ECOLOGICAL BASELINE ASSESSMENT

FOR

PROPOSED SWELLENDAM HOUSING PROJECT (Sites E & H on RE/1 and Site I on RE/157)

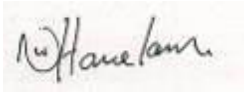
Prepared for: Swellendam Municipality
Private Bag X11
Swellendam
6740
Tel: 028 514 1100
Fax: 028 514 2694
Email: info@swellenmun.co.za

Prepared by: Eco Impact Legal Consulting (Pty) Ltd
P.O. Box 45070
Claremont
South Africa
7735
Tel: 021 671 1660
Fax: 088 021 671 1660
Email: admin@ecoimpact.co.za

Date: May 2018

PROJECT DETAILS

eco impact Environmental Health & Safety Legal Consulting	**Title**: Ecological Baseline Assessment for Proposed Swellendam Housing Project (Sites E & H on RE/1 and Site I on RE/157)	
Eco Impact No: 01/07/2016/2018	**Date:** May 2018	**Report Status:** Final
Carried Out By: Eco Impact Legal Consulting (Pty) Ltd P.O. Box 45070 Claremont 7735 Tel: 021 671 1660 Fax: 088 021 671 1660 Email: admin@ecoimpact.co.za	**Commissioned By:** ASLA Devco Mr David Douglas P.O. Box 118 Gordons Bay 7151 Tel: 021 845 8335 Fax: 021 845 8552 E-mail: david@asla.co.za	**Client:** Swellendam Municipality Private Bag X11 Swellendam 6740 Tel: 028 514 1100 Fax: 028 514 2694 E-mail: info@swellenmun.co.za
Authors: Johmandie Pienaar (Giliomee) Environmental Assessment Practitioner **and** Nicolaas Hanekom Pri.Sci.Nat (Ecological Science) No 400274/11	**Client Contact Person:** David Douglas (see contact details above)	

Verification	Capacity	Name	Signature	Date
By Author	Senior EAP & Biodiversity Specialist	Johmandie Pienaar (Giliomee)		22 May 2018
By Author and Reviewed	Director: Environmental Management; Principle EAP & Biodiversity Specialist	Nicolaas Hanekom		22 May 2018

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Executive Summary

Swellendam Municipality is in the process of identifying suitable development areas for required low income housing projects as per the municipal spatial development framework objectives.

Eco Impact has been appointed to conduct an ecological baseline assessment to determine the suitability of the identified location/site alternatives as provided by the municipality and the potential impact of the proposed activities on ecological features of the identified sites.

Three potential site alternatives were surveyed for this assessment:

- Site E (Remaining Extent of Erf 1) total area surveyed ± 20 ha
- Site H (Remaining Extent of Erf 1) total area surveyed ± 50 ha
- Site I (Remaining Extent of Erf 157) total area surveyed ± 8ha

As according to Mucina and Rutherford (2006) the types of natural vegetation originally occurring on all three sites as surveyed are classified as Swellendam Silcrete Fynbos (*Endangered*) and on Site I also Cape Lowland Alluvial Vegetation (*Critically Endangered*) as part of the Fynbos biome.

Site E is a small hill/koppie with steep gradients southeast of the primary school and residential areas of Swellendam South. Previous and ongoing impacts leading to degradation of indigenous vegetation and transformation of the site are the establishment of the water reservoirs and associated pipelines, informal gravel roads and footpaths also leading to alien vegetation encroachment etc. The size of the transformed areas and areas significantly encroached with alien vegetation species such as especially *Acacia saligna* and *Acacia mearnsii* is ± 2.5ha in total. The overall area of the ±20ha site as surveyed is characterised with indigenous vegetation in a moderate to good condition with high conservation value and high botanical sensitivity.

According to the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) the majority of the site has been identified as a Critical Biodiversity Area 2 ("CBA2"). CBA2 is defined as areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. From the survey conducted this specialist believes the CBA status of this area has not been be correctly ground-truthed and has indicated their observations on Map 4 of this report.

Site H is an undulating area in-between the residential area and the railway line of Swellendam South. At least ±42ha of the ±50ha area surveyed have been completely transformed presumably by previous cultivation activities that took place on the site (exact date of when the area was last ploughed and cultivated is unknown). Little to mainly no indigenous vegetation species have returned to this 42ha transformed area and this area therefore has low conservation value and low botanical sensitivity. The ± 8ha area which seems not to have been ploughed continuously or not at all in some sections still contains indigenous vegetation in a moderate to good condition, but due to isolated nature of the remnant and low ecological connectivity value it therefore has a medium conservation value and medium botanical sensitivity. No evidence of surface water or aquatic vegetation species indicating the presence of a wetland area is present on the site.

According to the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) approximately 19 ha is

classified as Critical Biodiversity Area 2 (“CBA2”) while approximately 31ha is classified as Ecological Support Areas. ESA are defined as areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.From the survey conducted this specialist believes the CBA status of this area has not been be ground-truthed and has indicated their observations on Map 5 of this report.

Site I is a flat lying area in-between the residential area and the railway adjacent to the national N2 road of Swellendam south. The ± 8ha area surveyed has been completely transformed presumably by previous land clearing which took place for cultivation and urban developments. As can be seen from the site photos taken during the survey the site is dominated by grass and weed species usually associated with transformed cultivated or cleared land. Exact date of when the area was cleared for cultivation and/or urban development is unknown, but little to mainly no indigenous vegetation species were found on site during the survey which indicates that natural rehabilitation has not and will not occur if the site is left as is. The species present include typical widespread agricultural weeds and grasses, and a few indigenous resilient herbs and grasses. No remaining indigenous vegetation species associated with Cape Lowland Alluvial Vegetation were recorded on site and no other indigenous vegetation species of conservation concern. The site is also surrounded with urban development to the north and west and is not connected with any remaining natural indigenous vegetation areas; ongoing maintenance of firebreaks, roads and stormwater infrastructure; illegal waste dumping; livestock grazing and old building foundations further add to the degraded and transformed state of the site and the surveyed site therefore has a low ecological connectivity value and low botanical sensitivity all concluding to a very low conservation value.

According to the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) approximately 4 ha is classified as Critical Biodiversity Area 2 (“CBA2”) while approximately 4ha is classified as Ecological Support Areas. The western half of the site has partially been identified as a Critical Biodiversity Area (“CBA”) due to the potential presence of critically endangered terrestrial indigenous vegetating habitat (Cape Lowland Alluvial Vegetation). ESA are defined as areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services. From the survey conducted this specialist believes the CBA status of this area has not been be ground-truthed and has indicated their observations on Map 6 of this report.

The areas most suitable/recommended for housing developments in terms of avoiding ecological sensitive areas as far as possible are indicated on Maps 4, 5 and 6 of this report. There are no sensitive environmental features found on the transformed Low Botanical Sensitivity Cultivated Area of ±42ha as present on Site H nor on the Low Botanical Sensitivity Transformed Area of ±8ha as present on Site I, therefore these areas are recommended as suitable for consideration by the municipality for the proposed housing development.

It was concluded that the proposed development will not have a significant negative environmental impact on the environment if specialist recommendations are taken into consideration and effectively implemented.

1. Background & Competency

This ecological baseline assessment is presented by Eco Impact Legal Consulting (Pty) Ltd ("Eco Impact").

Eco Impact has been appointed as the independent ecological impact assessment specialist for this project.

Eco Impact is independent and does not have any interest in the business nor receive any payment other than fair remuneration for services rendered as required in terms of the regulations.

Johmandie Pienaar (Giliomee) of Eco Impact holds a Baccalaureus Technologiae Degree (cum laude) in Nature Conservation from the Cape Peninsula University of Technology (2008).

She has completed the following short courses at the Centre for Environmental Management;

- Implementing Environmental Management Systems (ISO 14001) (2009);
- Occupational Health and Safety Law for Managers (2010);
- Implementing an OHS Management System based on OHSAS 18001 (2010)
- Occupational Health and Safety Management System OHSAS 18001 Audit: A Lead Auditor Course Based on ISO 19011 and ISO 17021 (2011).

Johmandie has trained as an Environmental Assessment Practitioner since March 2009 and has been involved in the compilation, coordination and management of Basic Assessment Reports, Environmental Impact Assessments, Environmental Management Programmes, Waste Licence Applications, Water Use Licence Applications, Rehabilitation Plans and Baseline Biodiversity and Freshwater Ecosystems Surveys for numerous clients.

Nicolaas Hanekom has 26 years' experience working as an ecologist for nature conservation organizations. He has extensive field experience and botanical knowledge, some knowledge of wetlands ecology, is knowledgeable of the region in which they are working and exercises sound and unbiased scientific and professional judgment. He is a qualified Environmental Assessment Practitioner and a registered Professional Natural Scientist (Ecologist) with the SACNASP who holds a M. Tech, Nature Conservation from the Cape Peninsula University of Technology. This master's thesis focussed on the impact of different land uses on the Phytodiversity ("Botany/ plants") of the West Coast Strandveld in and around Rocherpan Nature Reserve.

Hanekom further qualified in Environmental Management Systems ISO 14001:2004, at the Centre for Environmental Management, North-West University, as well as Environmental Management Systems ISO 14001:2004 Audit: Internal Auditors Course to ISO 19011:2011 level, from the Centre for Environmental Management, North-West University qualifying him to audit to ISO/SANS environmental compliance and EMS standards.

He has also completed the suite of Greener Governance courses with certificates in:

- An Overview of Environmental Management at the Local Government Level, Centre for Environmental Management, North-West University;

- Greener Governance for Local Authorities, Centre for Environmental Management, North-West University;
- Tools for Integrated Environmental Management and Governance, Centre for Environmental Management, North-West University.

Hanekom attended and obtained a certificate on Integrated Protected Area Planning at the Centre for Environmental Development, University of KwaZulu Natal and a certificate in Project Management (Theory and Practical), through CS Holdings. He has lectured in two subjects at the Cape Peninsula University of Technology. He has 14 years of environmental planning experience, working for Free State and Western Cape departments of environmental affairs, where he reviewed and commented on development (EIA) applications in the West Coast region.

Hanekom has been responsible for many environmental impact assessments and several EIA applications, waste license and atmospheric emission license applications as well as being involved in the implementation of several environmental management systems.

