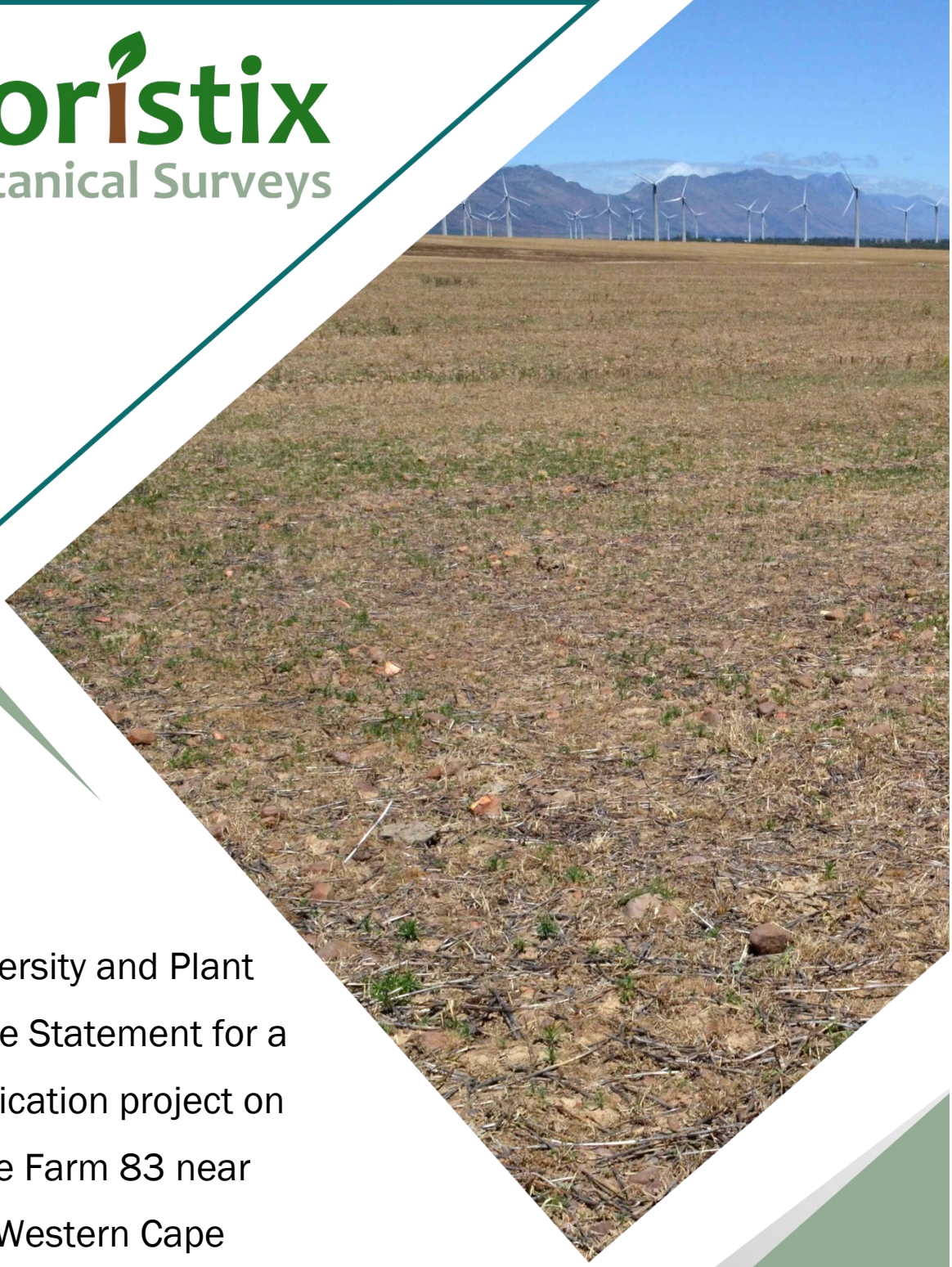
EcoFloristix
Specialist Botanical Surveys



Terrestrial Biodiversity and Plant Species Compliance Statement for a mining permit application project on Bonne Esperance Farm 83 near Tulbagh in the Western Cape Province

DATE
13 November 2024

PREPARED FOR
Greenmined Environmental

info@ecofloristix.co.za
+27 71 451 4853
www.ecofloristix.co.za
Acuity JRK (Pty) Ltd trading as
EcoFloristix Specialist Botanical Surveys

CELEBRATING RESEARCH EXCELLENCE

Internal Document Information

Running Title:	Terrestrial Biodiversity and Plant Species Compliance Statement for a mining permit application project on Bonne Esperance Farm 83 near Tulbagh in the Western Cape Province
Date:	13 November 2024
Status (Draft/Final):	Final Report
Version:	1.0
Reference:	IA.24.023
Client:	Greenmined Environmental
Author Details:	**Dr. Jan-Hendrik Keet** [BSc, BSc Hons, MSc (University of the Free State), PhD (Stellenbosch University); SACNASP Pr.Sci.Nat: 121678 (Botanical Science)] Email: info@ecofloristix.co.za Contact: 071 451 4853
Suggested Citation:	Keet, J-H (2024) Terrestrial Biodiversity and Plant Species Compliance Statement for a mining permit application project on Bonne Esperance Farm 83 near Tulbagh in the Western Cape Province. Report prepared for Greenmined Environmental. Final Report, Version 1.0. Reference: IA.24.023.

CONTENTS

i. List of Abbreviations

BODATSA:	Botanical Database of Southern Africa
CARA:	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA:	Critical Biodiversity Area
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR:	Critically Endangered (threat status)
DD:	Data Deficient (threat status)
DDD:	Data Deficient – Insufficient Information (threat status)
DDT:	Data Deficient – Taxonomically Problematic (threat status)
EA:	Environmental Authorization
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment: EIA regulations promulgated under section 24(5) of NEMA and published in Government Notice R. 543 in Government Gazette 33306 of 18 June 2010
EMPr:	Environmental Management Programme
EN:	Endangered (threat status)
EO:	Environmental Officer
ESA:	Ecological Support Area
EW:	Extinct in the Wild (threat status)
EX:	Extinct (threat status)
FEPA:	Freshwater Ecosystem Priority Area
IAPs:	Invasive Alien Plant species
IUCN:	International Union for Conservation of Nature
LC:	Least Concern (threat status)
MP:	Moderately Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
NE:	Not Evaluated (threat status)
NEM:BA A&IS:	NEM:BA Alien and Invasive Species Regulations, 2020
NEM:BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMA:	National Environmental Management Act (Act 107 of 1998)
NFA:	National Forest Act 1998 (No. 84 of 1998)
NFEPA:	National Freshwater Ecosystem Priority Areas; identified to meet national freshwater conservation targets (CSIR, 2011)
NP:	Not Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
NT:	Near Threatened (threat status)
NWA:	National Water Act 36 of 1998
ONA:	Other Natural Area
PA:	Protected Area
PAOI:	Project Areas of Influence
POSA:	Plants of southern Africa (online database)
PP:	Poorly Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
RE:	Regionally Extinct (threat status)
REEA:	SA Renewable Energy EIA Application Database (https://egis.environment.gov.za/)
RLE:	Red List of Ecosystems for South Africa
SAIIAE:	South African Inventory of Inland Aquatic Ecosystems
SANBI:	South African National Biodiversity Institute
SCC:	Species of Conservation Concern (includes species listed under the IUCN Red List Criteria as Critically Endangered [CR], Endangered [EN], Vulnerable [VU], Near Threatened [NT], or Data Deficient [DD], as well as range-restricted species which are not declining and are nationally listed as Rare or Extremely Rare [sometimes also termed "Critically Rare"])
SSV:	Site Sensitivity Verification
SWSA:	Strategic Water Source Area
VegMap:	National Vegetation Map of Southern Africa, Lesotho, and Swaziland (as per Mucina and Rutherford, 2006, with subsequent updates, e.g., 2018)
VU:	Vulnerable (threat status)
WP:	Well Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)

ii. List of Figures

iii. List of Tables

iv. Report Minimum Legal Requirements

The requirements for the Protocol for the "Specialist Assessment and Minimum Report Content Requirements For Environmental Impacts on Terrestrial Plant Species" (GN 1150, 43855, 30 October 2020) and the "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity" (GN 320, 43110, 20 March 2020) are presented here, together with their fulfilments within this report.

Specifically, fulfilments are given in terms of the requirements for Terrestrial Biodiversity and Terrestrial Plant Species Compliance Statements. Protocol reference numbers represent the references as indicated in the published guidelines; those occurring in the Terrestrial Biodiversity protocol are numbered as "**4**.x.x", while those occurring in the Terrestrial Plant Species protocol are numbered as "**5**.x.x".

Protocol Reference	Plant Species and Terrestrial Biodiversity Compliance Statement Content	Sections in this Report	Page
4.3.1/5.3.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	8	54
4.3.2/5.3.2	A signed statement of independence by the specialist	v	viii
4.3.3/5.3.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	7.1	47
4.3.4	A baseline profile description of biodiversity and ecosystems of the site	2.1, 2.2	11, 21
4.3.5/5.3.4	A description of the methodology used to undertake the site survey and to verify the sensitivities of the terrestrial biodiversity features on the site, and prepare the compliance statement, including equipment and modelling used where relevant	6, 7	39, 47
4.3.6.	In the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase	Not Applicable	Not Applicable
4.3.7/5.3.5	Where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr	3	35
4.3.8/5.3.6	A description of the assumptions made and any uncertainties or gaps in knowledge or data	1.5	8
5.3.7	The mean density of observations / number of samples sites per unit area	7	47
4.3.9/5.3.8	Any conditions to which the compliance statement is subjected	4	36

v. Declaration of Consultant Independence

The consultant hereby declares that he:

- Is an independent specialist in this application;
- Regards the information contained in this report as it relates to specialist input/study to be true and correct at the time of publication;
- Do not, and will not, have any financial interest(s) in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA Environmental Impact Assessment Regulations, 2014, and any specific environmental management Act;
- Do not, and will not, have any vested interest(s) in the proceedings of the proposed activities;
- Have disclosed, to the applicant, EAP, and/or competent authority(-ies), any information that have, or may have, the potential to influence the decision of the competent authority(-ies) or the objectivity of any report, plan, or document required in terms of the NEMA Environmental Impact Assessment Regulations 2014, and any specific environmental management Act;
- Is fully aware of, and meet, the responsibilities in terms of the NEMA Environmental Impact Assessment Regulations 2014 (specifically in terms of regulation 13 of GN No. R. 326), and any specific environmental management Act, and that failure to comply with these requirements may result in disqualification;
- Have provided the competent authority(-ies) with access to all necessary information at his disposal at the time of publication regarding the application, whether such information is favourable to the applicant or not; and
- Is aware that a false declaration is an offense in terms of regulation 48 of GN No. R. 326.

REPORT AUTHOR:

Dr. Jan-Hendrik Keet
Pr.Sci.Nat 121678 (Botanical Science)

Fields of Expertise: Botany; Biogeography; Terrestrial Biodiversity; Vegetation Surveys and Mapping; Invasive Alien Plant Species Identification, Management, and Monitoring; Biological Sciences; Biodiversity Informatics; Experimental Design and Analysis; Geographic Information Systems; and Statistical Computing and Data Analysis.

Summary of Qualifications: BSc (*cum laude*) Chemistry with Physics and Biology; BSc (Hons *cum laude*) Botany (majoring in Plant Taxonomy, Plant Ecology, and Plant Physiology); MSc Botany (Invasive Plant Species and Risk Assessment); PhD Botany (Invasive Plant Species and Impacts); GIS Intermediate (GISB1500S NQF Level 5); SAGIC Invasive Species Consultant; Professional Natural Scientist (Botanical Science: 121678).

November 2024

PART 1: Introduction, Background, and Findings of the Assessment

1. Introduction

1.1. General Information

This project, as well as any and all related areas/sites, may from here on interchangeably be referred to as either the "project", "site", "development site" or "proposed development site", "development site and surrounds", "study area", or "study area and surrounds". If the proposed activity(-ies) will impact on Species of Conservation Concern (SCC) beyond the boundary of the proposed development site, the "project areas of influence" (PAOI) will be defined and used where relevant. The development footprint in the context of this document means the area on which the proposed development will take place and includes the area that will be directly disturbed or impacted. The term "property" might also be used to refer to the entire property (that is, the area enclosed within the property boundary), and not just the proposed development site.

Greenmined Environmental (hereafter referred to as the "client"), on behalf of Power Construction (Pty) Ltd (hereafter referred to as the "applicant"), approached EcoFloristix Specialist Botanical Surveys to conduct a Terrestrial Biodiversity and Plant Species Compliance Statement for a mining permit application project on Bonne Esperance Farm 83 near Tulbagh in the Western Cape Province.

1.2. Terms of Reference (ToR)

The main aim of this assessment was to provide a professional opinion on botanical and terrestrial biodiversity issues related to the proposed activities within the proposed development site. Specifically, this assessment intends to provide the relevant information for guiding and mitigating the risk(s) associated with the proposed activities and their impacts on the local plant communities and associated ecosystems within the proposed development site and surrounds by conducting a desktop analysis and a Site Sensitivity Verification (also referred to as a "SSV").

Briefly, the following activities were performed:

- A desktop assessment to identify relevant ecologically important geographical features (for example, unique habitats, Critical Biodiversity Areas (CBAs), and threatened ecosystems);
- A desktop assessment to compile a list of plant species that might occur in the proposed development site and surrounds, with a focus on plant Species of Conservation Concern (SCC);
- A field survey to assess the general species composition of the plant communities within and around the proposed development site, as well as the presence of any SCC;
- A delineation and mapping of the plant communities and/or habitat types that occur within the proposed development site, and a determination of their respective Site Ecological Importance values;
- An identification of the potential impacts of the proposed activities on the SCC and plant communities of the proposed development site, and an evaluation of the risks associated with these potential impacts; and
- A prescription of mitigation measures and recommendations for the identified risks.

1.3. Locality and Details of Proposed Activities

The proposed development site is located on Bonne Esperance Farm 83 in Tulbagh in the Western Cape Province, and is located within the Drakenstein Local Municipality (WC023) (Figure 1 and Figure 2).

Project Overview

The applicant is proposing an open-cast mining operation on a 5-hectare section of Bonne Esperance Farm 83 in Tulbagh, Western Cape. The target materials, silty sand and quartzitic sandstone pebbles, are intended to support construction projects in the region, including the Berg and Zen Wind Farms, and other infrastructure developments in Gouda and Tulbagh.

The mining activities will consist out of the following:

- Stripping and stockpiling of topsoil;
- Excavating / Loading of *in situ* material;
- Crushing and Screening
- Stockpiling and transporting;
- Sloping and landscaping upon closure of the site; and replacing the topsoil and vegetation the disturbed area.

The mining site will contain the following:

- Excavating / loading equipment;
- Earth moving equipment;
- Mobile Crusher
- Access Roads;
- Site office (Container);
- Site vehicles;
- Parking area for visitors and site vehicles;
- Ablution facilities (Chemical toilets).

Commodity and Extraction Method

The operation will extract silty sand and quartzitic sandstone pebbles, prized for their durability and suitability as concrete aggregates and road base materials. Mining will employ open-cast methods, using earth-moving equipment to excavate and transport materials. These will be processed on-site at a mobile crushing and screening plant to produce various aggregate sizes for construction purposes. Each section of up to 1-1.5 hectares will be mined and rehabilitated before moving to the next.

Site Access and Transportation

Access to the site will utilize an existing gravel road from the R44, with minimal additional infrastructure required. A 250-meter entrance and internal haul roads will be constructed to facilitate material movement within the site. Tipper trucks

will transport materials along these internal roads and use the R44 to reach delivery destinations. The transport plan minimizes impact on surrounding areas, utilizing low-speed limits and dust control measures to protect local fauna.

Environmental Management and Rehabilitation

An Environmental Management Programme (EMPr) is in place to mitigate dust, manage vegetation, and reduce environmental disruption. This includes ongoing rehabilitation, with topsoil replacement and re-seeding (as necessary) to restore the site after each section is mined. Upon completion, a final rehabilitation phase will be conducted before a closure application is submitted to the Department of Mineral Resources and Energy (DMRE), ensuring compliance with section 43(4) of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998.

Project Phases

Should the MP be issued, and the mining of gravel be allowed, the proposed project will comprise of activities that can be divided into three key phases (discussed in more detail below) namely the:

The project consists of three key phases:

Site Establishment: Involves marking the mining area, clearing vegetation, and stockpiling topsoil. Necessary machinery and equipment will be introduced to the site.

Operational Phase: Extraction of silty sand and quartzitic sandstone pebbles via open-cast mining. Materials will be screened and stockpiled for transport to clients.

Decommissioning and Rehabilitation: Includes site landscaping, top dressing, and removal of all infrastructure and waste. Weed and invasive species clearing will occur as mandated by the National Environmental Management: Biodiversity Act (NEMBA). Following rehabilitation, a closure application will be submitted in compliance with the MPRDA and NEMA regulations.

- Rehabilitation of the surface area shall entail landscaping, levelling, top dressing, land preparation, seeding (if required), and weed / alien clearing.
- All infrastructures, equipment, and other items used during the mining period will be removed from the site (section 44 of the MPRDA).
- Waste material of any description, including receptacles, scrap, rubble, and tyres, will be removed entirely from the mining area and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on the site.
- Weed / Alien clearing will be done in a sporadic manner during the life of the mining activities. Species categorised as weeds according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) [NEMBA] Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure.
- Final rehabilitation shall be completed within a period specified by the Regional Manager. Once the mining area was rehabilitated, the mining permit holder will submit a closure application to the DMRE in accordance with

section 43(4) of the MPRDA, 2002. The Closure Application will be submitted in terms of Regulation 62 of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998 (as amended).

The proposed project will not require any additional electricity connections, as power will be supplied, when needed, by generators. All diesel storage will be below the threshold as mentioned in the EIA regulations of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended. Any water required for the implementation of the project will be bought and transported to site.

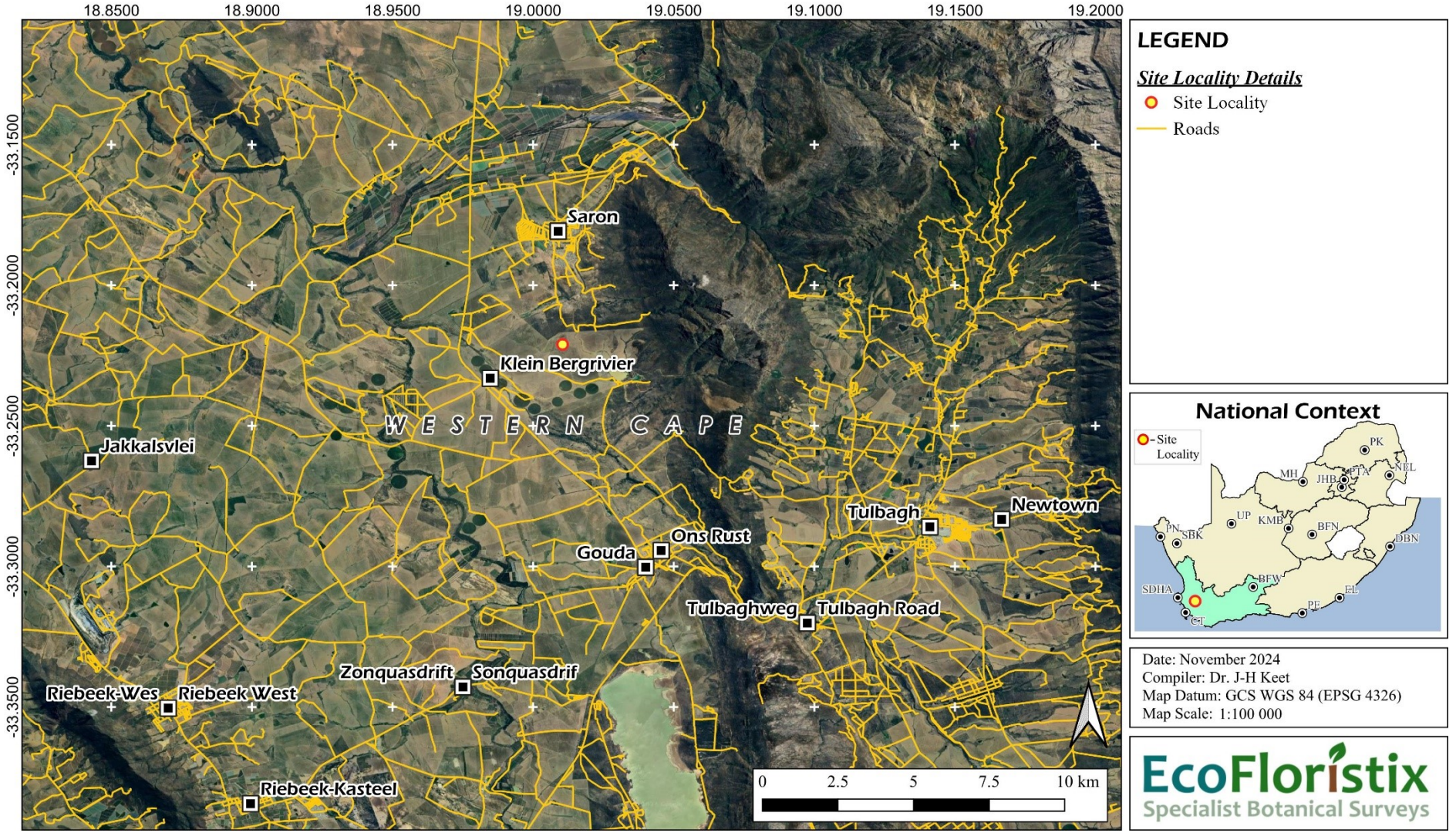


Figure 1: Locality of the proposed development site, zoomed out to give a broad context. The inset map shows the main map extent within the broader (national) context of South Africa.

