not appear to be as strong as the population east of Irene Market Parking Area (outlined in bright central left).

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).



Figure 3 Map of Doornkloof Ptn 129 (outlined in red) and core areas that are highly sensitive (outlined in yellow). These highly sensitive areas contain significant populations of Near Threatened or Threatened plant or animal species. These areas of particular high sensitivity fall outside Doornkloof Ptn 129 but near its western boundary such as indicated.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument.
Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).

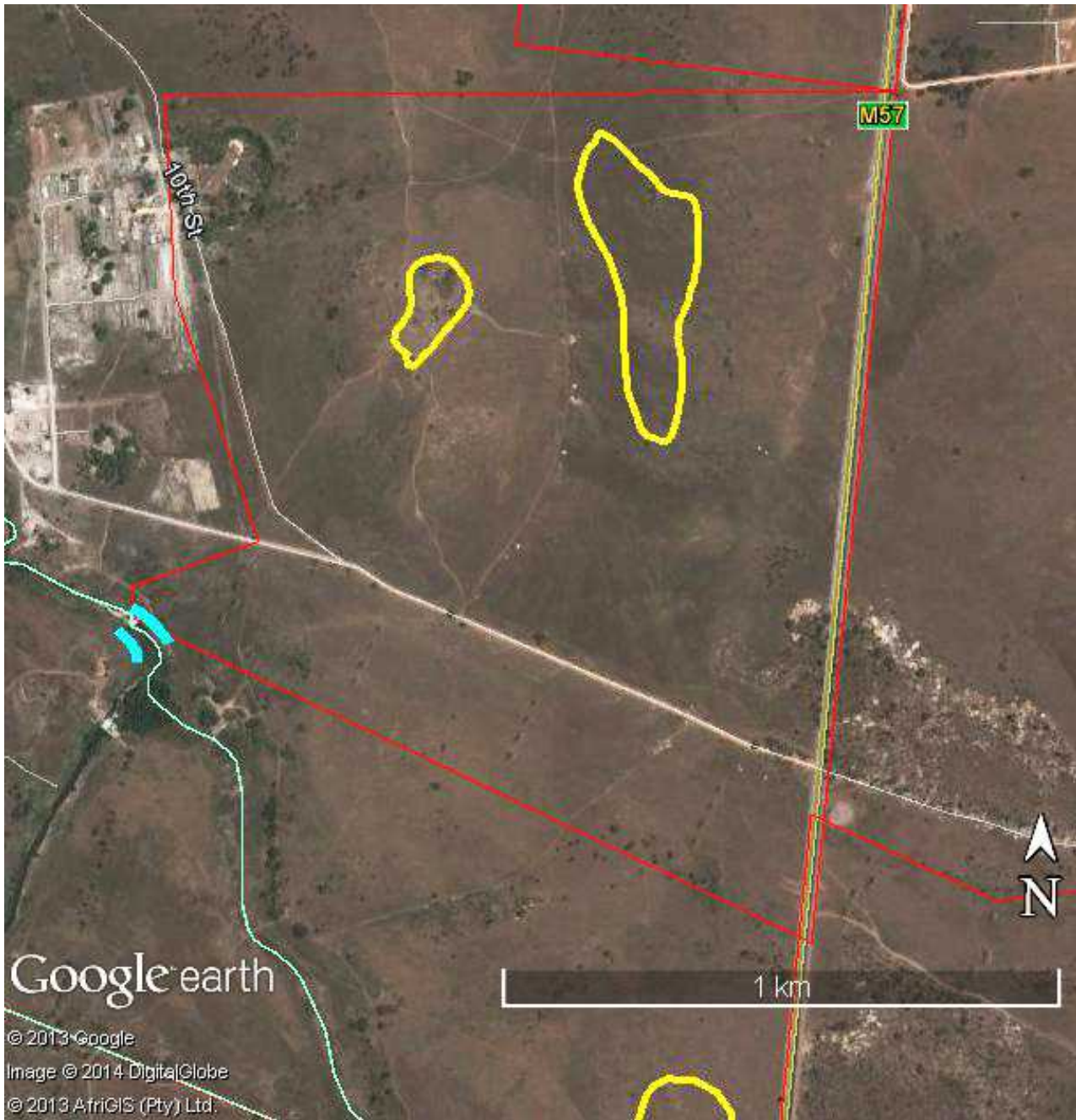


Figure 4 Map of Rietvlei 7 (outlined in red) and core areas that are highly sensitive (outlined in yellow). Area outlined in yellow at north-eastern (right) part indicates a habitat that contains the ENDANGERED orchid, *Habenaria mossii*, a Near Threatened orchid *Habenaria kraenzliniana* and a Near Threatened herbaceous plant species, *Cleome conrathii*. Area outlined in yellow at north-western part (left) indicates a rocky outcrop with the VULNERABLE fern *Cheilanthes deltoidea* subsp. *sillicicola*.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).



Figure 5 Map of Rietvlei 6 (outlined in red). Rietvlei 6 is increasingly degraded and considered to be of low sensitivity. Vast majority of trees that either occur in clumps or dot the landscape are exotic species, of which *Eucalyptus camaldulensis* (red gum) was visibly abundant during the site surveys.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).

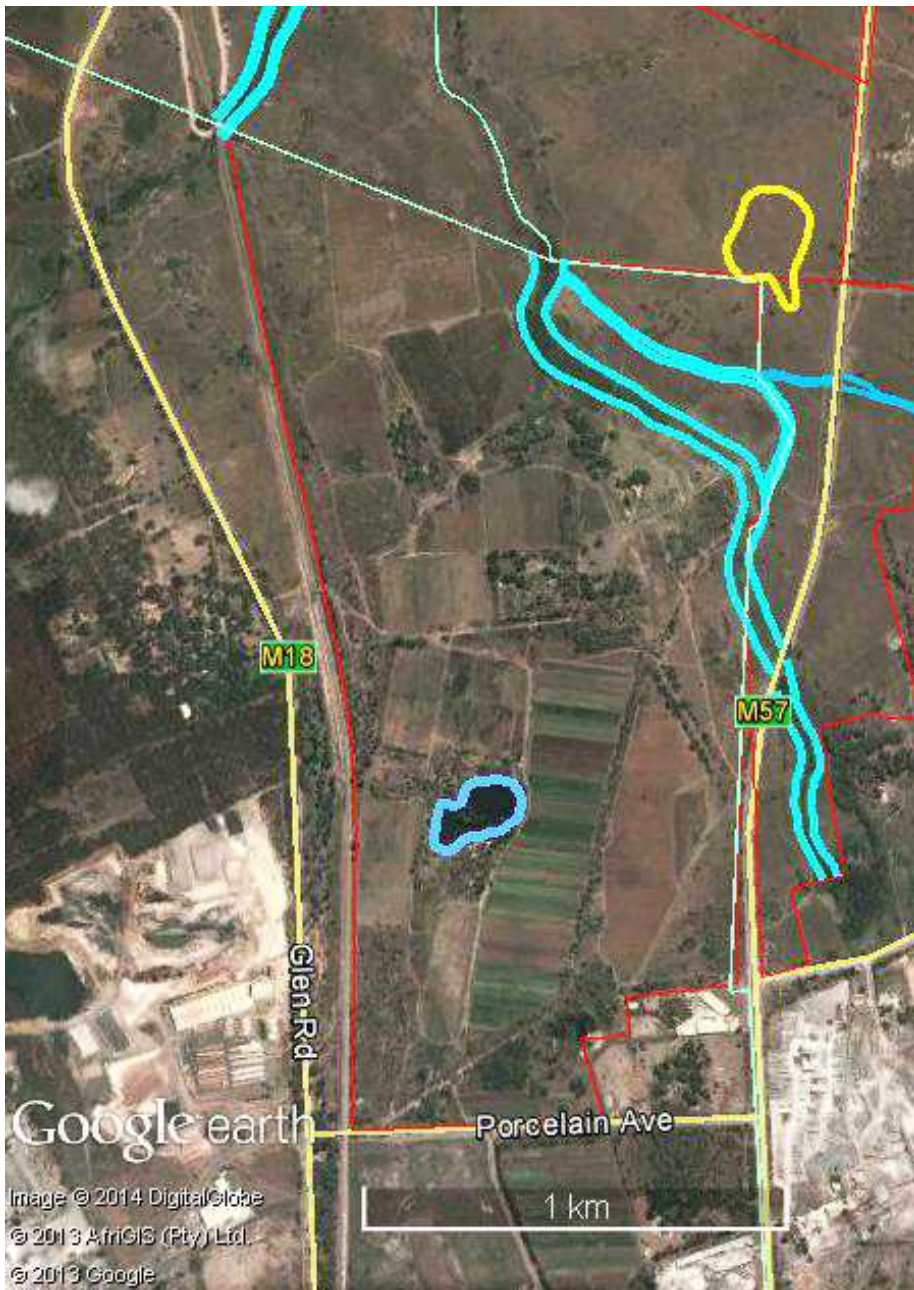


Figure 6 Map of Strawberry Farm Phase 2 (outlined in red). Aquatic ecosystems such as a quarry (central-southern part) and a perennial active channel (north-eastern parts) are outlined in blue. Area outlined in yellow that enters the north-eastern extreme of the site contains the Near Threatened succulent *Lithops leslei* and a Near Threatened herbaceous species *Cloeme conrathii*.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).

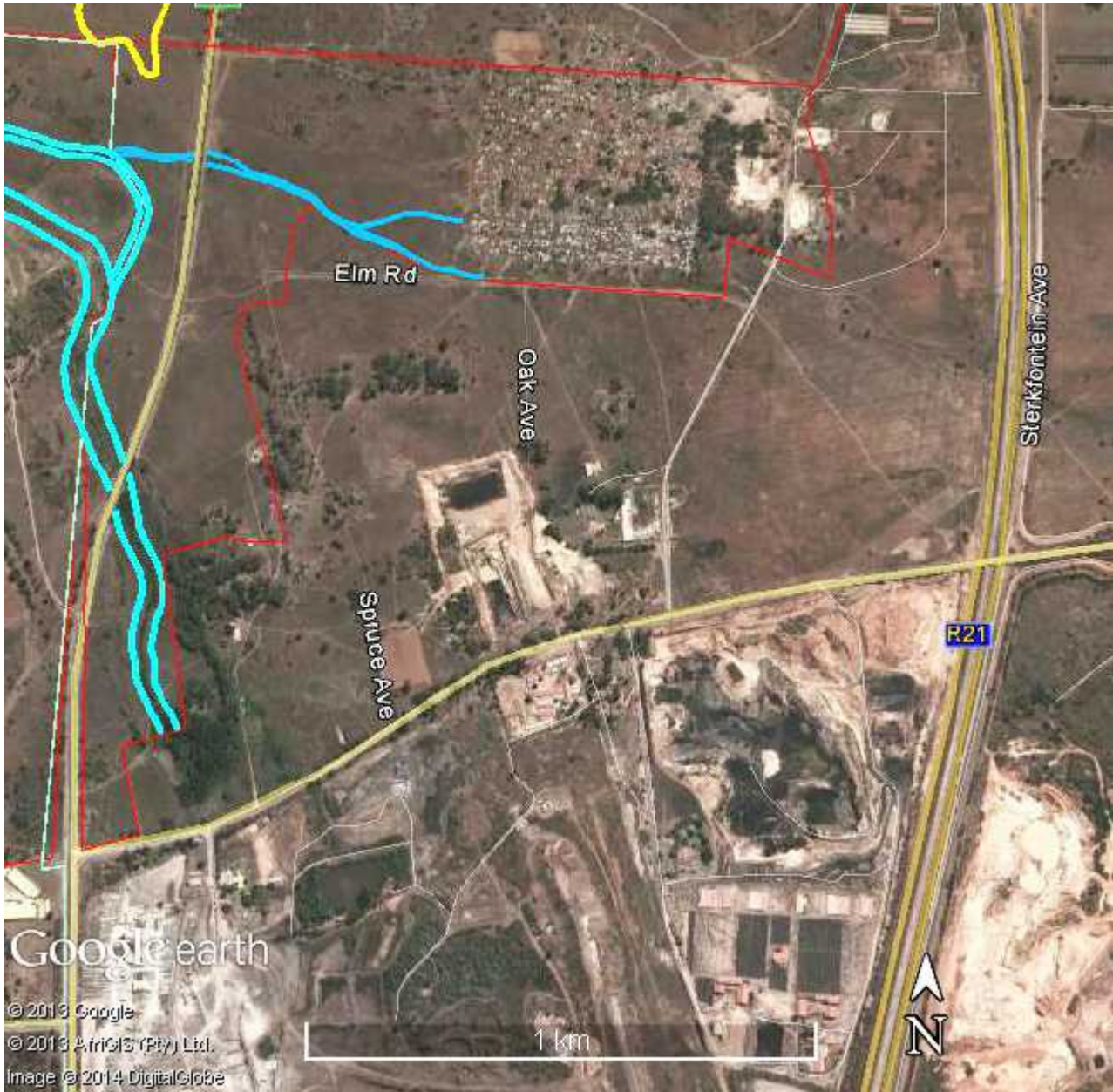


Figure 7 Map of Strawberry Farm Phase 1 (outlined in red). Aquatic ecosystems such as a perennial active channel (north-western parts) and a non-perennial small water course are outlined in blue. Area outlined in yellow that enters the north-western extreme of the site contains the Near Threatened succulent species *Lithops leslei* and a Near Threatened herbaceous species *Cloeme conrathii*.

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2013, licenced software bought by the author).

Table 1.1: Outline of topography, rockiness vegetation, disturbances and aquatic aspects of the sites at the study area.

		DOORNKLOOF PTN 107	DOORNKLOOF PTN 129	RIETVLEI 7	RIETVLEI 6	STRAWBERRY FARM PHASE 1	STRAWBERRY FARM PHASE 2
Topography		Summit with gentle to moderate slopes.	Gentle to moderate slopes.	Rocky ridge in the west, flats in the southern parts and shallow valley in eastern parts.	Gentle to moderate slopes.	Flat/ gentle slopes.	Flat/ Gentle slopes.
Rockiness		Chert rocks occur in patches near summit and some slopes. Pebbles in soil.	Chert rocks surface but not highly concentrated and not as large as that of adjacent areas.	Rocky outcrop as extension of north-south ridge. Few rocks in eastern and southern parts of site.	Few rocks and small rocky patches.	Rocks few and sparse. No rocky ridges of note.	Rocks sparse and very few rocky patches. No rocky ridges of note.
Note: Vegetation		Indigenous and diverse grassland with few trees and patch of exotic trees in the south-western part.	Grassland patches. Western and north-western parts of site contain many exotic trees.	Mostly grassland with few trees. Bushclump of indigenous trees at upper northern slope of rocky outcrop. Exotic trees at eastern parts.	Large tracks of grassland invaded by dense patches of mainly exotic <i>Eucalyptus</i> trees.	Few natural grassland patches remain. Degraded or modified grassland with high infestation of alien invasive tree species.	Few natural grassland patches remain. Degraded or modified grassland with high infestation of alien invasive tree species.
Note: Disturbances		Disturbance low but large patch of exotic trees, mainly alien invasive Australian <i>Acacia</i> species.	Increasing disturbances recognised over recent years. Substation enters site. Pylons and excavations. Band of alien invasive trees.	Many tracks and invasion by <i>Eucalyptus</i> in the eastern parts.	Becoming increasingly disturbed and degraded.	Highly disturbed and degraded or modified area.	Highly disturbed and degraded or modified area.
Aquatic	Presence of active channels and riparian zones	No riparian zones or active channels of any note.	No riparian zones or active channels of any note.	Riparian zone of tributary of Olifantspruit crosses south-western extreme.	No riparian zones or active channels of any note.	Perennial active channel runs across southern extreme of site and a non-perennial active channel run through central-northern parts of the site.	Perennial active channel and non-perennial active channel run through north-eastern part of the site.
	Presence of wetlands	No wetlands of any note.	No wetlands of any note.	No wetlands of any note.	No wetlands of any note.	No wetlands of any note.	Artificial wetland: Quarry filled with water and surrounded by exotic trees at central-western part of the site. A weakly developed wetland occurs south of the quarry.

Table 2.2: Outline of key fauna and flora considerations stemming from the habitat assessment and surveys. Categories of presence or degree: Very low, Low, Moderate, High, Very high, Confirmed.