2. Conditions Relating to this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. Eco Impact and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, as pertaining to this investigation.

This report may not be altered or added to without the prior written consent of the author. This restraint also refers to electronic copies of this report which are supplied as sub portion of other reports, including main reports. Similarly, any recommendations, statements, or conclusions drawn from or based on this report must specifically refer to this report. If such comments form part of a main report for this investigation, the base line report must be included in its entirety as an appendix or separate section to the main report.

3. Scope and Terms of Reference for the Study

ASLA Devco on behalf of Swellendam Municipality appointed Eco Impact Legal Consulting (Pty) Ltd to conduct an ecological baseline assessment to determine the most suitable areas for the proposed housing development and significance of potential impacts that proposed activities may have on the biodiversity and freshwater ecosystems of the applicable site and surrounds.

The basic terms of reference (TOR) for this study were the Cape Nature recommended TOR for biodiversity specialists, and are as follows:

- Produce a baseline analysis of the botanical attributes of the study area as a whole.

- This report should clearly indicate any constraints that would need to be taken into account in considering the development proposals further.

- The baseline report must include a map of the identified sensitive areas as well as indications of important constraints on the property. It must also:

- Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering viability etc.

- In terms of biodiversity pattern, identify or describe:

  Community and ecosystem level
  - The main vegetation type, its aerial extent and interaction with neighbouring types, soil or topography;
  - The types of plant communities that occur in the vicinity of the site
  - Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, etc.*)

  Species level
  - Red Data Book species of conservation concern (RDBSCC) - (provide location)
  - The viability of and estimated population size of the RDBSCC that are present (include degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High = 70-100% confident, Medium 40-70% confident, Low 0-40% confident)
  - The likelihood of other RDBSCC species occurring within the vicinity (include degree of confidence)

  Other pattern issues
  - Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
  - The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying
  - The condition of the site in terms of current or previous land uses

- In terms of biodiversity process, identify or describe:
  - The key ecological “drivers” of ecosystems on the site and in the vicinity, such as fire.
  - Any mapped spatial component of an ecological process that may occur at the site or in the vicinity i.e. watercourses, biome boundaries, migration routes etc.
  - Any possible changes in key processes e.g. increase fire frequency or drainage/artificial recharge of aquatic systems.

- Describe what is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, landscape, and regional scales.

- Recommend actions that should be taken to prevent or mitigate impacts. Indicated how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.

- Indicate limitations and assumptions, particularly in relation to seasonality.

4. Limitations, Assumptions and Methodology

The sites were surveyed during the afternoons of 13 October 2015 and 18 July 2016. This report has subsequently been updated in accordance with the Western Cape Biodiversity Spatial Plan 2017.

Three potential development sites were surveyed with a total combined area of approximately 78ha including an overview of adjacent environmental features.

The natural vegetation areas and any other prominent environmental features on the sites such as watercourses i.e. wetlands, drainage lines etc. if present were delineated and prominent indigenous and alien invasive species were recorded.

Characteristic plant species (if present on the proposed development site) were recorded during the survey as well as any rare, threatened or species of conservation concern or habitats. The South African National Biodiversity Institute (SANBI) vegetation map for South Africa (Mucina and Rutherford 2006) and the Western Cape Biodiversity Spatial Plan was consulted, along with the available regional conservation plans (CAPE), and the National Spatial Biodiversity Assessment (NSBA; Rouget *et al* 2004), and a conclusion was drawn based on this documentation and professional experience in the area. SANBI – Red List of South African Plants website was also referred to if required.

One of the primary assumptions of this study is that sufficient botanical and ecosystem characteristics information could be gathered during the visit to make accurate conclusions regarding the conservation value of the area and potential impact of the development as proposed. Habitats (type, quality, rarity, characteristics) rather than species are used to inform mapping and decision making in this case.

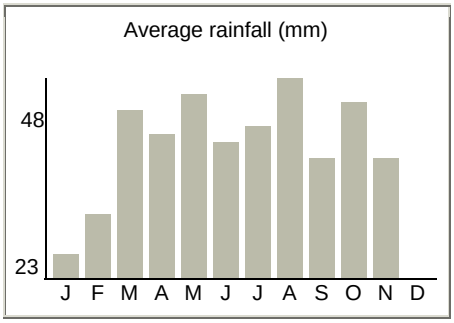
5. Broad Ecological Characteristics of the Site and Surrounds

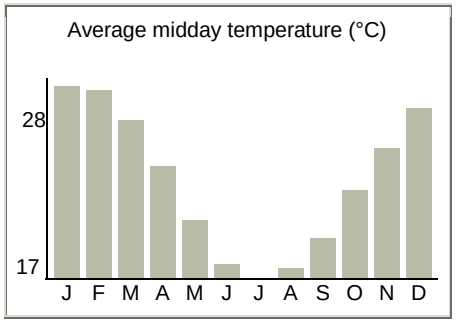
5.1 Topography

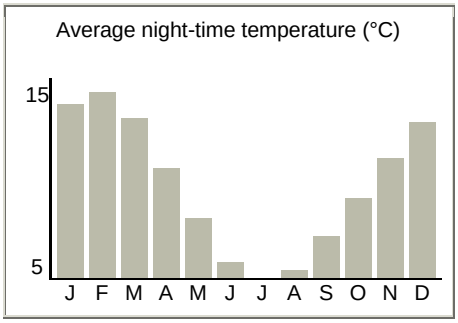
The area is characterised by an undulating landscape with associated moderate to steep slopes, a transformed and degraded non-perennial drainage lines is present within the gorge that separates Site E and Site H. Site I is located on a relatively flat area with the transformed and degraded non-perennial drainage line running along the eastern border in-between Site I and Site H.

5.2 Climate

Swellendam normally receives about 462mm of rain per year, with rainfall occurring throughout the year. The chart below (lower left) shows the average rainfall values for Swellendam per month. It receives the lowest rainfall (23mm) in December and the highest (48mm) in August. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Swellendam range from 17.1°C in July to 27.5°C in January. The region is the coldest during July when the mercury drops to 5°C on average during the night. Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures.







5.3 Geology

The sites are underlain by geological formations derived from the Table Mountain group. A prominent geological feature associated with the study area is the occurrence of Silcrete which is an ancient sedimentary rock that has almost entirely eroded during the course of time. It is however a prominent feature of hilltops and undulating plains on the South Coast especially around Swellendam. It is readily identified by the cobbles and pebbles of fine textured rock and also the neutral fine-grained substrate that is usually orange-red or even pinkish.

5.4 Vegetation at a Regional and National Context

The study area is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012). The GCFR is one of only six Floristic Regions in the world and is the only one largely confined to a single country (the Succulent Karoo component extends into southern Namibia). It is also by far the smallest floristic region, occupying only 0.2% of the world's land surface, and supporting about 11500 plant species, over half of all the plant species in South Africa (on 12% of the land area). At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Many of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the nationwide plant Red Listing project indicate that 67% of the threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* 2009)! It should thus be clear that the southwestern Cape is a major national and global conservation priority and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The study area lies within the Southern Fynbos bioregion (Mucina & Rutherford 2006). This bioregion has high numbers of plant Species of Conservation Concern, with the main pressures being extensive habitat loss, due mainly to agriculture, followed by alien invasive vegetation, quarrying and urbanisation, and habitat modification due to lack of appropriate fire regimes. The Western Cape Biodiversity Spatial Plan indicates the ESA's and CBA's as mapped for the relevant areas is shown in Map 3. The primary reason for selection of these areas as a CBA is that it helps meet the national conservation target for this threatened vegetation type, and ancillary reasons are that it offers opportunities for continuation of ecological connectivity.

See study area maps in Appendix E and site photographs attached as Appendix D.

6. Observations and Findings Relative to the Terms of Reference

6.1 In terms of biodiversity pattern, identify or describe, at a community and ecosystem level-

6.1.1 The main vegetation type and plant communities that occur on, and in the vicinity of the site:

As according to Mucina and Rutherford (2006) the type of natural vegetation originally occurring on all three sites as surveyed are classified as Swellendam Silcrete Fynbos (*Endangered*) and on Site I also Cape Lowland Alluvial Vegetation (*Critically Endangered*) as part of the Fynbos biome.

Vegetation Type *: Swellendam Silcrete Fynbos (FFc 1)*
Reference number: FFc 1
Ecosystem threat status: Endangered (En)
Listed under criterion: Biome: Fynbos
Province: Western Cape
Municipalities:
Swellendam (WC034)
Hessequa (WC042)
Mossel Bay (WC043)
Original area of ecosystem: 87000 ha
Remaining natural area of ecosystem (%): 49%
Proportion of ecosystem protected: 4% of original area
Known **of species of special concern:** 23 Red Data plant species (EX, EN, CR, EN & VU excl VU D2) and 14 endemic plant species

Geographical location:
Relatively large patches on southern foothills of the Langeberg from around Swellendam to north of Dekriet/Soutpan (between Riversdale and Albertinia), becoming highly fragmented between Albertinia and the southern side of Robinson Pass to around Molenrivier (north of Klein-Brak River).

Description:
Mainly undulating hills on the coastal forelands, the remains of the old African surface. Structurally it is a medium tall evergreen shrubland or grassland. Predominantly asteraceous fynbos, but graminoid fynbos on summits and northern slopes where disturbed. Proteoid fynbos occurs on southern slopes and ericaceous fynbos is found in wetter habitats. Afrotemperate forest occurs in fire-safe alluvial areas, such as along perennial rivers. It is uncertain whether proteoid fynbos, renosterveld or thicket was the dominant type in some of the eastern plateaus; it has all been converted to pasture. At least 14 endemic plant species and 23 Red Data List plant species occur in the ecosystem.

Notes:
Approximately 4% of the ecosystem is protected in the Bontebok National Park and small patches are also found in Langeberg-oos (mountain catchment area).