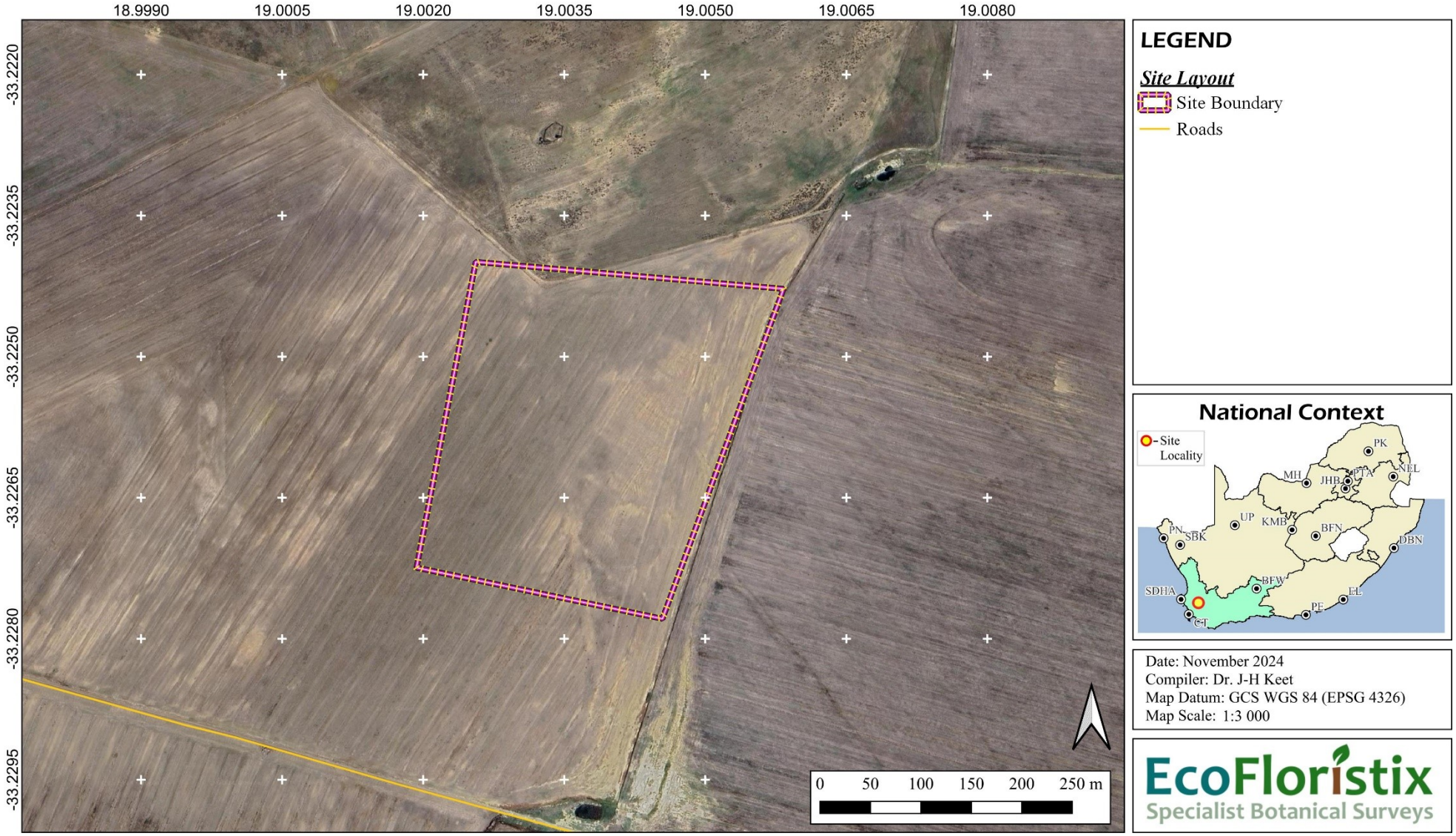


Figure 2: Overview of the proposed development site. The inset map shows the main map extent within the broader (national) context of South Africa.

1.4. Conditions of This Report

This report deals exclusively with the proposed development site as defined in sections 1.1 and 1.3, and the impacts upon plant biodiversity and ecosystems in that area. Therefore, all relevant project information provided by the applicant and/or the client, as well as any other relevant Environmental Impact Assessment practitioner(s), was assumed to be correct and valid at the time of its provision. This report is not liable to include and assess any alterations to the proposed development site, as provided by the client, if such alterations occurred after the survey date(s).

All findings, recommendations, and conclusions provided in this report are based on the author's best scientific and professional knowledge at the time of compilation, as well as information available at the time of compilation. This report, whether in full or in part, may not be amended or extended in any way whatsoever without the prior explicit written consent of the author. Any recommendations, statements, or conclusions drawn from, or based on, this report must clearly cite or make reference to this report, making sure to include the following reference: IA.24.023. This report must be included in its entirety whenever any recommendations, statements, or conclusions relating to this report form any part of another report.

1.5. General Assumptions and Potential Limitations

Temporal variation plays an important role in the structure and patterns of plant biodiversity, communities, and species occurrences. One site visit (or even multiple visits), or a single season's survey, might not fully catalogue plant species diversity in an area (for example, due to seasonal variation in vegetation and plant growth patterns).

Specifically, some annual, short-lived, ephemeral (plants surviving unfavourable conditions as seeds), geophytic (species with underground storage organs), or other cryptic species might not be observable/detectable. That is, many plant species are known to completely die back during certain times of the year, depending on respective life strategies. Thus, during these times such species remain unobservable/undetectable and survive only as dormant bulbs, corms, tubers, or rhizomes (for geophytes), or seeds (for ephemeral species) below the soil surface. Together with this, rare and threatened plant species are generally uncommon and/or localized, and can easily be overlooked. Even multiple site visits might fail to locate such species.

Furthermore, flowers and fruits are crucial for the complete and accurate identification of plant species, and any absence of such flowers and fruits might prevent the complete and accurate identification of such plant species. Flowering and fruiting times are species specific, and there are invariably always some plant species not flowering and/or fruiting during surveying. This not only impacts identifiability, but also detectability/visibility.

Finally, in practice it is almost always impossible to survey any area to its full extent, both spatially (i.e., over land surface area) and temporally (i.e., over time). The total number of plant species recorded in any area is, therefore, almost always an underestimate of the potential number of species that could occur in such an area.

Considering all of the aforementioned, the possibility always exists that certain plant species might not be observable/detectable on site during the time of surveying, as a result of their potential annual, short-lived, dormant, cryptic, or ephemeral nature, or their rare and/or localized distributions on site, or the incomplete and inaccurate identification of plant species which lacked flowers and/or fruits and/or other characteristic features during surveying. This presents a gap

in knowledge, but can be mitigated to a great extent by supplementing site species lists with records from online databases (see section 6.3 for more details).

1.6. Key Legislative Requirements

The lists below provide legislation, policies, and guidelines that are applicable to the current project in terms of biodiversity and ecological support systems. Although these lists are extensive, they are not exhaustive, and other legislation, policies, and guidelines may also apply.

International Legislation:

- Convention on Biological Diversity (CBD, 1993)
- The Convention on Wetlands (RAMSAR Convention, 1971)
- The United Nations Framework Convention on Climate Change (UNFCC,1994)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)

National Legislation:

- Constitution of the Republic of South Africa (Act No. 108 of 1996)
- The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
- The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
- The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004), Threatened or Protected Species Regulations
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
- The National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
- The Environment Conservation Act (Act No. 73 of 1989)
- National Protected Areas Expansion Strategy (NPAES)
- Natural Scientific Professions Act (Act No. 27 of 2003)
- National Biodiversity Framework (NBF, 2009)
- National Forest Act (Act No. 84 of 1998)
- National Veld and Forest Fire Act (101 of 1998)
- National Water Act (NWA) (Act No. 36 of 1998)
- National Spatial Biodiversity Assessment (NSBA)
- World Heritage Convention Act (Act No. 49 of 1999)
- Municipal Systems Act (Act No. 32 of 2000)

- Alien and Invasive Species Regulations and, Alien and Invasive Species Lists, published under NEM:BA (NEM:BA A&IS Regulations)
- South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)

Provincial Legislation:

- Western Cape Nature Conservation Ordinance, (Act No. 19 of 1974)
- Western Cape Nature Conservation Regulations, (Act No. 955 of 1975)
- Western Cape Nature Conservation Board Act, (Act No. 15 of 1998)
- Western Cape Nature Conservation Laws Amendment Act, (Act No. 3 of 2000)
- Western Cape Biodiversity Act, (Act No. 6 of 2021)

2. Results

For all relevant methodology, see sections 6 and 7 in Part 2 at the end of this document.

2.1. Desktop Analyses: Botanical Assessment

2.1.1. Vegetation Types of Proposed Development Site and Surrounds

According to VegMap, the proposed development site overlaps with two vegetation types, namely Swartland Alluvium Fynbos (FFa3) and Swartland Shale Renosterveld (FRs9) (Figure 3 and Figure 4; Table 1). The vegetation types Winterhoek Sandstone Fynbos (FFs5) and Atlantis Sand Fynbos (FFd4) are mapped to occur within 4 – 5 km of the proposed development site boundary; however, the former is a mountainous vegetation type and the latter a sand fynbos type, both of which are not characteristic of the site, and neither of which were found on site. As such, only Swartland Alluvium Fynbos (FFa3) and Swartland Shale Renosterveld (FRs9) are described here.

Table 1: Total area sizes (approximately) for vegetation types occurring within, or near, the proposed development site, as mapped by the National Vegetation Map 2018 (with subsequent updates).

Vegetation Type	Historic Distribution		Current Distribution		RLE Threat Status
	Total Area (km^2)	Total Area (ha)	Total Area (km^2)	Total Area (ha)	
Swartland Alluvium Fynbos	477.19	47 719	133.61	13 361	Endangered
Swartland Shale Renosterveld	4 963.72	496 372	265	26 500	Critically Endangered

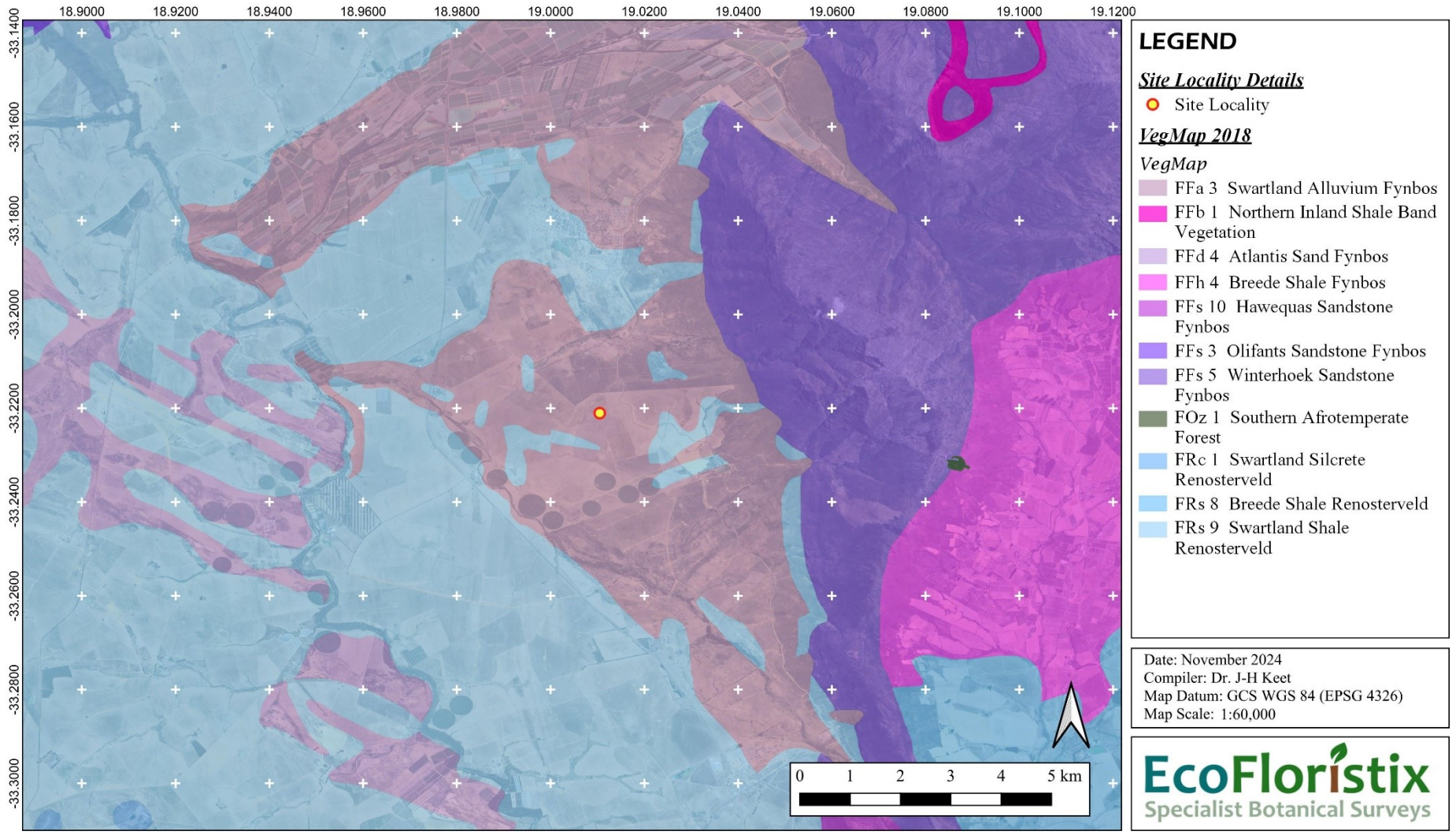


Figure 3: Vegetation types (according to VegMap 2018) for the proposed development site and surrounds. This map is specifically zoomed out to show the broader extent of each vegetation type surrounding the proposed development site (see Figure 4 for site specific vegetation).

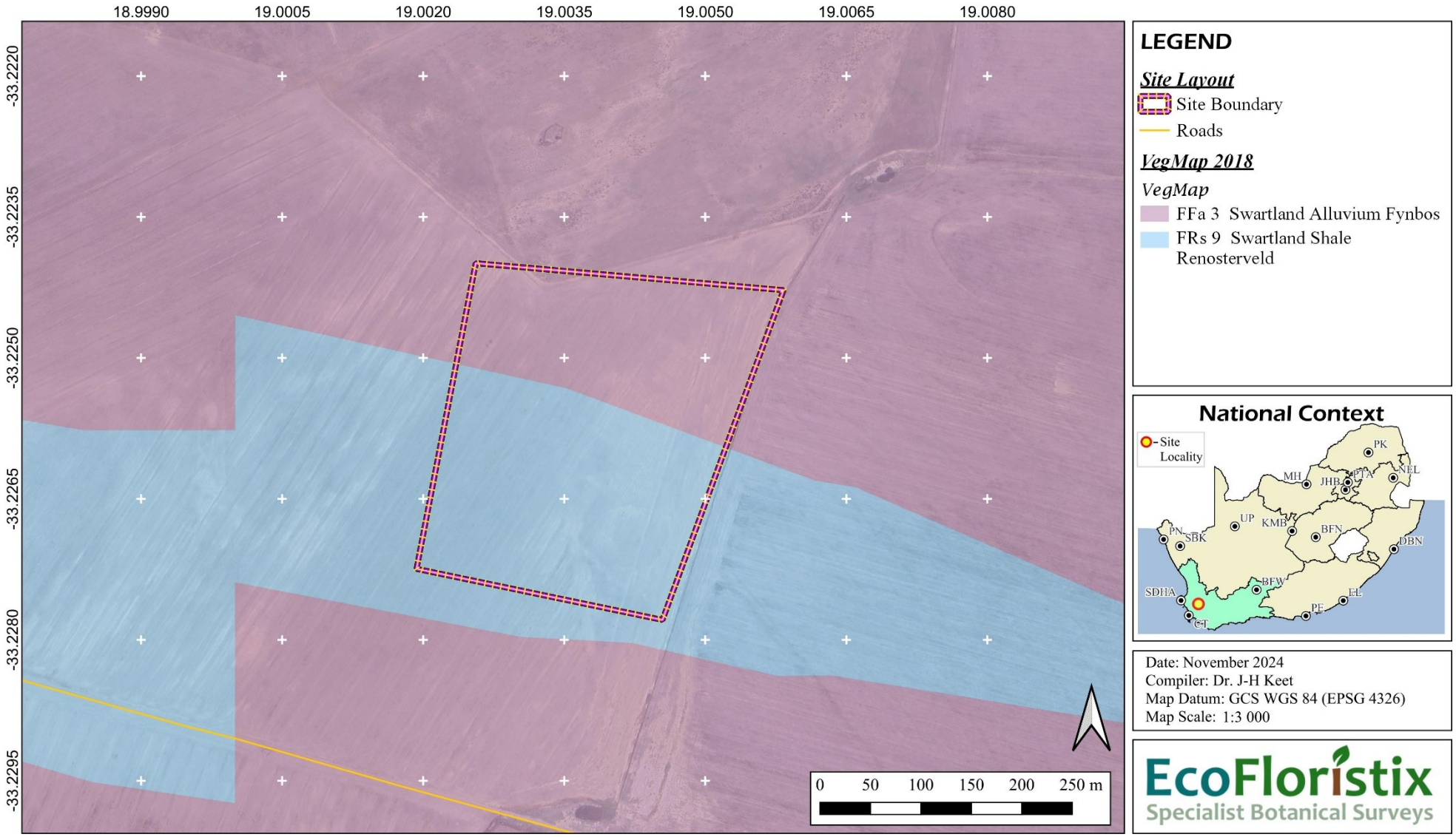


Figure 4: Specific vegetation types (according to VegMap 2018) of the proposed development site and surrounds.

2.1.1.a) Swartland Alluvium Fynbos (FFa3)

This vegetation type is distributed in the Western Cape Province on Swartland lowlands at west-facing piedmonts of the Groot Winterhoekberge near Porterville, Saronberg, Elandskloofberge to the Limietberge near Wellington, broad valley bottoms of the Paarl, Drakenstein, Franschhoek, and Banhoek Valleys, and with some extensions west of Paarl Mountain and to Klapmuts.

It is characterized by moderately undulating plains, adjacent to mountains and in river basins, of a low altitudinal range (60 – 250 m, rarely reaching 350 m). The vegetation is a matrix of low, evergreen shrubland with emergent sparse, moderately tall shrubs and a conspicuous graminoid layer. Proteoid, restioid, and asteraceous fynbos types are dominant, with closed-scrub fynbos common along the river courses. Ericaceous and restioid fynbos are found in seeps. The geology and soils comprise alluvial gravel and cobble fields typically resting over Malmesbury Group schists and phyllites (in the northern part of the area) as well as over Cape Suite granites (in Drakenstein Valley from Wellington to Franschhoek) and on Malmesbury Group sandstones from Simondium to Klipheuwel. Rainfall occurs in winter, peaking from May to August. Frost an infrequent phenomenon. This is the wettest and hottest alluvium fynbos type.

Conservation: EN according to RLE2021. Target: 30% according to NBA 2018.

Nearly 10% is conserved in the Waterval Nature Reserve, Winterhoek (mountain catchment area), and private reserves such as Elandsberg, Langerug, and Wiesenhof Wildpark. More than 75% is already transformed for vineyards, olive orchards, pine plantations, urban settlements, and by building of the Voëlvlei and Wemmershoek Dams. Alien *Acacia saligna* and *Hakea sericea* are prominent in places. Erosion is moderate and very low. This unit forms a complicated mosaic with FRs 9 Swartland Shale Renosterveld at its lower extremity, and some of the communities have an ecotonal character, for example where the soils are dominated by clay-rich silts.

Key species associated with Swartland Alluvium Fynbos (FFa3).