	DOORNKLOOF PTN 107	DOORNKLOOF PTN 129	RIETVLEI 7	RIETVLEI 6	STRAWBERRY FARM PHASE 1	STRAWBERRY FARM PHASE 2
Unique habitat of Threatened Plant Species	Low	Low	Confirmed <i>Habenaria mossii</i> ENDANGERED , <i>Cheilanthes deltoidea</i> subsp. <i>silvicola</i> VULNERABLE	Low	Low	Low
Unique habitat other plant species of conservation concern: Near Threatened Plant Species	Low	Low	Confirmed <i>Habenaria kraenzliniana</i> NEAR THREATENED <i>Cleome conrathii</i> NEAR THREATENED	Low	Confirmed <i>Cleome conrathii</i> NEAR THREATENED <i>Lithops lesliei</i> subsp. <i>lesliei</i> NEAR THREATENED	Confirmed <i>Cleome conrathii</i> NEAR THREATENED <i>Lithops lesliei</i> subsp. <i>lesliei</i> NEAR THREATENED
Unique habitat other plant species of conservation concern: Declining / Rare/ Plant Species	Confirmed <i>Boophone disticha</i> Declining <i>Hypoxis hemerocallidea</i> Declining	Confirmed <i>Boophone disticha</i> Declining <i>Hypoxis hemerocallidea</i> Declining	Confirmed <i>Hypoxis hemerocallidea</i> Declining <i>Eucomis autumnalis</i> subsp. <i>clavata</i> Declining	Confirmed <i>Boophone disticha</i> Declining <i>Hypoxis hemerocallidea</i> Declining	Low	Low
Unique habitat of Threatened Fauna	Confirmed <i>Ichnestoma stobbiai</i> (Beetle) VULNERABLE	Low Historically some records of <i>Ichnestoma stobbiai</i> but no recent observations. Viable sub-population unlikely.	Low	Low	Low	Low
Unique habitat of Near Threatened Fauna	Low	Low	Low	Low	Low	Low
General cover of indigenous plant species	High	High	High	Medium	Low	Very Low
Grazing importance* (of entire area including the sites)	Low	Low	Low	Low	Low	Low
Connectivity, intactness (of entire area including the sites)	Low	Low	Low	Low	Low	Low

6 TOWARDS ENVIRONMENTAL MANAGEMENT AND PLANNING OF THE STUDY AREA

Habitats of threatened plants are in danger most often due to urban developments such as is the case for the Gauteng Province (Pfab & Victor, 2002). Habitat conservation is the key to the conservation of invertebrates such as threatened butterflies (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Furthermore corridors and linkages may play a significant role in insect conservation (Pryke & Samways, 2003, Samways, 2005).

Urbanisation is a major additional influence on the loss of natural areas (Rutherford & Westfall 1994). In the Gauteng the pressure to develop areas are high since its infrastructure allows for improvement of human well-being in some way. Urban nature conservation issues in South Africa are overshadowed by the goal to improve human well-being, which focuses on aspects such as poverty, equity, redistribution of wealth and wealth creation (Cilliers, Müller & Drewes 2004). Nevertheless the conservation of habitats is the key to invertebrate conservation, especially for those red listed species that are very habitat specific. This is also true for any detailed planning of corridors and buffer zones for invertebrates. Though proper management plans for habitats are not in place, setting aside special ecosystems is in line with the recent Biodiversity Act (2004) of the Republic of South Africa.

Corridors are important to link ecosystems of high conservation priority. Such corridors or linkages are there to improve the chances of survival of otherwise isolated populations (Samways, 2005). How wide should corridors be? The answer to this question depends on the conservation goal and the focal species (Samways, 2005). For an African butterfly assemblage this is about 250m when the corridor is for movement as well as being a habitat source (Pryke and Samways 2003). Hill (1995) found a figure of 200m for dung beetles in tropical Australian forest. In the agricultural context, and at least for some common insects, even small corridors can play a valuable role (Samways, 2005). Much more research remains to be done to find refined answers to the width of grassland corridors in South Africa. The width of corridors will also depend on the type of development, for instance the effects of the shade of multiple story buildings will be quite different from that of small houses.

To summarise: In practice, as far as residential developments are concerned, the key would be to prioritise and plan according to sensitive species and special ecosystems.

In the case of this study study area the vegetation ranges from pristine patches that are mostly present in the northern parts to extensively transformed at most of the southern parts of the study area. With careful planning unique ecosystems and sensitive species could be conserved if the development is approved. If some areas such as the core sensitive habitats are developed there would be a significant loss of unique local ecosystems and in particular loss of species of conservation concern of which some are in reality threatened species. In other areas there appear to be no loss of any particular sensitive species or particular unique ecosystems. A challenge in the area is that a trend of increasing degradation has been observed and decisions have to be made on the future of the study area south of Irene.

Riparian zone at the site is a very important conservation corridor and a 50 m buffer zone from the edge of the river is thought to be sufficient to conserve the riparian zone.

7 CONCLUSION

A holistic approach was deliberately followed during this study to address present limitations in the consolidation and confirmation of key biodiversity information and consequently biodiversity priorities of the study area.

The study area is a mosaic of which the vegetation and habitat ranges from extensively degraded in most of the southern parts to pristine patches of grassland in the northern parts. Some of the remaining patches of grassland and rocky outcrops in the study area contain not only Near Threatened species but also threatened plant and animal species. In other parts of the study area large areas are unfortunately covered by alien invasive Australian *Acacia* species and exotic *Eucalyptus* species (gum trees). Though some of these exotic trees harbour some raptor bird species, these are not threatened and can in the case of this study, not weigh up against loss of indigenous grassland patches which serve as habitat for a number of localised plant and animal species.

A key issue at the study area is the apparent continuous ecological degradation of indigenous grassland and unique indigenous bushclumps in the area, witnessed for one, by the author of this document, in the past decade. If this trend of habitat degradation continues, habitat loss and loss of plant and animal species of particular conservation are most likely scenarios.

Another critical issue is that the entire study area is increasingly isolated and that corridors and buffer zones should be viewed in that context. Grassland and bushclump patches as well as sensitive species to be conserved in the area are unlikely to be linked to the Rietvlei Reserve as a continuous corridor, i.e. any conserved areas are more likely to be viewed in terms of stepping stone corridor models. Buffer zones such as required for species of particular conservation concern is impractical in this case and have already been compromised by extant developments, if not entirely. It may, however, and is then vital to have as great as possible connectivity of conserved areas in the study area itself, south of Irene. Such planning of the entire area falls beyond the scope of this study but should be conducted as soon as possible.

A summary of important considerations at each site follows (see Table 5.1 and Table 5.2 for an outline):

Doornkloof Ptn 107

- Doornkloof Ptn 107 is situated north of a large substation but contains large patches of pristine and diverse grassland.
- Northern and north western parts of the site contain an extant habitat of the VULNERABLE beetle species *Ichneustoma stobbiai*. Population of the beetle *Ichneustoma stobbiai* in this area does not appear to be as strong as the population east of Irene Market Parking Area but could with careful planning and eradication of exotic tree species be connected to the core population lower down.
- A large patch of alien invasive trees (mainly Australian *Acacia* species) is present at the south-western parts of the site. Eradication of this patch will benefit conservation of indigenous grassland and associated fauna in the area.

Doornkloof Ptn 129

- Doornkloof Ptn 129 is ecologically increasingly degraded in terms of available quality indigenous grassland habitats.
- Areas of particular high sensitivity fall outside Doornkloof Ptn 129 but near its western boundary such as indicated (Figure 3).
- There are numerous exotic tree species, especially at the western and north western parts of the site. These exotic trees at the western boundary of the site where have already started to encroach on unique localised ecosystems of chert rock and bushclumps next and west of Doornkloof Ptn 129.

Rietvlei 7

- Numerous tracks, pylons, excavations and some exotic tree species reflect disturbances in the area. A rocky outcrop is present but also appears to be increasingly degraded.
- Despite these disturbances a VULNERABLE fern species, *Cheilanthes deltoidea* subsp. *silicicola* is found on chert rock at the rocky outcrop east of the cement factory.
- An area of very high sensitivity occurs in the shallow valley east of the rocky outcrop at the site. This area includes habitat and a significant population of the ENDANGERED orchid, *Habenaria mossii*, a Near Threatened orchid *Habenaria kraenzliniana* and a Near Threatened herbaceous plant species, *Cleome conrathii*.

Rietvlei 6

- Rietvlei 6 is increasingly degraded and considered to be of low sensitivity.
- Informal settlements in the area have expanded to the south-eastern parts of the site and are further cause for ecological degradation in the area.
- Vast majority of trees that either occur in clumps or dot the landscape are exotic species, of which *Eucalyptus camaldulensis* (red gum) was visibly abundant during the site surveys.

Strawberry Farm Phase 2

- Degradation and transformation of indigenous grassland are severe at most of Strawberry Farm Phase 2.
- A patch of indigenous grassland containing the Near Threatened succulent *Lithops leslei* and a Near Threatened herbaceous species *Cleome conrathii* enters the north-eastern extreme of the site. These are very important to set aside from any developments.

- Aquatic ecosystems such as a quarry (central-southern part) and a perennial active channel (north-eastern parts) are present at the site. The quarry is surrounded by exotic *Eucalyptus* (gum trees). Riparian zone of the active channel is highly transformed and exotic plant species are visibly abundant.

Strawberry Farm Phase 1

- Strawberry Farm Phase 1 is another site in the area that is of which the indigenous grassland is highly degraded or transformed.
- A large informal settlement is spreading at the site, resulting in an increase of tracks and poorly managed human impacts such as informal dumping and pollution.
- An area outlined in yellow that enters the north-western extreme of the site contains the Near Threatened succulent species *Lithops leslei* and a Near Threatened herbaceous species *Cloeme conrathii*. Owing to an apparent increase of tracks, trampling and informal dumping the future of the *Lithops leslei* population is precarious given the status quo.
- Aquatic ecosystems such as a perennial active channel (north-western parts) and a non-perennial small water course are present.
- Vegetation of riparian zones and vegetation associated with the non-perennial narrow water course are in an obvious degraded state and visibly infested by exotic trees and weeds.

An opportunity presents itself to secure some diverse and highly sensitive grassland south of Irene through careful planning and eradication of large patches of exotic trees. This report removes some uncertainties and gives an indication of areas of particular high sensitivity and suggests some indicators of the conservation of these. The planning and management of the study area falls beyond the scope of this report, however, decisions cannot be postponed any longer, because the area is in a constant state of degradation.

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ANNEXURE 1: Plants

List of plant species that have been recorded or are likely to occur in the study area

Plant species are listed alphabetically under life forms that are generally recognizable.
Plant species marked with an asterisk (*) are exotic.

Sources: Germishuizen (2003), Manning (2003), Manning (2009), Van Oudtshoorn (1999), Van Wyk (2000), Van Wyk & Malan (1998), Van Wyk & Van Wyk (1997), Crouch, Klopper, Burrows & Burrows (2011), Goldblatt (1986), Goldblatt & Manning (1998), Jacobsen (1983), McMurtry, Grobler, Grobler & Burns (2008), Smit (2008), Van Ginkel *et al.* (2011), Van Jaarsveld (2006), Van Wyk & Smith (2003).

TAXON	COMMON NAMES	FAMILY	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
PTERIDOPHYTA (MONILOPHYTA)	PTERIDOPHYTES/ TRUE FERNS							
<i>Cheilanthes hirta</i>		SINOPTERIDACEAE	Dn 107	Dn 129	Rv 7			
<i>Cheilanthes viridis</i> (cf. subsp. <i>glauca</i>)		SINOPTERIDACEAE	Dn 107	Dn 129	Rv 7			
<i>Pellaea calomelanos</i>		SINOPTERIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Pleopeltis macrocarpa</i>		POLYPODIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Pteridium aquilinum</i>	Bracken fern	DENNSTAEDTIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
GYMNOSPERMAE	GYMNOSPERMS							
* <i>Pinus</i> species	Pine species	PINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
ANGIOSPERMAE: MONOCOTYLEDONS								
<i>Albuca setosa</i>	Fibrous Slime Lily	HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Aloe greatheadii</i> var. <i>davyana</i>	Kgopane	ASPHODELACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Aloe zebrina</i>		ASPHODELACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Alloteropsis semialata</i>	Black-seed Grass	POACEAE	Dn 107	Dn 129	Rv 7			
<i>Andropogon schirensis</i>	Hairy Blue Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
<i>Andropogon schirensis</i>	Stab Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
<i>Aristida adscensionis</i>	Annual Three-awn	POACEAE	Dn	Dn	Rv	Rv	Sf	Sf

			107	129	7	6	2	1
Aristida canescens	Pale Three-awn	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Aristida congesta subsp. congesta	Tassel Three-awn	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Aristida diffusa	Iron Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Aristida scabrivalvis/ transvaalensis	Purple Three-awn	POACEAE	Dn 107	Dn 129	Rv 7			
Asparagus flavicaulis subsp. flavicaulis		ASPARAGACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Asparagus laricinus	Common Wild Asparagus	ASPARAGACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Asparagus suaveolens	Wild Asparagus	ASPARAGACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Arundo donax	Spanish Reed	POACEAE					Sf 2	Sf 1
Bewsia biflora	False Love Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Boophone disticha	Poison Bulb	AMARYLLIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Brachiaria serrata	Velvet Signal Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Bromus catharticus	Rescue Grass	POACEAE					Sf 2	Sf 1
Bulbine capitata		ASPHODELACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Bulbine narcissifolia		ASPHODELACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Bulbostylis burchellii		CYPERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Chloris virgata	Feather-top Chloris	POACEAE					Sf 2	
Chlorophytum fasciculatum		ANTHERICACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Commelina africana		COMMELINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Commelina benghalensis	Wanderinh Jew	COMMELINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Crinum graminicola	Grass Lily	AMARYLLIDACEAE					Sf 2	Sf 1
Cyanotis speciosa	Doll's Powderpuff	COMMELINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Cymbopogon caesius	Broad-leaved Turpentine Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Cymbopogon pospischilii	Narrow-leaved Turpentine Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Cynodon dactylon	Couch Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Cyperus esculentus	Yellow nutsedge	CYPERACEAE	Dn	Dn	Rv	Rv	Sf	Sf

			107	129	7	6	2	1
Cyperus species		CYPERACEAE					Sf 2	Sf 1
Cyperus obtusiflorus		CYPERACEAE					Sf 2	Sf 1
Digitaria eriantha	Common Finger Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Digitaria monodactyla	Common Finger Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Digitaria tricholaenoides	Purple Finger Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Diheteropogon amplexans	Broad-leaved Bluestem	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Dipcadi viride		LILIACEAE					Sf 2	Sf 1
Drimia calcarata		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Drimia depressa		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Drimia sanguinea		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Eleusine coracana	Goose Grass	POACEAE				Rv 6	Sf 2	Sf 1
Elionurus muticus	Wire Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eragrostis capensis	Heart-seed Love Grass	POACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Eragrostis chloromelas	Narrow Curly Leaf	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eragrostis curvula	Weeping Love Grass	POACEAE					Sf 2	Sf 1
Eragrostis gummiflua	Gum Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Eragrostis nindensis	Wether Love Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eragrostis micrantha		POACEAE	Dn 107	Dn 129	Rv 7			
Eragrostis racemosa	Narrow Heart Love Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eragrostis superba	Saw-toothed Love Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eriospermum flagelliforme		ASPARAGACEAE					Sf 2	
Eucomis autumnalis subsp. clavata	Common Pineapple Lily	HYACINTHACEAE			Rv 7			
Eulophia hians		ORCHIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Eulophia welwitschii		ORCHIDACEAE			Rv 7			
Eustachys paspaloides	Brown Rhodes	POACEAE	Dn	Dn	Rv	Rv	Sf	Sf

	Grass		107	129	7	6	2	1
Gladiolus crassifolius	Thick-leaved Gladiolus	IRIDACEAE			Rv 7			
Gladiolus permeabilis		IRIDACEAE	Dn 107		Rv 7		Sf 2	
Habenaria epipactidea		ORCHIDACEAE			Rv 7			
Habenaria kraenzliniana		ORCHIDACEAE			Rv 7			
Habenaria mossii		ORCHIDACEAE			Rv 7			
Habenaria nyikana		ORCHIDACEAE			Rv 7			
Heteropogon contortus	Spear Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hyparrhenia hirta	Common Thatching Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hypoxis argentea		HYPOXIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Hypoxis hemerocallidea	Star Flower	HYPOXIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hypoxis obtusa		HYPOXIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hypoxis rigidula		HYPOXIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Imperata cylindrica	Cotton Wool Grass	POACEAE					Sf 2	Sf 1
Kyllinga alba		CYPERACEAE					Sf 2	Sf 1
Ledebouria ovatifolia		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ledebouria revoluta		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Loudetia simplex	Common Russet Grass	POACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Melinis nerviglumis	Bristle-leaved Red Top	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Melinis repens	Natal Red Top	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Michrochloa caffra	Pincushion Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Monocymbium cerasiiforme	Boat Grass	POACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Ornithogalum tenuifolium		HYACINTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Panicum maximum	Guinea Grass	POACEAE					Sf 2	Sf 1
* Paspalum dilatatum	Dallis Grass	POACEAE			Rv 7	Rv 6	Sf 2	Sf 1
* Pennisetum clandestinum	Kikuyu Grass	POACEAE			Rv	Rv	Sf	Sf