Vegetation Type *: Cape Lowland Alluvial Vegetation (Aza 2)*
Reference number: Aza 2
Ecosystem threat status: Critically Endangered (CR)
Listed under criterion: A1
Biome: Azonal
Province: Western Cape
Municipalities:
Breede River/Winelands LM
Theewaterskloof LM
Swellendam LM
Hessequa LM
Mossel Bay LM
George LM
Plettenberg Bay LM
Original area of ecosystem: 36 000 ha
Remaining natural area of ecosystem (%): 33%
Proportion of ecosystem protected: 1% of original area
Known **of species of special concern:** 10 Red Listed plant species (EX, EW, CR, EN & VU excl VU D2)

Geographical location:
Vegetation of broad alluvia of middle and lower stretches of rivers of the Western Cape such as the upper Olifants, Berg, Eerste, Laurens, Palmiet, Bot, Klein, Breede, Goekoe, Gouritz, Hartebeeskuil, Klein Brak, Groot Brak, Keurbooms and a number of small tributaries of the above-mentioned water course.

Other information:
Approximately 1% of the ecosystem is protected in the Bontebok National Park, Verlorenvlei (a Ramsar site), Broomvlei and Marloth Nature Reserves or privately protected in Wadrif.

Observations and Findings:

Site E - Previous and ongoing impacts leading to degradation of indigenous vegetation and transformation of the site are the establishment of the water reservoirs and associated pipelines, informal gravel roads and footpaths also leading to alien vegetation encroachment etc. The size of the transformed areas and areas significantly encroached with alien vegetation species such as especially *Acacia saligna* and *Acacia mearnsii* is ± 2.5ha in total. The overall area of the ±20ha site as surveyed is characterised with indigenous vegetation in a moderate to good condition with high diversity and therefore a high conservation value and high botanical sensitivity.

Site H - At least ±42ha of the ±50ha area surveyed have been completely transformed presumably by previous cultivation activities that took place on the site (exact date of when the area was last ploughed and cultivated is unknown) and supports no intact natural habitat, and very low to mainly non-existent indigenous plant diversity. The species present include typical widespread agricultural weeds and grasses, and a few indigenous resilient herbs and grasses. Little to mainly no

indigenous vegetation species have returned to this 42ha transformed area and this area therefore has low conservation value and low botanical sensitivity. The ± 8ha area which seems not to have been ploughed continuously or not at all in some sections still contains a high diversity of indigenous vegetation in a moderate to good condition, but due to isolated nature of the remnant and low ecological connectivity value it therefore has a medium conservation value and medium botanical sensitivity.

Site I – The ± 8ha area surveyed has been completely transformed presumably by previous land clearing which took place for cultivation and urban developments. As can be seen from the site photos taken during the survey the site is dominated by grass and weed species usually associated with transformed cultivated or cleared land. Exact date of when the area was cleared for cultivation and/or urban development is unknown, but little to mainly no indigenous vegetation species were found on site during the survey which indicates that natural rehabilitation has not and will not occur if the site is left as is. No remaining indigenous vegetation species associated with Cape Lowland Alluvial Vegetation were recorded on site and also no other indigenous vegetation species of conservation concern. The site is also surrounded with urban development to the north and west and is not connected with any remaining natural indigenous vegetation areas; ongoing maintenance of firebreaks, roads and stormwater infrastructure; illegal waste dumping; livestock grazing and old building foundations further add to the degraded and transformed state of the site and the surveyed site therefore has a low ecological connectivity value and low botanical sensitivity all concluding to a very low conservation value.

6.1.2 Threatened or vulnerable ecosystems:

Refer to 6.1.1 above for description of threatened and/or vulnerable ecosystems as found on the surveyed areas.

6.1.3 The types of animal communities (fish, invertebrates, avifauna, mammals, reptiles):

Fish

No fish species are present on the site or within close proximity to the site. The freshwater ecosystems within the area are mainly secondary drainage lines and small man-made dams with non-perennial characteristics.

Invertebrates

Observations and Findings:

It is expected that the area has a rich and diverse invertebrate life especially within the remaining indigenous vegetation areas. The proposed development, if restricted to recommended development areas, will not have significant detrimental impact on invertebrate species within the sensitive indigenous vegetation areas.

Birds (Avifauna)

Approximately 164 species are known to occur in the bigger area (Hockey et al 2006).

Observations and Findings:

If recommendations as provided in this report are adhered to it is not expected that the proposed development will have a significant detrimental impact on any bird species of conservation concern or their habitat due to extensive undeveloped areas that will remain adjacent to proposed development areas and the already transformed and degraded nature of the areas recommended for development.

Mammals

As reported in Smithers (1983) small buck e.g. common duiker, steenbok and grysbok, bushbuck, rodents such as mole rats, field mice and hares, as well as carnivores such as genets, mongoose and caracal are likely to inhabit the area.

Some 70 mammal species are known to occur in the bigger area (Smithers 1983).

Observations and Findings:

If recommendations as provided in this report are adhered to it is not expected that the proposed development will have a significant detrimental impact on any mammal species of conservation concern or their habitat due to extensive undeveloped areas that will remain adjacent to proposed development areas and the already transformed and degraded nature areas recommended for development.

Amphibians and Reptiles (Herpetofauna)

With respect to amphibians, Minter et al (2004) state that “habitat loss or modification as a result of agriculture and other forms of human activity remains the most important single threat to the survival of amphibian populations. The scale of these changes and their relative permanence are the major cause. At greatest risk are species that have limited distributions.”

As reported in Alexander et al (2007) 26 reptile species are likely to inhabit the area.

Observations and Findings:

It is not expected that the proposed development will have significant detrimental impact on reptiles or amphibians or their associated habitats. Potential reptile or amphibian habitats are mostly restricted to the indigenous vegetation areas in a moderate to good condition, man-made dams and non-perennial drainage lines adjacent to the site not to be impacted upon by the proposed development if specialist recommendations are adhered to.

6.2 In terms of biodiversity pattern, identify or describe, at species level-

(Show the degree of confidence in predictions based on the availability of information and specialist knowledge, i.e. High 70 -100% confident, Medium 40 - 70% confident, Low 0 - 40% confident. Assess the likelihood of other RDB species, or species of conservation concern, occurring in the vicinity. Reflect this in degree of confidence indicator).

6.2.1 The viability of, and estimated population size of the TOPS and RDB species of conservation concern that are present.

Red Data Listed or species listed under TOPS regulation (Vegetation)

As according to Mucina and Rutherford (2006) the type of natural vegetation originally occurring on all three sites as surveyed are classified as Swellendam Silcrete Fynbos (*Endangered*) and on Site I also Cape Lowland Alluvial Vegetation (*Critically Endangered*) as part of the Fynbos biome.

Observations and Findings:

Some of the prominent indigenous vegetation species recorded on Sites E and H within medium to high sensitivity botanical areas and surrounds are:

- *Disa bracteata (Monadenia bracteata)*
- *Metalasia muricata*
- *Leonotis leonurus*
- *Elytropappus rhinocerotis*
- *Ornithogalum thyrsoides*
- *Cysticapnos sp.*
- *Helichrysum pandurifolium*
- *Pelargonium sp.*
- *Ursinia sp.*
- *Oedera sp.*
- *Protea repens*
- *Bobartia orientalis*
- *Lanaria lanata*
- *Anthanasia trifurcata*

No remaining indigenous vegetation species associated with Cape Lowland Alluvial Vegetation were recorded on site I and also no other indigenous vegetation species of conservation concern.

No species of conservation concern was recorded during the survey. The survey focussed on recording overall sensitive habitats and significant ecological features (type, quality, rarity, characteristics) rather than species; and overall habitat condition and diversity were used to inform mapping and decision making in this case.

Red Data Listed or species listed under TOPS regulation (Reptiles and Amphibians)

Observation and Findings:

(High 90% confident):
No Red Data Listed amphibian or reptile species are known to occur on proposed development sites. No rare and localized species were recorded at the time of the survey.

Red Data Listed or species listed under TOPS regulation (Mammals)

The following table lists the Red Data mammal species (including their status) which are predicted, or confirmed to occur in the general area and possibly within the study area (Friedman & Daly, 2004):

RED DATA MAMMAL SPECIES				
	COMMON NAME	**SCIENTIFIC NAME**	**RED DATA CATEGORY**	**PREDICTED OCCURENCE**
1	Lesueur's Wing-gland Bat	Cistugo lesueuri	Near threatened	Unlikely
2	Long-tailed Serotine Bat	*Eptesicus hottentotus*	Least Concern	Unlikely
3	Schreibers' Long-fingered Bat	*Miniopterus schreibersii*	Near Threatened	Unlikely
4	Temminck's Hairy Bat	*Myotis tricolor*	Near Threatened	Unlikely
5	Cape Serotine Bat	*Neoromicia capensis*	Least Concern	Possible
6	Egyptian Split Faced Bat	*Nycteris thebaica*	Near threatened	Possible
7	Cape horseshoe bat	*Rhinolophus capensis*	Near threatened	Possible
8	Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Near threatened	Possible
9	Egyptian Fruit Bat	*Rousettus aegyptiacus*	Least Concern	Possible
10	Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	Least Concern	Possible
11	Rock Hyrax	*Procavia capensis*	Least Concern	Unlikely
12	Cape Clawless Otter	*Aonyx capensis*	Least Concern	Unlikely
13	Water Mongoose	*Atilax paludinosus*	Least Concern	Possible
14	Black-backed Jackal	*Canis mesomelas*	Least Concern	Unlikely
15	Caracal	*Caracal caracal*	Least Concern	Likely
16	Yellow Mongoose	*Cynictis penicillata*	Least Concern	Possible
17	African Wild Cat	*Felis silvestris*	Least Concern	Unlikely
18	Small Grey Mongoose	*Galerella pulverulenta*	Least Concern	Possible
19	Small-spotted Genet	*Genetta genetta*	Least Concern	Unlikely
20	Large-spotted Genet	*Genetta tigrina*	Least Concern	Unlikely
21	Large Grey Mongoose	*Herpestes ichneumon*	Least Concern	Possible
22	Striped Polecat	*Ictonyx striatus*	Least Concern	Unlikely
23	Honey badger	*Mellivora capensis*	Near threatened	Unlikely
24	Bat-eared Fox	*Otocyon megalotis*	Least Concern	Likely
25	Leopard	*Panthera pardus*	Least Concern	Unlikely
26	African Weasel	*Poecilogale albinucha*	Data deficient	Unlikely
27	Aardwolf	*Proteles cristatus*	Least Concern	Unlikely