IMPORTANT SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Tall Shrubs	*Diospyros glabra (d), Oea europaea subsp. africana (d), Psoralea aphylla (d), Searsia angustifolia (d), Dodonaea viscosa var. angustifolia, Metalasia densa, Morella cordifolia, Passerina corymbosa, Phylica buxifolia, Protea repens, Searsia incisa, Rubus rigidus*
Low Shrubs	*Cliffortia ferruginea (d), Dicerothamnus rhinocerotis (d), Eriocephaus africanus var. africanus (d), Leucadendron corymbosum (d), Leucospermum calligerum (d), Passerina truncate subsp. truncata (d), Senecio halimifolius (d), Serruria candicans (d), Athanasia trifurcata, Cliffortia juniperina, C. ruscifolia, Dicerothamnus gnaphaloides, Euryops pinnatipartitus, Galenia africana, Leucadendron lanigerum var. lanigerum, L. salignum, L. stellare, Oftia africana, Plecostachys serpyllifolia, Stoebe plumosa, Trichocephalus stipularis*
Woody Climber	*Microloma sagittatum*
Herbs	*Conyza pinnatifida, Corymbium africanum, Dischisma arenarium, Lebeckia sepiaria*

Geophytic Herbs	*Pteridium aquilinum (d), Zantedeschia aethiopica (d), Geissorhiza imbricata subsp. bicolor, G. setacea, Mohria caffrorum, Oxalis goniorrhiza, Pauridia flaccida*
Herbaceous Climber	*Dipogon lignosus*
Graminoids	*Restio paniculatus (d), Cynodon dactylon (d), Elegia filacea (d), Ficinia brevifolia (d), Restio capensis (d), R. tenuissima (d), Juncus capensis (d), Capeochloa cincta (d), Restio rigoratus, Cannomois parviflora, Elegia nuda, E. recta, Eragrostis curvula, Pentameris curvifolia, P. pallida, Pycreus polystachyos, Restio filiformis, Thamnochortus fruticosus, T. punctatus, Willdenowia glomerata, W. incurvata, W. sulcata, W. teres*
ENDEMIC SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Low Shrubs	*Diastella buekii, Erica alexandri, E. bakeri, Marasmodes dummeri, M. undulata, Phylica stenopetala, Protea mucronifolia*
Succulent Shrub	*Lampranthus schlechteri*
Geophytic Herbs	*Brunsvigia elandsmontana, Bulbine monophyla, Geissorhiza furva, Moraea villosa subsp. elandsmontana*

2.1.1.b) Swartland Shale Renosterveld (FRs9)

This vegetation type is distributed in the Western Cape Province as large, generally continuous areas of the Swartland and the Boland on the West Coast lowlands, from Het Kruis in the north, southwards between the Piketberg and Olifahtsrivierberge, widening appreciably in the region around Moorreesburg between Gouda and Hopefield, and encompassing Riebeek-Kasteel, Klipheuwel, Philadelphia, Durbanville, Stellenbosch to the south, and Sir Lowry's Pass Village near Gordon's Bay.

It is characterized by moderately undulating plains and valleys supporting low to moderately tall leptophyllous shrubland of varying canopy cover as well as low, open shrubland dominated by renosterbos. Heuweltjies are a very prominent local feature of the environment, forming "hummockveld" hear Piketberg and giving the Tygerberg Hills their name. Stunted trees and thicket are often associated with these heuweltjies. Disturbed areas are dominated by *Athanasia trifurcata* and *Otholobium hirtum*. Patches of *Cynodon dactylon* "grazing lawns" also occur in abundance. The geology and soils comprise soils derived from Malmesbury Group shales (specifically the Porterville Formation in the north and east and the Moorreesburg Formation in the west). The soils contain prismacutanic and pedocutanic diagnostic horizons, and Glenrosa and Mispah forms are predominant. Mists are common in winter.

Conservation: CR according to RLE2021. Target: 26% according to NBA 2018.

Since 90% of the area has been totally transformed (mainly for cropland), the conservation target remains unattainable. Remnants are found in isolated pockets, usually on steeper ground. So far only a few patches have been included in conservation schemes (e.g. Elandsberg, Paardenberg). Aliens include *Acacia saligna* (very scattered over 65%), *A. mearnsii* (very scattered over 62%), as well as several species of *Prosopis* and *Eucalyptus*. Alien annual grasses of the genera *Avena*, *Briza*, *Bromus*, *Lolium*, *Phalaris* and *Vulpia* are a primary problem in remnant patches. Other serious aliens include herbs

such as *Erodium cicutarium*, *E. moschatum*, *Echium plantagineum*, and *Petrorhagia prolifera*. Erosion is very low and low. Various special vegetation units are embedded within the West Coast renosterveld matrix, composed of vernal pools, ferricrete gravels, quartz patches, and seasonally wet lowlands, all ranking among the most threatened Cape habitats and housing many endemic taxa.

Key species associated with Swartland Shale Renosterveld (FRs9).

IMPORTANT SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Tall Shrubs	*Aspalathus acuminata subsp. acuminata (d), Oea europaea subsp. africana (d), Searsia angustifolia (d), R. incisa (d), Osteospermum monilifera, Euryops speciosissimus, E. tenuissimus, Gymnosporia buxifolia, Lebeckia cytisoides*
Low Shrubs	*Anthospermum aethiopicum (d), A. spathulatum subsp. tulbaghense (d), Dicerothamnus rhinocerotis (d), Eriocephalus africanus var. africanus (d), Euryops thunbergii (d), Galenia secunda (d), Helichrysum cymosum (d), H. teretifolium (d), Osteospermum spinosum (d), Otholobium hirtum (d), Agathosma glandulosa, Aspalathus aculeata, A. pinguis subsp. pinguis, A. spinosa subsp. flavispina, A. tridentata subsp. staurantha, A. varians, Asparagus rubicundus, Athanasia trifurcata, Cliffortia marginata, Diosma hirsuta, Euclea acutifolia, Felicia filifolia subsp. filifolia, F. hyssopifolia, Galenia africana, Lebeckia cinerea, Leucadendron lanigerum var. lanigerum, Marasmodes polycephala, Metalasia dregeana, M. octoflora, Muraltia decipiens, M. ononidifolia, Oftia africana, Passerina truncata subsp. truncata, Phylica gracilis, Plecostachys serpyllifolia, Pteronia divaricata, P. incana, Searsia dissecta, Senecio pubigerus, Stoebe plumosa*
Succulent Shrubs	*Euphorbia burmannii (d), E. mauritanica, Lampranthus elegans*
Woody Climber	*Microloma sagittatum*
Herbs	*Berkheya armata (d), B. rigida, Cotula turbinata, Echiostachys spicatus, Lichtensteinia obscura, Manulea cephalotes, Senecio laxus, Stachys aethiopica*
Geophytic Herbs	*Cyanella hyacinthoides (d), Melasphaerula ramosa (d), Albuca maxima, Aristea africana, Babiana melanops, Cheilanthes capensis, Disa physodes, Geissorhiza imbricata subsp. bicolor, G. inflexa, G. juncea, G. purpureolutea, G. tulbaghensis, Lachenalia longibracteata, L. pallida, L. polyphylla, Mohria caffrorum, Ornithogalum thyrsoides, Oxalis pes-caprae, Romulea flava, R. leipoldtii, R. rosea, R. tabularis, Watsonia marginata*
Graminoids	*Cynodon dactylon (d), Ehrharta calycina (d), Elegia capensis (d), E. recta (d), E. tectorum (d), Ficinia brevifolia (d), Restio capensis (d), Tenaxia stricta (d), Ehrharta delicatula, E. thunbergii, Hordeum capense, Capeochloa arundinacea, Tribolium hispidum*
ENDEMIC SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Low Shrubs	*Leucadendron verticillatum (d), Aspalathus acanthophylla, A. horizontalis, A. pinguis subsp. longissima, A. pinguis subsp. occidentalis, A. puberula, A. rectistyla, Cliffortia acockii, Lotononis complanata, Serruria incrassata*
Succulent Shrub	*Erepsia ramosa, Ruschia patens, R. pauciflora*

Herb	*Indigofera triquetra*
Geophytic Herbs	*Aristea lugens, Babiana angustifolia, B. odorata, B. secunda, Hesperantha pallescens, H. spicata subsp. fistulosa, Lachenalia liliiflora, L. mediana var. rogersii, L. orthopetala, Lapeirousia fastigiata, Moraea gigandra, M. tulbaghensis, Oxalis fragilis, O. involuta, O. leptocalyx, O. levis, O. macra, O. perineson, O. strigosa, Pelargonium viciifolium*

2.1.2. Species of Conservation Concern and General Species Occurrences

Only SCC that might potentially occur in the proposed development site and surrounds, as predicted by online databases (see section 6.3.1), are listed in this section. The field survey(s) aimed to validate if any of these species occur within or near the proposed development site, and whether any additional species were present that may not yet have been recorded in official databases (see section 2.3). Also see section 1.6 for key legislation used to assess SCC and protected plant species.

A total of 6346 records were extracted from the online iNaturalist (records) database. The total area used to extract the records covered 528 970 hectares (5 290 km^2), with the records covering a minimum convex hull area of 414 246 hectares (4 142 km^2).

Together, these records consisted of a combined total of 1087 plant species that have been recorded within the extracted area (representing a total of 1015 species at an inclusive level, i.e., without considering subspecies, varieties, etc.), with the top three representative families being Iridaceae (133 spp.), Asteraceae (108 spp.), and Fabaceae (100 spp.).

This list included a total of 214 SCC, including 152 threatened species (full summary: 1 CR PE, 27 CR, 70 EN, 54 VU, 45 NT, 4 Critically Rare, 7 DDT, 3 DDD, 589 LC, and 91 Not Evaluated). The high number of SCC is a reflection of the fact that an area larger than necessary was used to obtain species records, and it is highly unlikely that many of these species will occur within the proposed development site (or even the broader surrounds).

A total of 92 of these SCC are protected. Apart from these, a further 210 species are also protected (thus yielding a total of 302 protected plant species, consisting of 299 provincially protected species and 4 nationally protected trees; note that these trees might also be provincially protected).

Finally, the online screening report also revealed the potential presence of 104 Sensitive Species (some of these might have been included in the other online databases).

The following is a full summary of SCC, according to descending threat status (this list might include sensitive species; if this is the case, note that, for their protection, their identities will not be made public, and they have therefore been assigned random names):

- *Aspalathus complicata* (CR)
- *Aspalathus crewiana* (CR)
- *Aspalathus horizontalis* (CR)
- *Aspalathus rectistyla* (CR)
- *Babiana regia* (CR; Protected [Provincial Schedule 4])
- *Cephalophyllum parviflorum* (CR)
- *Conophytum turrigerum* (CR)
- *Geissorhiza sufflava* (CR; Protected [Provincial Schedule 4])

- *Haemanthus pumilio* (CR; Protected [Provincial Schedule 4])
- *Ixia rouxii* (CR; Protected [Provincial Schedule 4])
- *Ixia vinacea* (CR; Protected [Provincial Schedule 4])
- *Marasmodes oubinae* (CR)
- *Marasmodes trifida* (CR)
- *Moraea angulata* (CR; Protected [Provincial Schedule 4])
- *Moraea ogamana* (CR; Protected [Provincial Schedule 4])
- *Oxalis fragilis* (CR)
- *Oxalis natans* (CR)
- *Pelargonium heterophyllum* (CR)
- *Podalyria microphylla* (CR)
- *Polhillia ignota* (CR)
- *Rafnia angulata subsp. ericifolia* (CR)
- *Senecio cadiscus* (CR)
- *Serruria pinnata* (CR; Protected [Provincial Schedule 4])
- *Serruria scoparia* (CR; Protected [Provincial Schedule 4])
- *Sorocephalus imbricatus* (CR; Protected [Provincial Schedule 4])
- *Stylapterus ericoides subsp. ericoides* (CR; Protected [Provincial Schedule 4])
- *Watsonia strictiflora* (CR; Protected [Provincial Schedule 4])
- *Agathosma latipetala* (EN; Protected [Provincial Schedule 4])
- *Albuca albucoides* (EN)
- *Annesorhiza articulata* (EN)
- *Anthospermum ericifolium* (EN)
- *Antimima aristulata* (EN)
- *Aristea lugens* (EN; Protected [Provincial Schedule 4])
- *Aspalathus muraltioides* (EN)
- *Aspalathus puberula* (EN)
- *Aspalathus secunda* (EN)
- *Aspalathus wurmbeana* (EN)
- *Athanasia crenata* (EN)
- *Babiana inclinata* (EN; Protected [Provincial Schedule 4])
- *Babiana latifolia* (EN; Protected [Provincial Schedule 4])
- *Babiana leipoldtii* (EN; Protected [Provincial Schedule 4])
- *Babiana secunda* (EN; Protected [Provincial Schedule 4])
- *Cannomois arenicola* (EN)
- *Diplosoma retroversum* (EN)
- *Drosanthemum zygophylloides* (EN)
- *Dymondia margaretae* (EN)
- *Geissorhiza erosa* (EN; Protected [Provincial Schedule 4])
- *Geissorhiza furva* (EN; Protected [Provincial Schedule 4])
- *Geissorhiza setacea* (EN; Protected [Provincial Schedule 4])
- *Geissorhiza tulbaghensis* (EN; Protected [Provincial Schedule 4])
- *Hypodiscus rugosus* (EN)
- *Indigofera psoraloides* (EN)
- *Isoetes capensis* (EN)
- *Ixia aurea* (EN; Protected [Provincial Schedule 4])
- *Ixia erubescens* (EN; Protected [Provincial Schedule 4])
- *Ixia sarmentosa* (EN; Protected [Provincial Schedule 4])
- *Lachenalia bachmannii* (EN; Protected [Provincial Schedule 4])
- *Lachenalia polyphylla* (EN; Protected [Provincial Schedule 4])
- *Lampranthus debilis* (EN)
- *Lampranthus leptaleon* (EN)
- *Lampranthus scaber* (EN)
- *Lampranthus sociorum* (EN)
- *Lebeckia plukenetiana* (EN)
- *Leucadendron lanigerum var. lanigerum* (EN; Protected [Provincial Schedule 4])
- *Leucadendron stellare* (EN; Protected [Provincial Schedule 4])
- *Leucadendron thymifolium* (EN; Protected [Provincial Schedule 4])
- *Lotononis complanata* (EN)
- *Marasmodes spinosa* (EN)
- *Merciera tetraloba* (EN)
- *Mesembryanthemum suffruticosum* (EN)
- *Monopsis variifolia* (EN)
- *Monsonia speciosa* (EN)
- *Moraea gigandra* (EN; Protected [Provincial Schedule 4])
- *Moraea tricolor* (EN; Protected [Provincial Schedule 4])
- *Moraea tulbaghensis* (EN; Protected [Provincial Schedule 4])
- *Othonna linearifolia* (EN)
- *Oxalis droseroides* (EN)
- *Oxalis strigosa* (EN)
- *Pauridia pygmaea* (EN)
- *Pelargonium chelidonium* (EN)
- *Pelargonium ellaphieae* (EN)
- *Pelargonium viciifolium* (EN)
- *Pentameris pholiuroides* (EN)
- *Protea mucronifolia* (EN; Protected [Provincial Schedule 4])
- *Pterygodium inversum* (EN; Protected [Provincial Schedule 4])
- *Rafnia lancea* (EN)
- *Restio rigoratus* (EN)
- *Romulea aquatica* (EN; Protected [Provincial Schedule 4])
- *Serruria incrassata* (EN; Protected [Provincial Schedule 4])
- *Serruria linearis* (EN; Protected [Provincial Schedule 4])
- *Serruria roxburghii* (EN; Protected [Provincial Schedule 4])
- *Sparaxis grandiflora subsp. grandiflora* (EN; Protected [Provincial Schedule 4])
- *Steirodiscus gamolepis* (EN)
- *Thereianthus bulbiferus* (EN; Protected [Provincial Schedule 4])
- *Trianoptiles solitaria* (EN)
- *Tritoniopsis elongata* (EN; Protected [Provincial Schedule 4])
- *Watsonia dubia* (EN; Protected [Provincial Schedule 4])
- *Agathosma trichocarpa* (VU; Protected [Provincial Schedule 4])
- *Antimima mucronata* (VU)
- *Aspalathus aculeata* (VU)
- *Aspalathus latifolia* (VU)
- *Aspalathus pinguis subsp. occidentalis* (VU)
- *Aspalathus recurva* (VU)
- *Caesia sabulosa* (VU)
- *Drimia albiflora* (VU)
- *Drosanthemum hispifolium* (VU)
- *Echiostachys incanus* (VU)
- *Erepsia ramosa* (VU)
- *Erica oxysepala* (VU; Protected [Provincial Schedule 4])
- *Gladiolus trichonemifolius* (VU; Protected [Provincial Schedule 4])
- *Hermannia rugosa* (VU)
- *Indigofera triquetra* (VU)
- *Ixia abbreviata* (VU; Protected [Provincial Schedule 4])

- *Lachenalia corymbosa* (VU; Protected [Provincial Schedule 4])
- *Lachenalia flava* (VU; Protected [Provincial Schedule 4])
- *Lachenalia longibracteata* (VU; Protected [Provincial Schedule 4])
- *Lachnaea grandiflora* (VU)
- *Lachnaea pusilla* (VU)
- *Lachnaea uniflora* (VU)
- *Lampranthus filicaulis* (VU)
- *Lampranthus peacockiae* (VU)
- *Lampranthus spiniformis* (VU)
- *Leucadendron argenteum* (VU; Nationally Protected Tree)
- *Leucospermum parile* (VU; Protected [Provincial Schedule 4])
- *Leucospermum vestitum* (VU; Protected [Provincial Schedule 4])
- *Lobostemon capitatus* (VU)
- *Metalasia capitata* (VU)
- *Metalasia octoflora* (VU)
- *Moraea cooperi* (VU; Protected [Provincial Schedule 4])
- *Moraea mutila* (VU; Protected [Provincial Schedule 4])
- *Moraea versicolor* (VU; Protected [Provincial Schedule 4])
- *Moraea villosa subsp. elandsmontana* (VU; Protected [Provincial Schedule 4])
- *Moraea villosa subsp. villosa* (VU; Protected [Provincial Schedule 4])
- *Muraltia macropetala* (VU)
- *Othonna ciliata* (VU)
- *Pauridia alba* (VU)
- *Pelargonium asarifolium* (VU)
- *Pelargonium leptum* (VU)
- *Phylica plumosa var. horizontalis* (VU)
- *Phylica stenopetala var. stenopetala* (VU)
- *Phylica strigulosa* (VU)
- *Podalyria sericea* (VU)
- *Protea burchellii* (VU; Protected [Provincial Schedule 4])
- *Protea scolymocephala* (VU; Protected [Provincial Schedule 4])
- *Psoralea alata* (VU)
- *Restio duthieae* (VU)
- *Ruschia diversifolia* (VU)
- *Serruria candicans* (VU; Protected [Provincial Schedule 4])
- *Trachyandra chlamydophylla* (VU)
- *Wurmbea inusta* (VU)
- *Xiphotheca lanceolata* (VU)
- *Aponogeton angustifolius* (NT)
- *Arctopus dregei* (NT)
- *Aspalathus linearifolia* (NT)
- *Asparagus lignosus* (NT)
- *Babiana angustifolia* (NT; Protected [Provincial Schedule 4])
- *Babiana fragrans* (NT; Protected [Provincial Schedule 4])
- *Babiana melanops* (NT; Protected [Provincial Schedule 4])
- *Babiana nervosa* (NT; Protected [Provincial Schedule 4])
- *Babiana odorata* (NT; Protected [Provincial Schedule 4])
- *Babiana villosa* (NT; Protected [Provincial Schedule 4])
- *Centella capensis* (NT)
- *Cryptocarya angustifolia* (NT)
- *Curtisia dentata* (NT; Nationally Protected Tree)
- *Cyphia phyteuma* (NT)
- *Disa flexuosa* (NT; Protected [Provincial Schedule 4])
- *Drosanthemum calycinum* (NT)
- *Eriospermum lanuginosum* (NT)
- *Geissorhiza imbricata subsp. imbricata* (NT; Protected [Provincial Schedule 4])
- *Geissorhiza purpureolutea* (NT; Protected [Provincial Schedule 4])
- *Gethyllis ciliaris subsp. ciliaris* (NT; Protected [Provincial Schedule 4])
- *Gladiolus watsonius* (NT; Protected [Provincial Schedule 4])
- *Gorteria personata* (NT)
- *Hesperantha radiata* (NT; Protected [Provincial Schedule 4])
- *Ixia capillaris* (NT; Protected [Provincial Schedule 4])
- *Ixia scillaris subsp. scillaris* (NT; Protected [Provincial Schedule 4])
- *Lachenalia contaminata* (NT; Protected [Provincial Schedule 4])
- *Lachenalia quadricolor* (NT; Protected [Provincial Schedule 4])
- *Lampranthus glaucus* (NT)
- *Lessertia tomentosa* (NT)
- *Leucadendron corymbosum* (NT; Protected [Provincial Schedule 4])
- *Leucadendron daphnoides* (NT; Protected [Provincial Schedule 4])
- *Leucadendron modestum* (NT; Protected [Provincial Schedule 4])
- *Leucospermum lineare* (NT; Protected [Provincial Schedule 4])
- *Leucospermum oleifolium* (NT; Protected [Provincial Schedule 4])
- *Leucospermum rodolentum* (NT; Protected [Provincial Schedule 4])
- *Leucospermum tottum var. tottum* (NT; Protected [Provincial Schedule 4])
- *Lotononis prostrata* (NT)
- *Muraltia trinervia* (NT)
- *Oedera fruticosa* (NT)
- *Oxalis disticha* (NT)
- *Pauridia minuta* (NT)
- *Pelargonium ternifolium* (NT)
- *Protea acaulos* (NT; Protected [Provincial Schedule 4])
- *Serruria effusa* (NT; Protected [Provincial Schedule 4])
- *Sparaxis grandiflora subsp. fimbriata* (NT; Protected [Provincial Schedule 4])
- *Adenogramma natans* (Critically Rare)
- *Brunsvigia elandsmontana* (Critically Rare; Protected [Provincial Schedule 4])
- *Pelargonium elandsmontanum* (Critically Rare)
- *Pelargonium saxatile* (Critically Rare)
- *Dietes bicolor* (Rare; Protected [Provincial Schedule 4])
- *Drosera regia* (Rare)
- *Eriospermum flavum* (Rare)
- *Lachenalia thunbergii* (Rare; Protected [Provincial Schedule 4])
- *Lampranthus aduncus* (DDT)
- *Lampranthus altistylus* (DDT)
- *Lampranthus calcaratus* (DDT)
- *Lampranthus emarginatoides* (DDT)
- *Oxalis hirta var. intermedia* (DDT)
- *Oxalis leptocalyx* (DDT)
- *Ruschia rariflora* (DDT)