					7	6	2	1
Phragmites australis	Common Reed	POACEAE					Sf 2	Sf 6
Pogonarthria squarrosa	Herringbone Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Scadoxus puniceus	Red Blood Lily	AMARYLLIDACEAE			Rv 7			
Schizachyrium sanguineum	Red Autumn Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Schizocarpus nervosus	Wild Squill	HYACINTHACEAE					Sf 2	
Scheonoplectus brachyceras		CYPERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Setaria incrassata	Vlei Bristle Grass	POACEAE				Rv 6	Sf 2	Sf 1
Setaria megaphylla	Broad-leaved Bristle Grass	POACEAE		Dn 129				
Setaria nigrirostris		POACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Setaria sphacelata var. sphacelata	Common Bristle Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Setaria sphacelata var. torta	Creeping Bristle Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Sorghum halepense	Johnson Grass	POACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Sporobolus africanus	Ratstail Dropseed	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Sporobolus festivus	Red Dropseed	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Sporobolus fimbriatus	Dropseed Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Sporobolus stapfianus	Fibrous Dropseed	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Themeda triandra	Red Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Trachyandra saltii		ASPHODELACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Trachypogon spicatus	Giant Spear Grass	POACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Tricholaena monachne	Blue-seed Grass	POACEAE	Dn 107	Dn 129	Rv 7			
Trichoneura grandiglumis	Small Rolling Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Triraphis andropogonoides	Broom Needle Grass	POACEAE	Dn 107	Dn 129	Rv 7			
Tristachya biseriata		POACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Tristachya leucothrix	Hairy Trident Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	

Tristachya rehmannii		POACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Tulbaghia leucantha		ALLIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Typha capensis	Bulrush	TYPHACEAE					Sf 2	Sf 1
Urelytrum agropyroides	Quinine Grass	POACEAE	Dn 107		Rv 7			
Urochloa mosambicensis	Bushveld Signal Grass	POACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Xerophyta retinervis	Black-stick Lily/ Monkey's Tail	VELLOZIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
ANGIOSPERMS: DICOTYLEDONS			Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Acacia baileyana	Bailey's Wattle	MIMOSACEAE					Sf 2	Sf 1
Acacia caffra	Common Hook-thorn	MIMOSACEAE	Dn 107		Rv 7			
* Acacia dealbata	Silver Wattle	MIMOSACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Acacia decurrens	Green Wattle	MIMOSACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Acacia karroo	Sweet Thorn	MIMOSACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Acacia mearnsii	Black Wattle	MIMOSACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Acalypha angustata	Copper leaf	EUPHORBIACEAE	Dn 107	Dn 129	Rv 7			
Acalypha caperonioides		EUPHORBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Acalypha villicaulis	Heart-leaved Brooms and Brushes	EUPHORBIACEAE	Dn 107	Dn 129	Rv 7			
* Acanthospermum australe	Prostrate Starbur	ASTERACEAE	Dn 107	Dn 129				
* Achyranthes aspera	Chaff Flower	AMARANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Alternanthera pungens	Duwweltjie	AMARANTHACEAE					Sf 2	Sf 1
Alysicarpus rugosus subsp. perrennirufus		FABACEAE	Dn 107	Dn 129	Rv 7			
* Amaranthus hybridus	Pigweed	AMARANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ancylobotrys capensis	Rock Wild Apricot	APOCYNACEAE			Rv 7			
* Araujia sericifera	Moth catcher	ASCLEPIADACEAE			Rv 7	Rv 6		
Anthospermum rigidum subsp. rigidum		RUBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Argemone ochroleuca	White-flowered	PAPAVERACEAE	Dn	Dn	Rv	Rv	Sf	Sf

	Mexican poppy		107	129	7	6	2	1
Asclepias adscendens		APOCYNACEAE		Dn 129	Rv 7			
Aster harveyanus		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Barleria macrostegia		ACANTHACEAE	Dn 107	Dn 129	Rv 7			
Berkheya radula		ASTERACEAE					Sf 2	Sf 1
* Bidens bipinnata	Spanish blackjack	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Bidens pilosa	Common blackjack	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Campuloclinium macrocephalum	Pom Pom Weed	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Canthium gilfillanii	Velvet Rock Alder	RUBIACEAE	Dn 107	Dn 129	Rv 7			
Celtis africana	White Stinkwood	CELTIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
* Celtis australis/ Celtis occidentalis/ Celtis sinensis	Exotic Stinkwoods	CELTIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Chaetacanthus costatus		ACANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Chamaecrista capensis/ comosa		CAESALPINIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Chamaesyce inaequilatera	Smooth Creeping Milkweed	EUPHORBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Chenopodium album	White Goosefoot	CHENOPODIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Cirsium vulgare	Scotch Thistle	ASTERACEAE					Sf 2	Sf 1
Clematis brachiata	Traveller's Joy	RANUNCULACEAE	Dn 107	Dn 129	Rv 7	Rv 6		Sf 1
Cleome conrathii		CAPPARACEAE			Rv 7			
Cleome monophylla	Single-leaved Spindle Pod	BRASSICACEAE (or Capparaceae)	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Combretum erythrophyllum	River Bushwillow	COMBRETACEAE					Sf 2	Sf 1
Combretum molle	Velvet Bushwillow	COMBRETACEAE	Dn 107	Dn 129	Rv 7			
Convolvulus sagittatus		CONVOLVULACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Conyza albida/ bonariensis/ canadensis	Tall Fleabane	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Conyza podocephala		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Corchorus asplenifolius		MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Crabbea angustifolia		ACANTHACEAE	Dn	Dn	Rv	Rv	Sf	Sf

			107	129	7	6	2	1
Crabbea hirsuta		ACANTHACEAE					Sf 2	Sf 1
Crassula capitella		CRASSULACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Crassula setulosa		CRASSULACEAE	Dn 107	Dn 129	Rv 7			
Cryptolepis oblongifolia		PERIPLOCACEAE	Dn 107					
Cucumis hirsutus		CUCURBITACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Cucumis zeyheri		CUCURBITACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Cussiaea paniculata	Highveld Cabbage Tree	ARALIACEAE	Dn 107	Dn 129	Rv 7			
Cynoglossum lanceolatum		BORAGINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Datura ferox	Large Thorn-apple	SOLANACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Datura stramonium	Common Thorn-apple	SOLANACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Dianthus mooiensis	Wild Pink	CARYOPHYLLACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Dicoma anomala		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Dichrostachys cinerea	Sickle Bush	MIMOSACEAE (or Fabaceae)	Dn 107	Dn 129	Rv 7			
Dimorphotheca spectabilis	Blou Bietou	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Diospyros lycioides var. guerkei	Bluebush	EBENACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Dombeya rotundifolia	Common Wild Pear	STERCULIACEAE			Rv 7			
Elephantorrhiza elephantina		MIMOSACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Englerophytum magalismsontanum	Transvaal Milkplum	SAPOTACEAE		Dn 129	Rv 7			
Eriosema burkei		FABACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Eriosema cordatum		FABACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
* Eucalyptus camaldulensis	Red Gum	MYRTACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Euclea crispa	Blue Guarri	EBENACEAE	Dn 107	Dn 129	Rv 7			
Euphorbia trichadenia	Melkbol	EUPHORBIACEAE			Rv 7			
Felicia muricata		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Ficus carica	Fig	MORACEAE			Rv			

					7			
Ficus ingens	Red-leaved Fig	MORACEAE			Rv 7			
* Flaveria bidentis	Smelter's bush	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Gazania krebsiana subsp. serrulata		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Geigeria burkei		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6		
Gerbera piloselloides	Swarteebossie	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Gerbera viridifolia subsp. viridifolia		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Gleditsia triacanthos	Honey Locust	CAESALPINIACEAE					Sf 2	Sf 1
Gnidia capitata		THYMELAEACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Gnidia kraussiana var. kraussiana		THYMELAEACEAE	Dn 107	Dn 129	Rv 7			
Gnidia microcephala		THYMELAEACEAE	Dn 107	Dn 129	Rv 7			
Gnidia sericocephala		THYMELAEACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Gomphocarpus fruticosus	Milkweed	APOCYNACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Gomphrena celosioides	Bachelor's Button	AMARANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Graderia subintegra	Wild Penstemon	OROBANCHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Gymnosporia buxifolia	Common Spike-thorn	CELASTRACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Haplocarpha lyrata		ASTERACEAE					Sf 2	Sf 1
Helichrysum acutatum		ASTERACEAE			Rv 7			
Helichrysum cerastioides		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Helichrysum nudifolium	Hottentot's tea	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Helichrysum rugulosum		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Helichrysum setosum	Yellow Everlasting	ASTERACEAE	Dn 107		Rv 7			
Hemizygia pretoriae		LAMIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hermannia cordata		MALVACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Hermannia depressa	Creeping Red Hermannia	MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1

Hermannia transvaalensis		MALVACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Hibiscus microcarpus		MALVACEAE			Rv 7			
Hibiscus pusillus		MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Hibiscus trionum	Bladder hibiscus	MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hilliardiella aristata (= <i>Vernonia natalensis</i>)		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Hilliardiella oligocephala (= <i>Vernonia oligocephala</i>)		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Indigastrum burkeanum			Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Indigofera hedyantha	Black-bud Indigo	FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Indigofera heterotricha		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6		Sf 1
Indigofera hilaris	Red Indigo Bush	FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Indigofera melanadenia		FABACEAE	Dn 107	Dn 129	Rv 7			
* Indigofera suffruticosis			Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ipomoea bolusiana		CONVOLVULACEAE			Rv 7			
Ipomoea crassipes		CONVOLVULACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ipomoea oblongata		CONVOLVULACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ipomoea ommaneyi	Beespatat	CONVOLVULACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Ipomoea purpurea	Common Morning Glory	CONVOLVULACEAE		Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Justicia anagalloides		ACANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Kalanchoe thyrsiflora		CRASSULACEAE	Dn 107	Dn 129	Rv 7			
Kiggelaria africana	Wild Peach	KIGGELARIACEAE (or Flacourtiaceae)			Rv 7			
Kohautia amatymbica		RUBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Kyphocarpa angustifolia		AMARANTHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Lactuca inermis		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Lannea edulis		ANACARDIACEAE			Rv 7			
Lantana rugosa		VERBENACEAE	Dn	Dn	Rv			

			107	129	7			
* Lepidium bonariense	Pepperweed	BRASSICACEAE					Sf 2	Sf 1
* Ligustrum species	Privets	OLEACEAE					Sf 2	Sf 1
Lippia javanica	Fever Tea	VERBENACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Lithops lesliei subsp. lesliei		MESEMBRYANTHEMA CEAE					Sf 2	
Lotononis calycina		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Lotononis foliosa		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Lotononis laxa		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Macledium zeyheri		ASTERACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
* Malva parviflora	Small Mallow	MALVACEAE				Rv 6	Sf 2	Sf 1
* Malvastrum coromandelianum	Malvastrum	MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Medicago sativa	Lucerne	FABACEAE				Rv 6	Sf 2	Sf 1
* Melia azedarach	Seringa	MELIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Melilotus alba	Bokhara Clover	FABACEAE			Rv 7	Rv 6	Sf 2	Sf 1
* Mirabilis jalapa	Four O'clock	NYCTAGINACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Monsonia angustifolia	Crane's Bill	GERANIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Morea stricta	Bloutulp	IRIDACEAE				Rv 6	Sf 2	Sf 1
* Morus alba	Common Mulberry	MORACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Nemesia fruticans		SROPHULARIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Neorautanenia fivifolius		FABACEAE	Dn 107	Dn 129	Rv 7			
* Nicotiana glauca	Wild Tobacco	SOLANACEAE	Dn 107	Dn 129				Sf 1
Nidorella anomala		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Nidorella hottentotica		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ocimum obovatum	Cat's whiskers	LAMIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Oenothera rosea	Rose Evening Primrose	ONAGRACEAE				Rv 6	Sf 2	Sf 1
* Oenothera stricta	Yellow Evening	ONAGRACEAE	Dn	Dn	Rv	Rv	Sf	Sf

	Primrose		107	129	7	6	2	1
Oldenlandia herbacea		RUBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Opuntia ficus-indica	Sweet Prickly Pear	CACTACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Osteospermum muricatum		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Oxalis corniculata	Creeping Sorrel	OXALIDACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Oxalis obliquifolia	Oblique-leaved Sorrel	OXALIDACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Ozoroa paniculosa	Bushveld Ozoroa	ANACARDIACEAE	Dn 107		Rv 7			
Pachycarpus schinzianus	Dark-eyed Bell	APOCYNACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Parapodium costatum		APOCYNACEAE					Sf 2	
Parinari capensis subsp. capensis	Dwarf Mobolo Plum	CHRYSOBALANACEAE	Dn 107	Dn 129	Rv 7			
Pearsonia cajanifolia		FABACEAE	Dn 107	Dn 129	Rv 7			
Pearsonia sessillifolia		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Pelargonium luridum		GERANIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Pentanisia angustifolia		RUBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Pentarrhinum insipidum	African Heartvine	APOCYNACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Persicaria lapathifolia		POLYGONACEAE				Rv 6	Sf 2	Sf 1
Peucedanum magalismsontanum	Wild Parsley	APIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Phyllanthus incurvus		EUPHORBIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Plantago lanceolata	Narrow-leaved plantain	PLANTAGINACEAE					Sf 2	Sf 1
Pollichia campestris	Waxberry	ILLECEBRACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Polygala amatymbica		POLYGALACEAE	Dn 107	Dn 129	Rv 7		Sf 2	SF 1
Polygala hottentotta		POLYGALACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Polygala rehmannii		POLYGALACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Populus x canescens	Grey Poplar	SALICACEAE					Sf 2	Sf 1
* Populus deltoides	Match Poplar	SALICACEAE					Sf 2	Sf 1

Protea welwitschii	Cluster-head Sugarbush	PROTEACEAE	Dn 107	Dn 129	Rv 7			
* Prunus persica	Peach	ROSACEAE				Rv 6	Sf 2	Sf 1
Psammotropha myriantha		AIZOACEAE	Dn 107	Dn 129	Rv 7			
Pygmaeothamnus zeyheri	Sand Apple	RUBIACEAE	Dn 107	Dn 129	Rv 7			
* Pyracantha angustifolia	Yellow Firethorn	ROSACEAE			Rv 7	RV 6	Sf 2	Sf 1
* Raphanus raphanistrum	Wild Radish	BRASSICACEAE					Sf 2	Sf 1
Raphionacme galpinii		APOCYNACEAE	Dn 107	Dn 129	Rv 7		Sf 2	Sf 1
Raphionacme hirsuta	Khadi Root	APOCYNACEAE	Dn 107	Dn 129	Rv 7		Sf 2	Sf 1
Rhamnus priniioides		RHAMNACEAE			Rv 7			
Rhynchosia monophylla		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
Rhynchosia totta		FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Robinia pseudoacacia	Black Locust	FABACEAE					Sf 2	
Rorippa nudiuscula		BRASSICACEAE						Sf 1
Rothea hirsuta	Bush Violet	LAMIACEAE	Dn 107	Dn 129	Rv 7			
Rubia horrida	Kleefgras	RUBIACEAE			Rv 7			
Ruellia cordata	Veld Violet	ACANTHACEAE	Dn 107	Dn 129	Rv 7			
* Rumex crispus	Curly Dock	POLYGONACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Salix babylonica	Weeping Willow	SALICACEAE					Sf 2	Sf 1
Salvia runcinata		LAMIACEAE					Sf 2	
Scabiosa columbaria	Wild Scabious	DIPSACACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Schkuhria pinnata	Dwarf Marigold	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Searsia discolor		ANACARDIACEAE	Dn 107	Dn 129	Rv 7			
Searsia lancea	Karree	ANACARDIACEAE	Dn 107	Dn 129			Sf 2	Sf 1
Searsia leptodictya	Mountain Karree	ANACARDIACEAE	Dn 107					
Searsia pyroides	Common Wild Currant	ANACARDIACEAE	Dn	Dn	Rv	Rv	Sf	Sf