28	Cape Fox	*Vulpes chama*	Least Concern	Unlikely
29	Red Hartebeest	*Alcelaphus buselaphus*	Least Concern	Unlikely
30	Springbok	*Antidorcas marsupialis*	Least Concern	Unlikely
31	Klipspringer	*Oreotragus oreotragus*	Least Concern	Unlikely
32	Grey Rhebok	*Palea capreolus*	Least Concern	Unlikely
33	Steenbok	*Raphicerus campestris*	Least Concern	Likely
34	Cape Grysbok	*Raphicerus melanotis*	Least Concern	Unlikely
35	Common Duiker	*Sylvicapra grimmia*	Least Concern	Possible
36	Eland	*Taurotragus oryx*	Least Concern	Unlikely
37	Bushbuck	*Tragelaphus scriptus*	Least Concern	Unlikely
38	Fynbos golden mole	*Amblysomus corriae*	Near threatened	Possible
39	Cape golden mole	*Chrysochloris asiatica*	Data deficient	Possible
40	Reddish-grey Musk Shrew	*Crocidura cyanea*	Data Deficient	Unlikely
41	Greater Musk Shrew	*Crocidura flavescens*	Data Deficient	Unlikely
42	Forest shrew	*Myosorex varius*	Data deficient	Unlikely
43	Lesser Dwarf Shrew	*Suncus varilla*	Data Deficient	Unlikely
44	Cape Hare	*Lepus capensis*	Least Concern	Likely
45	Scrub Hare	*Lepus saxatilis*	Least Concern	Possible
46	Chacma Baboon	*Papio ursinus*	Least Concern	Possible
47	Cape Spiny Mouse	*Acomys subspinosus*	Least Threatened	Possible
48	Namaqua Rock Mouse	*Aethomys namaquensis*	Least Threatened	Unlikely
49	Cape Dune Mole Rat	*Bathyergus suillus*	Least Concern	Possible
50	Common Mole Rat	*Cryptomys hottentotus*	Least Concern	Possible
51	Grey Climbing Mouse	*Dendromus melanotis*	Least Concern	Possible
52	Brant’s Climbing Mouse	*Dendromus mesomelas*	Least Concern	Unlikely
53	Short-tailed Gerbil	*Desmodillus auricularis*	Least Concern	Possible
54	Cape Mole Rat	*Georychus capensis*	Least Concern	Unlikely
55	Hairy Footed Gerbil	*Gerbillurus paeba*	Least Concern	Possible
56	Spectacled Dormouse	*Graphiurus ocularis*	Least Concern	Possible
57	Porcupine	*Hystrix africaeaustralis*	Least Concern	Likely
58	Pygmy Mouse	*Mus minutoides*	Least Concern	Unlikely
59	Verreaux's Mouse	*Myomyscus verreauxi*	Least Concern	Unlikely
60	White-Tailed Rat	*Mystromys albicaudatus*	Endangered	Unlikely
61	Vlei Rat	*Otomys irroratus*	Least Concern	Unlikely
62	Laminate Vlei Rat	*Otomys laminatus*	Least Concern	Unlikely
63	Saunders Vlei Rat	*Otomys saundersiae*	Least Concern	Unlikely
64	Karoo Bush Rat	*Otomys unisulcatus*	Least Concern	Unlikely
65	Striped Mouse	*Rhabdomys pumilio*	Least Concern	Likely
66	Pouched Mouse	*Saccostomus campestris*	Least Concern	Unlikely
67	Kreb’s Fat Mouse	*Steatomys krebsii*	Least Concern	Possible
68	Cape Gerbil	*Tatera afra*	Least Concern	Possible
69	Cape Rock Elephant-shrew	*Elephantulus edwardii*	Least Concern	Unlikely
70	Aardvark	*Orycteropus afer*	Least Concern	Unlikely

Observations and Findings:

(High 90% confident): No rare mammal species as listed were observed during the site survey.

Red Data Listed or species listed under TOPS regulation (Avifauna)

The only avifauna species of special significance likely to occur within the vicinity of the site are:

- Giant Eagle Owl *Bubo lacteus* (vulnerable and vagrant species)
- Stanley's Bustard *Neotis denhami* (Vulnerable)
- Blue Crane *Anthropoides paradiscus* (Vulnerable)
- Chestnut Banded Plover *Charadrius pallidus* (Near Threatened)
- Cape Vulture *Gyps coprotheres* (vulnerable)
- African Marsh Harrier *Circus ranivorus* (Vulnerable)
- Black Harrier *Circus maurus* (Near Threatened)
- Martial Eagle *Polemaetus bellicosus* (Vulnerable)
- Lesser Kestrel *Falco naumanni* (Vulnerable)
- Lanner Falcon *Falco biarmicus* (Near Threatened)
- Peregrine falcon *Falco peregrinus* (Near Threatened)
- African Fish Eagle *Haliaeetus vocifer* (Vulnerable)
- Denham's Bustard *Neotis denhami* (Vulnerable)
- Greater Flamingo *Phoenicopterus ruber* (Near Threatened)
- Lesser Flamingo *Phoenicopterus minor* (Near Threatened)

(Barnes 2000)

Observations and Findings:

(High 80% confident): None of the above species were observed on or near site during the survey and are more likely to occasionally visit the site and do not breed there.

6.3 Other pattern issues-

Any significant landscape features or rare or important vegetation/faunal associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity:

A secondary non-perennial drainage line is present in-between Site E and Site H; and Site I and Site H. It is recommended that the proposed housing development be placed outside of the 1:100 year floodline area in line with adjacent residential current development boarders.

No evidence of surface water nor associated aquatic vegetation species indicating the presence of a wetland area is present on the sites.

6.4 The extent of alien plant cover on the site:

Site E- The size of the transformed areas and areas significantly encroached with alien vegetation species such as especially *Acacia saligna* and *Acacia mearnsii* is ± 2.5ha in

total. The overall area of the ±20ha site as surveyed is characterised with indigenous vegetation in a moderate to good condition with high conservation value and high botanical sensitivity.

Site H- At least ±42ha of the ±50ha area surveyed have been completely transformed presumably by previous cultivation activities that took place on the site (exact date of when the area was last ploughed and cultivated is unknown) and supports no intact natural habitat, and very low to mainly non-existent indigenous plant diversity. The species present include typical widespread agricultural weeds and grasses, and a few indigenous resilient herbs and grasses. Little to mainly no indigenous vegetation species have returned to this 42ha transformed area and this area therefore has low conservation value and low botanical sensitivity. No alien tree infestation is present on the site.

Site I – The 8ha site as surveyed has been completely transformed presumably by previous land clearing which took place for cultivation and urban developments. As can be seen from the site photos taken during the survey the site is dominated by grass and weed species usually associated with transformed cultivated or cleared land and supports no intact natural habitat, and very low to mainly non-existent indigenous plant species diversity. The species present include typical widespread agricultural weeds and grasses, and a few indigenous resilient herbs and grasses. No remaining indigenous vegetation species associated with Cape Lowland Alluvial Vegetation were recorded on site and also no other indigenous vegetation species of conservation concern. The site is also surrounded with urban development to the north and west and is not connected with any remaining natural indigenous vegetation areas; ongoing maintenance of firebreaks, roads and stormwater infrastructure; illegal waste dumping; livestock grazing and old building foundations further add to the degraded and transformed state of the site and the surveyed site therefore has a low ecological connectivity value and low botanical sensitivity all concluding to a very low conservation value. Alien tree infestation is present on the site and concentrated mainly along the edges of the site, alien tree species present include *Acacia saligna*, *Acacia mearnsii* and *Eucalyptus* trees.

6.5 The condition of the site/s in terms of current or previous land uses:

Site E – Previous and ongoing impacts leading to degradation of indigenous vegetation and transformation of the site are the establishment of the water reservoirs and associated pipelines, informal gravel roads and footpaths also leading to alien vegetation encroachment etc. The size of the transformed areas and areas significantly encroached with alien vegetation species such as especially *Acacia saligna* and *Acacia mearnsii* is ± 2.5ha in total. The overall area of the ±20ha site as surveyed is characterised with indigenous vegetation in a moderate to good condition with high conservation value and high botanical sensitivity.

Site H - At least ±42ha of the ±50ha area surveyed have been completely transformed presumably by previous cultivation activities that took place on the site (exact date of when the area was last ploughed and cultivated is unknown). Little to mainly no indigenous vegetation species have returned to this 42ha transformed area and this area therefore has low conservation value and low botanical sensitivity. The ± 8ha area which seems not to have been ploughed continuously or not at all in some sections still

contains indigenous vegetation in a moderate to good condition, but due to isolated nature of the remnant and low ecological connectivity value it therefore has a medium conservation value and medium botanical sensitivity.

Site I - The 8ha site as surveyed has been completely transformed presumably by previous land clearing which took place for cultivation and urban developments. The site is also surrounded with urban development to the north and west and is not connected with any remaining natural indigenous vegetation areas; ongoing maintenance of firebreaks, roads and stormwater infrastructure; illegal waste dumping; livestock grazing and old building foundations further add to the degraded and transformed state of the site and the surveyed site therefore has a low ecological connectivity value and low botanical sensitivity all concluding to a very low conservation value. Alien tree infestation is present on the site and concentrated mainly along the edges of the site, alien tree species present include *Acacia saligna*, *Acacia mearnsii* and *Eucalyptus* trees.

6.6 In terms of biodiversity process, identify or describe:

6.6.1. The key ecological "drivers" and/or environmental gradients of ecosystems on the site and in the vicinity.

Key ecological drivers identified on the sites and surroundings are the moderate to steep slopes on sites E and H and non-perennial drainage line running in-between the sites surveyed.

6.6.2 Any possible changes in key processes e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.

If the proposed housing development proceeds it will lead to hardening of surfaces which will in turn lead to increase of stormwater runoff and artificial recharge of the non-perennial drainage line and potential erosion of surrounding undeveloped areas remaining. Therefore, site specific storm water management measures must be incorporated into the proposed layout, to decrease storm water runoff speed as much as possible but still maintain current hydrological recharge status quo as far as possible.

6.6.3 The condition and functioning of rivers and wetlands (if present) in terms of possible changes to the channel, flow regime and naturally-occurring riparian vegetation.