- *Aloe perfoliata* (DDD; Protected [Provincial Schedule 4])
- *Aspalathus pinguis subsp. longissima* (DDD)
- *Manulea acutiloba* (DDD)

2.1.3. Alien and Invasive Plant Species

A total of 123 alien plant species have been recorded within the extracted area, with 40 of them being listed invasive species within the NEM:BA A&IS Regulations (note that if "Category Multi" exists in this list, then it is intended to indicate that the listing of the species in question is context dependent; should such a species is found on site, then the category applicable to its context will be made clear in the sections on site-specific results). The NEM:BA A&IS Regulations species are:

- *Acacia cyclops* (Red eye; Category 1b)
- *Acacia mearnsii* (Black wattle; Category 2)
- *Acacia podalyriifolia* (Pearl acacia; Category 1b)
- *Acacia pycnantha* (Golden wattle; Category 1b)
- *Acacia saligna* (Port Jackson, Port Jackson willow; Category 1b)
- *Arundo donax* (Giant reed, Spanish reed; Category 1b)
- *Casuarina cunninghamiana* (Beefwood; Category Multi)
- *Catharanthus roseus* (Madagascar periwinkle; Category Multi)
- *Cirsium vulgare* (Spear thistle, Scotch thistle; Category 1b)
- *Coreopsis lanceolata* (Tickseed; Category 1b)
- *Cuscuta campestris* (Common dodder; Category 1b)
- *Datura stramonium* (Common thorn apple; Category 1b)
- *Duranta erecta* (Forget-me-not-tree, Pigeon berry; Category Multi)
- *Echium plantagineum* (Patterson's curse; Category 1b)
- *Eucalyptus camaldulensis* (River red gum; Category Multi)
- *Eucalyptus cladocalyx* (Sugar gum; Category Multi)
- *Hakea salicifolia* (Willow hakea; Category Multi)
- *Hakea sericea* (Silky hakea; Category 1b)
- *Ipomoea indica* (Blue morning glory; Category 1b)
- *Limonium sinuatum* (Statice, Sea lavender; Category Multi)
- *Melia azedarach* (Syringa; Category Multi)
- *Myriophyllum aquaticum* (Parrot's feather; Category 1b)
- *Nicotiana glauca* (Wild tobacco; Category 1b)
- *Opuntia ficus-indica* (Mission prickly pear, Sweet prickly pear; Category Multi)
- *Paraserianthes lophantha* (Australian albizia, Stink bean; Category 1b)
- *Pinus radiata* (Radiata pine, Monterey pine; Category Multi)
- *Pittosporum undulatum* (Australian cheesewood, Sweet pittosporum; Category 1b)
- *Ricinus communis* (Castor-oil plant; Category 2)
- *Rumex acetosella* (Sheep sorrel, Red sorrel; Category Multi)
- *Salsola kali* (Tumbleweed; Category 1b)
- *Senna didymobotrya* (Peanut butter cassia; Category Multi)
- *Sesbania punicea* (Red sesbania; Category 1b)
- *Solanum mauritianum* (Bugweed; Category 1b)
- *Solanum pseudocapsicum* (Jerusalem cherry; Category 1b)
- *Solanum sisymbriifolium* (Wild tomato, Dense- thorned bitter apple; Category 1b)
- *Spartium junceum* (Spanish broom; Category Multi)
- *Stellaria media* (Common chickweed; Category Multi)
- *Tecoma stans* (Yellow bells; Category 1b)
- *Verbena bonariensis* (Wild verbena, Tall verbena, Purple top; Category 1b)
- *Xanthium strumarium* (Large cocklebur; Category 1b)

2.2. Desktop Analyses: Ecologically Important Landscape Features

2.2.1. Ecosystem Threat Status: RLE 2021 and NBA 2018

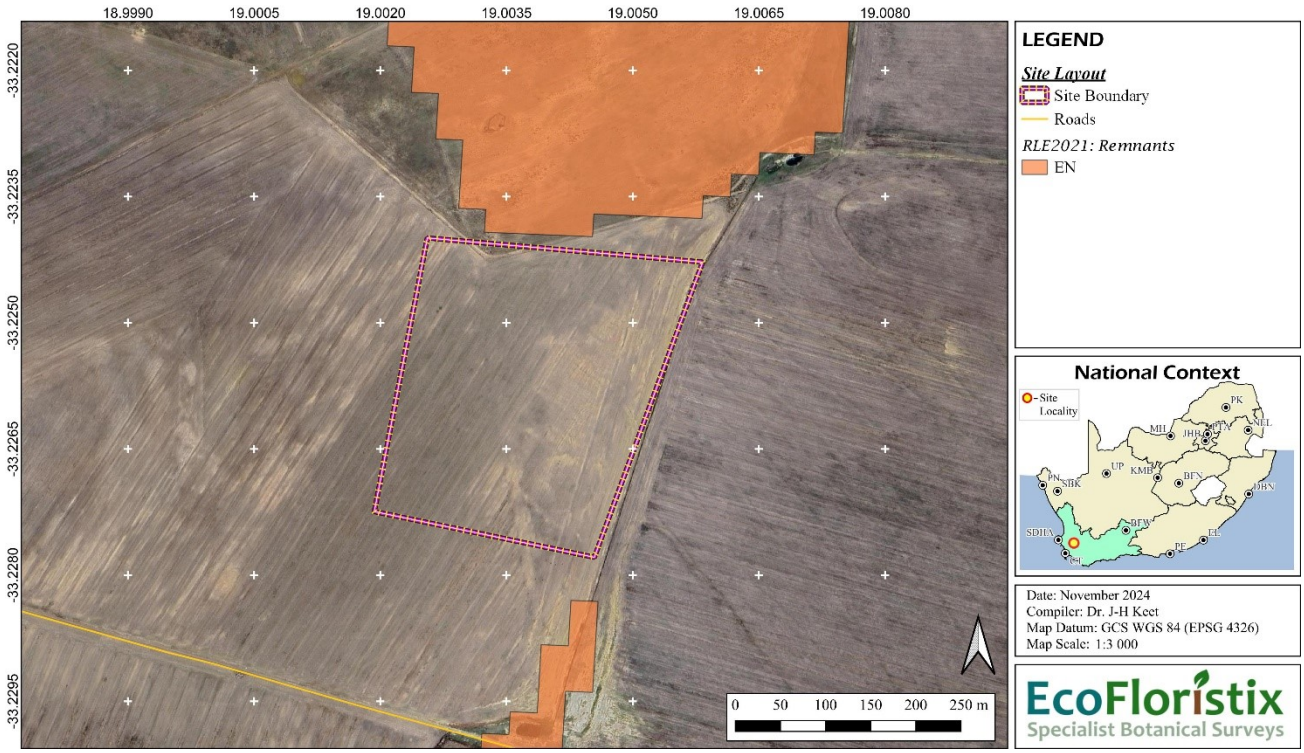


Figure 5: Ecosystem Threat Status, according to the Red List of Ecosystems for South Africa (2021), associated with the proposed development site and surrounds.

According to the Red List of Ecosystems for South Africa (2021) spatial dataset the entire proposed development site is located outside any listed ecosystems (Figure 5; see section 6.2.1 for more details and notes on Ecosystem Threat Status categories). The National Biodiversity Assessment 2018 essentially presents the same information.

A fragment of remnant Swartland Alluvium Fynbos (listed as Endangered) is mapped to occur within 20 m of the northern proposed development site boundary. However, site inspection revealed that this is not accurate and that the area is comprised of fallow agricultural fields (see section 2.3).

2.2.2. Ecosystem Protection Level

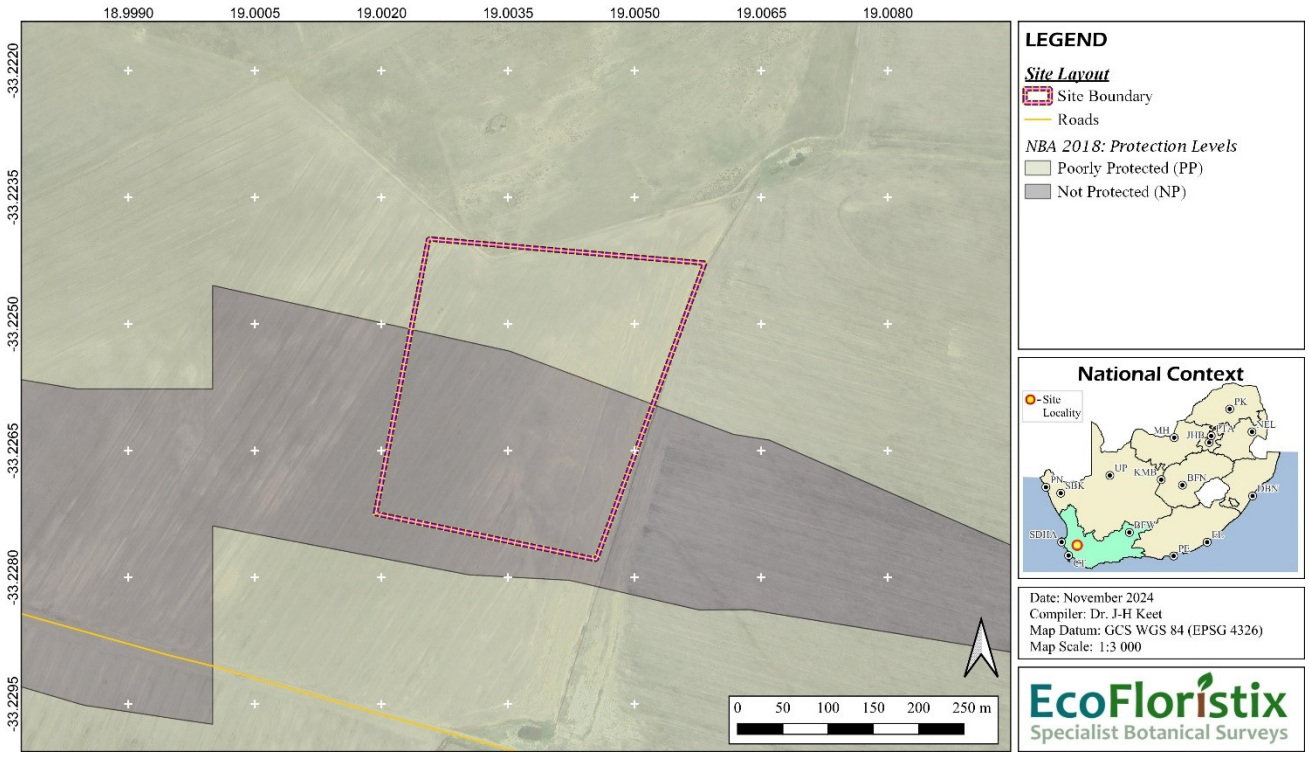


Figure 6: Ecosystem Protection Level, according to the National Biodiversity Assessment 2018, associated with the proposed development site and surrounds.

According to the National Biodiversity Assessment 2018 spatial dataset the proposed development site is located partly within an NP ecosystem (Swartland Shale Renosterveld) and a PP ecosystem (Swartland Alluvium Fynbos) (Figure 6; see section 6.2.1 for more details and notes on Ecosystem Protection Level categories).

Very few patches of Swartland Shale Renosterveld have been included in conservation schemes, and it's conservation target remains unattainable since 90% of the area has been totally transformed even though the unit historically occurred over vast stretches of land within the Swartland (only 265 out of 4 963 km^2 is mapped as remaining, which is still likely a large overestimate).

In contrast, Swartland Alluvium Fynbos is somewhat protected since about 10% is conserved in the Waterval Nature Reserve, Winterhoek (mountain catchment area), and private reserves such as Elandsberg, Langerug, and Wiesenhof Wildpark. However, given that 75% is already transformed for vineyards, olive orchards, pine plantations, urban settlements, and by building of the Voëlvlei and Wemmershoek Dams, prospects for its future conservation are strenuous. About 133.61 km^2 (out of a historic 477.19 km^2) is mapped as still remaining.

Site inspection revealed that no remnants of either Swartland Alluvium Fynbos or Swartland Shale Renosterveld occur within or near the proposed development site boundary, but only agricultural fields. Thus, the proposed development site is not eligible for contributing to national ecosystem protection levels for either of the two listed vegetation types.

2.2.3. Critical Biodiversity Areas and Ecological Support Areas

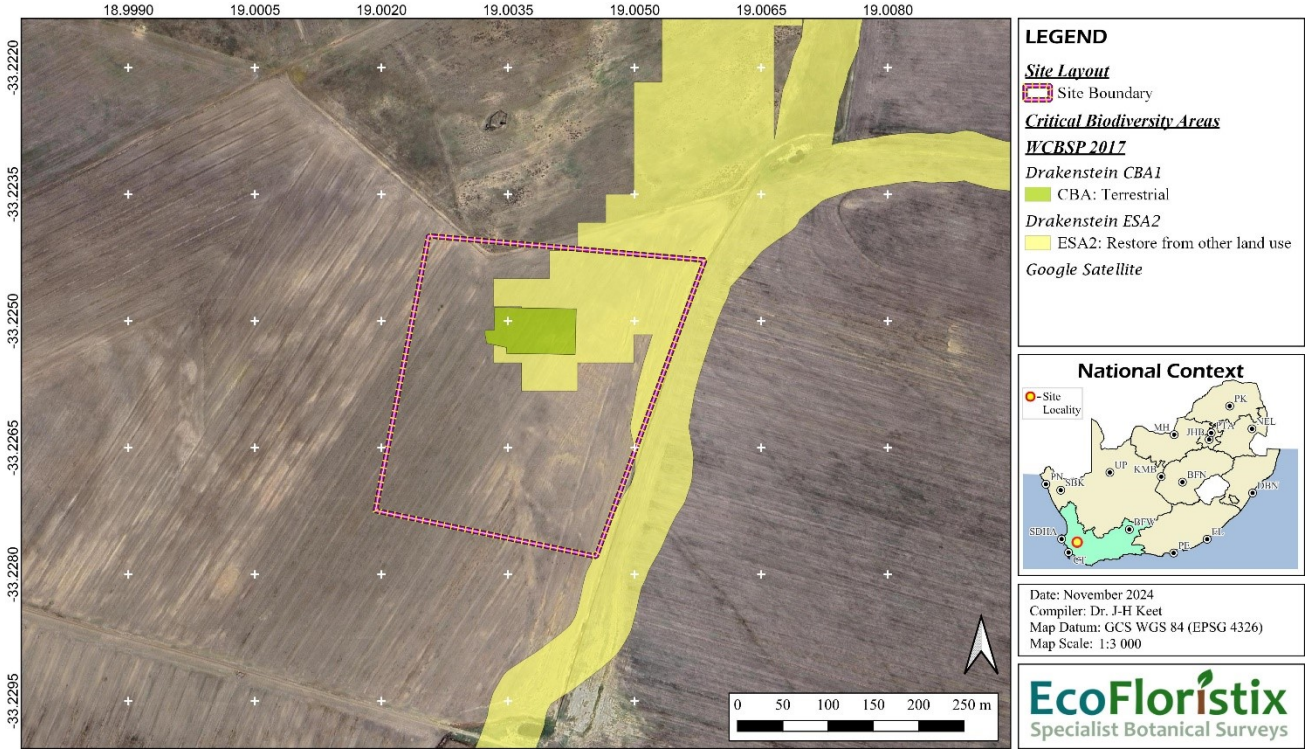


Figure 7: Layout of Critical Biodiversity Areas within the proposed development site and surrounds.

The proposed development site is located within an area mapped as "CBA1:Terrestrial" and "ESA2:Restore from other land use" (Figure 7; see section 6.2.4 for more details and notes on CBA and ESA categories).

The CBA1 area does not accurately reflect the situation on site since it occurs within an agricultural field (see section 2.3). Furthermore, the ESA classification also does not accurately reflect the situation on site and is likely correlated with the presence of a small modified watercourse occurring on the eastern side of the proposed development site.

2.2.4. National Protected Area Expansion Strategy

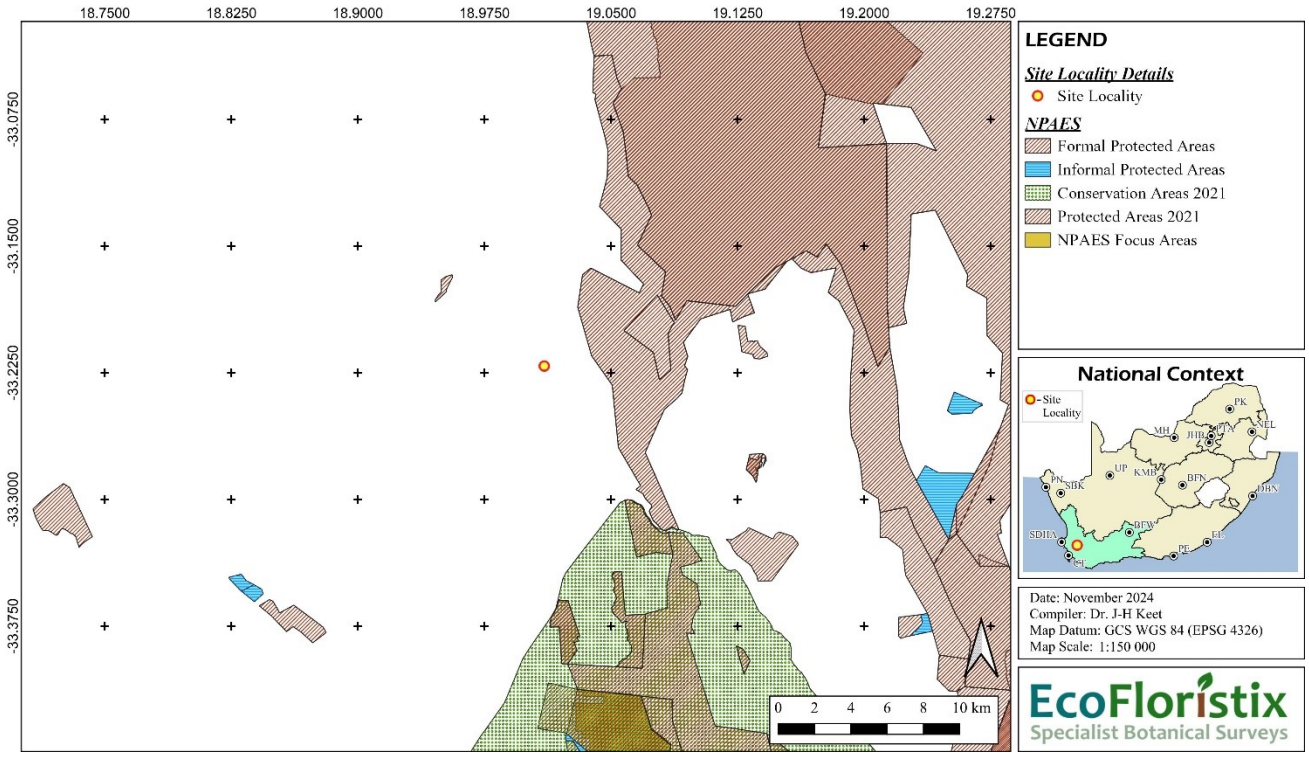


Figure 8: Proposed development site locality in relation to designated areas of the National Protected Area Expansion Strategy (NPAES).

The proposed development site not located within any NPAES Focus Areas.

The closest Formal Protected Area, namely the Winterhoek Mountain Catchment Area (Figure 8; see section 6.2.3 for more details and notes on the NPAES) occurs more than 2.7 km east of the proposed development site, and will not be impacted by the proposed activities.