			107	129	7	6	2	1
Searsia rigida		ANACARDIACEAE	Dn 107		Rv 7			
Searsia zeyheri		ANACARDIACEAE	Dn 107		Rv 7			
Senecio affinis		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Senecio coronatus	Sybossie	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Senecio inaequidens	Canary Weed	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Senecio inornatus		ASTERACEAE					Sf 2	Sf 1
Senecio oxyriifolius	False Nasturtium	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Senecio venosus		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Seriphium plumosum	Bankrupt Bush	ASTERACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Sida dregei		MALVACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Silene burchellii	Gunpowder Plant	CARYOPHYLLACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	
* Solanum mauritianum	Bugweed	SOLANACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Solanum panduriforme	Poison Apple	SOLANACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Solanum sisymbriifolium	Dense-thorned Bitter Apple	SOLANACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Sonchus oleraceus	Sowthistle	ASTERACEAE		Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Sphenostylis angustifolia	Wild Sweetpea	FABACEAE	Dn 107	Dn 129	Rv 7		Sf 2	Sf 1
Striga asiatica	Witchweed	OROBANCHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Striga elegans	Large Witchweed	OROBANCHACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Tagetes minuta	Khakiweed	ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Tephrosia capensis var. capensis		FABACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Tephrosia longipes		FABACEAE	Dn 107	Dn 129	Rv 7		Sf 2	
Tephrosia semiglabra		FABACEAE			Rv 7	Rv 6	Sf 2	Sf 1
Teucrium trifidum		LAMIACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Thesium sp.		SANTALACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Thesium utile		SANTALACEAE	Dn	Dn	Rv	Rv	Sf	

			107	129	7	6	2	
* Tipuana tipu	Tipu Tree	FABACEAE					Sf 2	Sf 1
* Tragopogon dubius	Yellow Goat's Beard	ASTERACEAE					Sf 2	Sf 1
Triaspis hypericoides		MALPIGHIACEAE	Dn 107		Rv 7			
Ursinia nana		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Vangueria infausta	Wild Medlar	RUBIACEAE	Dn 107		Rv 7			
* Verbena aristigera	Fine-leaved Verbena	VERBENACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Verbena bonariensis	Purple top	VERBENACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
* Verbena brasiliensis		VERBENACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Vernonia galpinii		ASTERACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Vernonia staehelinoides		ASTERACEAE	Dn 107	Dn 129	Rv 7			
Vigna vexillata	Narrow-leaved Sweetpea	FABACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Wahlenbergia denticulata	Bellflower	CAMPANULACEAE	Dn 107		Rv 7			
Xysmalobium undulatum		APOCYNACEAE					Sf 2	Sf 1
Zanthoxylum capense	Small Knobwood	RUTACEAE			Rv 7			
Ziziphus zeyheriana	Dwarf Buffalo-thorn	RHAMNACEAE	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	

ANNEXURE 2: Mammals

List of mammals species that have been or could possibly be recorded at the study area.

Compiled by R.F. Terblanche

Sources: Apps (2012); Skinner & Chimimba (2005); Rautenbach (1982); Stuart & Stuart (2000)

Note that the species are listed alphabetically under the distinctive orders for easy reference.

ORDERS AND SPECIES	COMMON NAMES ENGLISH/ AFRIKAANS	LOCAL STATUS
ORDER CHIROPTERA		
	BAT ORDER	
Neoromicia capensis (A. Smith, 1829)	Cape Serotine Bat	Likely, forager: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Nycteris thebaica E. Geoffroy Saint-Hilaire, 1813	Egyptian Slit-faced Bat	Likely, forager: Dn107, Dn129
Scotophilus dinganii (A. Smith, 1833)	African Yellow Bat	Moderate: Sf2, Sf1
Tadarida aegyptiaca (E. Geoffroy Saint-Hilaire, 1818)	Egyptian Free-tailed Bat	Likely, forager: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
ORDER MACROSCELIDEA		
	SENGI ORDER	
Elephantulus myurus Thomas & Schwann, 1906	Eastern Rock Elephant- Sengi	Suitable rocky habitat, but presence needs confirmation
ORDER EULIPOTYPHLA		
	SHREW AND HEDGEHOG FAMILY	
Crocidura cyanea (Duvernoy, 1838)	Reddish-grey Musk Shrew	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Crocidura hirta (Peters, 1852)	Lesser Red Musk Shrew	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
ORDER RODENTIA		
	RODENT ORDER	
Aethomys ineptus (Thomas & Wroughton, 1908)	Tete Veld Rat	Likely Dn107, Dn129, Rv7

Cryptomys hottentotus (Lesson, 1826)	African Mole-rat	Confirmed: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Hystrix africaeaustralis Peters, 1852	Cape Porcupine	Likely Dn107, Dn129, Rv7
Lemniscomys rosalia (Thomas, 1904)	Single-striped Grass Mouse	Localised
Mastomys coucha/ natalensis*	Multimammate Mouse Species Complex	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Rhabdomys pumilio (Spearman, 1784)	Four-striped Grass Mouse	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Tatera brantsii (A. Smith, 1836)	Highveld Gerbil	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Tatera leucogaster (Peters, 1852)	Bushveld Gerbil	Likely: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
ORDER LAGOMORPHA	HARES AND RABBITS ORDER	
Lepus saxatilis F. Cuvier, 1823	Scrub Hare	Confirmed: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
ORDER RUMINANTIA	RUMINANTS	
Sylvicapra grimmia (Linnaeus, 1758)	Common Duiker	Confirmed (but rare in the area)
ORDER CARNIVORA	CARNIVORE ORDER	
Cynictis penicillata (G. Cuvier, 1829)	Yellow Mongoose	Confirmed: Dn107, Dn129, Rv7, Rv6, Sf2, Sf1
Galerella sanguinea (Rüppell, 1836)	Slender Mongoose	Confirmed: Rv7, Sf2; Likely: Dn107, Dn129, Rv6, Sf1

* Species complexes are under revision or else species could not reliably be identified by using external characters.

ANNEXURE 3: Birds

List of bird species that have been recorded at the study area

Compiled by R.F. Terblanche

Sources: Chittenden (2007), Hockey, Dean & Ryan (2005), Peacock (2006).

Note that the species are listed according to their Roberts Bird numbers for easy reference.

SPECIES	COMMON NAMES ENGLISH	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
Roberts Bird No.							
8	Tachybaptus ruficollis					Sf 2	Sf 1
63	Ardea melanocephala				Rv 6	Sf 2	Sf 1
71	Bubulcus ibis	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
91	Threskiornis aethiopicus					Sf 2	Sf 1
94	Bostrychia hagedash				Rv 6	Sf 2	Sf 1
102	Alopochen aegyptiaca					Sf 2	Sf 1
104	Anas undulata					Sf 2	Sf 1
105	Anas sparsa					Sf 2	Sf 1
127	Elanus caeruleus	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
199	Pternistis swainsonii	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
203	Numida meleagris	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
228	Fulica cristata					Sf 2	Sf 1
255	Vanellus coronatus	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
258	Vanellus armatus					Sf 2	Sf 1
260	Vanellus senegallus					Sf 2	
297	Burhinus capensis	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
304	Afrotis afraoides			Rv 7			
348	Columba livia	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
352	Streptopelia semitorquata	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
354	Streptopelia capicola	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
355	Streptopelia senegalensis	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1

417	Apus affinis	Little Swift	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
424	Colius striatus	Speckled Mousebird	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
426	Urocolius indicus	Red-faced Mousebird	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
443	Merops bullockoides	White-fronted Bee-eater	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
473	Trachyphonus vaillantii	Crested Barbet			Rv 7	Rv 6	Sf 2	Sf 1
494	Mirafra africana	Rufous-naped Lark	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
518	Hirundo rustica	Barn Swallow	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
520	Hirundo albigularis	White-throated Swallow					Sf 2	Sf 1
526	Hirundo cucullata	Greater Striped Swallow	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
527	Hirundo abyssinica	Lesser Striped Swallow	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
568	Pycnonotus tricolor	Dark-capped Bulbul	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
-	Turdus smithi	Karoo Thrush					Sf 2	Sf 1
601	Cossypha caffra	Cape Robin-Chat					Sf 2	Sf 1
664	Cisticola juncidis	Zitting Cisticola	Dn 107	Dn 129			Sf 2	
713	Motacilla capensis	Cape Wagtail	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
732	Lanius collaris	Common Fiscal	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
758	Acridotheres tristis	Common Myna					Sf 2	
787	Cinnyris talatala	White-bellied Sunbird			Rv 7			
796	Zosterops virens	Cape White-eye					Sf 2	Sf 1
803	Passer melanurus	Cape Sparrow	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
804	Passer diffusus	Southern Grey-headed Sparrow	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
814	Ploceus velatus	Southern Masked-weaver	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
824	Euplectes orix	Southern Red Bishop					Sf 2	Sf 1
852	Ortygospiza atricollis	African Quailfinch					Sf 2	Sf 1
854	Sporaeginthus subflavus	Orange-Breasted Waxbill					Sf 2	Sf 1
870	Crithagra atrogularis	Black-throated Canary	Dn 107	Dn 129	Rv 7	Rv 6	Sf 2	Sf 1
878	Crithagra flaviventris	Yellow Canary					Sf 2	Sf 1
881	Crithagra gularis	Streaky-headed Seedeater			Rv 7	Rv 6	Sf 2	Sf 1

ANNEXURE 4: Reptiles

List of reptile species that have been recorded or are likely to occur at the study area

Compiled by R.F. Terblanche

Sources of names and identifications:

Alexander & Marais (2007), Branch (1998), Branch (2008), Marais (2004).

Reptile species are listed alphabetically.

SPECIES	COMMON NAMES ENGLISH	SITES
Agama aculeata subsp. distanti	Ground Agama	? ?
Aparallactus capensis	Cape Centipede Eater	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1
Crotaphopeltis hotamboeia	Herald Red-lipped Snake	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1
Dasypeltis scabra	Common Egg Eater	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1
Lamprophis capensis	Brown House Snake	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1
Pachydactylus capensis	Cape Thick-toed Gecko	Dn 107 Rv 7
Trachylepis capensis	Cape Skink	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1
Trachylepis striata subsp. punctatissima	Striped Skink	Dn 107 Dn 129 Rv 7 Rv 6 Sf 2 Sf 1

ANNEXURE 5: Amphibians

List of frog species that have been recorded at study area

Compiled by R.F. Terblanche

Sources of names, distributions and habitats:

¹Conradie, Du Preez, Smith & Weldon, ²Carruthers & Du Preez (2011), ³Du Preez (1996), ⁴Du Preez & Carruthers (2009)

Note that the species are listed alphabetically for easy reference.

SPECIES	COMMON NAMES ENGLISH/ AFRIKAANS	STATUS
Amietia angolensis (Bocage, 1866)	Common River Frog	Grassland streams and other permanent water bodies ^{2,4}
Amietophrynus gutturalis (Power, 1927)	Guttural Toad	Grassland and savanna, Breeds in permanent waterholes, streams and garden ponds ^{2,4}
Schismaderma carens (Smith, 1848)	Red Toad	Breeds in deep pools, farm dams and swimming pools. Forages widely and then retreats into holes in trees ^{2,4}

ANNEXURE 6: Butterflies

List of butterfly species at the study area

Compiled by R.F. Terblanche

FAMILIES, SUBFAMILIES AND SPECIES	COMMON NAMES ENGLISH/ AFRIKAANS
FAMILY: PAPILIONIDAE	SWALLOWTAIL FAMILY SWAELSTERTFAMILIE
SUBFAMILY PAPILIONINAE	SWALLOWTAILS AND SWORDTAILS SWAELSTERTE EN SWAARDSTERTE
Papilio demodocus (Esper, 1798)	Citrus Swallowtail Lemoenswaelstert
FAMILY PIERIDAE	WHITES, YELLOWS AND TIPS WITJIES, GELETJIES EN PUNTJIES
SUBFAMILY COLIADINAE	YELLOWS AND CLOUDED YELLOWS GELETJIES EN WOLK-ORANJES
Catopsilia florella (Fabricius, 1775)	African Migrant Afrikaanse Migreerder
Colias electo electo (Linnaeus, 1763)	African Clouded Yellow Afrikaanse Wolk-oranje
Eurema brigitta brigitta (Stoll, 1780)	Broad-bordered Grass Yellow Grasveldgeletjie
SUBFAMILY PIERINAE	WHITES AND TIPS SUBFAMILY WITJIES EN PUNTJIES SUBFAMILIE
Belenois aurota aurota (Fabricius, 1793)	Brown-veined White Grasveldwitjie
Belenois creona severina (Stoll, 1781)	African Common White Afrikaanse Gewone Witjie
Colotis evinina evinina (Wallengren, 1857)	Common Orange Tip Gewone Oranjepuntjie
Colotis subfasciatus subfasciatus (Swainson, 1833)	Lemon Traveller Tip Suurlemoensmous
Mylothris agathina agathina (Cramer, 1779)	Common Dotted Border Gewone Spikkelrandjie/ Voëlentwitjie
Pinacopteryx eriphia eriphia (Godart, 1819)	Zebra White Kwagga
Pontia helice helice (Linnaeus, 1764)	African Meadow White Bontrokkie
FAMILY NYMPHALIDAE	BRUSH-FOOTED BUTTERFLIES BORSELPOOTSKOENLAPPERS
SUBFAMILY DANAINAE	MONARCH SUBFAMILY MONARG-SUBFAMILIE
Danaus chrysippus chrysippus (Linnaeus, 1758)	African Monarch Afrikaanse Melkbosskoelapper
SUBFAMILY CHARAXINAE	CHARAXES SUBFAMILY DUBBELSTERT SUBFAMILIE
Charaxes jasius saturnus Butler, 1866	Saturn Foxy Charaxes Saturnus-koppiedubbelstert
SUBFAMILY SATYRINAE	BROWNS SUBFAMILY BRUINTJIES-SUBFAMILIE

Paternympha narycia (Wallengren, 1857)	Spotted-eye Brown Koloogbruintjie
Stygionympha wichgrafi wichgrafi Van Son, 1955	Wichgraf's Hillside Brown Wichgraf-rantbruintjie
SUBFAMILY BIBLIDINAE	BYBLIA SUBFAMILY BIBLIA SUBFAMILIE
Byblia ilithyia (Drury, 1773)	Spotted Joker Leliegrasvegter
SUBFAMILY NYMPHALINAE	PANSY SUBFAMILY GESIGGIE SUBFAMILIE
Catacroptera cloanthe cloanthe (Stoll, 1781)	Pirate Seerower
Hypolimnas misippus (Linnaeus, 1764)	Common Diadem Gewone Na-aper/ Blouglans
Junonia hierta cebrene Trimen, 1870	Yellow Pansy Geelgesiggie
Junonia oenone oenone (Linnaeus, 1758)	Blue Pansy Blougesiggie
Junonia orithya madagascariensis Guenée, 1865	Eyed Pansy Padwagttertjie
Precis archesia archesia (Cramer, 1779)	Garden Commodore Rots-blaarvlerk
Vanessa cardui (Linnaeus, 1758)	Painted Lady Sondagsrokkie
SUBFAMILY HELICONIINAE	ACRAEA SUBFAMILY ACRAEA SUBFAMILIE
Acraea natalica natalica De Boisduval, 1847	Natal Acraea Natal-se-rooitjie
Acraea neobule neobule Doubleday, 1847	Wandering Donkey Acraea Dwaalesel-rooitjie
Acraea rahira rahira De Boisduval, 1833	Marsh Acraea Moerasrooitjie
Acraea serena (=Acraea eponina) Fabricius, 1775	Small Orange Acraea Klein-oranjerootjie
Phalanta phalantha aethiopica (Rothschild & Jordan, 1903)	African Leopard Butterfly Afrikaanse Luiperdskoenlapper
FAMILY LYCAENIDAE	BLUES AND COPPERS BLOUTJIES EN KOPERVLERKIES
SUBFAMILY THECLINAE	HAIRSTREAKS AND COPPERS LANGSTERTE EN KOPERVLERKIES
Aloeides aranda (Wallengren, 1857)	Aranda Copper Aranda-kopervlerkie
Aloeides henningi Tite & Dickson, 1973	Henning's Copper Henning-se-kopervlerkie
Aloeides molomo molomo (Trimen, 1870)	Grassland Molomo Copper Grasveld-molomokopervlerkie
Cigaritis mozambica (Bertoloni, 1850)	Mozambique Bar Mosambiek-se-streepvlerkie
Cigaritis natalensis (Westwood, 1852)	Natal Bar Natal-se-streepvlerkie
Leptomyrina henningi Dickson, 1976	Henning's Black-eye Henning-se-swartogte
SUBFAMILY POLYOMMATINAE	BLOUTJIES AND CILIATED BLUES