No wetland, rivers or riparian vegetation will be significantly impacted upon if recommendations as indicated in this report are adhered to. The non-perennial drainage line with associated riparian vegetation areas not to be developed upon will remain and function as is.

6.6.4 Would the conservation of the site lead to greater viability of the adjacent ecosystem by securing any of the functional factors listed?

Site E – Yes, due to the location of Site E in close proximity to natural vegetation areas of the Bontebok National Park south of the site, and the moderate to good

condition of the indigenous vegetation areas as found on site conservation of the applicable ±20ha site will lead to greater viability of the onsite and adjacent indigenous vegetation ecosystem.

Site H – No, the completely cultivated and transformed 42ha area of the ±50ha area surveyed is bordered by residential areas and a non-perennial drainage line to the west, railway line to the north and east and similar cultivated and transformed area to the south.

Site I – No, the completely degraded and transformed 8ha area surveyed is surrounded by developed and transformed areas, with no ecological connectivity value and no remaining viable indigenous vegetation remnants.

6.6.5 Does the site or neighbouring properties potentially contribute to meeting regional conservation targets for both biodiversity pattern and ecological processes?

Conservation of the indigenous vegetation remnants of Medium and High Botanical Sensitivity as found on Sites E and H as surveyed will potentially contribute to meeting regional conservation targets.

6.6.6 Is this a potential candidate site for conservation stewardship?

Site E -Yes, the applicable 20ha site is a viable candidate for conservation stewardship especially if it can be included as part of the Bontebok National Park.

Site H – No, due to the low ecological connectivity value of the site and degree of transformation that occurred this site will not be a viable candidate for conservation stewardship.

Site I – No, due to the low ecological connectivity value of the site and degree of transformation that occurred this site will not be a viable candidate for conservation stewardship.

7. Ecological Impact Assessment with Associated Mitigation and Rehabilitation Measures to be implemented

(See Appendix B attached for Impact Assessment Methodology used)

Construction and Operational Phases:

Nature of potential impact:
Impact of proposed development activities on surrounding indigenous vegetation areas.

Discussion:
Proposed development activities on cultivated agricultural lands and transformed areas may lead to edge effects such as damage or erosion of adjacent indigenous vegetation areas.

Cumulative impacts:
Erosion, loss of conservation worthy species and natural vegetation habitat during construction and operational activities.

Mitigation:

- Undertake development activities only in identified and specifically demarcated areas as proposed
- Demarcate no-go areas before any land clearing occurs under the supervision of an ECO. Demarcation must be clearly visible and effective and no-go area must remain demarcated throughout construction phase.
- Site clearance along the border of the no-go areas must be done under the supervision of an ECO.
- Personnel should be restricted to the construction camp site and immediate construction areas only.
- Rehabilitate impact indigenous vegetation areas immediately if disturbed.
- Ongoing monitoring and clearing of alien vegetation species must be implemented by the municipality on within indigenous vegetation areas. As well as ongoing monitoring and rectification of erosion as required.
- Inform residence of the importance of protecting adjacent indigenous vegetation areas and municipality to ensure that no development or any activities occurs within the remaining indigenous vegetation areas such as vegetation clearance, illegal waste dumping etc.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	5	1
Magnitude	10	2
Probability	5	1
Significance	85 - High	4 - Low
Status	High Negative	Low Negative (Acceptable)
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1- Completely	

Nature of potential impact:
Impact of proposed development activities on surrounding water resources i.e. drainage lines

Discussion:
Construction activities can impact negatively upon the surface and groundwater resources on and adjacent to the site.

However, no construction will take place within the 1:100 year flood line area of the tributary adjacent to the proposed development site.

No permanent surface water resources will be impacted upon by the proposed development.

Possible chemicals found on site during construction as well as any hydrocarbon spillages will negatively affect the soil and surface or ground water interacting with it. Should the spills not be cleaned up and surface water infiltrate the ground, pollutants may even affect the groundwater resource.

Cumulative impacts:
Loss of fresh water habitat and pollution of surface water resources.

Mitigation:

- All construction activities and personnel on site to stay within demarcated construction areas.
- Proper waste bins to be provided to construction staff and all waste to be regularly removed to municipal landfill site.
- If any fuel or hazardous materials is spilled on site it must be treated as according to EMP requirements.
- Cement mixing only to take place within demarcated cement mixing area that has a berm and has been line with impermeable materials so that no cement mix comes into contact with bare soil and no runoff water escapes from cement mixing area. Refer to EMP requirements.
- Inform residence of the importance of protecting adjacent drainage line and municipality to ensure that no development or any activities occurs within the 1:100year floodline and drainage line area i.e. vegetation clearance, illegal waste dumping etc.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	5	1
Magnitude	10	2
Probability	5	1
Significance	85 - High	4 - Low
Status	High Negative	Low Negative (Acceptable)
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1- Completely	

Nature of potential impact:
Potential erosion of the site and surrounds due to development activities along steep slopes.

Discussion:
During construction access roads for construction, workers camps, etc. will cause a disturbance to the soil and the vegetation cover. This disturbance, unless carefully managed, could spread as a result of unnecessary construction of additional access roads or site clearing outside of approved development footprint. Construction camps, if not fenced and restricted in size, could result in unnecessarily large areas being disturbed. Soil erosion could occur due to wind (wind erosion cause dust pollution) or due to overland flow should rains fall during construction.

Due to an increase in hardened surfaces stormwater runoff and speed may increase which may lead to erosion of surrounding environments if not mitigated.

Cumulative impacts:
Soil erosion due to exposed soil surfaces and clearing of indigenous vegetation could lead to further degradation on surrounding critically endangered indigenous vegetation type.

Soil erosion may lead to loss in topsoil and impact environmental processes of adjacent sensitive environments.

Mitigation:

- Demarcate no-go areas before any land clearing occurs under the supervision of an ECO. Demarcation must be clearly visible and effective and no-go area must remain demarcated throughout construction phase.
- Site clearance along the border of the no-go areas must be done under the supervision of an ECO.
- Personnel should be restricted to the construction camp site and immediate construction areas only.
- Undertake specific erosion monitoring and maintenance throughout the construction phase as and if required.
- Monitor soil erosion on a regular basis and rehabilitate impacted areas as soon as possible under supervision of appointed ECO.
- Stormwater discharge flow must be managed and restricted in such a manner that it does not cause erosion.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	3	1
Duration	5	1
Magnitude	6	2
Probability	4	2
Significance	56 - Medium	8 - Low
Status	Medium Negative	Low Negative (Acceptable)
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1 – Can be completely mitigated	

Decommissioning/Rehabilitation Phase:

Nature of potential impact: Introduction of alien plant species during rehabilitation.
Discussion: Indirect impacts occur mostly during the rehabilitation phase and in this case the nature would vary from the introduction of alien vegetation, to partial disruption of ecological processes due to the effects of the alien species. The extent of the indirect impact in this case is local
Cumulative impacts: Is this case the introduction of alien vegetation during rehabilitation may lead to infestation of surrounding remaining natural areas and drainage lines resulting in disruption and destruction of ecological processes.
Mitigation: • Only use topsoil as derived and conserved from the proposed development areas to be rehabilitated after development activities have ceased on the property. • Only use vegetation indigenous to the area to rehabilitate impacted/decommissioned areas and implement ongoing monitoring of the rehabilitated areas until successful rehabilitation has taken place. • After topsoil has been replaced ongoing monitoring and removal of alien vegetation regrowth must be conducted to ensure effective rehabilitation on indigenous vegetation.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	3	1
Duration	5	1
Magnitude	6	2
Probability	4	2
Significance	56 - Medium	8 - Low
Status	Negative	Negative
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1 – Can be completely mitigated	

Nature of potential impact: Potential erosion of the site and surrounds during rehabilitation phase
Discussion: Decommissioning (i.e. demolishing developed structures) could lead to soil erosion which can occur due to wind (wind erosion cause dust pollution); and due to overland storm water flow should heavy rains fall.
Cumulative impacts: Exposing soil may lead to erosion of site and surrounds if not mitigated.
Mitigation: • Decommissioned areas must be rehabilitated and planted with indigenous vegetation immediately after built structures have been removed. • Engineered contour structures reinstated and maintained. • Monitor rehabilitation of area on a 6 monthly basis until effective/successful rehabilitation has been obtained. • If erosion is detected implement erosion rectification and preventions measures as guided by an ECO

Criteria	**Without Mitigation**	**With Mitigation**
Extent	3	1
Duration	5	1
Magnitude	6	2
Probability	4	2
Significance	56 - Medium	8 - Low
Status	Medium Negative	Low Negative (Acceptable)
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1 – Can be completely mitigated	

8. Concluding Remarks and Summary of Impact Mitigation and Rehabilitation Measures Proposed before, during and after the Proposed Activities

If strict adherence is kept to the recommendations as set out in this report and a site specific Environmental Management Programme with associated storm water management guidelines is compiled and implemented, the proposed development will not have a significant impact on any listed species or sensitive environments.

No significant fauna of avifauna breeding, roosting or their associated habitat will be impacted upon. Most species occasionally visiting the recommended development areas will move out of the area into adjacent indigenous vegetation habitats when construction activities start.

Summary of recommendations as listed in the report and additional recommendations:

Planning considerations -

- There are no sensitive environmental features found on the transformed Low Botanical Sensitivity Cultivated Area of ±42ha as present on Site H nor on the Low Botanical Sensitivity Transformed Area of ±8ha as present on Site I, therefore these areas are recommended as suitable for consideration by the municipality for the proposed housing development. Refer to Maps 5 and 6.

- A secondary non-perennial drainage line is present in-between Site E and Site H; and Site I and Site H. It is recommended that the proposed housing development be placed outside of the 1:100-year floodline area in line with adjacent residential current development boarders.

- If the proposed housing development proceeds it will lead to hardening of surfaces which will in turn lead to increase of stormwater runoff and artificial recharge of the non-perennial drainage line and potential erosion of surrounding undeveloped areas remaining. Therefore, site specific storm water management measures must be incorporated into the proposed layout, to decrease storm water runoff speed as much as possible but still maintain current hydrological recharge status quo as far as possible.