2.2.5. Hydrological Features

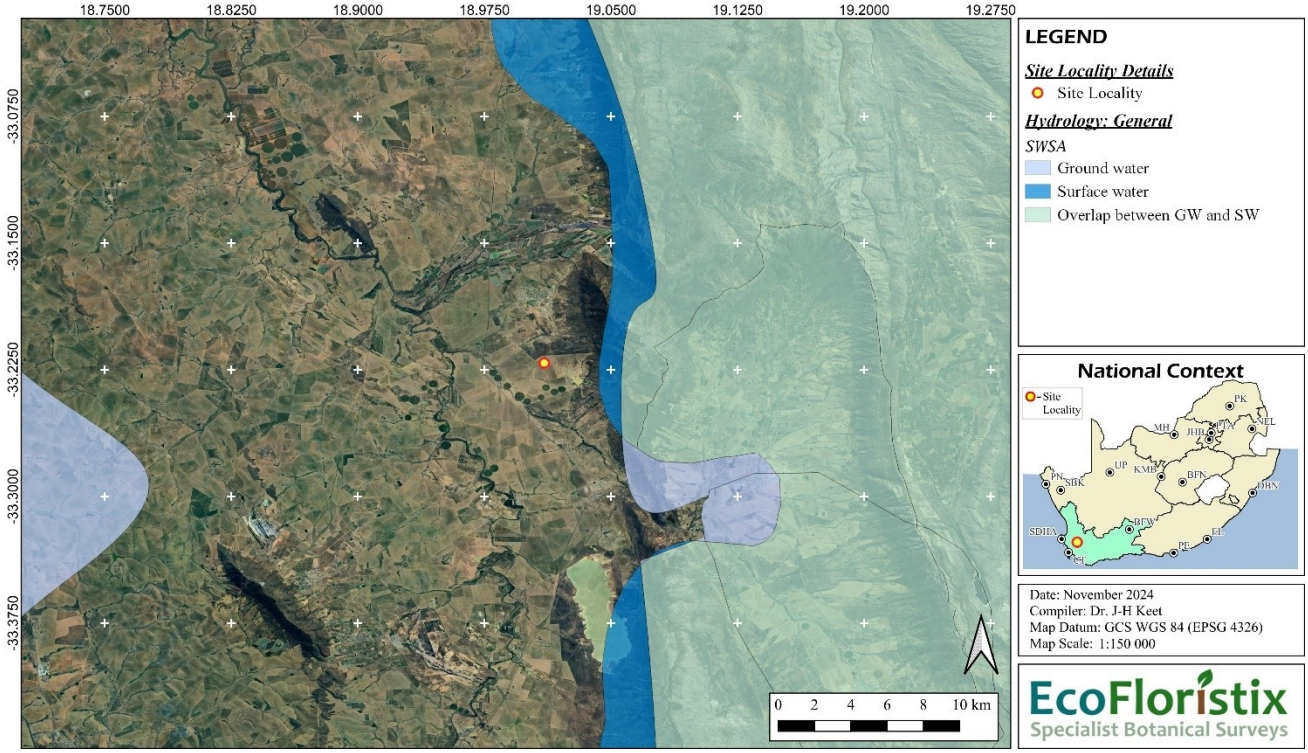


Figure 9: Hydrological setting of the proposed development site and surrounds in the context of National Freshwater Ecosystem Priority Areas and Strategic Water Source Areas (SWSA).

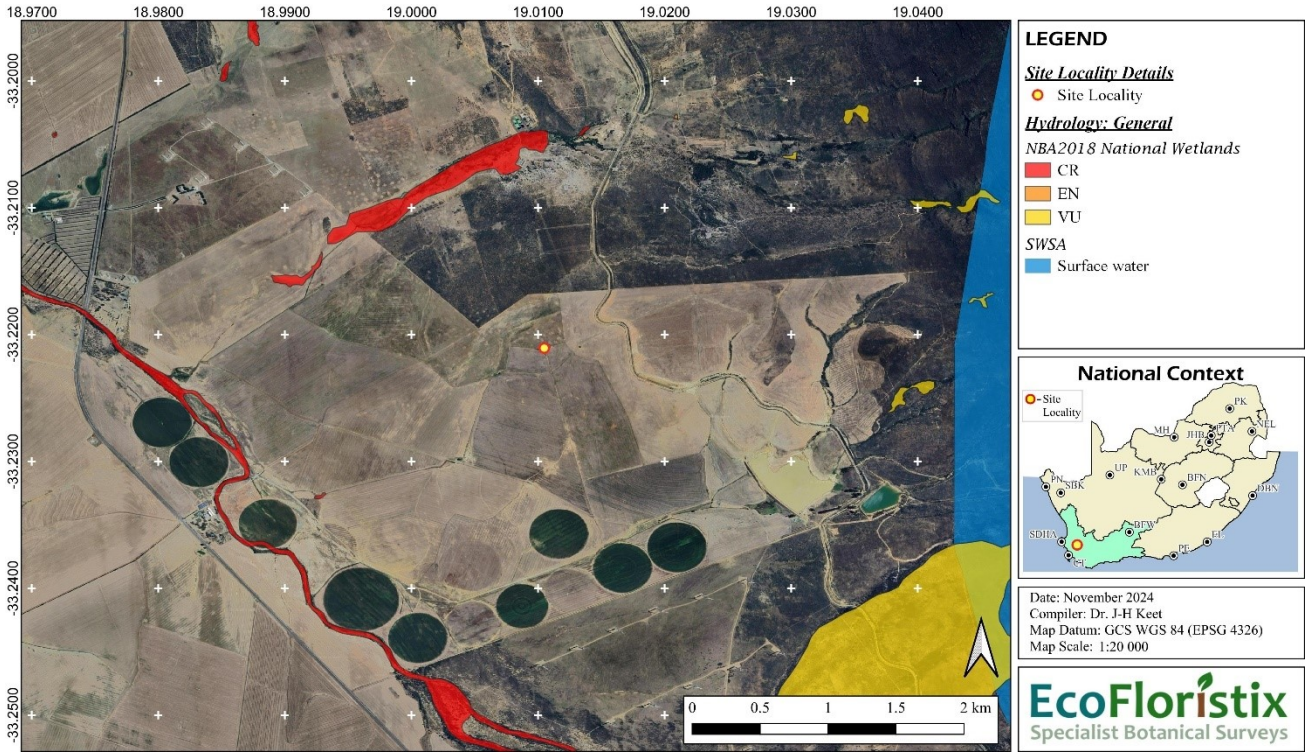


Figure 10: Hydrological setting of the proposed development site and surrounds in the context of the NBA National Wetlands database.

The proposed development site is not located within or near a SWSA (the closest areas are 3 km east [Groot Winterhoek] and 23 km southwest [West Coast Aquifer]; Figure 9).

The proposed development site occurs some distance from an NFEPA river (± 2.5 km east of the Klein Berg river; (Figure 10; see sections 6.2.4 and 6.2.5 for more details and notes on the NFEPA, and SWSA). However, a small watercourse flowing directly past the eastern border of the proposed development site drains into the Klein Berg river (see section 2.3).

The proposed development site does occur near an unclassified valley-bottom wetland (unspecified names), which occurs ± 1.5 northwest of the proposed development site (Figure 10). However, given the direction of drainage (generally in the southwestern direction), the proposed activities will not influence this specific wetland.

Finally, the proposed development site is not close to any RAMSAR site.

2.3. Fieldwork and Site Inspection: Assessment of the Proposed Development Site and Surrounds

2.3.1. Plant Community Types

This section describes the different habitats and vegetation patterns, as expressed in plant community types, observed within the proposed development site and surrounds. As these are field-based observations, they are more reliable and applicable than the coarsely mapped results of VegMap, which does not yet adequately represent such finer details.

The PAOI is considered to be the same as the total extent of the proposed development site.

A total distance of ± 14 km was surveyed across the proposed development site and surrounds (this was done both on foot and with a vehicle). The proposed development site was therefore adequately surveyed due to its small size.

Furthermore, the SANBI Species Environmental Assessment Guideline (South African National Biodiversity Institute, 2020) requires that a 200 m buffer zone be placed around any SCC found in a proposed development site. Thus, surveying was also conducted within a 200 m radius of the proposed development site boundary to confirm the presence or absence of SCC's (see Figure 11).

Only two plant community types (one with two subtypes) were found in the proposed development site and surrounds (Figure 11, Figure 12, and Figure 13). Although other communities occur in the broader surrounding area, only communities that will be impacted are described, namely:

- Farmland Community
- Riparian Community

The Farmland plant community type is characterized by extremely high levels of disturbance given that it overlies active agricultural fields. As such, all species recorded within the community comprise pioneer species, which are mostly weedy and/or alien in nature. Also, given the extremely high levels of disturbance, this community is very species poor, and species mostly included *Avena fatua*, *Lupinus angustifolius*, and *Erodium botrys*.

Two variants were considered, namely variant A and B. Variant A forms the largest portion of the proposed development site (10.68 ha, 99.72%), and occurs on an active agricultural field. Variant B, occurring to the north of the proposed

development site, with only a very small portion within the proposed development site boundary itself (0.03 ha), is similar to variant A but only differs in that it has been laid fallow for a longer period than variant A. Thus, weedy, and woody species such as *Galenia africana* also occur within this type, while the density of the other species are somewhat higher.

The riparian community does not constitute true riparian vegetation, and was named as such only based on the fact that it borders a small perennial modified watercourse (at the eastern boundary of the proposed development site), and consists of a few aquatic species both within the stream and lining its banks. Similar to the farmland communities, it is mostly compromised of alien species, but with a few individuals of native *Aspalathus acuminata* subsp. *acuminata* and *Asparagus retrofractus* on the banks, and native aquatic species such as *Eleocharis limosa*, *Juncus acutus*, and *Typha capensis* within the stream itself. Three small manmade dams occur near the proposed development site (one approximately 150 m northeast of the proposed development site boundary, and the other two approximately 240 m south), all of which contain *Typha capensis*.

Thus, all plant community types found within and near the proposed development site boundary are highly disturbed and artificial, and no pristine plant communities types occur on site.

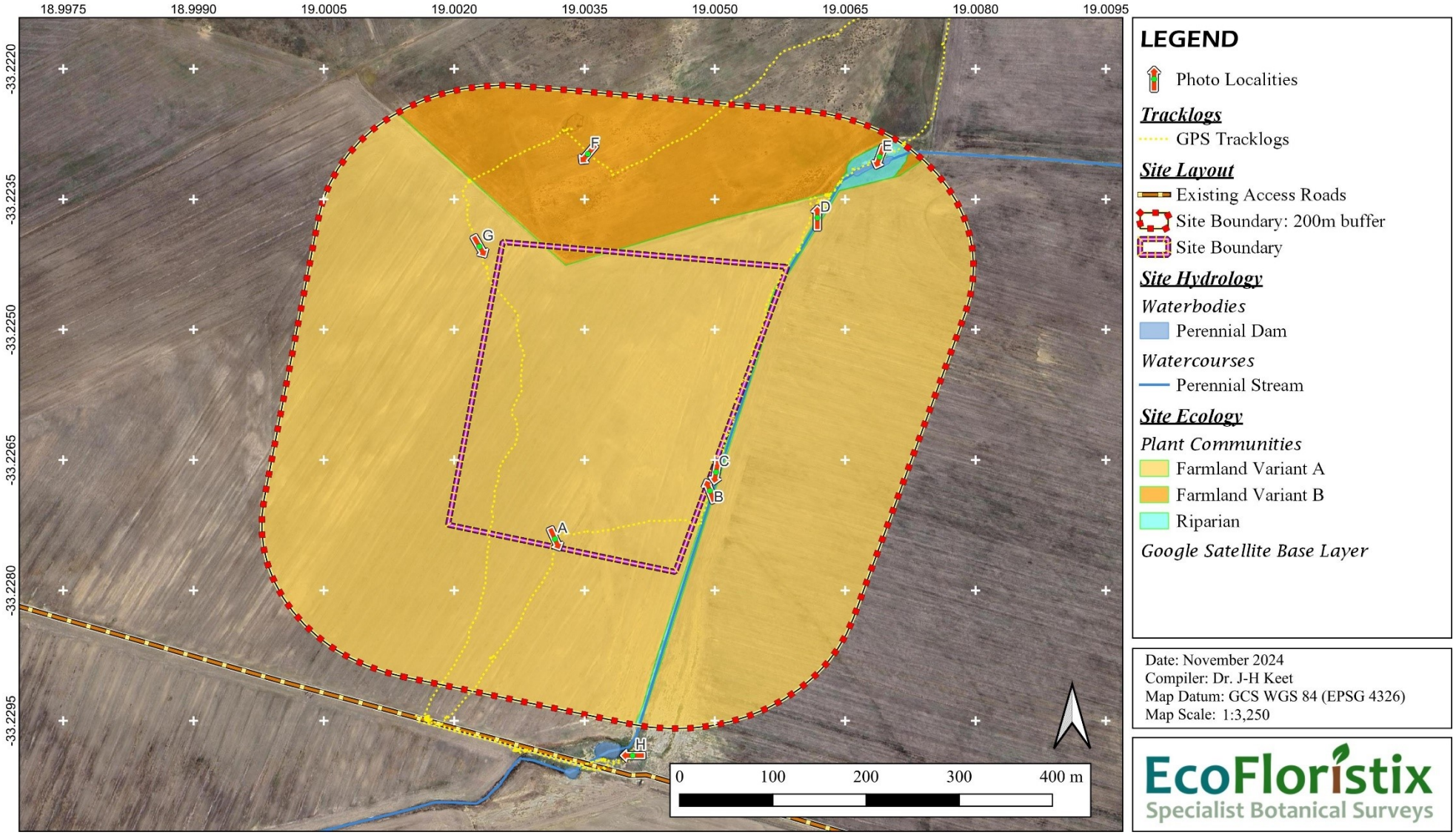


Figure 11: Plant communities that were observed in the proposed development site and surrounds, as well as general site ecology and other relevant information.

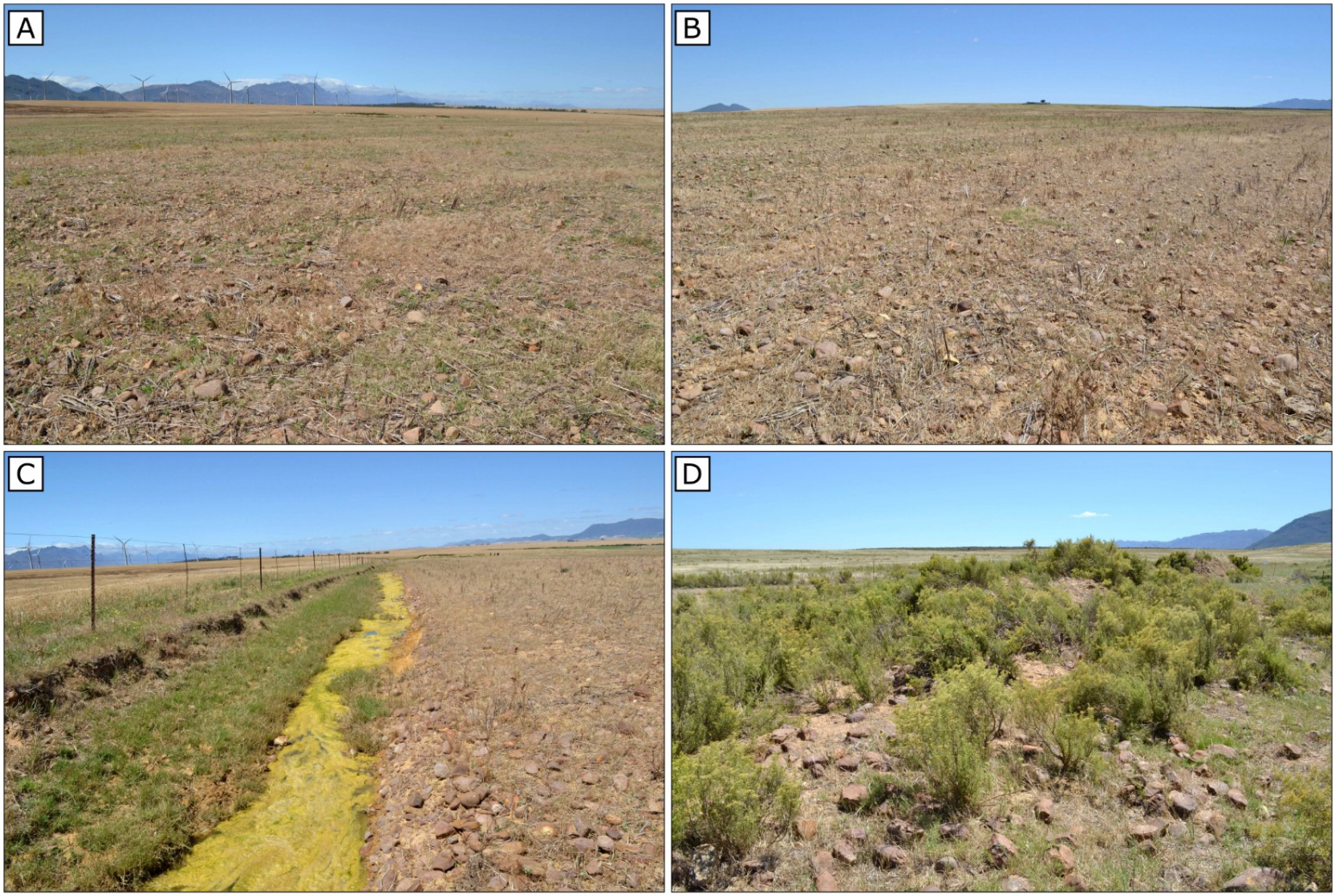


Figure 12: Various photos representative of the proposed development site and surrounds, which aim to show the site-specific vegetation and its condition. A and B represent the farmland plant community type "variant A", C represents the riparian community and modified perennial stream, and D represent the farmland plant community type "variant B", showing the dominance of *Galenia africana* (kraalbos). See Figure 11 for photo localities and directions.

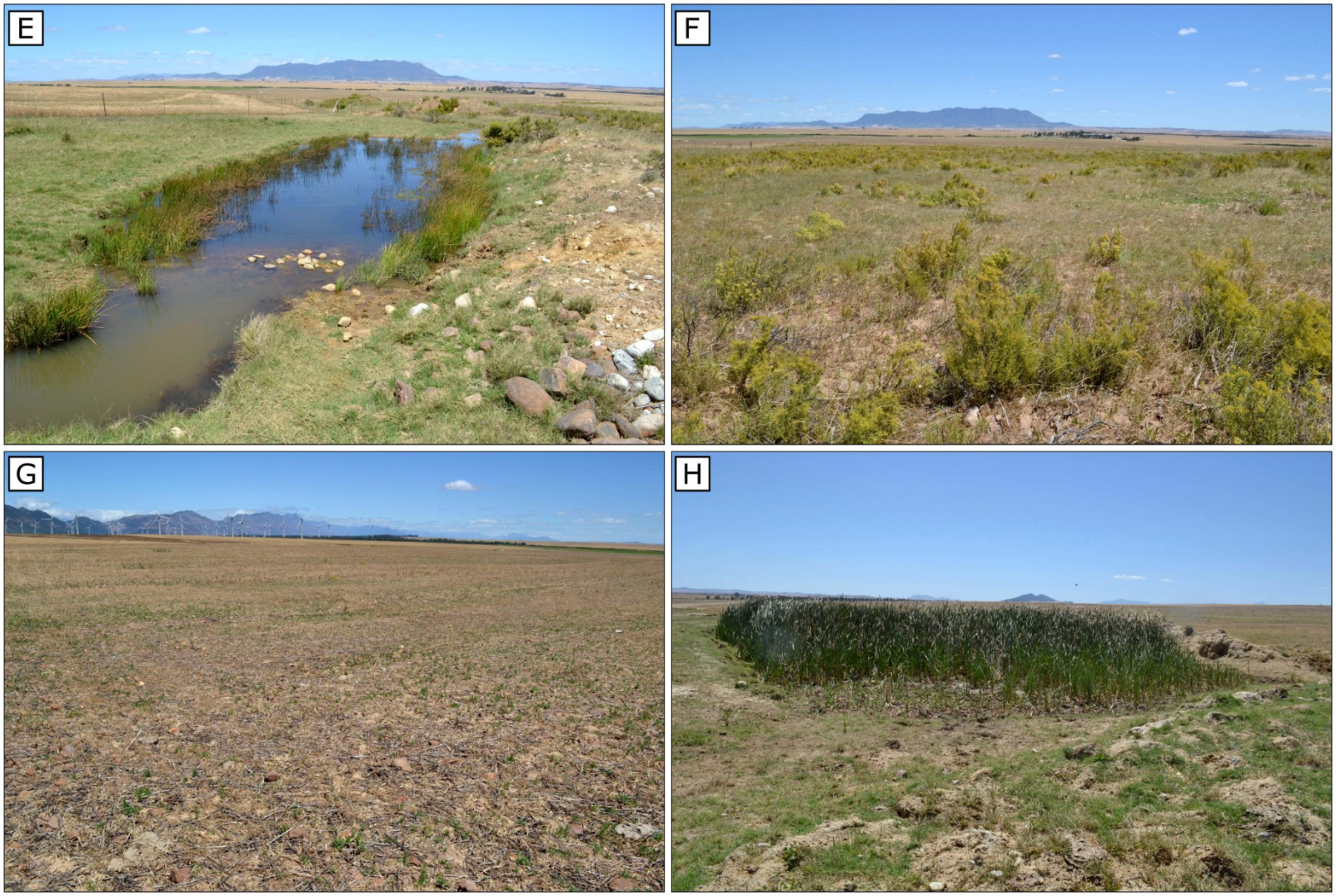


Figure 13: Continued from Figure 12. E and H are two of the manmade dams occurring near the proposed development site, and G represents the farmland plant community type "variant B", showing the dominance of *Galenia africana* (kraalbos), while F represents the farmland plant community type "variant A". See Figure 11 for photo localities and directions.