BLOUTJIES EN KORTSTERTJIES

Actizera lucida

(Trimen, 1883)

Anthene amarah amarah

(Guérin-Méneville, 1849)

Anthene definita definita

(Butler, 1899)

Azanus jesous jesous

(Guérin-Méneville, 1849)

Azanus moriqua

(Wallengren, 1857)

Azanus ubaldus

(Stoll, 1782)

Cacyreus marshalli

Butler, 1898

Chilades trochylus

(Freyer, 1843)

Cupidopsis cissus cissus

(Godart, 1824)

Cupidopsis jobates jobates

(Hopffer, 1855)

Eicochrysops messapus mahallakoena

(Wallengren, 1857)

Euchrysops osiris

(Hopffer, 1885)

Lampides boeticus

(Linneaus, 1767)

Lepidochrysops patricia

(Trimen, 1887)

Lepidochrysops plebeia plebeia

(Butler, 1898)

Leptotes brevidentatus

(Tite, 1958)

Leptotes species

Tarucus sybaris sybaris

(Hopffer, 1855)

Tuxentius melaena melaena

(Trimen, 1887)

Zintha hintza hintza

(Trimen, 1864)

Zizeeria knysna

(Trimen, 1862)

Zizula hylax

(Fabricius, 1775)

FAMILY HESPERIIDAE

SUBFAMILY COELIADINAE

Coeliades forestan forestan

(Stoll, 1782)

Coeliades pisistratus

(Fabricius, 1793)

Rayed Blue

Witstreepbloutjie

Black-striped Hairtail

Swartstreep-kortstertjie

Common Hairtail

Donkerkortstertjie

Topaz-spotted Blue

Hemels-kolbloutjie

Thorn-tree Blue

Doringboombbloutjie

Velvet-spotted Blue

Fluweel-kolbloutjie

Geranium Bronze

Pelargoniumbrons

Grass Jewel Blue

Grasjuweeltjie

Common Meadow Blue

Vleibloutjie

Tailed Meadow Blue

Aasbloutjie

Grassland Cupreous Copper

Grasveldkoperbloutjie

Osiris Smokey Blue

Osiris Dowwebloutjie

Longtailed Pea Blue

Langstert-ertjiebloutjie

Patricia Blue

Patricia-bloutjie

Twin-spot Blue

Dubbelkolbloutjie

Short-toothed Blue

Korttandbloutjie

Common Blue

Gewone bloutjie

Dotted Blue

Spikkelbloutjie

Black Pie

Swartbontetjie

Hintza Pie

Hintza-bontetjie

Sooty Blue

Duwweltjiebloutjie

Gaika Blue

Gaika-bloutjie

SKIPPERS

DARTELAARS

POLICEMEN

KONSTABELS

Striped Policeman

Witbroekkonstabel

Two-pip Policeman

Dubbelkolkonstabel

SUBFAMILY PYRGINAE

Eretis umbra umbra

(Trimen, 1862)

Spialia diomus ferax

(Wallengren, 1863)

Spialia mafa mafa

(Trimen, 1870)

Spialia spio

(Linnaeus, 1764)

SUBFAMILY HETEROPTERINAE

Tsitana tsita

(Trimen, 1870)

SUBFAMILY HESPERIINAE

Gegenes niso niso

(Linnaeus, 1764)

Gegenes pumilio gambica

(Mabille, 1878)

Kedestes barberae barberae

(Trimen, 1873)

Kedestes nerva nerva

(Fabricius, 1793)

Pelopidas mathias

(Fabricius, 1798)

Pelopidas thrax inconspicua

(Bertoloni, 1850)

Platylesches ayresii

(Trimen, 1889)

SANDMEN AND ELFINS
SANDMANNETJIES EN ELWE**Small Marbled Elf**

Umbra-kabouter

Common Sandman

Kwagga-sandmannetjie

Mafa Sandman

Mafa-sandmannetjie

Mountain Sandman

Bergsandmannetjie

SYLPHS

WALSERTJIES

Grassland Dismal Sylph

Grasveld Donkerwalsertjie

RANGERS AND SWIFTS

WAGTERTJIES EN RATSVLIEËRS

Common Gold Skipper

Gewone Goud

Dark Gold Skipper

Donker Goud

Barber's Ranger

Barber-se-wagtertjie

Scarce Ranger

Seldsame wagtertjie

Black-banded Swift

Swartmerk-ratsvlieër

White-branded Swift

Witmerk-ratsvlieër

Peppered Hopper

Ayres-se-hoppertjie

Annexure 5: GLS Report

Annexure 6: Services Report

29 May 2015

M & T Development
PO Box 39727
Faerie Glen
0043

Tel: 012 348 4920
Fax: 012 349 8256

Office 10, 3rd Floor
476 Kings Highway
Lynnwood, 0081

Att: Mr Wim Lotz

Dear Sir,

Registered as:
Linbus Trust
Registration no:
IT 3403/09

DOORNVALLEI EXT 5 & 6 ~ EXTERNAL CIVIL ENGINEERING SERVICES

With reference to the meeting between ourselves on Wednesday 27 May 2015 and the draft GLS report dated 4 May 2015, herewith a summary of the external civil engineering services (water & sanitation) required for the successful development of the above mentioned project, as well as for environmental authorization purposes.

Water:

The following items will have to be installed as a minimum requirement to supply potable water to the project in line with the master plan.

- Item 1 – Isolating Valve 550mm diameter.
- Item 2 – Isolating Valve 550mm diameter.
- Item 3 – Isolating Valve 450mm diameter.
- BVR.1a – Rand Water Connection 5m x 600mm diameter.
- BVR.1 – Main Feeder Pipe 285m x 600mm diameter.
- BVR. 9 – Pressure Reducing Valve 355mm diameter.
- BVR.10 – Main Feeder Pipe 15m x 600mm diameter.
- BVR.11 – Head Pump 55m x 245 l/s
- VRH.15 – Main Pipe 1065m x 400mm diameter.
- VRH.16 – Main Pipe 360m x 400mm diameter.
- VRH.17 – Main Pipe 305m x 250mm diameter.
- VRH.18 – Main Pipe 495m x 250mm diameter.

The location of the above mentioned items are indicated on the attached water layout plan.

Sewer:

The following items will have to be installed as a minimum requirement for sewer drainage away from the project in line with the master plan.

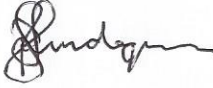
- Item 2 – New Pipe 250m x 200mm diameter.
- OF_F013.02 – New Pipe 182m x 160mm diameter.
- OF_F013.01 – New Pipe 897m x 200mm diameter.
- OF_F012.01 – New Pipe 3161m x 525mm diameter.
- OF_F002.02 – New Pipe 160m x 525mm diameter.
- OF_F011.01 – New Pipe 50m x 160mm diameter.

OF_F011.02 – New Pipe 900m x 160mm diameter.
OF_F011.03 – New Pipe 100m x 160mm diameter.

The location of the above mentioned items are indicated on the attached sewer layout plan.

Should you have any queries do not hesitate to contact the undersigned.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'PJ Lindeque', with a stylized flourish at the end.

PJ LINDEQUE
pp LV & Partners

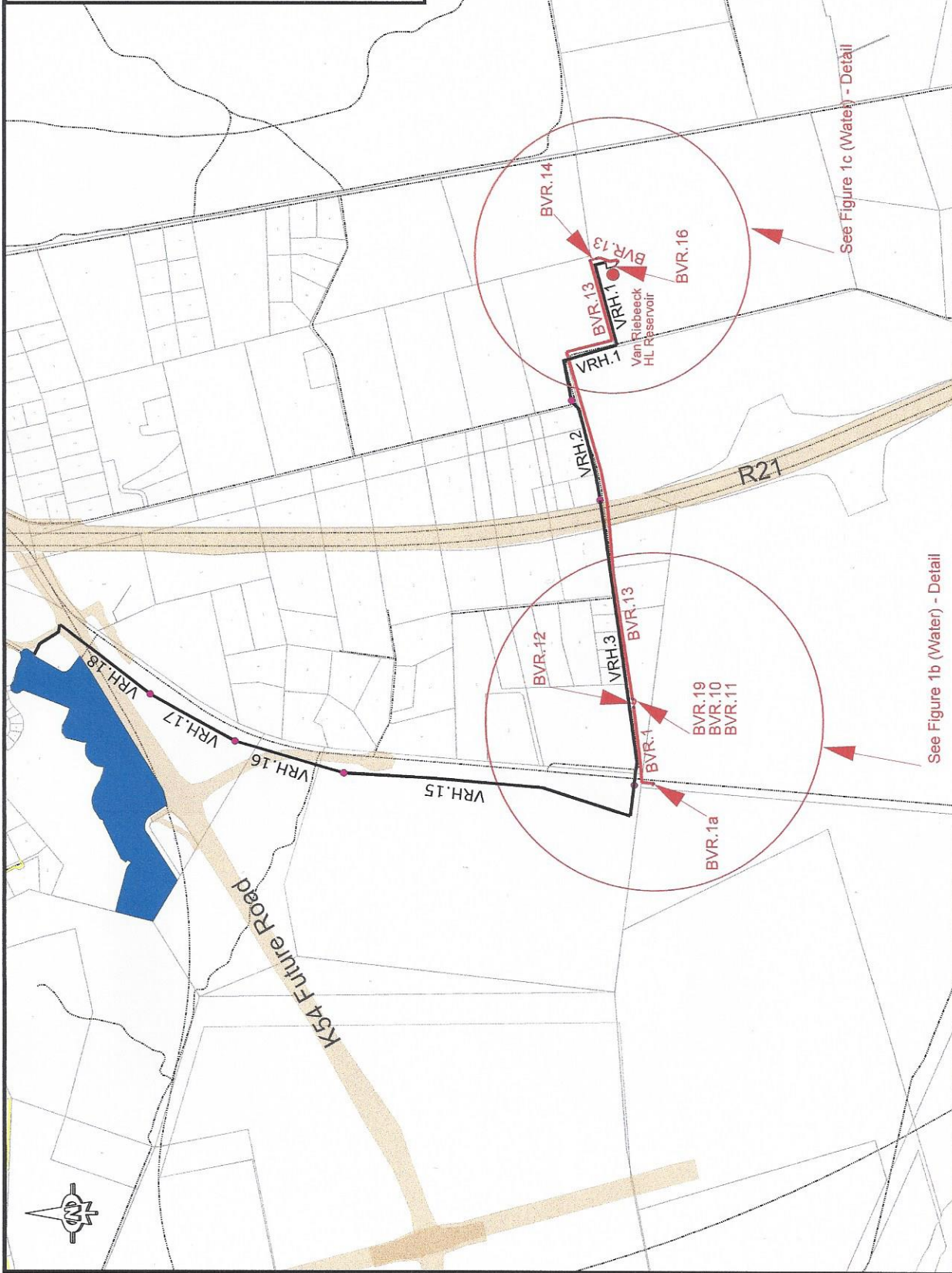
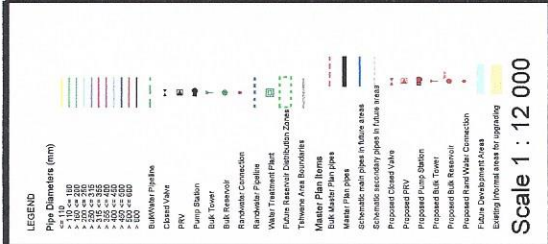



FIGURE 1a (Water)
 Master Plan Items/Required Works & Proposed Connection
 Doornvallei X5 and X6 2nd Assessment
 (Van Riebeeck HL Reservoir Zone)



January 2015 Master Plan Models
 WATER/SEWER MIS
 Tshwane:
 Computer Analysis and
 Master Planning of Water Distribution Network



CITY OF TSHWANE
 Tshwane Metropolitan Municipality

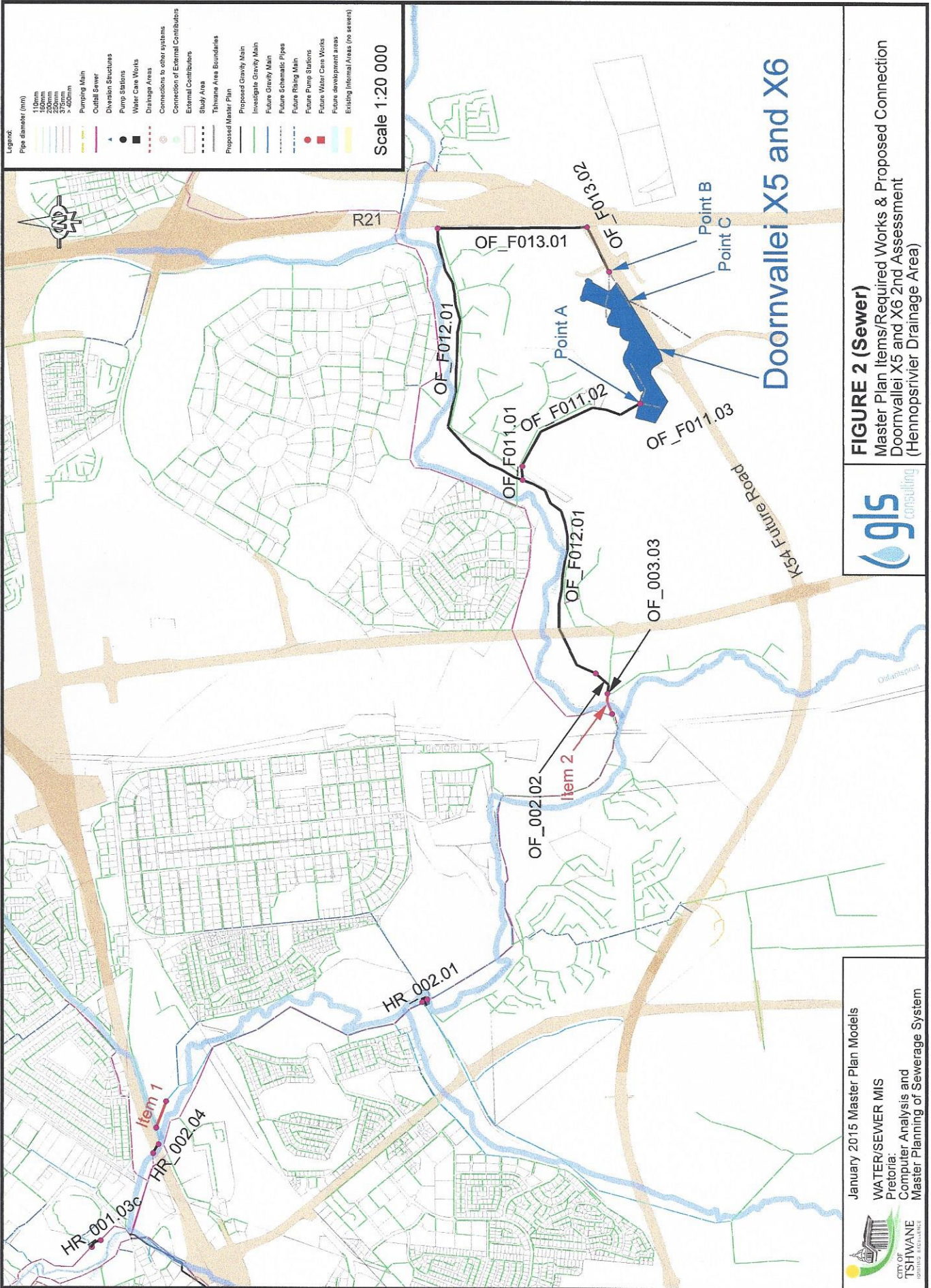


FIGURE 2 (Sewer)
 Master Plan Items/Required Works & Proposed Connection
 Doornvallei X5 and X6 2nd Assessment
 (Hennopsvier Drainage Area)



January 2015 Master Plan Models
 WATER/SEWER MIS
 Pretoria:
 Computer Analysis and
 Master Planning of Sewerage System



Annexure 7: Letter from GeoPower

2015-04-02

M&T Development (Pty) Ltd
340 Witch-Hazel Avenue
Highveld
CENTURION


Attention: Mr Wim Lotz
{sent per email to: Wim Lotz wim.lotz@m-t.co.za}

Copy to: City of Tshwane – Energy & Electricity Division – Attention: Mr Charles du Toit
{sent per email to: Charles du Toit charlesdt@tshwane.gov.za}



PROPOSED LAND DEVELOPMENT ON PORTION 107 DOORKLOOF 391-JR: PHASE 1:
PROVISION OF A SUSTAINABLE ELECTRICITY SUPPLY

1. The fore-mentioned land development is situated within the municipal jurisdiction, as well as the licensed electricity supply and distribution area, of the City of Tshwane. The latter has been endorsed by the National Energy Regulator of South Africa (NERSA).
2. The proposed land development is situated within Region 4 of the City of Tshwane, which region is supplied with electricity from Eskom via its Rietvlei 400/275/132kV in-feed substation. Region 4 incorporates Centurion and Irene in the east, Olievenhoutbosch in the south and the Rhens nature reserve in the west. This substation is situated on Portion 136 of the Farm Doornkloof 391-JR and is contiguous with Portion 107 of the same farm, on which land the township development is envisaged. The upgrading of the Rietvlei substation from a firm (N-1) 125MVA, 275/132kV station to a firm (N-1) 250MVA, 400/132kV station is nearing completion. The upgraded station will be commissioned prior to the establishment of the said township, although there is currently sufficient capacity available at the Rietvlei station to supply the initial and ultimate saturated demand of this township on a continuous basis. The upgrading of the Rietvlei substation makes provision for the future inclusion of a third 250MVA, 400/132kV power transformer which will double the firm supply capacity of the current upgrade to 500MVA.
3. The authorised capacity sought for the proposed land development is 1,575kVA and is based on an ADMD of 5kVA per Residential 2 unit, as prescribed by the City of Tshwane, for this geographical area. The number of units as per the attached plan is 315 Residential 2 units. The authorised capacity of the land development translates to 1,3% of the additional 125MVA firm (N-1) capacity, augmented to the Rietvlei substation, as part of its current upgrade.
4. The standard medium-voltage level required for the provision of electricity services to and within a township development is 11,000 volts (11kV). Electricity is typically purchased by the City of Tshwane from Eskom at a much higher voltage level namely 132,000 volts (132kV). In the context of this land development the Eskom point of delivery is at the fore-mentioned Rietvlei substation. A primary substation is however required to transform (reduce) the voltage level from the 132kV level to the standard 11kV distribution voltage level. M&T Development provided the Cornwall Hill 40MVA, 132/11kV primary substation, in terms of an engineering agreement signed between the City of Tshwane and M&T Development on 9 July 2010. This agreement allocated 26,100kVA to the envisaged land developments of M&T Development, situated within the Cornwall Hill supply Area, which includes 5487,58kVA for the said land development on Portion 107 of the Farm Doornkloof 391JR. The original envisaged land use yielded a significantly higher demand from the 1,575kVA which is now required for the proposed land development.