- Site E (±20ha) is a viable candidate for conservation stewardship especially if it can be included as part of the Bontebok National Park.

Construction, Operational and Rehabilitation phases -

- The project implementation process should be subject to standard Environmental Management Programme (EMP) prescripts and conditions and only proceed under supervision of a competent and diligent Environmental Control Officer, both during the construction, operational and decommission/rehabilitation phases.
- Undertake development activities only in identified and specifically demarcated areas as proposed.
- Demarcate no-go areas before any land clearing occurs under the supervision of an ECO. Demarcation must be clearly visible and effective and no-go area must remain demarcated throughout construction phase.
- Site clearance along the border of the no-go areas must be done under the supervision of an ECO.
- Personnel should be restricted to the construction camp site and immediate construction areas only.
- Rehabilitate impacted indigenous vegetation areas immediately if disturbed.
- Ongoing monitoring and clearing of alien vegetation species must be implemented by the municipality within remaining indigenous vegetation areas. As well as ongoing monitoring and rectification of erosion as required.
- Inform residence of the importance of protecting adjacent indigenous vegetation areas and municipality to ensure that no development or any activities occurs within the remaining indigenous vegetation areas such as vegetation clearance, illegal waste dumping etc.
- Proper waste bins to be provided to construction staff and all waste to be regularly removed to municipal landfill site.

- If any fuel or hazardous materials is spilled on site it must be treated as according to EMP requirements.
- Cement mixing only to take place within demarcated cement mixing area that has a berm and has been lined with impermeable materials so that no cement mix comes into contact with bare soil and no runoff water escapes from cement mixing area.
- Inform residence of the importance of protecting adjacent drainage line and municipality to ensure that no development or any activities occurs within the 1:100year floodline and drainage line area i.e. vegetation clearance, illegal waste dumping etc.
- Undertake specific erosion monitoring and maintenance throughout the construction phase as and if required.
- Monitor soil erosion on a regular basis and rehabilitate impacted areas as soon as possible under supervision of appointed ECO.
- Stormwater discharge flow must be managed and restricted in such a manner that it does not cause erosion.
- Only use topsoil as derived and conserved from the proposed development areas to be rehabilitated after development activities have ceased on the property.
- After topsoil has been replaced ongoing monitoring and removal of alien vegetation regrowth must be conducted to ensure effective rehabilitation on indigenous vegetation.
- Decommissioned areas must be rehabilitated and planted with indigenous vegetation immediately after built structures have been removed.
- Engineered contour structures reinstated and maintained.
- Monitor rehabilitation of areas impacted outside of the proposed development areas or decommissioned areas on a 6-monthly basis until effective/successful rehabilitation has been obtained.
- If erosion is detected during or after rehabilitation implement erosion rectification and preventions measures as guided by an ECO

Eco Impact is of the opinion, and based on the survey and desk study done, that the proposed development activities; if designed and implemented according to the recommendations as provided in this report, will not impact significantly on the biodiversity, or adversely affect the ecological functioning of the site and surrounding area.

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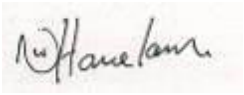
APPENDIX A: Declaration of Independence

THE INDEPENDENT PERSON WHO COMPILED OR REVIEWED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I …… Nicolaas Willem Hanekom ……., as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  O other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
  O am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).



Pri.Sci.Nat (Ecological Science) 400274/11

Signature of the specialist:
Name of company: Eco Impact
Date: 22 May 2018

APPENDIX B: Impact Assessment Methodology

Below is the assessment methodology utilized in determining the significance of the potential mining impacts on the biophysical environment, and where applicable the possible alternatives. The methodology is broadly consistent with that described in the Department of Environmental Affairs' Guideline Document on the EIA Regulations (1998).

For each potential impact, the significance is determined by specified factors as in Table 1. Significance is described prior to mitigation as well as with the most effective mitigation measure(s) in place.

The mitigation described in the document represents the full range of plausible and pragmatic measures that must be implemented.

Despite the attempts at providing a completely objective and impartial assessment of the environmental implications of proposed activities, the specialist can never completely escape the subjectivity inherent in attempting to define significance.

Recognising this, potential subjectivity in the current process is addressed as follows:

- Be clear about the difficulty of being completely objective in the determination of significance;
- Develop an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the report with a clear summary of how the assessor derived the assigned significance; and
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not eliminate subjectivity, they do provide an explicit context within which to review the assessment of impacts.

Table 1: Assessment criteria for the evaluation of impacts

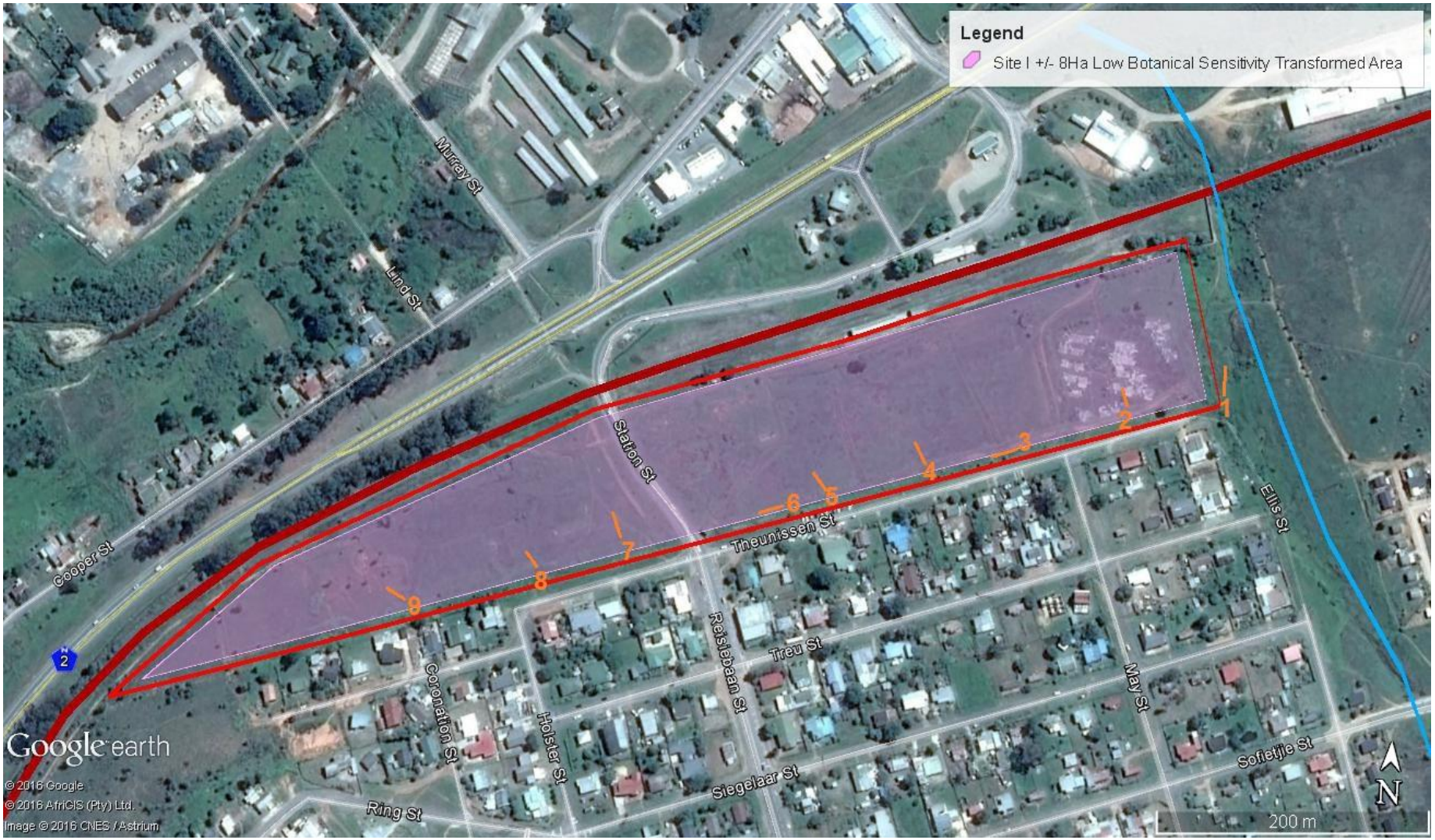
Criteria	Description		
Nature	a description of what causes the effect, what will be affected, and how it will be affected.		
	Type	**Score**	**Description**
Extent (E)	None (No)	1	Footprint
	Site (S)	2	On site or within 100 m of the site
	Local (L)	3	Within a 20 km radius of the centre of the site
	Regional (R)	4	Beyond a 20 km radius of the site
	National (Na)	5	Crossing provincial boundaries or on a national / land wide scale
Duration (D)	Short term (S)	1	0 – 1 years
	Short to medium (S-M)	2	2 – 5 years
	Medium term (M)	3	5 – 15 years
	Long term (L)	4	> 15 years
	Permanent(P)	5	Will not cease
Magnitude (M)	Small (S)	0	will have no effect on the environment
	Minor (Mi)	2	will not result in an impact on processes
	Low (L)	4	will cause a slight impact on processes
	Moderate (Mo)	6	processes continuing but in a modified way
	High (H)	8	processes are altered to the extent that they temporarily cease
	Very high (VH)	10	results in complete destruction of patterns and permanent cessation of processes.
Probability (P) the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned	Very improbable (VP)	1	probably will not happen
	Improbable (I)	2	some possibility, but low likelihood
	Probable (P)	3	distinct possibility
	Highly probable (HP)	4	most likely
	Definite (D)	5	impact will occur regardless of any prevention measures
Significance (S)	Determined through a synthesis of the characteristics described above: **S = (E+D+M) x P** Significance can be assessed as low, medium or high		
Low: < 30 points:	The impact would not have a direct influence on the decision to develop in the area		
Med:30 – 60 points:	The impact could influence the decision to develop in the area unless it is effectively mitigated		
High: < 60 points:	The impact must have an influence on the decision process to develop in the area		
No significance	When no impact will occur or the impact will not affect the environment		
Status	Positive (+)		Negative (-)
The degree to which the impact can be reversed	Completely reversible (R)	90-100%	The impact can be mostly to completely reversed with the implementation of the correct mitigation and rehabilitation measures.
	Partly reversible (PR)	6-89%	The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken
	Irreversible (IR)	0-5%	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures taking place
The degree to which the impact may cause irreplaceable loss of resources	Resource will not be lost (R)	1	The resource will not be lost or destroyed provided that mitigation and rehabilitation measures as stipulated in the EMP are implemented
	Resource may be partly destroyed (PR)	2	Partial loss or destruction of the resources will occur even though all management and mitigation measures as stipulated in the EMP are implemented
	Resource cannot be replaced (IR)	3	The resource cannot be replaced no matter which management or mitigation measures are implemented.
The degree to which the impact can be mitigated	Completely mitigatible (CM)	1	The impact can be completely mitigated providing that all management and mitigation measures as stipulated in the EMP are implemented
	Partly mitigatible (PM)	2	The impact cannot be completely mitigated even though all management and mitigation measures as stipulated in the EMP are implemented. Implementation of these measures will provide a measure of mitigatibility
	Un-mitigatible (UM)	3	The impact cannot be mitigated no matter which management or mitigation measures are implemented.