2.3.2. Species of Conservation Concern

Ground truthing confirmed that no SCC occur within the proposed development site, or within 200 m (the minimum required buffer zone for plant SCC according to the SANBI Species Environmental Assessment Guideline) of the proposed development site boundary.

2.3.3. Alien and Invasive Plant Species

No alien or NEM:BA A&IS Regulations listed species were observed in the proposed development site.

2.3.4. Site Ecological Importance Assessment

The Relative Plant Species Theme Sensitivity for the proposed development site and surrounds, according to the online screening tool, was scored as "Medium" (Figure 14). This is likely based on potential predicted presences of sensitive species in the area, as well as SCC (see sections 6.3.1 and 2.1.2). Ground truthing confirmed that no SCC occur within the proposed development site, or within 200 m of the boundary. Also, given the highly disturbed nature of the site, the true Relative Plant Species Theme Sensitivity of the site can instead be considered as "Low" according to the criteria given by Government Notice 1150 of Government Gazette 43855 (October 2020; see section 1.6).

The Relative Biodiversity Theme Sensitivity for the proposed development site and surrounds, according to the online screening tool, was scored as "Very High" (Figure 14). This is due to the proposed development site being mapped to occur within CBA 1 (Terrestrial), ESA 2 (Restore from other land use), and two threatened ecosystems (Swartland Alluvium Fynbos [EN] and Swartland Shale Renosterveld [CR]). Ground truthing confirmed that almost the entire proposed development site overlies an active agricultural field, and the site therefore does not qualify for CBA or ESA criteria. Also, neither Swartland Alluvium Fynbos nor Swartland Shale Renosterveld occur on site. The true Relative Biodiversity Theme Sensitivity of the site can instead be considered as "Low" according to the criteria given by Government Notice 320 of Government Gazette 43110 (March 2020).

Field observations, together with the SEI assessment presented here (see section 7.2 for details), indicated that the proposed development site should be classified as "Very Low" (Table 2 and Figure 15). The following specific reasons contributed towards this score:

- The Farmland Community (variant A and B) is regarded as "Very Low" since it is highly disturbed and several major current negative ecological impacts are present due to agricultural activities.
- The Riparian Community is regarded as "Very Low" since it is highly disturbed and several major current negative ecological impacts are present due to agricultural activities. As mentioned previously, this plant community type was named "riparian" based on the fact that it borders a small and modified perennial stream, and the vegetation does not constitute true riparian vegetation.

Finally, none of the areas within the proposed development site are considered as "No-Go" areas.

The SEI score interpretations according to *the Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (South African National Biodiversity Institute, 2020) are as follows (specifically see Figure 19 and details given in section 7.2):

- "Very Low": minimization mitigation.

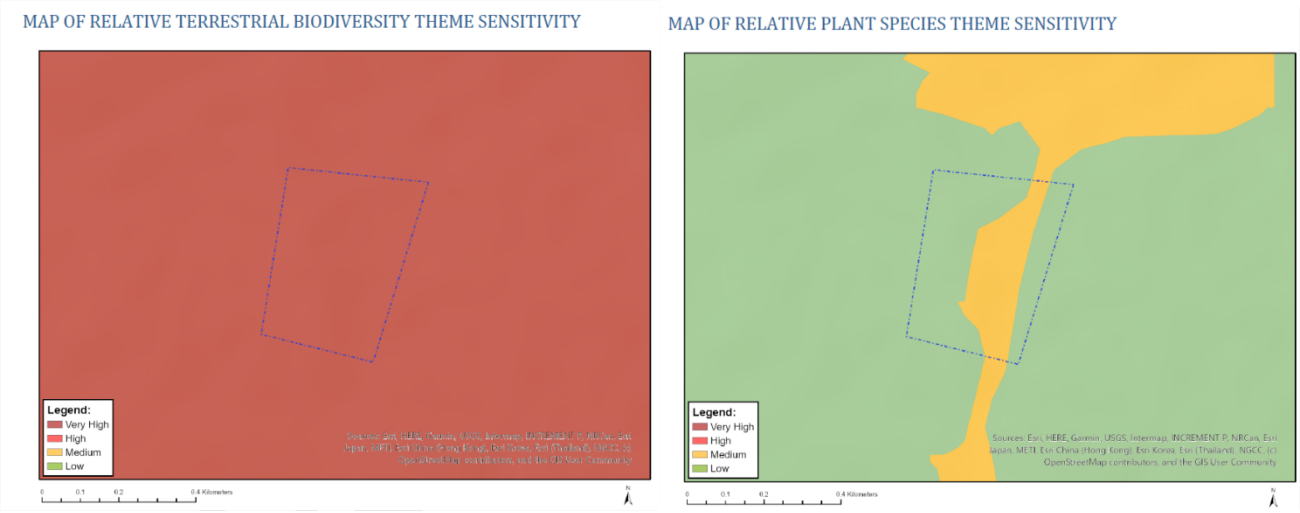


Figure 14: Relative Plant Species and Terrestrial Biodiversity Theme Sensitivities for the proposed development site, as indicated by the National Web-based Environmental Screening Tool.

Table 2: Evaluation of Site Ecological Importance (SEI) for the plant community type(s) within the proposed development site and surrounds. BI = Biodiversity Importance. See section 7.2 for more details.

Plant Community Type / Habitat	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	SEI
Farmland Community (Variant A)	Very Low: No natural habitat remaining. No confirmed and highly unlikely populations of SCC.	Very Low: Several major current negative ecological impacts. No habitat connectivity except for flying species or flora with wind-dispersed seeds.	Low: Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore less than 50% of the original species composition and functionality of the receptor functionality.	Very Low (BI: Very Low)
Farmland Community (Variant B)	Very Low: No natural habitat remaining. No confirmed and highly unlikely populations of SCC.	Very Low: Several major current negative ecological impacts. No habitat connectivity except for flying species or flora with wind-dispersed seeds.	Low: Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore less than 50% of the original species composition and functionality of the receptor functionality.	Very Low (BI: Very Low)

Riparian Community	Very Low: No natural habitat remaining. No confirmed and highly unlikely populations of SCC.	Very Low: No natural habitat remaining. No confirmed and highly unlikely populations of SCC.	Low: Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore less than 50% of the original species composition and functionality of the receptor functionality.	Very Low (BI: Very Low)

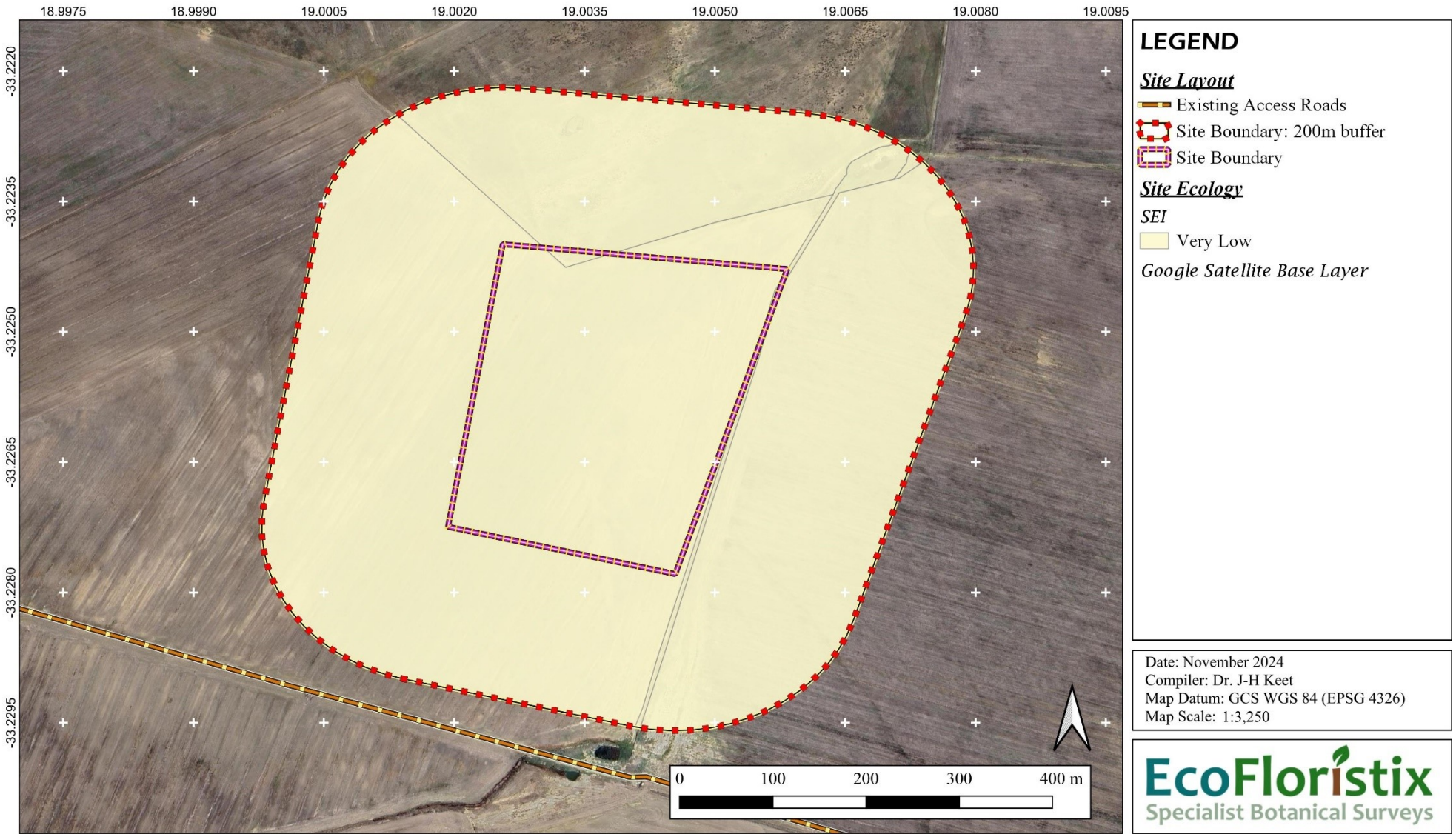


Figure 15: Site Ecological Importance (SEI) for the proposed development site and surrounds (see Table 2 for more details).

3. Proposed Impact Management Actions

Construction and Operational Phases	
Impact	**Mitigation**
General terrestrial biodiversity impacts.	Any landowners must adhere to their legal obligations to actively eradicate and manage alien vegetation infestations present on the applicable and surrounding properties No plant species, whether native or exotic, should be brought into, or removed from, the proposed development site, to prevent the spread of exotic or invasive species. A pre-construction environmental induction must be provided for all staff to ensure compliance with basic environmental principles. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, minimizing environmental damage, and remaining within demarcated construction areas. Areas of indigenous vegetation communities outside of the direct project footprint, if present, should under no circumstances be fragmented or disturbed further. All vehicles, if present on site, must remain on demarcated roads and no unnecessary driving in the veld outside these areas are allowed.
Soil erosion and associated degradation of ecosystems.	Minimize the number of disturbed areas. Any signs of erosion resulting from the project activities must be rectified immediately and monitored thereafter to ensure that they do not re-occur. Roads and other disturbed areas within the study area should be regularly monitored for erosion problems, and problem areas should receive follow-up monitoring to assess remediation success. Existing access routes and walking paths must be made use of wherever possible. Silt/sediment traps/barriers should be used where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and/or other sensitive areas. These sediment/silt barriers should be regularly maintained and cleared so as to ensure effective drainage of the areas Runoff water on exposed areas should be controlled.
Spread and/or establishment of alien and/or invasive species.	If any invasive alien plant species are found, then they must be removed from the site as per NEM:BA requirements. Regular monitoring for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring. When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. Any area that is cleared of invasive alien plant species must receive regular follow-up treatments (preferably at least three follow-ups) to ensure that populations do no re-establish after such initial clearing efforts. Any chemicals/herbicides used during clearing efforts must strictly be used only in accordance with the manufactures guidelines, especially when occurring in or close to hydrological features. No planting or importing of any alien species to the site for landscaping, rehabilitation, or any other purpose should be allowed.

4. Conclusion and Impact Statement

A comprehensive desktop study, together with field survey results, suggest a high confidence in the information provided. The surveys ensured that a suitable coverage was obtained for the proposed development site, and the relevant plant communities were assessed to obtain a general species overview, while any current impacts were carefully observed.

The entirety of the proposed development site is classified as being "Very Low" in sensitivity based on the Site Sensitivity Verification and SEI scores. More specifically:

- No pristine/undisturbed vegetation occurs within the proposed development site;
- No plant SCC occur within the proposed development site or within 200 m of the proposed development site boundary;
- No threatened ecosystems or CBA/ESA areas occur within the proposed development site; and
- The proposed development site is not eligible for contributing to national ecosystem protection levels and/or conservation targets for any of the listed vegetation types occurring within the area.

The proposed development will therefore not have any impact on terrestrial plant SCC or listed terrestrial ecosystems.

The only conditions to which this compliance statement is subjected to are those listed in section 3, and include general measures to minimize environmental impacts.

FINAL STATEMENT

Considering all the findings of this report, no fatal flaws are evident for the proposed project. The proposed activities within the proposed development site may be favourably considered.

PART 2: References, Methodology, and Supplementary Information

5. References

Bromilow, C. (2010). *Problem Plants and Alien Weeds of South Africa* (3rd ed.). Briza Publications.

Dayaram, A., Harris, L., Grobler, B. A., van der Merwe, S., Rebelo, A. G., Powrie, L. W., Vlok, J. H. J., Desmet, P., Qabaqaba, M., Hlahane, K. M., & Skowno, A. L. (2018). Vegetation Map of South Africa, Lesotho and Swaziland 2018: A description of changes since 2006. *Bothalia*, *49*(1), a2452. https://doi.org/10.4102/ abc.v49i1.2452

Henderson, L. (2020). *Invasive Alien Plants in South Africa. PPRI Handbook No 21.* Department of Environment, Forestry and Fisheries of South Africa.

Manning, J. C. (2007). *Field Guide to Fynbos*. Struik Nature.

Manning, J. C., & Goldblatt, P. (2012). Plants of The Greater Cape Floristic Region 1: The Core Cape Flora. In *Strelitzia 29* (Vol. 29). South African National Biodiversity Institute.

Mucina, L., & Rutherford, M. C. (Eds.). (2006). *The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.* South African National Biodiversity Institute.

Nel, J., Maherry, A. M., Peterson, C. P., Roux, D. J., Driver, A., Hill, L., van Deventer, H., Funke, N., Swartz, E. R., Smith-Adao, L. B., Mbona, N., Downsborough, L., & Nienaber, S. (2011). *Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. 1801/2/11.*

Raimondo, D., von Staden, L., Foden, W., Victor, J. E., Helme, N., Turner, R. C., Kamundi, D. A., & Manyama, P. A. (2009). *Red List of South African plants 2009. Strelitzia 25.* South African National Biodiversity Institute.

Skowno, A. L., Poole, C. J., Raimondo, D., Sink, K., van Deventer, H., van Niekerk, L., Harris, L. R., Smith-Adao, L. B., Tolley, K. A., Zengeya, T. A., Foden, W., Midgley, G. F., & Driver, A. (2019). *National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries.*

South African National Biodiversity Institute. (2018). *The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 2018*. http://bgis.sanbi.org/Projects/Detail/186

South African National Biodiversity Institute. (2020). *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (Issue 3.1). South African National Biodiversity Institute.

Van Oudtshoorn, F. (2012). *Gids tot Grasse van suider-Afrika* (3rd ed.). Briza Publications.

6. Methodology Desktop Phase

This assessment was conducted according to the 2014 EIA Regulations, as amended on 7 April 2017, as well as according to the most up to date *Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (South African National Biodiversity Institute, 2020) and the *Ecosystem Environmental Assessment Guideline: Draft* (http://opus.sanbi.org/jspui/handle/20.500.12143/7624).

A desktop assessment was undertaken using an appropriate Geographic Information System (GIS) and the latest available spatial datasets, as well as relevant online biodiversity databases and/or literature (these are listed where applicable). The aim of this was to develop local digital cartographs and species lists/databases. The various subsections that follow expand upon this desktop assessment.

It must be noted that during the entirety of this project it was assumed that all third-party information used — e.g., GIS software and data, satellite imagery, mapping algorithms, etc. — was correct and accurate at the time of their use. The author of this report accepts no liability for any erroneous data or algorithms produced by any third-parties, or any subsequent products derived from such data.

Finally, use of any maps within this report is entirely at the applicant and/or client's own risk. Acuity JRK (Pty) Ltd (trading as EcoFloristix Specialist Botanical Surveys) shall not be liable for any direct, indirect, incidental, special, or consequential damages arising out of or in connection with the use of or inability to use any or all maps within this report. By using any or all maps within this report, the client and/or applicant agrees to indemnify and hold Acuity JRK (Pty) Ltd (trading as EcoFloristix Specialist Botanical Surveys) harmless from any and all claims, liabilities, damages, and/or expenses, arising out of or in connection with usage of any or all maps within this report.

6.1. Ecologically Important Landscape Features: Custom GIS Mapping

The GIS was used together with the latest Google Earth satellite imagery to delineate and map observable landscape features in the proposed development site and surrounds. Specifically, attention was given to homogenous units that could easily be recognized. Some examples of such features include watercourses, plains and floodplains, hill- and mountain tops, and hill- and mountains slopes (if present and if sufficiently large and distinct from surrounding features), as well as areas that have distinctly recognizable vegetation features, such as the presence/absence of large trees and/or shrubs, and vegetation patches of differing colours — these likely represent distinct plant community types. However, while satellite imagery is highly useful, it nevertheless suffers from several issues. For example, these include the generation of areas where image stitching has resulted in different colours for the same features, or imagery that might not have a high enough resolution, among other things. For this reason ground truthing is required to validate and refine the results of such desktop analyses.

6.2. Ecologically Important Landscape Features: Existing Data

Existing ecologically relevant data layers were incorporated into the GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

6.2.1. Red List of Ecosystems for South Africa

The Red List of Ecosystems (RLE; http://bgis.sanbi.org/Projects/Detail/1233/) for South Africa is a dataset containing the historical/potential extent, as well as the remaining remnants, of each ecosystem type. This represents a revision of the "List of terrestrial ecosystems that are threatened or in need of protection" published in December 2011. Ecosystems are categorised into one of four classes representing their risk of collapse, namely Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Least Concern (LC). The units of assessment for the RLE are the vegetation types of VegMap (see section 6.3.2).

6.2.2. National Biodiversity Assessment 2018

The National Biodiversity Assessment 2018 (NBA) (Skowno et al., 2019) assessed the state of South Africa's biodiversity based on the best available science to understand temporal trends, and informs policy and decision-making across a range of sectors. The NBA deals with three biodiversity components: 1) genetics, 2) species, and 3) ecosystems. The NBA also assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine, and marine environments. The two headline indicators assessed in the NBA are:

- **Ecosystem Threat Status**: An indicator of ecosystem wellbeing. This concerns the amount of change regarding ecosystem structure, function, and/or composition, based on the proportion of the original extent of each ecosystem type still currently in good ecological condition. Specifically, ecosystem threat levels are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), or Least Concern (LC).
- **Ecosystem Protection Level**: An indicator of how well ecosystems are adequately protected or under-protected. Specifically, ecosystems protection levels are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on biodiversity targets for each ecosystem type included within one or more protected areas. So-called "under-protected ecosystems" include NP, PP, or MP ecosystem types.

6.2.3. Protected Areas

National Protected Areas Expansion Strategy (NPAES; SANBI, 2010): NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These present the best opportunities for meeting ecosystem-specific protected area targets set out in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. NPAES focus areas are large, intact, and unfragmented, and are therefore highly important for biodiversity, climate resilience, and freshwater protection. Note that these areas are not necessarily future protected area boundaries — often times only a portion of a particular focus area would be required to meet protected area targets. Moreover, they do not replace fine scale planning. Such planning might identify many different priority sites based on local requirements, constraints, and opportunities.

6.2.4. Hydrological Features: Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) represent 10% of South Africa's land area that provides a disproportionate 50% of the country's water runoff. The localities of SWSAs are crucial for planning and managing water resources, including the ecosystems that support water quality and quantity (SWSAs extend into Lesotho and eSwatini).

6.2.5. Hydrological Features: National Freshwater Ecosystem Priority Area Status

South African river systems are categorised based on ecological criteria (such as ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to better conserve aquatic ecosystems, and are represented by Freshwater Ecosystem Priority Areas (FEPAs) (Nel et al., 2011). FEPAs are intended to support conservation and are intended to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals.