61 Ingersol Road, Menlyn, Pretoria
PO Box 365, Menlyn, 0063
www.geopower.co.za
T: 0861 E POWER

5. Neither the external nor the internal electricity services for the proposed land development on Portion 107 Doornkloof 391JR triggers an activity that necessitates a specific environmental authorisation and/or a water use licence. The external electricity service to this development will in actual fact enhance the security of electricity supply, and hence the sustainability of the electricity supply to the Irene Glen Estate, which abuts the northern boundary of Portion 107 Doornkloof 391JR. The current electricity supply to the Irene Glen Estate is via a radial medium voltage cable, which crosses the Sesmylspruit river to the north of Irene Glen Estate. The proposed new electricity supply to the Irene Glen Estate will be part of the medium voltage cable ring that is to be installed for the external electricity service to the above-mentioned land development on Portion 107 of the Farm Doornkloof 391JR, and will be provided at the main entrance to the estate.
6. Attached please find a letter from the then Strategic Executive Officer: Tshwane Electricity to GDARD, dated 30 November 2006, in which it was stated at that stage: *"that the development is in line with our infrastructure development plans and that capacity will be made available for the mentioned development through the normal processes"*.
7. Summary
 - 7.1 The proposed township is situated within the supply area of the Cornwall Hill primary substation which has a firm capacity of 40MVA, upgradable to 80MVA. There is adequate spare capacity available on the 11kV bus of the Cornwall Hill substation to supply electricity on a sustainable basis to the proposed land development.
 - 7.2 The Cornwall Hill primary substation is supplied from the Rietvlei 132kV substation, via a high voltage 132kV, double circuit power-line with a firm (N-1) transfer capacity of 150MVA.
 - 7.3 The firm (N-1) supply capacity of the Rietvlei in-feed substation is being upgraded from 125MVA to 250MVA.
 - 7.4 The point of common coupling for this proposed township to the City of Tshwane network is at the T3 unit installed for Rietvlei Heights. The approved connection point is on the southern side of the Sesmylspruit river and hence no river crossing is required for the external electricity service for this township.

We trust that the foregoing is in order and hold ourselves available for the provision of any supporting documentation that may be required by GDARD in support of the environmental authorisation for the above-mentioned land development.

Yours sincerely

REL ZIETSMAN Pr. Eng
GEOPOWER (PTY) LTD

Annexure 8: Amended EMPr

Amended Environmental Management Programme (EMPr): Residential Development: Doornvallei Ext 5 on Doornkloof 107 of 391JR

Date Amended: May 2015

Original Author: Bokamoso Landscape Architects and Environmental Consultants

1.0 PROJECT OUTLINE

1.1 Project description and location

Doornvallei X05 and X06 (Phase one) townships are located on Portion 107 of the farm Doornkloof 391-JR, South of the N1, West of the R21 and south west of Rietvlei National Park (**See Figure 1**). The location is adjacent to the R21, in close proximity to the N1 and in between Johannesburg and Pretoria, this makes the site very desirable for residential and commercial use. The size of the area to be developed is approximately 12.7232 hectares. Doornvallei X05 and X06 falls within the area of jurisdiction of the City of Tshwane Metropolitan Municipality (TMM).

The initial EMPr was for the development of a low density, full title residential township which was authorised by GDARD. The EMPr has been amended as the environmental application for the change of land use for the proposed development has been submitted to GDARD. The application seeks to change the land use of Doornvallei Extension 5 to a medium density, sectional title residential township. The EMPr has therefore been amended to reflect the potential environmental impacts that maybe brought about by the proposed landuses.

Due to the, high sensitivity regarding red species of the study area and the presence of dolomite on site, any development on site needs to be planned and implemented with great care and sensitivity to the receiving environment. For this reason specialist studies were conducted specially to identify weather red data species were present and to ensure the appropriate measures are put in place to ensure their survival.



Figure 1: Locality of the site

1.2 EMP objectives

The objectives of this plan are to:

- Ensure all environmental safeguards are carried out correctly.
- Manage site activities effectively and coordinate with other trades.
- Minimise adverse impacts on the environment.
- Minimise disruption to fauna and flora.
- Minimise the possible visual impacts on the surrounding environment.
- Meet the requirements of the Record of Decision of GDARD and requirements of other Authorities.
- Monitor the project.

1.3 EMP context

This EMP fits into the overall planning process of the project by providing measures to limit the impacts of different phases of the project on the environment as well as ensuring a systematic monitoring of the conditions of authorisation as set out by the Gauteng Department of Agriculture and Rural Development. The Conditions will be attached to, or included in this document.

1.4 Sensitivities, impacts and environmental risks

The Scoping Report identified the following impacts that need to be mitigated during the Construction Phase:

- Red data plant species were found on site and are concentrated on the rocky outcrops on the western portion of the site.
- The Geotechnical conditions on site vary from suitable for residential construction to areas that are not suitable for any construction. The layout of the site was done according to these geotechnical zones.
- The site is located next to the R21 highway and M57. The K54 is proposed to cross the South Eastern corner of the development.

2.0 RISK STATEMENT

The risk to the environment by carrying out the construction works vary from low to high.

The main risks that remain include:

- Damage to the natural flora and fauna systems;
- Construction work, if not correctly implemented, could still cause erosion, siltation, water pollution, soil compaction and sinkholes;
- If the landscaping is not correctly designed and implemented the species movement corridors from the conservation area to the surrounding natural environment and habitats may be detrimentally damaged;
- Safety risks to the surrounding road users;
- Safety risks to the future residents on site due to the geotechnical conditions on site;
- Risk of sinkhole formation.

The primary control measures for these risks include:

- Manage the site and construction works in a manner that will mitigate the visual impact of the construction works and site during the construction phase;
- Manage surface runoffs in a sustainable manner during the construction and the operational phase;
- No oil and/or fuel leaking vehicles and equipment shall be allowed;
- Stockpiling management;
- Waste management;
- Establishing a barrier between the construction site and the conservation area that should be conserved during the construction phase;
- Rehabilitate areas immediately after construction;
- Control dust and noise pollution;
- Control heavy vehicle movement on the surrounding road network and gravel roads on site.

3.0 ROLES AND RESPONSIBILITY MATRIX

In order for the EMP to be successfully implemented, all the role players involved in the project need to co-operate. For this to happen, role players must clearly understand their roles and responsibilities in the project, must be professional, form respectful and transparent relationships and maintain open lines of communication.

Table 1: Functions and responsibilities of the project team

KEY	FUNCTION	RESPONSIBILITY
D	Developer/ proponent	<p>Proponent ultimately accountable for ensuring compliance to the EMPR and conditions contained in the Environmental Authorisation (EA). The ECO must be contracted by the developer (full time or part time depending on the size of the project) as an independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the EMPR for the project.</p> <p>The developer is further responsible for providing and giving mandate to enable the ECO to perform responsibilities. The developer must ensure that the ECO is integrated as part of the project team.</p>
CE	Consulting Engineer	Contracted by the developer to design and specify the project engineering aspects. Generally the engineer runs the works contract. The CE may also fulfil the role of Project Manager on the proponent's behalf
PM	Project Manger	The Project Manager has over-all responsibility for managing the project, contractors, and consultants and for ensuring that the environmental management requirements are met. The CE may also act as the PM. All decisions regarding environmental procedures must be approved by the PM. The PM has the authority to stop any construction activity in contravention of the EMPR in accordance with an agreed warning procedure.
ER	Engineers Representative	The consulting engineer's representative on site. Has the power/mandate to issue site instructions and in some instances, variation orders to the contractor, following request by the EO or ECO. The ER oversees site works, liaison with Contractor and ECO.

<p>ECO</p>	<p>Environmental Control Officer</p>	<p>An independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the EMPR for the project. The ECO must be on site prior to any site establishment and must endeavour to form an integral part of the project team.</p> <p>The ECO must be proactive and have access to specialist expertise as and when required, these include botanists, ecologists, game capture, snake catching, etc.</p> <p>The ECO must conduct audits on compliance to relevant environmental legislation, conditions of EA, and the EMPR for the project. The size and sensitivity of the development, based on the EIA, will determine the frequency at which the ECO will be required to conduct audits. (A minimum of a monthly site inspection must be undertaken).</p> <p>The ECO must be the liaison between the relevant authorities and the project team. The ECO must communicate and inform the developer and consulting engineers of any changes to environmental conditions as required by relevant authoritative bodies. The ECO must ensure that the registration and updating of all relevant EMPR documentation is carried out.</p> <p>The ECO must be suitably experienced with the relevant environmental management and or related qualifications and preferably competent in construction related methods and practices. The ECO must handle information received from whistle blowers as confidential and must address and report these incidences to the relevant Authority as soon as possible. The EO once appointed must convey the contents of this EMPR to the Contractor/site team and discuss the contents in detail with the Contractor as well as undertake to conduct an induction or environmental awareness training session prior to site handover to all contractors and their workforce if required.</p>
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C	Contractor	<p>The principle contractor, hereafter known as the 'Contractor', is responsible for implementation and compliance with the requirements of the EMPR and conditions of the EA's, contract and relevant environmental legislation. The Contractor must ensure that all sub- contractors have a copy of and are fully aware of the content and requirements of this EMPR.</p> <p>The contractor is required, where specified, to provide Method Statements setting out in detail how the management actions contained in the EMPR will be implemented.</p>
ESO	Environmental Site Officer	<p>The ESO is employed by the Contractor as his/her environmental representative to monitor, review and verify compliance with the EMPr by the contractor. This is not an independent appointment; rather the ESO must be a respected member of the contractor's management team. The ESO must be involved at all phases of the construction process.</p>
A	Lead Authority	<p>The lead authority is the relevant environmental department that has issued the Environmental Authorisation. The authorities are responsible for ensuring that the monitoring of the EMPr and other authorisation documentation is carried out, this will be achieved by reviewing audit reports submitted by the ECO and conducting regular site visits.</p>
OA	Other Authority	<p>Other authorities are those that may be involved in the approval process of an EMPR. Their involvement may include reviewing EMPRs to ensure the accuracy of the information relevant to their specific mandate.</p> <p>Other authorities may be involved in the development, review or implementation of an EMPR. For example if a specific development requires a water use licence for the relevant national authority then that authority should review and comment on the content of the particular section pertaining to that mandate.</p>

EAP	Environmental Assessment Practitioner	The definition of an environmental assessment practitioner in Section 1 of NEMA is “the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments introduced through regulations”.
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4.0 ENFORCEMENT, MONITORING AND SITE AUDITING

The ECO must conduct, at a frequency determined by the Department and stipulated in the relevant Environmental Authorisation (EA) for the project, independent environmental audits. The audits are to verify the projects compliance with the EMPr and conditions of the Environmental Authorisation (EA).

Before any construction activities commence, the ECO must be appointed, conduct site inspection and, together with the contractor determine the positioning of the construction camp and other equipment on site. The ECO must at the request of the Department forward audit reports to the Department at a frequency determined by the Department which must be stipulated in the Environmental Authorisation (EA). Evidence of the following as key performance indicators, must be included in the audit reports where required:

1. Complaints received from landowners and actions taken.
2. Environmental incidents, such as oil spills, concrete spills, etc. and actions taken (litigation excluded).
3. Incidents leading to litigation and legal contraventions.
4. Environmental damage that needs rehabilitation measures to be taken.

Copies of all monitoring reports, contractor method statements and pro forma documentation must be kept on site and be made available to the Department or officials upon request.

4.1 Non-Compliance

The Contractor is deemed NOT to have complied with the EMPr if:

- within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of the EMPr confirmed and verified by the ECO;
- environmental damage ensues due to non-compliance to EMPr requirements;
- the Contractor fails to comply with corrective or other instructions issued by the ECO within a specific time, and
- the Contractor fails to respond adequately to complaints from the public in line with requirements of this EMPr.

4.2 General guidelines

The following measures provide guideline solutions to frequently anticipated issues on most development activities.

- The prevention of any site degradation due to non-compliance, administrative or financial problems, and inactivity during the construction phase, illegal activities, delays caused by archaeological finds, etc. is ultimately the responsibility of the applicant/developer. Section 28, National Environmental Management Act [NEMA] (Act No. 107 of 1998)
- The site must be clearly defined. All workforce members and other construction personnel are to be confined to the site.
- The Contractors must adhere to agreed and approved access points and hauls roads which will for the most be off Allandale Road.
- No camping is allowed on any adjacent private property.
- Damage to private or public property such as fences, gates and other infrastructure may occur at any time. All damage to be repaired immediately and to the satisfaction of the owner.
- Relevant landowners and businesses must be informed of the starting date of construction as well as the phases in which the construction shall take place.
- The Contractor must adhere to all conditions of contract including this EMPr.

- Proper planning of the construction process must be undertaken to allow for disruptions due to rain and very wet conditions.
- All private and public manmade structures near the project site must be protected against damage at all times and any damage must be rectified immediately.
- Proper site management and regular monitoring of site works. Proper documentation and record keeping of all complaints and actions taken.
- Regular site inspections and good control over the construction process throughout the construction period.
- A positive attitude towards Environmental Management by all site personnel must be motivated through regular and effective awareness and training sessions (see below).
- An ESO, on behalf of the Contractor, is to be appointed to implement this EMPr. The EO/ESO is to deal with any landowner related matters.
- Environmental Audits to be carried out during and upon completion of construction.

4.3 Awareness training

The ECO is responsible for ensuring that the contractor and other professions on site are given an environmental awareness induction session which not only clearly defines what the environment is but outlines the requirements of the EMPr as a management tool to protect the environment. The EO or ESO must ensure daily toolbox talks include alerting the workforce to particular environmental concerns associated with the tasks for that day or the area/habitat in which they are working. Awareness posters and a hand outs may be produced to create awareness throughout the site.

4.4 Contractor Environmental Method Statements

Method Statements are written submissions by the Contractor in collaboration with his/her ESO, detailing the work packages and may be in response to a request of the EO, ECO and/or Engineer. The Method Statements set out the plant, materials, labour and method that the contractor proposes using to carry out an activity, identified by the EO, ECO and/or

Engineer. The Method Statements contain the appropriate detail that allows an assessment to be made on whether the Contractor's proposal is in accordance with the requirements of the EMPr.