APPENDIX C: Relevant Environmental Legislation Considered

Agricultural Pests Act 36 of 1983
Atmospheric Pollution Prevention Act 45 of 1965 (regulations only)
Conservation of Agricultural Resources Act 43 of 1983
Constitution of the Republic of South Africa 1996
Environment Conservation Act 73 of 1989
Fencing Act 31 of 1963
Fertilizers Farm Feeds Agricultural Remedies and Stock Remedies Act 36 of 1947
Mineral and Petroleum Resources Development Act 28 of 2002
National Environmental Management Act 107 of 1998
National Environmental Management: Air Quality Act 39 of 2004
National Environmental Management: Biodiversity Act 10 of 2004
National Environmental Management: Protected Areas Act 57 of 2003
National Environmental Management: Waste Act 59 of 2008
National Forests Act 84 of 1998
National Veld and Forrest Fire Act 101 of 1998
National Water Act 36 of 1996

APPENDIX D: Photos of sites and surrounds taken 13 October 2015 and 18 July 2016

Map 7.1: Location and direction of site photos taken on 13 October 2015 during the survey**.**



Map 7.2: Location and direction of site photos taken on 18 July 2016 during the survey**.**

SITE H PHOTOS 1-21

Photo 1: Site H – Transformed area along drainage line.

Photo 2: Site H – Transformed area in-between residential area and medium botanical sensitivity area.

Photo 3: Site H – Transformed area in-between medium botanical sensitivity area and drainage line.

Photo 4: Site H – Transformed area in-between medium botanical sensitivity area and residential area.

Photo 5: Site H – Transformed area adjacent to residential area.

Photo 6: Site H – Transformed area/agricultural land.

Photo 7: Site H – Transformed area/agricultural land.

Photo 8: Site H – Transformed area/agricultural land.

Photo 9: Site H – Transformed area/agricultural land.

Photo 10: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 11: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 12: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 13: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 14: Site H – Transformed area/agricultural land.

Photo 15: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 16: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 17: Site H – Transformed area/agricultural land adjacent to railway line in the background along Blue gum treeline.

Photo 18: Site H – Edge in-between transformed agricultural land and medium botanical sensitivity indigenous vegetation area.

Photo 19: Site H – Medium botanical sensitivity indigenous vegetation area.

Photo 20: Site H – Medium botanical sensitivity indigenous vegetation area.

Photo 21: Site H – Medium botanical sensitivity indigenous vegetation area with transformed area in-between and drainage line in lower lying area.

SITE E PHOTOS 1-7

Photo 1: Site E – High botanical sensitivity indigenous vegetation area with alien tree encroached present along the lower slopes.

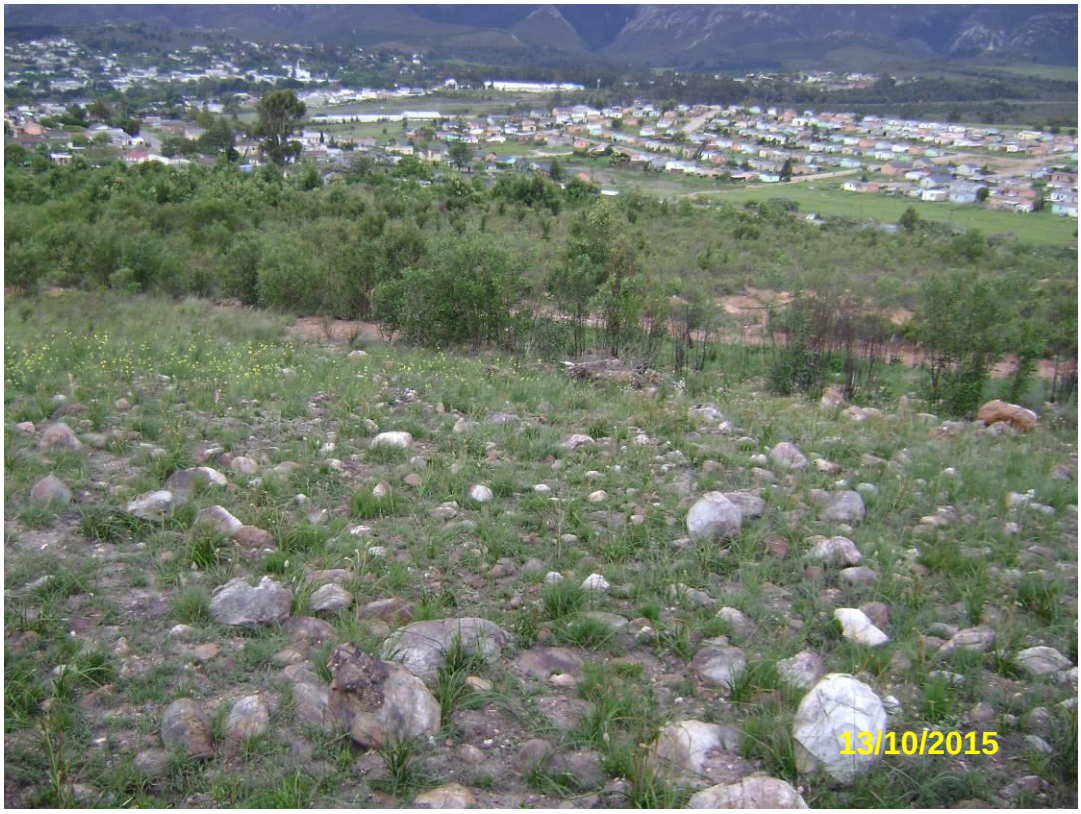


Photo 2: Site E – High botanical sensitivity indigenous vegetation area with alien tree encroached present along the lower slopes.

Photo 3: Site E – High botanical sensitivity indigenous vegetation area adjacent to school grounds.

Photo 4: Site E – High botanical sensitivity indigenous vegetation area in the foreground, Swellendam cemetery and adjacent indigenous vegetation areas in the background.

Photo 5: Site E – High botanical sensitivity indigenous vegetation area in the foreground, drainage line area along lower lying gorge and Site H on the other side of the drainage line adjacent to residential area.

Photo 6: Site E – High botanical sensitivity indigenous vegetation area with Swellendam cemetery to the right of the gravel road and Site H to the left in the background.

Photo 7: Site E – Transformed area around reservoir site adjacent to high botanical sensitivity indigenous vegetation area encroached with alien tree vegetation.

SITE I PHOTOS 1-9

Photo 1: Site I – Low botanical sensitivity area adjacent to transformed watercourse area.

Photo 2: Site I – Low botanical sensitivity transformed area.

Photo 3: Site I – Low botanical sensitivity transformed area.

Photo 4: Site I – Low botanical sensitivity transformed area.

Photo 5: Site I – Low botanical sensitivity transformed area.

Photo 6: Site I – Low botanical sensitivity transformed area.

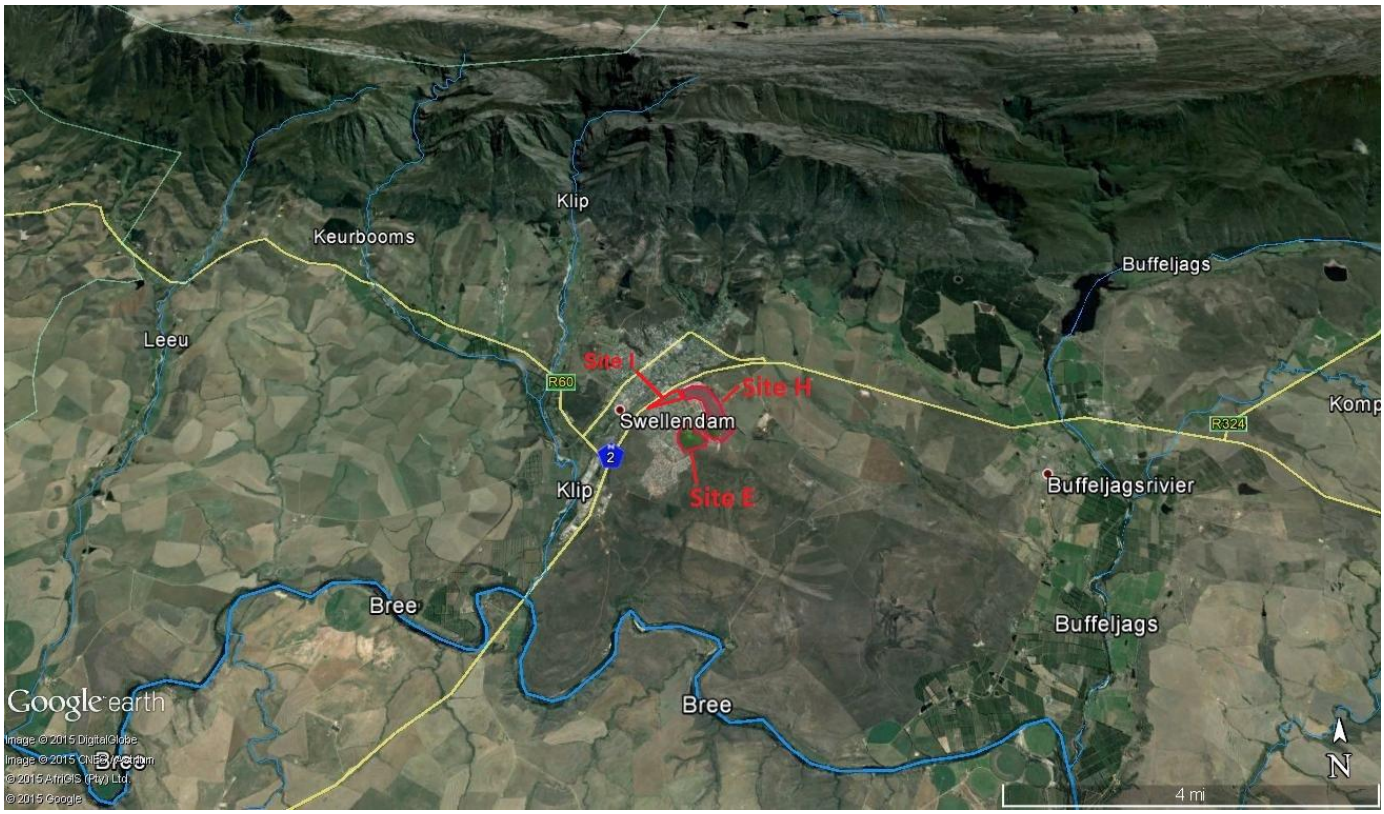
Photo 7: Site I – Low botanical sensitivity transformed area.