6.2.6. Biodiversity Spatial Plan

The Western Cape Biodiversity Spatial Plan classifies areas within the province based on their contribution towards provincial conservation targets. Various land use types are classified according to their biodiversity and environmental importance as follows:

- **Critical Biodiversity Areas** (CBAs): areas that are required to meet biodiversity targets for species, ecosystems, or ecological processes and infrastructure. CBAs are of high biodiversity and ecological value and must be kept in a natural or near-natural state, with no further loss of habitat or species. Moreover, degraded areas should be rehabilitated to natural or near-natural conditions, and only low-impact, biodiversity-sensitive land uses are appropriate. Examples are areas required to meet biodiversity pattern (e.g. species and ecosystems) targets, Critically Endangered (CR) ecosystems, all areas required to meet ecological infrastructure targets, and critical corridors that maintain landscape connectivity. Two subtypes are distinguished:
    - CBA Irreplaceable (CBA 1): Areas that are critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable species populations and ecosystem functionality.
    - CBA Optimal (CBA 2): Areas which represent the best localities, from a potentially larger selection of available planning units, that are optimally located to meet conservation targets, as well as other criteria.
- **Ecological Support Areas** (ESAs): the ecological functioning and sustainability of CBAs require support from additional areas, namely ESAs. Although ESAs are not essential for meeting biodiversity targets, they are nevertheless important for supporting PAs or CBAs. ESAs are often crucial for delivering ecosystem services. For terrestrial and aquatic environments, such areas are functional, but not necessarily pristine and natural. However, they are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within CBAs, and also contribute significantly to the maintenance of ecological infrastructure. Two subtypes are distinguished:
    - ESA 1: Areas that might still be functional, and could be natural, near-natural, or moderately degraded.
    - ESA 2: Areas that are severely degraded or have no natural cover remaining and therefore require restoration.
- **Other Natural Areas** (ONAs): Some areas have not been identified as a priority in the current biodiversity spatial plan. However, they retain most of their natural character, and still perform many biodiversity and ecological infrastructure functions. Therefore, they are an important part of the natural ecosystem. It is desirable that ONAs, where possible, are managed or utilized to minimize habitat and species loss, and that ecosystem functionality through strategic landscape planning is ensured.
- **Severely Modified to No Natural Remaining** (NNR): These areas have been severely modified by human activity. They are no longer natural and do not contribute to biodiversity targets. However, these areas may still provide

limited biodiversity and ecological infrastructure functions (and could potentially be useful for restoration/rehabilitation endeavours).

- **Protected Areas** (PAs): Areas that are formally protected by law in terms of the NEM:PAA. This includes gazetted private Nature Reserves and Protected Environments.

6.3. Botanical Assessment

The flora of the region was assessed both floristically (species identity) and compositionally (community assembly patterns).

6.3.1. Species Identities

Various reasons exist why the flora of a region cannot be fully catalogued within a limited timeframe (or even an extended timeframe; specifically see section 1.5). Therefore, the following data sources were used to obtain historical distribution records to develop a comprehensive list of plant species potentially occurring within the proposed development site and broader region:

- **Botanical Database of Southern Africa** (BODATSA; also often referred to as POSA [Plants of southern Africa]): this is an electronic database hosted by the South African National Biodiversity Institute (SANBI) that provides herbarium records collected in the region (http://posa.sanbi.org/). Records were specifically extracted from a very large area surrounding the actual proposed development site.
- **The Red List of South African Plants** (Raimondo et al., 2009): this online database (http://redlist.sanbi.org/) provides the most current national status of South Africa's vascular plant species. This was used to assess SCC[1], which are taxa (in this case plant species) that have a significant conservation importance for preserving South Africa's high biological diversity. SCC have a high conservation importance in terms of preserving South Africa's high floristic diversity, and include threatened species (CR, EN, and VU), as well as NT or DD, and also includes range-restricted species which are not declining and are nationally listed as "Rare" or "Extremely Rare" (also referred to in some Red Lists as Critically Rare; see Figure 17) (South African National Biodiversity Institute, 2020). Note that SANBI divides the IUCN category DD into "Data Deficient: Insufficient Information (DDD)", and "Data Deficient: Taxonomically Problematic (DDT)". When SCC occur in a proposed development site or PAOI, the proposed activities could impact them and result in significant biodiversity loss — the loss of SCC populations might either increase the extinction risk of the respective species, or might even contribute toward their extinction. As such, it is very important to note that a permit must be obtained from the relevant local authorities to destroy or relocate any SCC (or even protected species).
- **iNaturalist**: this is a comprehensive online platform (https://www.inaturalist.org/) to which numerous citizen scientists contribute distribution records of biodiversity, mostly in the form of photos. Although many of the users

[1] Note that all South African plants have been assessed (i.e., assigned a red list category, or "redlisted") by the Red List of South African Plants. Therefore, using the terms "redlist" or "red list" specifically for Threatened or other conservation concern species is not accurate (even though it remains popular). The term "Species of Conservation Concern" (or SCC) is preferable, or "Threatened" where applicable.

are not professional botanists, various recognized botanical experts from across the globe assist in accurate species identification, and the platform is therefore an invaluable source of information regarding biodiversity. Nevertheless, to ensure a higher data reliability (i.e., only relevant/accurate records), the following parameters were used to extract records for this project: Quality Grade = "Research"; Identifications = "most agree"; Captive / Cultivated = "no". Records were specifically extracted from a very large area surrounding the actual proposed development site. Species records were then clipped with the relevant vegetation types (as indicated by VegMap; see section 6.3.2) that underlie the proposed development site (Figure 16). This ensured that only relevant species that are most likely to occur within the proposed development site and surrounds were extracted, since many specialist species might be included in a large extraction area, but are highly unlikely to occur on site given their specialist habitat requirements.

- **National Web Based Environmental Screening Tool**: a geographically based, web-enabled governmental application (https://screening.environment.gov.za/screeningtool/#/pages/welcome) which allows a proponent intending on submitting an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended, to screen their proposed development site for environmental sensitivity. Of specific interest for this report are the potential presences of so-called "sensitive plant species" that might occur in the proposed development site and surrounds, as well as any terrestrial biodiversity features listed as having a "Very High" sensitivity rating.

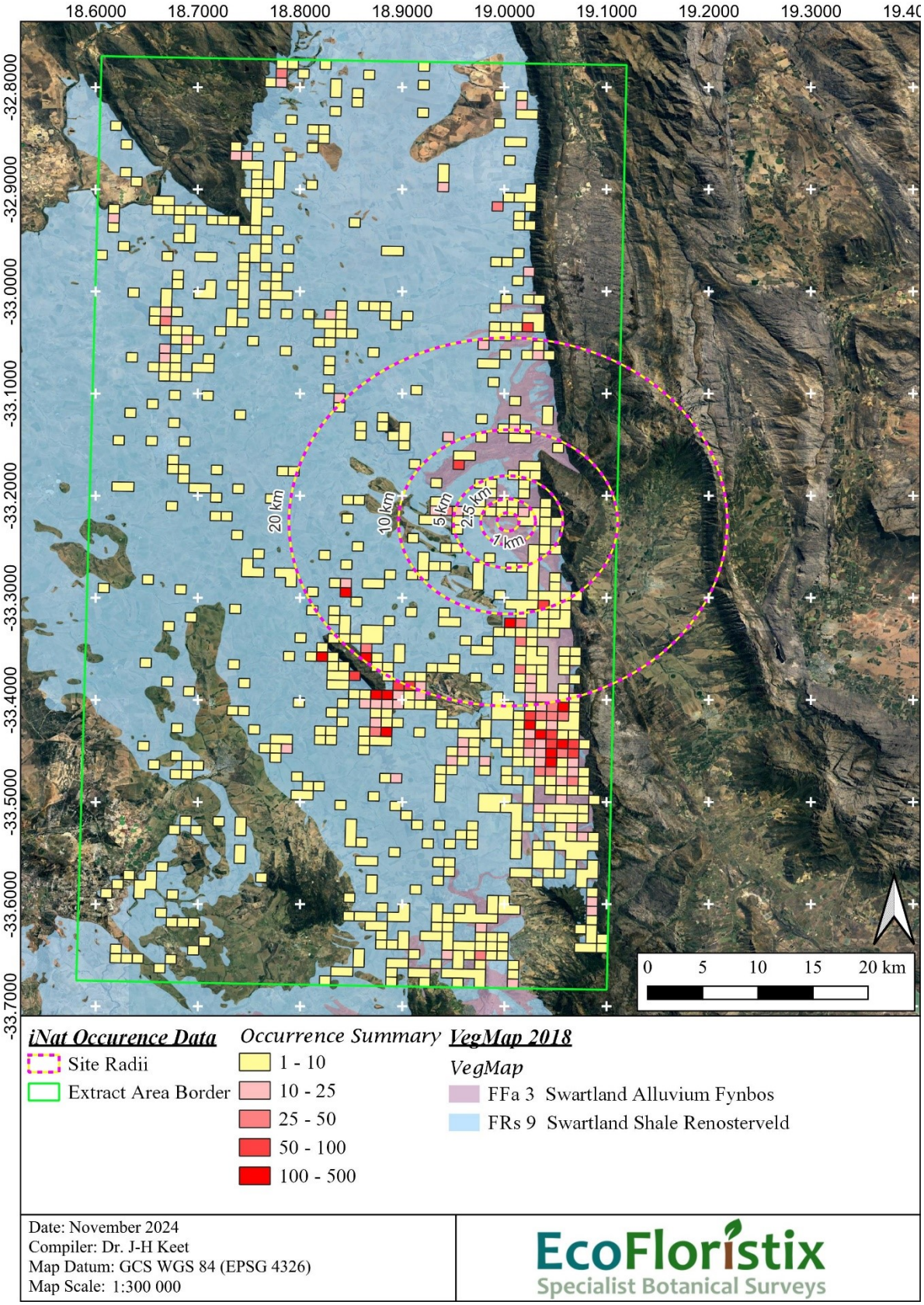


Figure 16: Plant species occurrence data extracted from the online platform iNaturalist. Grid squares (± 1 x 1 km) indicate the number of occurrences records that were extracted per square. The site radii (circular lines, each of a specific distance, radiating out from the centre of the site) indicate that a large proportion of records occur within 20 km of the proposed

development site, thus indicating a high degree of confidence in the likely species that could potentially occur on site based on the online data. Also indicated are the underlying vegetation types (as per VegMap) predicted to occur on site.

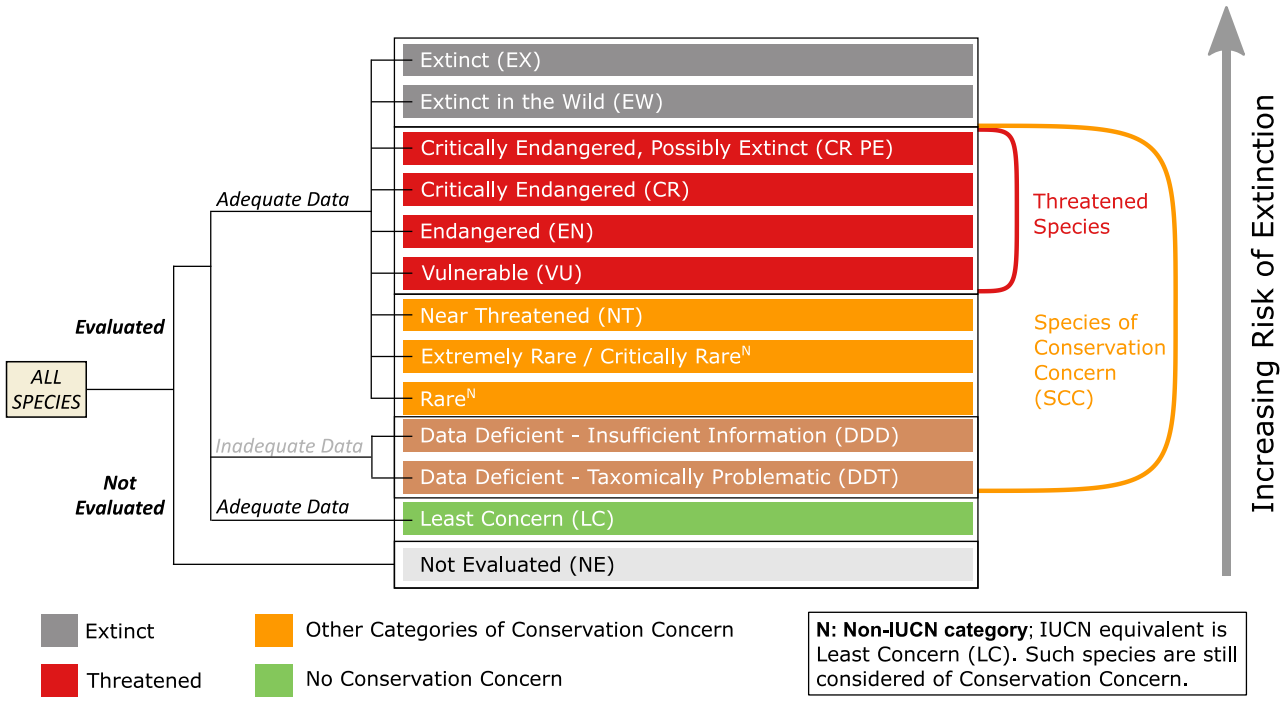


Figure 17: Red List and SCC categories used in this report as originally delineated according to SANBI's Red List of South African Plants (http://redlist.sanbi.org/redcat.php), and recently updated in the *Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (South African National Biodiversity Institute, 2020).

Finally, the lists obtained from these databases were used to identify invasive alien plant species (IAPs) that are listed in the NEM:BA A&IS Regulations. IAPs can dominate, and even replace, native flora. Therefore, they have the ability to completely transform the structure, composition, and functioning of ecosystems. IAPs must be controlled, and preferably eradicated, by means of an eradication and monitoring program (see below for details).

6.3.1.a) NEM:BA Alien and Invasive Species Regulations

The NEM:BA A&IS Regulations is the most current legislation regarding IAPs. The IAPs list of was first published in August 2014 in terms of NEM:BA, with subsequent updates. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation requires the removal and/or control of Category 1a and 1b IAPs. In addition, unless authorised in terms of the National Water Act, no land user may allow Category 2 IAPs to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam, or wetland. Category 3 IAPs are also prohibited from occurring close to a watercourse.

The NEM:BA A&IS Regulations categories are, briefly, as follows:

- **Category 1a**: Invasive species requiring compulsory control. All specimens must be removed and destroyed, and the species must be eradicated from the environment. No permits will be issued.

- **Category 1b**: Invasive species requiring compulsory control as part of an invasive species control program. All specimens must be removed and destroyed. Since these IAPs can have a high invasive potential, infestations may qualify for a government sponsored invasive species management program. No permits will be issued.
- **Category 2**: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy, or accept as a gift any Category 2 IAPs. No permits will be issued for Category 2 plants to exist in riparian zones.
- **Category 3**: Invasive species regulated by activity. An individual plant permit is required to undertake restricted activities such as importing, possessing, growing, breeding, moving, selling, buying, or accepting as a gift any Category 3 IAPs. No permits will be issued for Category 3 plants to exist in riparian zones.

According to the NEM:BA A&IS Regulations, any person in control of a Category 1b IAPs must immediately:

- Notify the competent authority in writing; and
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of NEM:BA;
    - The relevant invasive species management program developed in terms of regulation 4; and
- Any directive issued in terms of section 73(3) of NEM:BA.

6.3.2. Community Composition: Vegetation Types

The vegetation types (and their conservation statuses) of the proposed development site, as well as the broader regions surrounding the proposed development site, were verified using the South African National Vegetation Map, or simply "VegMap" (Dayaram et al., 2018; Mucina & Rutherford, 2006; South African National Biodiversity Institute, 2018) and the Red List of Ecosystems (see section 6.2.1). The latest version of VegMap was consulted for any updates of the respective regions. Although vegetation descriptions given in this report are as per VegMap 2006, these units were cross-validated with VegMap 2018 to inspect their respective extents.

7. Methodology Fieldwork Phase

Briefly, the field surveys aimed to investigate the following on-site aspects:

- The occurrence of plant SCC and protected plant species;
- The specific vegetation types (identification, classification, and delineation); and
- The specific habitat/community types (classification and delineation).

7.1. Botanical Assessment Details

The botanical survey was conducted on 05 November 2024. This timeframe falls very slightly outside the optimum surveying period (which is generally accepted to be during spring; also see section 1.5 for assumptions and potential limitations). However, this did not unduly influence the results.

Surveying was done within specifically targeted areas that were perceived as ecologically distinct and/or sensitive based on the results obtained from the desktop assessment of plant community types (sections 6.1 and 6.2). This was to optimize coverage and to perform a rapid, but efficient, vegetation and ecological assessment at each survey area.

The botanical assessment was conducted by surveying fixed-point plots of sufficient size within each community type, which were also supplemented with timed meanders (South African National Biodiversity Institute, 2020) within the respective community types. The combination of single fixed-point plots, supplemented with timed random meanders, are highly efficient for conducting floristic analyses. This allows plant species coverages and SCC occurrences to be rapidly estimated, as well as the compilation of adequate plant species lists, thereby giving a prompt indication of botanical diversity. Other useful observations were also recorded within each community type, examples of which include ecological condition and current impacts (examples of which could include the presence of invasive alien plant species, livestock grazing, degree of erosion, etc.), general vegetation density and physiognomic characteristics, habitat notes, and the presence of any sensitive features (e.g., wetlands, seepages, and drainage lines) where applicable. Finally, any opportunistic observations were also made while surveying.

Various field guides and identification manuals were used for plant identification where applicable, as well as other relevant literature regarding the ecology of the region (Bromilow, 2010; Henderson, 2020; Manning, 2007; Manning & Goldblatt, 2012; Van Oudtshoorn, 2012), and are listed in section 5.

7.2. Sensitivities: Terrestrial Site Ecological Importance (SEI)

The most current site sensitivity methodology, namely the Site Ecological Importance (SEI), was followed here, as proposed by the *Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (South African National Biodiversity Institute, 2020).

The different plant community types within the study area were delineated and identified based on field observations and satellite imagery (also see section 6.1). These plant community types were assigned SEI categories based on various factors, such as ecological integrity, conservation value, functionality, ecosystem processes, and the presence/absence of SCC, among other things.

Specifically, SEI is a function of two factors (Figure 18): 1) The Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community, or habitat type) and Receptor Resilience (RR; the resilience of the receptor to impacts). BI is in turn a function of Conservation Importance (CI; the importance of a site for supporting biodiversity features of conservation concern that are present) and the Functional Integrity (FI; the receptors' current ability to maintain its structure and functions, compared to its known or predicted state under ideal conditions) of the receptor.

BI and SEI are both calculated using respective risk matrices (Figure 19). BI, FI, and RR categories are all circumscribed by various criteria (see Table 3, Table 4, and Table 5). The various criteria per category may be applied in combination or in isolation. See Figure 19 for guidelines on interpreting the resulting SEI categories. SEI is usually evaluated per plant community type / vegetation type.