All Method Statements including those which may be required as *ad hoc* or emergency construction method statements must be submitted to the Engineer for approval prior to the commencement of the activity.

Any changes to the method of works must be reflected by amendments to the original approved Method Statement. Any changes in this regard must be approved by the EO and Engineer on the understanding that such changes are environmentally acceptable and in line with the requirements of this EMPr.

The pro forma Method Statements attached must be used. The method statements for the following activities must be developed for approval before construction commences.

- Management of activities on dolomitic areas
- Solid waste management;
- Ecological sound stormwater management plan;
- Crew camps and construction lay down areas;
- Cement and concrete batching;
- Dust control;
- Hydrocarbon and emergency spills procedures;
- Diesel tanks and refuelling procedures;
- Sourcing, excavating, transporting and dumping of fill and spoil material;
- Topsoil management;
- Protection of the Riparian Zone and the associated buffer
- Noise;

- Fire; and
- Rehabilitation of disturbed areas.

4.5 Site documentation

All records related to the implementation of this management plan (e.g. site instruction book, ESA/ESO dairy, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years at any time be available for scrutiny by any relevant authorities.

The following is list of documentation that must be held on site and must be made available to the ECO and/or Approving Authority on request.

- Site daily diary /instruction book/ Incident reports;
- Records of all remediation / rehabilitation activities;
- Copies of ECO reports (management and monitoring);
- Environmental Management Plan (EMPr);
- Complaints register; and
- Method statements.

4.6 Lines of Communication

The Environmental Officer in writing should immediately report any breach of the EMPr to the project Manager/ESO. The Project Manager/ESO should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then the developer should be notified immediately before any additional steps are taken.

4.7 Reporting Procedures to the Developer

Any pollution incidents must be reported to the Environmental Officer immediately (within 12 hours). The Environmental Officer shall report to the Developer on a regular basis (site meetings).

5.0 LEGISLATIVE FRAMEWORK AND GUIDELINES

The common list of legislative references contained herein is by no means exhaustive but is applicable to the general principles of this document.

5.1 LEGAL PROVISIONS

Table 2: Summary of key legal provisions

Legislation	Section	Provision
The Constitution (No 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights.
National Environmental Management Act, (No 107 of 1998 [as amended])	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies through-out the Republic to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care
Environment Conservation Act (No 73 of 1989) and regulations	Sections 19	Prevention of littering by employees and subcontractors during construction and the maintenance phases of the proposed project
National Heritage	Section 34	No person may alter or demolish any structure or part of a structure which is older

Legislation	Section	Provision
Resources Act (No 25 of 1999) and regulations		than 60 years without a permit issued by the relevant provincial heritage resources authority.
	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other
	Section 38	This section provides for Heritage Impact Assessments (HIAs), which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during the HIA process. The Heritage Impact Assessment (HIA) will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of Noise
	Section 35	Control of offensive odours
Occupational Health and Safety Act (No 85 of 1993)	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
Occupational Health and Safety Act-Major Hazard Installation	Sections 5 and 6	A risk assessment must be conducted at intervals not exceeding five years and establish an on-site emergency plan to be followed inside the premises of the installation.

Legislation	Section	Provision
Regulations (GN R692, July 2001)		
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution
	Section 20	Control of emergency incidents
Hazardous Substances Act (No 15 of 1973) and regulations		Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances
National Environmental Management: Waste Act (No. 59 of 2008)		Provides for specific waste management measures and the remediation of contaminated land.
Advertising on Roads and Ribbon Development Act No. 24 of 1940		Regulates the display of adverts at places visible from public roads. Also controls the depositing of machinery or refuse, and the construction or laying of structures, near public roads. <i>Provincial Authorities</i>
Health Act No. 63 of 1977:		control of solid, liquid and gaseous wastes that may pose a health hazard

5.2 Environmental guidelines and standards

All applicable environmental standards contained within the environmental legislation will be adhered to. The following environmental guidelines and standards were identified as being applicable.

Air Quality Guidelines: Currently air pollution in South Africa is regulated under the National Environmental Management: Air Quality Act 39 of 2004. On 1 April 2010, the List of activities which result in atmospheric emissions in terms of section 21 of the Air Quality Act came into effect.

Waste Disposal: All waste (general and hazardous) generated during the construction and operation of the proposed project may only be collected, stored and transported under specific requirements.

Occupational Health and Safety: All safety, health and environmental standards and emergency procedures that must be adhered to in terms of the Occupational Health and Safety Act (No 85 of 1993), must be complied with during the construction and operation phases.

6.0 PROJECT ACTIVITIES

6.1 Pre-construction stage

<i>Environmental risk or issue</i>	<i>Objective requirement</i>	<i>or</i>	<i>Control measure</i>	<i>Responsibility</i>
DESIGN AND PLANNING				
Town planning and layout design	To design the layout and plan the implementation of infrastructure to conserve the assets on site and to design in line with the geotechnical constraints on site.		<ul style="list-style-type: none"> • The layout should be designed strictly according to the sensitivity map/analyses that was compiled for the development. • The conservation line should be indicated on the layout maps in the site camp, and this area should be enforced strictly as a no-go area. • Sufficient species movement corridors should be implemented from the conservation area to the surrounding habitats and natural areas in the vicinity of the site. • The buildings and land use should be in accordance to the suitability of the geotechnical conditions in 	Town Planners, Environmental Consultants

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<p>each geotechnical zone that was identified by the geotechnical engineer.</p> <ul style="list-style-type: none"> - Land use - Building types - Structure height - Engineering specifications for the implementation of infrastructure. <ul style="list-style-type: none"> • Buffer zones for the red data species should be incorporated in the conservation area to form one large natural area that will minimize the edge effects. • Sufficient infrastructure should be provided for the development to ensure a safe living environment that will not negatively impact on the existing infrastructure and the biophysical environment. 	
<p>Stability of structures and restrictions to land uses</p>	<p>To ensure stability of structures</p>	<ol style="list-style-type: none"> 1. The layout must correspond to the stability zonation and development types recommended by the geotech engineer. 2. The NHBRC precautionary measures for development on dolomite areas to be implemented. <p>More detailed foundation investigation shall be done for each of the structures.</p>	<p>Developer, Engineer</p>
<p>Risk of sinkholes</p>	<p>To prevent the development of sinkholes after the installation of</p>	<ol style="list-style-type: none"> 1. Special precautionary measures and a dolomite risk management system must be compiled to manage the entire site. 	

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	services or construction of buildings.	<ol style="list-style-type: none"> 2. A site specific dolomite risk management programme must be compiled and implemented to reduce the risk for sinkhole and doline formation. 3. A storm water management plan must be implemented to prevent the concentration of storm water on site. 4. Very stringent precautionary measures must be implemented to reduce any water ingress on site. 5. A pro-active maintenance strategy for water bearing services and other infrastructure should be implemented. 	
Impact on <i>Ichneustoma stobbiai</i>	To ensure long-term conservation of the Smuts Koppie population of <i>Ichneustoma stobbiai</i>	<p>Holistic for Smuts Koppie area</p> <p>Creation of an 80-hectare <i>Ichneustoma Beetle Reserve</i> together with other landowners (e.g., those owning Portions 15, 20, 53, 107, 111, 129 and 136 in the area), as indicated in figure 1. By setting aside a joint conservation area for <i>I. stobbiai</i>, this should increase the permissible land that each developer can develop and if included within the developments, would provide a draw card for advertising and marketing of the development, where the owners would get to share part of their own private nature reserve. This holistic approach would provide a better chance of survival to <i>I. stobbiai</i> than separate smaller sections upon each portion, although, if these were interconnected by corridors and well managed as</p>	Town Planners, Environmental Consultants, Fauna Specialists

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<p>natural grassland this approach would be the second option to ensure these beetles conservation.</p> <p>Refer to Addendum A</p>	
	<p>To prevent the destruction, degradation and /or fragmentation of the <i>Ichnestoma stobbiai</i> beetles' feeding and breeding habitat on Portions 107 and 129 of the Farm Doornkloof 391 JR</p>	<p>Portions 107 and 129 of the Farm Doornkloof 391 JR It is recommended that all remaining natural grassland be interconnected into an <i>Ichnestoma Beetle Reserve</i> with a corridor of 200 m to be left undeveloped. This area should be linked to suitable habitat near Smuts Koppie where <i>Ichnestoma stobbiai</i> beetles have also been recorded, and others sites within the area, as indicated in the map included within figure 1, Addendum A. Human and vehicle disturbance should be kept to the absolute minimum within this area, especially in the central section of the area that is left aside for <i>Ichnestoma stobbiai</i> beetles.</p>	<p>Town Planners, Environmental Consultants, Fauna Specialists, Project Manager</p>
<p>Architectural design:</p> <p>1. Visual impact of the structure</p>	<p>To minimize the visual impact of the structures on the surrounding environment.</p>	<p>Design finishes that will compliment the surrounding environment and contribute positively to the existing sense of place of the surrounding communities:</p> <ul style="list-style-type: none"> • Placement of buildings (and the building heights) should be planned and specified not to interfere with the skyline of the ridge, not at the Irene Glen Estate side but rather in the South West corner. • Neutral earthy colours that are not in contrast with the surrounding built environment and the natural features on the site. 	<p>Architect</p>

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<ul style="list-style-type: none"> • A tranquil combination of colours, materials, finishes and different textures to break up the large visual mass of the residential structures. • Avoiding shiny materials like unpainted metal or stainless steel in buildings that will be visible from the R21 highway and are a distraction for drivers on the M57. • Preventing reflections on large metal plains or exposed large windows (provide shading through overhangs or patios). 	
2. Geotechnical constraints	To minimize the risk of unsafe construction methods and unsafe living conditions in future.	<ul style="list-style-type: none"> • The geotechnical engineer should specify construction methods/mitigation measures and material specifications for the high and medium risk zones on site where construction will take place. • The specification and methods should be included in the tender document and other building specifications and documentation. • Architects should design according to the constraints with suitable materials, specifications and foundations. • Mitigation measures should be specified for the construction and operational phases to prevent erosion and pothole formation that may cause unsafe conditions. 	Engineer, Architect
Landscape design: 1. Visual impact	Minimize the visual impact of the	Design the planting plan to minimize the visual impact of the structures:	Landscape Architect

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	development on the surrounding environment.	<ul style="list-style-type: none"> • One tree for every two parking areas should be provided (All plants are required to be indigenous). • Street trees should be planted along all the roads no further than 20m apart. • Species should be used as a unifying element and species should blend in with the surrounding environment. • Placement of flowerbeds or planters in and around any large paved area. • By landscape grading or strategic placement of berms to hide sections of the paved areas. • Through strategic placement of clusters of trees and shrubs around the paved areas to block views from specific viewpoints like residential dwelling units from the surrounding properties. • Using downward projected lighting with low glaring qualities should prevent excessive light pollution. 	
2. Conservation of the natural vegetation and habitats especially in the movement corridors and the conservation area.	Minimize the impact of the landscaping on the natural vegetation through good ecologically friendly design strategies.	<ul style="list-style-type: none"> • The design and species that are used for the landscaping should function with, contribute to, enhance and mimic the natural ecosystems on site. • Only indigenous tree, shrubs and groundcovers may be used on the site. • No exotic species or other evading plants may be introduced to the study area. • An ecological transition zone should be established between landscaped areas and the natural conservation/ movement corridor areas to ensure that exotic species from resident's gardens do not 	Landscape Architect

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<p>spread into the natural habitats. This transition area should consist only of landscaping with endemic plants that are found on site.</p> <ul style="list-style-type: none"> • A hard surface barrier should be established between the natural area and the surrounding landscaped areas (for instance a pathway of at least one meter wide). 	
3. Storm water design	To prevent and restrict erosion, siltation and water pollution	Storm water flow and outlets shall be correctly designed to prevent soil erosion. Construction guidelines shall be provided for the prevention and restriction of erosion, siltation and water pollution.	Landscape Architect
		Storm water from hard surfaces like paved parking areas should be filtered by a bio-swale system to clean the water of heavy metals, litter and suspended silt particles, and to break the water velocity and allow for infiltration. Water from this system should be released in the form of sheet flow.	Landscape Architect
		Sheet flow should be used as far as possible and water from the gutters should be channelled to the landscaped areas where it should be retained and slowly released.	Landscape Architect
	The storm water management should function with the natural systems on site.	The natural flow on site should be altered as little as possible. Water that is channelled should be retained to break the water velocity and should be released in the form of sheet flow. Irrigation water from the landscaped areas that could be polluted by fertilizers should not be allowed to enter the natural conservation area.	Landscape Architect

Environmental risk or issue	Objective requirement	or Control measure	Responsibility
PLANNING OF THE CONSTRUCTION SITE AND ACTIVITIES			
Flora and habitat conservation	The conservation area as identified in the Sensitivity analyses and the scoping report should be identified and fenced off before any construction activities take place on site.	<ul style="list-style-type: none"> • A surveyor should peg the conservation line as indicated in the scoping report by the Environmental consultants. • A construction fence should be erected and should be at least six foot high. • No construction activities, workers, vehicles, building rubble, construction materials, litter or any person not authorized by the ECO may enter or be dumped in this conservation area that is fenced off. 	ECO, Project Manager, Site Manager, Contractor, Site workers
Compaction	To prevent the compaction of valuable soils due to traffic and construction equipment.	Plan the construction site office and material storage are to be located on already disturbed areas of the study area. Access routes and internal circulation routes for construction vehicles should be planned and laid out on site. Vehicles should be restricted to these routes. Remove the topsoil from all these routes and areas for the site camp and material storage area.	ECO, Contractor
	Excavate only where necessary	Mark out the areas that are to be excavated for the installation of services, infrastructure and foundations, and remove topsoil from these areas.	Contractor, ECO
Topsoil	To prevent the loss of valuable topsoil.	The top layer of all areas to be excavated for the purpose of construction must be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. The stockpiled material shall be used for the rehabilitation of the site and for landscaping purposes.	Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		Topsoil and other subsoil should be stored separately. A soil storage plan should be available at the site office that indicates the location, size and quantity of top and subsoil stockpiles. The stockpiles for subsoil should be located in areas where the subsoil will be used for construction or filling purposes.	Contractor
Waste storage	To control the temporary storage of waste.	<p>A temporary waste storage point on site shall be determined. The storage point shall be accessible by waste removal trucks and should not be located in areas highly visible from the properties of the surrounding land-owners/tenants/in areas where the wind direction will carry bad odours across the surrounding properties.</p> <p>This site should comply with the following:</p> <ul style="list-style-type: none"> ▪ Skips for the containment and disposal of a waste that could cause soil and water pollution, i.e. paint, lubricants, etc. ▪ Domestic waste should be contained in skips with lids to prevent wind littering. ▪ Bunded areas for containment and holding of dry building waste. <p>THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT IS ALREADY DISTURBED.</p>	Contractor, Construction workers ECO, Contractor
	Reuse or recycle material where possible and correctly dispose of unusable wastes.	Plan the waste management on site and coordinate with other trades and nearby businesses for potential reuse or 'waste exchange' possibilities.	Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	Solid waste disposal	Solid waste shall be disposed off in a manner supported by the Department of Water Affairs and Forestry and the local municipality.	Contractor
Hydrology	Prevent the pollution of groundwater.	One Chemical toilet for every 10 workers shall be provided on site and located in an area that is not highly visual and should be established in an already disturbed area that will not interfere with the natural drainage patterns on site.	Contractor, ECO

6.2 Construction stage

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
CONSTRUCTION SITE AND ACTIVITIES			
SOCIAL & SAFETY			
1. Road safety	Accidents can occur due to non-existence of safety measures on and around construction sites.	<ul style="list-style-type: none"> • Although regarded as a normal practice, it is important to erect proper signs indicating the operations of heavy vehicles in the vicinity of the site, dangerous crossings and access roads or even on the site if necessary. • Construction vehicles and activities are to avoid peak hour traffic times. • Construction vehicles should obey all traffic rules and drive no faster than 40 Km per hour on gravel roads. 	Contractor drivers