Photo 8: Site I – Low botanical sensitivity transformed area.

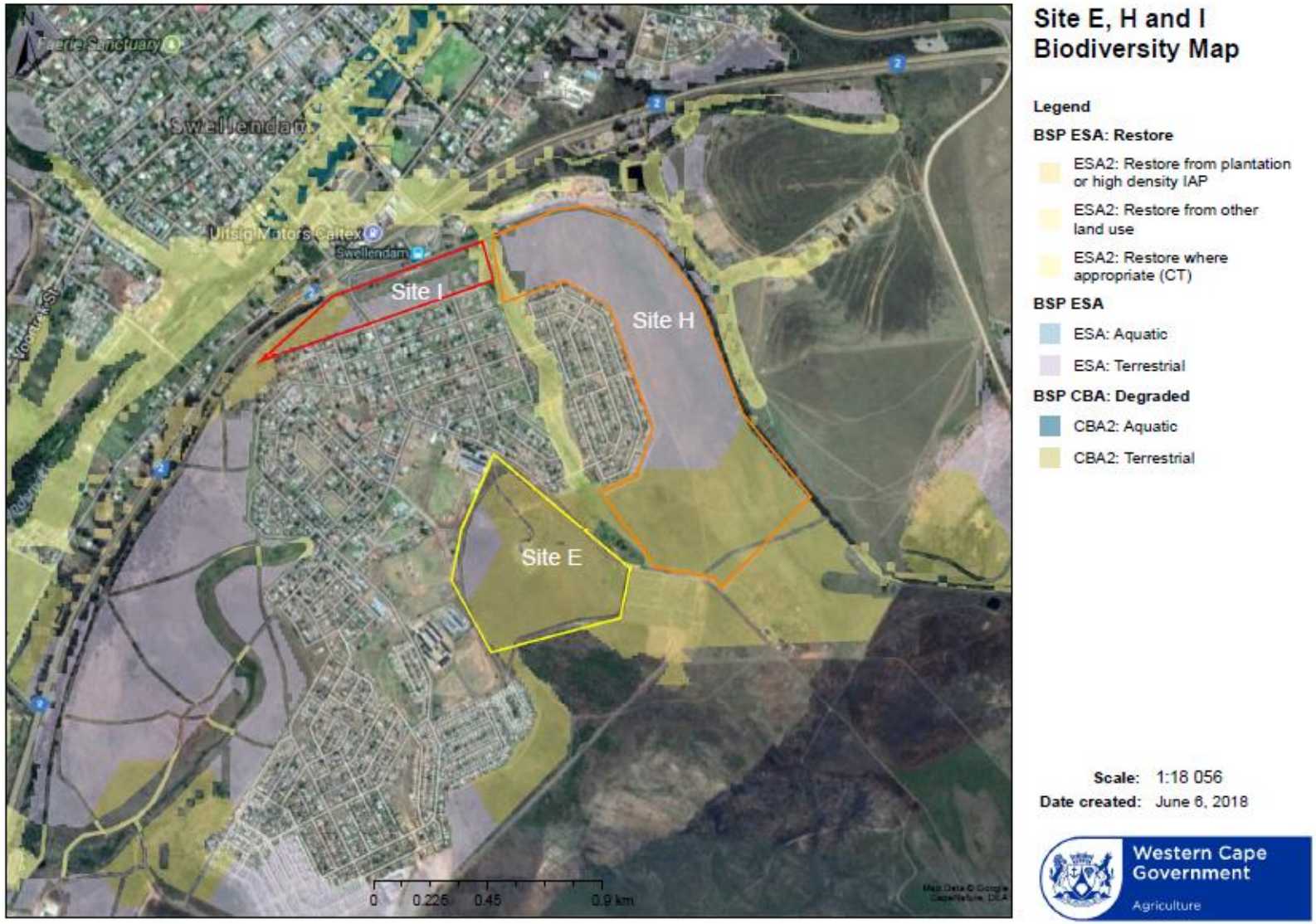
Photo 9: Site I – Low botanical sensitivity transformed area.

Appendix E: Maps

Map 1: Swellendam locality in the Western Cape.



Map 2: Locality map of Sites E, H and I as surveyed at Swellendam in the Western Cape.



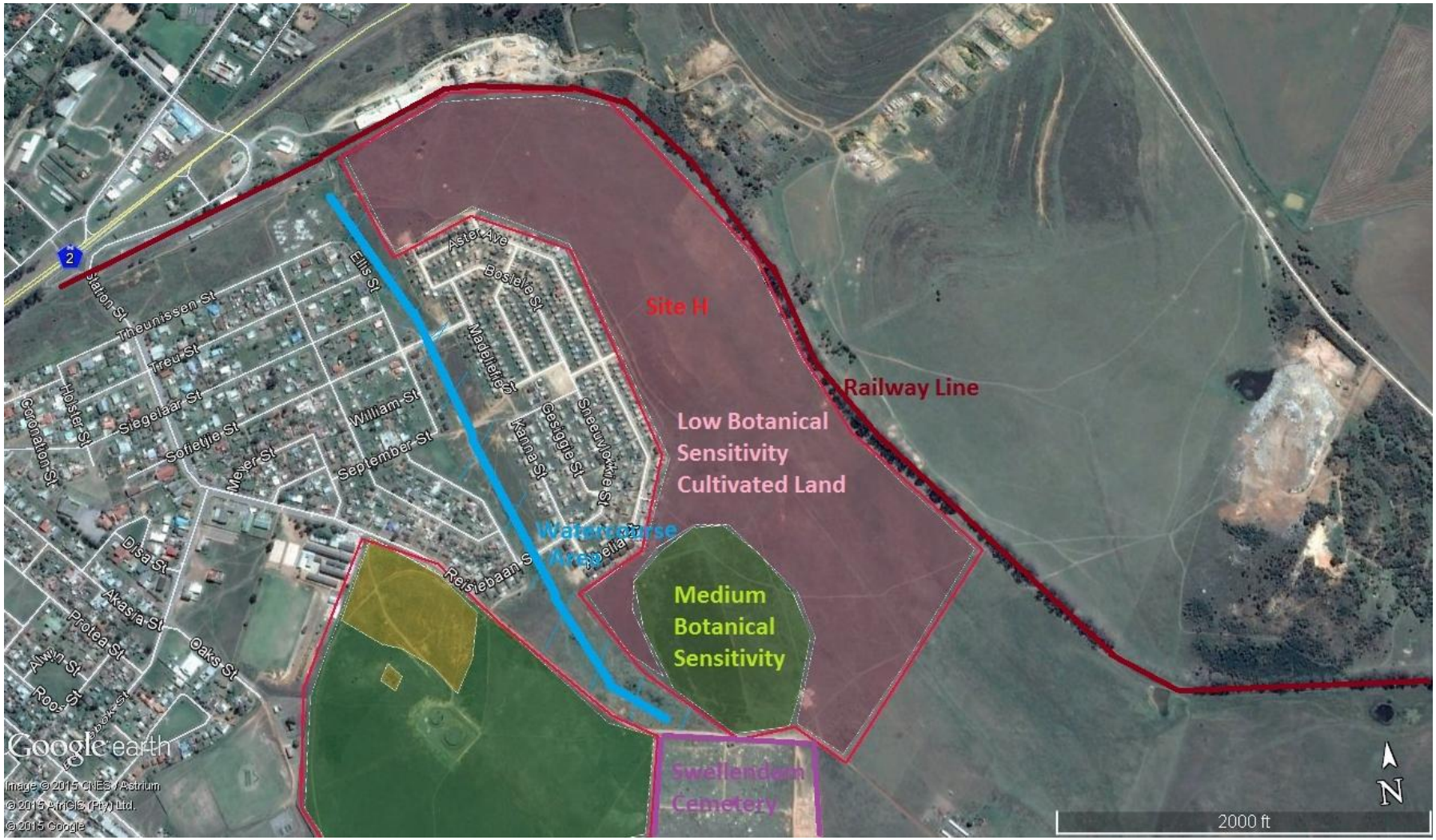
Site I: 50 % Critical Biodiversity Areas (Degr); 50% Ecological Support Areas

Site H: 40 % Critical Biodiversity Areas (Degr); 60% Ecological Support Areas

Site E: 90% Critical Biodiversity Areas (Degr); 10% Ecological Support Areas

Map 3: Biodiversity map indicating ESAs and CBAs as according to Western Cape Biodiversity Spatial Plan 2017.

Map 4: From observation and ground truthing - Site E indicating High Botanical Sensitivity Area and degraded natural area encroached with alien tree vegetation.



Map 5: From observation and ground truthing - Site H indicating Medium Botanical Sensitivity Area with remaining degraded indigenous vegetation in a moderate to good condition and Low Botanical Sensitivity Cultivated Land Area.

Map 6: From observation and ground truthing - Site I indicating Low Botanical Sensitivity of Transformed Area