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
2. Safety of the surrounding neighbours	Limit access on the site and neighbouring properties	With the exception of the appointed security personnel, no other workers, friend or relatives will be allowed to sleep on the construction site (weekends included).	Contractor
		No construction worker will be allowed to enter any adjacent property except with written consent from the landowner to the contractor.	Contractor
3. Fire hazard	To prevent detrimental fire hazards.	Fires shall only be permitted in specially designated areas (a cleared area in the site camp only) and under controlled circumstances (no smoking or fires outside this area or on days with strong winds).	Contractor workers
4. Noise pollution	To minimize the noise impact	Site workers must comply with the Provincial noise requirements and regulations. Construction works should further be limited to normal working hours (7:30-17:00 during weekdays and between 8:00 and 13:00 on Saturdays). The surrounding neighbours and the ECO should be informed if works are to take place outside these times.	Contractor
4. Dust Pollution	Prevent dust pollution as far as possible.	During dry and windy periods when dust is generated by the construction activities, all exposed areas should be damped down on a regular basis to prevent dust. Construction vehicles should drive no faster than 40km per hour on gravel roads in the area and on site to prevent excessive dust.	Contractor drivers
5. Visual impact	To minimize the visual impact of the construction activities and construction site	<ul style="list-style-type: none"> Establish an area for material and waste storage that is not highly visual from roads or neighbouring residential dwellings. Materials should be stored neatly and orderly. 	Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	on the surrounding environment.	<ul style="list-style-type: none"> • The site should be left in a clean and neat condition every day and weekend with no materials, machinery, rubble or litter not stored in the designated areas or containers. • Areas where the natural vegetation is disturbed by construction activities should be rehabilitated immediately after construction in that area has been completed. 	
6. Safety on site	Minimize the safety risks on site	Ensure that protective clothing and safety measures are implemented on site according to safety regulations. All dangerous excavation sites should be clearly marked with warning signs and establish an appropriate barrier for excavations deeper than 1500mm.	Contractor, ECO
7. Disruption of services	Minimize the inconvenience to affected neighbours	Determine the time and period that services to the neighbouring properties or local community will be disrupted due to construction activities on site, and inform all affected parties at least one week in advance. Plan the activities so that possible disruptions will occur at the most convenient times of the day.	Contractor
ECOLOGICAL 1. Hydrology	To ensure adequate slope drainage systems are implemented	<ul style="list-style-type: none"> • Plan and manage slope drainage systems throughout the construction phase and ensure that the installation of permanent measures is done according to design specifications. • If erosion occurs on site the contractor should stop the erosion by using measures like hydro-seeding, biodegradable geo-textiles or other measures authorized by the ECO. 	Contractor, ECO, Specialist

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		<ul style="list-style-type: none"> • If the problem persists or reoccurs an engineer, landscape architect or environmental consultant should be consulted to solve the problem. • The drainage plan as designed by the engineers or landscape architects should be implemented as an integral part of the project to prevent intermediate erosion problems especially during the rainy season. 	
2. Fauna and flora	To protect the existing fauna and flora.	<ul style="list-style-type: none"> • Due to the special flora resources on the Doornkloof 107 site a suitably qualified flora specialist should inspect the areas where vegetation will be cleared for construction activities before construction starts. Species that which are moved should be put in a safe place and then used for the landscaping. • Snaring and hunting of fauna by construction workers on or adjacent to the study area are strictly prohibited. • Wood harvesting of any trees or shrubs on the study area or adjacent areas is prohibited. • The conservation area that was identified in the sensitivity analyses should be fenced as prescribed in the previous section before any other construction on site starts. • The fence should allow for medium sized animals to migrate to and from this area. • The conservation area shall be a strict no-go area for the duration of the construction phase, and no construction worker, vehicle, machinery, dumping, litter, rubble or materials may enter or be stored in this area. 	Contractor, Site worker, ECO, Landscape Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<ul style="list-style-type: none"> • Due to the size of this area one person should be employed to monitor this fence on a weekly basis to ensure that people do not enter, plunder or live in this area. • The species movement corridors that were identified in the sensitivity analysis should be fenced with only specific crossings where final roads for the operational phase would be implemented. No other disturbance of this area should be allowed, except for the implementation of services across this area. These specific areas should be identified and fenced off to ensure that damage to the natural vegetation is limited. • No exotic species may be introduced to the study area, but indigenous and preferably endemic flora should be used for rehabilitation and landscaping. • All invaders still on the site and new shoots should be eradicated as an ongoing process and as an integrated part of this project. 	
<i>Ichneutoma stobbiai</i> habitat	Impact of large-scale site clearance by earth moving equipment	<ul style="list-style-type: none"> • The natural grassland, which is not to be developed, must be fenced off with metal palisade fencing to prevent habitat modification that would kill the grass or modify the top layer of soil. • Within the site, inclusion of a 50m buffer-zone between the development and the fenced-off natural grassland. • No dumping of building and grading material may be allowed within this area. 	Project Manager, Contractor

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		<ul style="list-style-type: none"> • No activity such as temporary housing, temporary ablution, disturbance of the natural habitat, storing of equipment or any other use of the conservation zone whatsoever, may be permitted during the construction phase. • Consequently, fixed construction vehicle roads should be determined to prevent habitat damage to the beetle reserve area. • The contractor must ensure that no fauna species are disturbed, trapped, hunted or killed during the construction phase. • Conservation-orientated clauses must be built into contracts for construction personnel, complete with penalty clauses for non-compliance. • Disturbance caused by human traffic and activities such as off-road vehicles must be kept outside this area. 	
	Destruction of feeding and breeding habitat	<p>It is vital not to destroy the natural grassland. The larvae of <i>Ichneustoma</i> beetles feed under and around the roots of natural veld grasses, and thus if the grassland is destroyed so is their food source. Thus, the conserved natural grassland area and buffer zone is important in the maintenance of a sustainable population.</p>	Project Manager, Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	Destruction or degradation of dispersal area	Buffer zones and corridors with healthy natural grassveld, preferably on softer soils, are necessary. The fences used should be metal palisade that will allow the beetles to fly through the gaps provided between the vertical metal slats making up the palisade fence. Dispersal corridors should be 200 m wide, which allows for a (2 x 50 m = 100 m) buffer zone and 100-metre corridor.	Project Manager, Contractor
	Disruption of migration routes	To maintain healthy populations adequate genetic exchange amongst adjacent sub-populations (e.g. Smuts Koppie) is essential The wide buffer zone and corridor (200 m) should be adequate to allow adult males to move between sites. The 200 m corridor allows for a (2 x 50 m = 100 m) buffer zone and 100-metre	Project Manager, Contractor
	Rehabilitation and landscaping	<ul style="list-style-type: none"> • Rehabilitate disturbed areas immediately after works in that area has been completed. • The landscape plan as designed by the landscape architect should be implemented strictly to the plan. If any deviations from the plan, the ECO and the Landscape architect should be informed. • Aerate compacted soil and check and correct pH for soils affected by construction activities. • All new indigenous trees and shrubs to be planted on the study area, shall be inspected for pests and diseases prior to them being planted. The inspection shall be carried out by the contractor at the property of the supplier. 	Landscape Contractor

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
		<ul style="list-style-type: none"> • All trees to be planted shall be in 20l containers with a height of approximately 1, 8 metres and a main stem diameter of approximately 300mm. • Make sure plant material will be matured enough and hardened to the conditions n site ready for planting. • Water plants immediately as planting proceeds. • Where necessary mulch should be applied to conserve moisture. • Ensure that materials used for mulching and topsoil/ fertilisers are certified weed free. Collect certifications where available. • Implement the landscaping and plant according to the layout and planting techniques specified by the Landscape Architect. • Control weed growth that appears during the construction phase. 	
3. Geology, soils and Topsoil	Topsoil should be stored for later use in landscape and rehabilitation works on site	During the laying of any cables, pipelines or infrastructure (on or adjacent to the site) topsoil shall be kept aside to cover the disturbed areas immediately after such activities are completed. Measures should be taken to ensure that no rocks are placed on top layer.	Contractor
	To ensure stability of structures Sinkholes are a danger due to	Preventative foundation designs shall be done. Detailed foundation inspections should be carried out at the time of construction to identify any variances and adjust foundation designs accordingly if need be.	Engineers, Contractor, Individual Developer

Environmental risk or issue	Objective requirement or	Control measure	Responsibility
	underlying dolomite.	The foundation recommendations from the geotechnical engineers must be adhered to.	
		When the stripping of topsoil takes place, the grass component shall be included in the stripped topsoil. The soil will contain a natural grass seed mixture that may assist in the re-growth of grass once the soil is used for back filling and landscaping.	Contractor
	Topsoil stockpiling	Protect topsoil that has been removed by correct stockpiling practices: <ul style="list-style-type: none"> • Stockpiles should not be higher than 2m. • Stockpiles should be located away from any natural storm water drainage lines. • Stockpile areas should be located out of the way of construction machinery or heavy construction vehicle main circulation ways. • Cover stockpiles and surround downhill sides with a sediment fence to stop materials washing away. 	Contractor
	Erosion prevention	Erosion problems occurring on site should be addressed by implementing measures such as: Hydro seeding, re-vegetation after soils have been stabilized, bunding areas of erosion areas to keep storm water from causing further erosion, installing geo-textiles or even gabions if needed. If the erosion problems persists or reoccur a specialist engineer, landscape architect or environmental consultant should be consulted.	Contractor, Engineer
	Waste management	<ul style="list-style-type: none"> • No waste materials shall at any stage be disposed of in the open veld of adjacent properties. 	Contractor

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
	- To prevent pollution of soils and water.	<ul style="list-style-type: none"> • No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site. • Avoid the cleaning of the site camp or paved surfaces with any soaps that can contaminate the surrounding soils or surface water. • No leaking vehicle shall be allowed on site. Before entering sensitive areas, the vehicles and equipment shall be inspected for leaks by a qualified mechanic/other suitably qualified person. The mechanic of the appointed contractor must supply the environmental officer with a letter of confirmation that the vehicles and equipment are leak proof. 	

6.3 Operational stage

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
SITE CLEAN UP AND PREPARATION FOR USE			
Storm water pollution	Do not allow any materials, rubble or litter to wash into the natural areas.	Clean the entire construction site. Remove erosion and sediment controls only if all bare soil is sealed, covered or re-vegetated. Sweep roadways clean and remove all debris.	Site worker
	Minimise waste	Decontaminate and collect waste in storage area ready for off-site recycling or disposal	Site worker

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		Arrange for final collection and removal of excess and waste materials	Site supervisor
SITE INSPECTION			
Site inspection		Do last inspection on site and sign off that the EMP has been complied with or identify breaches. Submit the final site audit report to the involved authorities.	ECO
		Fences and barriers for any protected area and the conservation area, may only be removed after an inspection and authorization from the ECO.	ECO Contractor
ESTABLISHMENT STAGE			
ESTABLISHING PLANTS <i>Slow or no re-vegetation to stabilise soil; loss or degradation of habitat</i>		Agreed schedule for regular follow-up watering, weed control, mulch supplements and amenity pruning, if needed. Replace all plant failures within three-month period after planting.	Landscape Contractor
MATERIALS FAILURE <i>Structural damage. Loss of site materials.</i>		Inspect all structures monthly to detect any cracking or structural problems. Confirm with designer if there are design problems. Rectify with materials to match, or other agreed solution.	Contractor
DRAINAGE FAILURE <i>On-site drainage pollution or flooding</i>	Stormwater management plan	Inspect all site drainage works and repair any failures. Confirm with designer to correct site problems	Contractor

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
SITE AUDIT Successful project establishment		Routinely audit the works and adjust maintenance schedule accordingly.	Landscape Architect, Contractor
OPERATIONAL PHASE			
General		Open fires and smoking during maintenance works are strictly prohibited.	Contractors
Conservation area		No waste materials shall at any stage be disposed of in adjacent open spaces. Conservation fences shall be kept up until such notice from ECO to remove them.	Contractor, ECO, Landscape Architect
		No exotic flora species may be introduced to the gardens, the natural open space or conservation area at any stage.	Landowner, Maintenance team
		Exotic invaders should be removed from the study area and new seedlings should be eradicated on a regular basis, as an ongoing fight against invasion.	Landowner, Maintenance team
	To ensure the protection of the <i>Ichneustoma stobbiai</i>	<p>During the operation phase the ecological integrity of the conserved grassland must be monitored by an independent party.</p> <ul style="list-style-type: none"> The conserved grassland must be maintained with proper veld management practiced, e.g. burning of the veld should be restricted to every three years and should take place after the first summer rains. However, not immediately after the first heavy down pour as this is when <i>Ichneustoma stobbiai</i> become 	A suitably qualified independent party Landowner, Maintenance team

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		<p>active. Thus, burning must occur after the adults have emerged, mated and disappeared.</p> <ul style="list-style-type: none"> • The discharge of swimming pool water into the grassland is not allowed, as the chemicals contained therein (e.g. chlorine and algaecides) would modify the soil chemistry, having a severe negative effect upon soil living insects, including the various underground stages of <i>Ichnestoma</i> beetles. Additionally, this would also result in the larvae drowning. Swimming pool water should therefore be directed into storm water drains. • No dumping of building rubble or garden refuse (which includes seeds of invasive plants) is allowed within the conservation grassland area. • Information boards should be erected within the development informing residents of the presence of the Red Data beetle species, their identification, conservation status and importance, biology, habitat requirements and the requirements of the management plan. • The owner / managing agent must commit in writing to the long-term implementation of this ecological management plan and it must be annually audited by GDACE. 	

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		<ul style="list-style-type: none"> • Disturbance caused by human traffic and activities such as off-road vehicles must be kept outside this area. • The presence of the <i>Ichnestoma stobbiai</i> beetle should be monitored annually and written into a site report for future reference. 	
	Management plan	<p>A suitably qualified specialist, to ensure that the conservation area and the species movement corridors are managed in a sustainable manner, should compile a maintenance and management plan.</p> <p>The management plan should specify the:</p> <ul style="list-style-type: none"> • Approach statement • methods • actions to be taken • timeframes • monitor systems • responsible parties • communication lines • and remediation methods for incidents or problems that are likely to occur. 	Environmental Consultant
Development of sinkholes due to lack of proper management	Effective management of dolomite risks	<p>1) A Dolomite Risk Management Plan must be established and adhered to at all times.</p> <p>2) The HOA may appoint a Dolomite Risk Manager to implement the plan. Information on risk of doline formation and measures required to be communicated to all residents by the HOA.</p>	Engineer, Contractor, Dolomite Risk manager as appointed by the home owner

Environmental risk or issue	Objective or requirement	Control measure	Responsibility
		<p>3) A Dolomite Risk Management system must be included in the Dolomite Risk Management Strategy of the City of Tshwane Municipality.</p> <p>4) The introduction of a pro-active maintenance strategy for water bearing services and other infrastructure will be required. Such maintenance strategies and precautionary measures should be adhered to reduce the probability of the occurrence of ground movement events.</p> <p>5) The management of run-off water draining across the site is of utmost importance.</p> <p>6) On-going monitoring of groundwater levels on and in the immediate vicinity of the site. The local authority should be responsible for gathering the data and this monitoring process should form part of the Local Authority's Dolomite Risk Management Strategy.</p>	

7.0 Procedures for environmental incidents

7.1 Leakages & spills

- Identify source of problem
- Stop goods leaking, if safe to do so.

- Contain spilt material, using spills kit or sand.
- Notify Environmental Control Officer
- Remove spilt material and place in sealed container for disposal (if possible).
- Environmental Control Officer to follow Incident Management Plan

7.2 Failure of erosion/sediment control devices

- Prevent further escape of sediment.
- Contain escaped material using silt fence, hay bales, pipes, etc.
- Notify ECO.
- Repair or replace failed device as appropriate.
- Dig/scrape up escaped material; take care not to damage vegetation.
- Remove escaped material from site.
- ECO to follow Incident Management plan.
- Monitor for effectiveness until re-establishment.

7.3 Bank/slope failure

Stabilize toe of slope to prevent sediment escape using aggregate bags, silt fence, logs, hay bales, pipes, etc.

- Notify ECO.
- ECO to follow Incident Management plan
- Divert water upslope from failed fence.
- Protect area from further collapse as appropriate.

- Restore as advised by ECO.
- Monitor for effectiveness until stabilized.

7.4 Discovery of rare or endangered species

- Stop work
- Notify ECO
- ECO to follow Incident Management Plan
- If a plant is found, mark location of plants.
- If an animal, mark location where sighted.
- ECO to identify or arrange for identification of species.
- If confirmed significant, ECO to liaise with Endangered Wildlife Trust.
- Recommence work when cleared by ECO.

7.5 Discovery of archeological or heritage items

- Stop work
- Do not further disturb the area.
- Notify ECO
- ECO to follow Incident Management Plan
- ECO to arrange appraisal of specimen
- If confirmed significant, ECO to liaise with National, Cultural and History Museum.

P.O. Box 28088 , SUNNYSIDE 0132

8.0 EMP REVIEW

1. The Environmental Consultants (Bokamoso Landscape Architects and Environmental Consultants) are authorized to change and re-issue this EMP.

The involved authority and contractor are to be informed of any changes made by the Environmental consultants.

2. The Contractor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes before starting any works.
3. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.