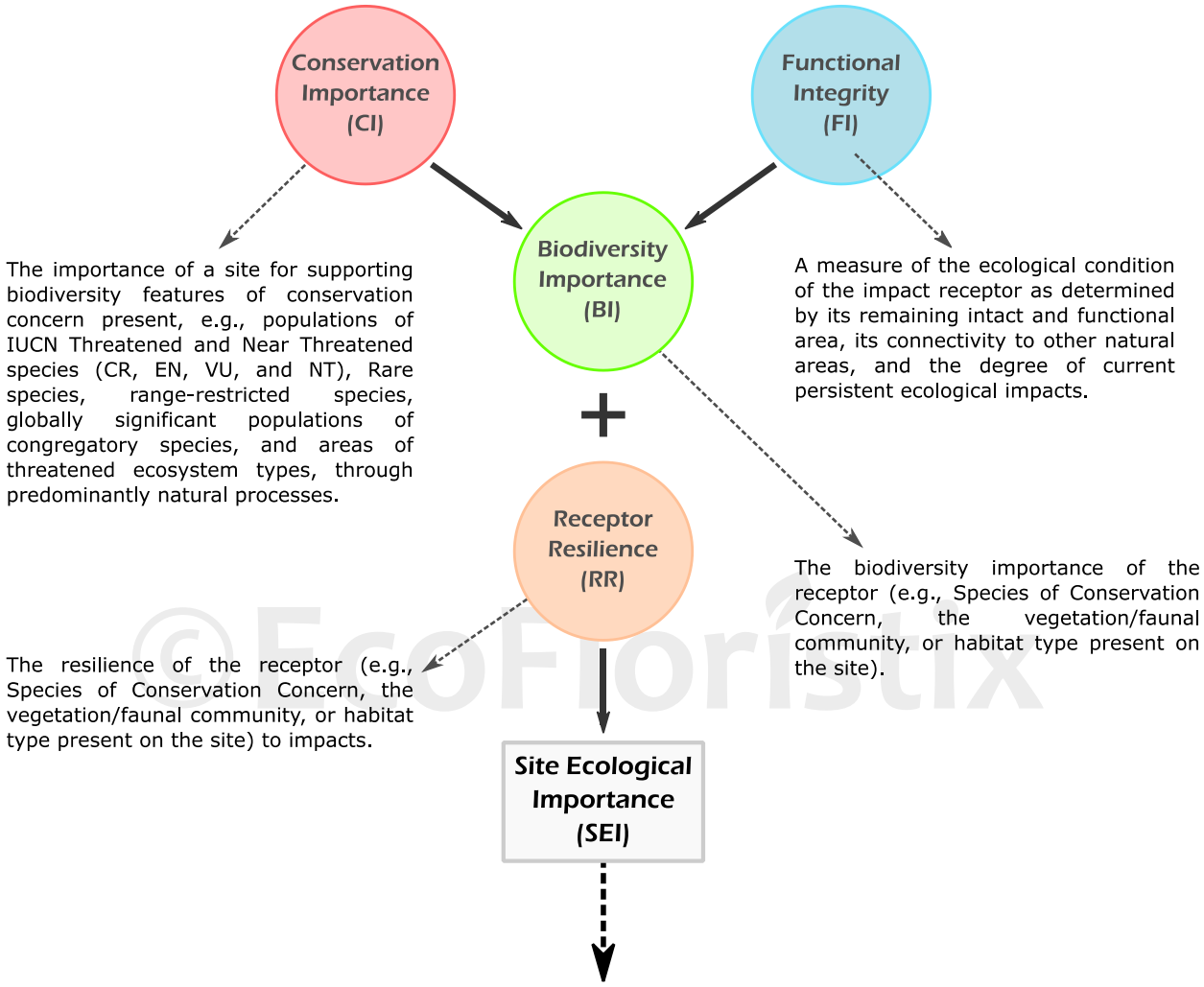
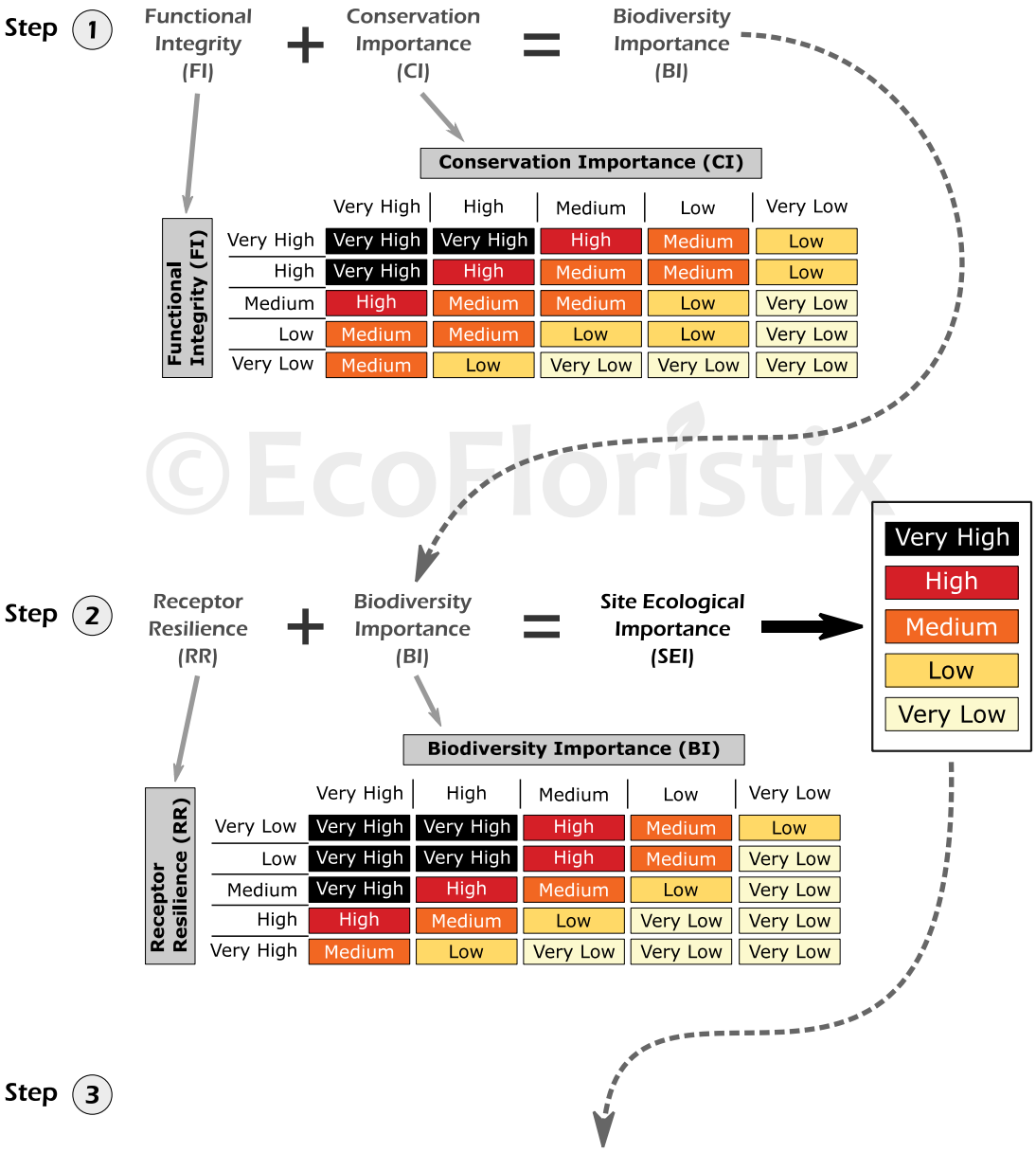


Figure 18: Details on the factors that contribute to the Site Ecological Importance value. Also see Figure 19.



SEI	Interpretation in Relation to Proposed Development Activities
Very High	Avoidance mitigation — no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation — changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation — development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation — development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation — development activities of medium to high impact acceptable and restoration activities may not be required.

Figure 19: Calculations, scores, process, and guidelines for calculating and interpreting Site Ecological Importance (SEI) categories (South African National Biodiversity Institute, 2020).

Table 3: Details regarding Conservation importance (CI) categories (South African National Biodiversity Institute, 2020).

Conservation Importance	Fulfilling criteria
Very high	• Confirmed or highly likely occurrence of CR, EN, VU, or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. • Any area of natural habitat of a CR ecosystem type or large area or > 0.1% of the total ecosystem type extent of natural habitat of EN ecosystem type. • Globally significant populations of congregatory species (> 10% of global population).
High	• Confirmed or highly likely occurrence of CR, EN, or VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. • Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. • Presence of Rare species. • Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	• Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. • Any area of natural habitat of threatened ecosystem type with status of VU. • Presence of range-restricted species. • > 50% of receptor contains natural habitat with potential to support SCC.
Low	• No confirmed or highly likely populations of SCC. • No confirmed or highly likely populations of range-restricted species. • < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	• No confirmed and highly unlikely populations of SCC. • No confirmed and highly unlikely populations of range-restricted species. • No natural habitat remaining.

Table 4: Details regarding Functional Integrity (FI) categories (South African National Biodiversity Institute, 2020).

Functional Integrity	Fulfilling criteria
Very high	• Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. • No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	• Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. • Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) and good rehabilitation potential.
Medium	• Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. • Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	• Small (> 1 ha but < 5 ha) area. • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. • Several minor and major current negative ecological impacts.
Very Low	• Very small (< 1 ha) area. • No habitat connectivity except for flying species or flora with wind-dispersed seeds. • Several major current negative ecological impacts.

Table 5: Details regarding Receptor Resilience (RR) categories (South African National Biodiversity Institute, 2020).

Receptor Resilience	Fulfilling criteria
Very high	• Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	• Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	• Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	• Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	• Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

8. Abbreviated Curriculum Vitae of the Specialist

Personal Details:

- Name: Dr. Jan-Hendrik Keet
- Address: Somerset West, Western Cape, 7130
- Cell: 071 451 4853
- Email: info@ecofloristix.co.za
- Date of Birth: 07 November 1988
- Website: https://ecofloristix.co.za/

Expertise and Experience:

- Current: Botanical & Terrestrial Biodiversity Specialist Consultant (EcoFloristix Specialist Botanical Surveys)
- Current: Freelance Academic/Technical Editor, Proof-reader, and Dissertation Specialist
- Previous: Post-Doctoral Researcher — Mathematical Biosciences Hub (Department of Mathematics), Stellenbosch University
- Previous: Post-Doctoral Researcher — DST NRF Centre of Excellence for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- Specialization: Botany, Ecology, Biogeography, Invasive Plant Species, and Invasion Biology
- Years of experience: > 10 years
- Published in various, high-impact, national and international scientific journals

Skills and Competencies:

- Botany and Ecology
- Invasive Species Biology (PhD in Botany [Stellenbosch University] with a focus on Invasive Alien Plant Species and their environmental impacts)
- Plant Biogeography
- Plant Identification and Taxonomy
- Vegetation Surveys and Mapping
- Biodiversity Informatics
- Biological Sciences
- Soil Microbiome Composition, Function, and Chemistry
- Geographic Information Systems (*GISB1500S, NQF level 5*)
- Research Data Management and Data Visualization
- Statistical Computing Methods (*R Statistical Computing Expert*)
- Experimental Design and Analysis

Global Scientific Influence:

- Research Interest Score >450
- Citations >500
- Global Publication Reads ~8600
- Scopus h-index 12
- Google Scholar h-index 12
- Google Scholar i10-index 13

Tertiary Education:

- 2015 – 2019: Stellenbosch University, Stellenbosch, South Africa. Doctor of Philosophy (Botany)
- 2013 – 2014: University of the Free State, Bloemfontein, South Africa. Magister Scientiae (Botany)
- 2012: University of the Free State, Bloemfontein, South Africa. Bachelor of Science Honours (Botany) - *cum laude*
- 2009 – 2011: University of the Free State, Bloemfontein, South Africa. Bachelor of Science (Chemistry with Physics and Biology) - *cum laude*

Employment History:

- 2015 – present: Botanical Specialist
- 2021 – present: Freelance Academic/Technical Editor, Proof-reader, and Dissertation Specialist
- 2019 – 2021: Post-Doctoral Researcher – Centre for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- 2011: Part-time demonstrator. Department of Plant Sciences, University of the Free State, Bloemfontein, South Africa
- 2010: Part-time lab assistant. Department of Chemistry, University of the Free State, Bloemfontein, South Africa
- 2007 – 2009: Shop Manager. Christian Tees, Brandwag Centre, Bloemfontein

Memberships, Certifications, and Short Courses:

- SACNASP: Professional Natural Scientist (No.: 121678)
- SAGIC Invasive Species Consultant (Cape Town, South Africa), March 2016
- GIS Intermediate (NQF level 5): Hydrological modelling and terrain analysis using digital elevation models (University of the Free State, South Africa), 2014
- Project Management (Stellenbosch University), 2023
- Good Laboratory Practice seminar presented by Merck Millipore South Africa, 2012
- Laboratory Safety seminar presented by Merck Millipore South Africa, 2012
- Golden Key International Honour Society (Membership No.: 7564025), 2012

Selected Peer-reviewed Scientific Publications and Book Chapters (a full list is available on request)**:**

- **Keet J-H**, Ellis AG, Hui C, Le Roux (2023) Responses of soil bacterial communities to invasive Australian *Acacia* species over large spatial scales. In: Richardson DM, Le Roux JJ, & Marchante E (Eds.) *Wattles: Australian Acacia Species Around the World*, CAB International, https://www.cabidigitallibrary.org/doi/10.1079/9781800622197.0000.
- **Keet J-H**, Datta A, Foxcroft LC, Kumschick S, Wilson JRU, Nichols GR, Richardson DM (2022) Assessing the level of compliance with alien plant regulations in a large African protected area. *Biological Invasions* 24: 3831 – 3844, https://doi.org/10.1007/s10530-022-02883-7.
- Warrington S, Ellis AG, **Keet J-H**, Le Roux JJ (2022) How does familiarity in rhizobial interactions impact the performance of invasive and native legumes? *Neobiota* 72: 129 – 156, https://neobiota.pensoft.net/article/79620/.
- **Keet J-H** & Richardson, DM (2022) A rapid survey of naturalized and invasive eucalypt species in southwestern Limpopo, South Africa. *South African Journal of Botany* 144: 339 – 346, https://doi.org/10.1016/j.sajb.2021.09.008.
- Novoa A, Foxcroft LC, **Keet J-H**, Pyšek P, Le Roux JJ (2021) The invasive cactus *Opuntia stricta* creates fertility islands in African savannas and benefits from those created by native trees. Scientific Reports 11: 20748, https://www.nature.com/articles/s41598-021-99857-x.
- **Keet J-H**, Ellis AG, Hui C, Novoa A, Le Roux JJ (2021) Impacts of invasive Australian acacias on soil bacterial community composition, microbial enzymatic activities, and nutrient availability in fynbos soils. *Microbial Ecology* 82: 704 – 721, http://dx.doi.org/10.1007/s00248-021-01683-1.
- **Keet J-H**, Robertson MP, Richardson DM (2020) *Alnus glutinosa* (Betulaceae) in South Africa: invasive potential and management options. *South African Journal of Botany* 135: 280 – 293, https://doi.org/10.1016/j.sajb.2020.09.009.
- Wilson JRU, Datta A, Hirsch H, **Keet J-H**, Mbobo T, Nkuna KV, Nsikani MM, Pyšek P, Richardson DM, Zengeya TA, Kumschick S (2020) Is invasion science moving towards agreed standards? The influence of selected frameworks. *NeoBiota*, 62: 569 – 590, https://doi.org/10.3897/neobiota.62.53243.
- Novoa A, **Keet J-H**, Lechuga-Lago Y, Pyšek P, Le Roux JJ (2020) Urbanization and *Carpobrotus edulis* invasion alter the diversity and composition of soil bacterial communities in coastal areas. FEMS Microbiology Ecology 96(7): fiaa106, https://doi.org/10.1093/femsec/fiaa106.
- Le Roux JJ, Leishman MR, Cinantya AP, Gufu GD, Hirsch H, **Keet J-H**, Manea A, Saul W-C, Tabassum S, Warrington S, Yannelli FA, Ossola A (2020) Plant biodiversity in the face of global change. *Current Biology* 30: R371 – R392, https://doi.org/10.1016/j.cub.2020.02.066.

- Hirsch H, Allsopp MH, Canavan S, Cheek M, Geerts S, Geldenhuys CJ, Harding G, Hurley BP, Jones W, **Keet J-H**, Klein H, Ruwanza S, van Wilgen BW, Wingfield MJ, Richardson DM (2019) *Eucalyptus camaldulensis* in South Africa – past, present, future. *Transactions of the Royal Society of South Africa* 75(1): 1 – 22, https://doi.org/10.1080/0035919X.2019.1669732.
- Le Roux JJ, Hui C, Castillo ML, Iriondo, JM, **Keet J-H**, Khapugin, AA, Médail F, Rejmánek M, Theron G, Yannelli FA, Hirsch H (2019) Recent anthropogenic plant extinctions differ in biodiversity hotspots and coldspots. *Current Biology* 29(17): 2912 – 2918, https://doi.org/10.1016/j.cub.2019.07.063.
- **Keet J-H**, Ellis AG, Hui C, Le Roux JJ (2019) Strong spatial and temporal turnover of soil bacterial communities in South Africa's hyperdiverse fynbos biome. *Soil Biology and Biochemistry* 136: 107541, https://doi.org/10.1016/j.soilbio.2019.107541.
- Le Roux JJ, Ellis AG, Van Zyl L-M, Hosking ND, **Keet J-H**, Yannelli F (2018) Importance of soil legacy effects and successful mutualistic interactions during Australian acacia invasions in nutrient-poor environments. *Journal of Ecology* 106(5): 2071 – 2081, https://doi.org/10.1111/1365-2745.1296.
- **Keet J-H**, Ellis AG, Hui C, Le Roux JJ (2017) Legume–rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness. *Annals of Botany* 119(8): 1319 – 1331, https://doi.org/10.1093/aob/mcx028.
- Le Roux JJ, **Keet J-H**, Mutiti B, Ellis AG (2017) Cultivation may not dramatically alter rhizobial community diversity or structure associated with rooibos tea (*Aspalathus linearis* Burm.f.) in South Africa. *South African Journal of Botany* 110: 87-96, https://doi.org/10.1016/j.sajb.2017.01.014.
- Le Roux JJ, Hui C, **Keet J-H**, Ellis AG (2017) Co-introduction vs ecological fitting as pathways to the establishment of effective mutualisms during biological invasions. *New Phytologist* 215(4): 1354 – 1360, https://doi.org/10.1111/nph.14593.
- Nsikani M, Novoa A, Van Wilgen B, **Keet J-H**, Gaertner M (2017) *Acacia saligna*'s soil legacy effects persist up to ten years after clearing: Implications for ecological restoration. *Austral Ecology* 42(8): 880 – 889, https://doi.org/10.1111/aec.12515.
- **Keet J-H**, Cindi D, Du Preez PJ (2016) Assessing the invasiveness of *Berberis aristata* and *B. julianae* (Berberidaceae) in South Africa: management options and legal recommendations. *South African Journal of Botany* 105: 288 – 298, https://doi.org/10.1016/j.sajb.2016.04.012.

Selected Conferences (a full list is available on request)**:**

- 46th South African Association of Botanists conference (Qwa-Qwa, South Africa), January 2020, ***Alnus glutinosa* (L.) Gaertn. [Black Alder]: *an emerging invader in South Africa***
- International Association for Food Protection (IAFP; Louisville, Kentucky, USA), July 2019.
- Ecological Society of America Conference, (New Orleans, Louisiana, USA), August 2018 **Invasive legumes dramatically impact soil bacterial community structures but not function**
- Legumes for Life Workshop (Stellenbosch, South Africa), May 2018 **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness**
- Fynbos Forum Conference (Swellendam, South Africa), July 2017 **Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot**
- 43rd South African Association of Botanists Conference (Cape Town, South Africa), January 2017, **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness** *Best PhD presentation*
- 43rd Annual Research Symposium on the Management of Biological Invasions Conference (Worcester, South Africa), May 2016, **Legume-rhizobium symbiotic promiscuity does not determine plant invasiveness**
- Evolutionary dynamics of tree invasions: drivers, dimensions, and implications for management (Stellenbosch, South Africa), November 2015
- Neobiota: 8th International Conference on Biological Invasions (Antalya, Turkey), November 2014, **Assessing the threat and potential for management of Berberis spp. (Berberidaceae) in South Africa**
- 42nd Annual Symposium on the Management of Invasive Alien Plants (Karridene Beach Hotel, Durban, South Africa)
- XXth Association for the Taxonomic Study of the Flora of Tropical Africa International Conference (Stellenbosch, South Africa), January 2014
- 41st Annual Symposium on the Management of Invasive Alien Plants (Cape St. Francis, South Africa), May 2013

Selected EIAs and other projects (a full list is available on request):

- N6 Galway City (Ireland) Ring Road Environmental Impact Assessment Report: Assistance with Data Analysis, Modelling, and Validation (July 2024 – Current). In collaboration with Scott Cawley, Ireland.
- Plant and Terrestrial Biodiversity Assessment for a Mining Permit Extension application for the mining site Norrabees near Henkries, Northern Cape Province (May 2024). Report prepared for Site Plan Consulting. Reference: IA.24.010A.
- Plant and Terrestrial Biodiversity Assessment for a Mining Permit Application for the mining site Spodumene Kop near Henkries, Northern Cape Province (May 2024). Report prepared for Site Plan Consulting. Reference: IA.24.010B.
- Terrestrial Biodiversity (Fauna, Flora and Terrestrial Biodiversity) study and impact Report for the Grid Connection Solution for the Proposed Onderstepoort Solar 1 and 2 Facilities Near Boshoek in the North West Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (April 2024). Report prepared for Atlantic Energy Partners.
- Specialist Invasive Alien Plant Species Assessment. (March 2024). Report prepared for Mpact Corrugated. Reference: IA.24.006.
- Terrestrial Biodiversity (Fauna, Flora, and Ecological EIA Phase Assessment) Report for the Proposed Kingston Solar PV Energy Facility Near Bothaville, Free State Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (March 2024). Report prepared for Atlantic Energy Partners.
- Terrestrial Biodiversity (Fauna, Flora, and Ecological EIA Phase Assessment) Report for the Proposed Crecy Photovoltaic Solar 4 Energy Facility and Associated Infrastructure near Mookgopong, Limpopo Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (February 2024). Report prepared for Atlantic Energy Partners.
- Plant and Terrestrial Biodiversity Assessment for a Solar Photovoltaic Facility near Northam, Limpopo. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (November 2023). Report prepared for Atlantic Energy Partners.
- Botanical Impact Assessment for a proposed rerouting of a sewer pipeline on Erf 5076, Khayalethu, Knysna, Western Cape. In collaboration with Keep Rooted (PTY) Ltd. (October 2023). Report prepared for Ohana Environmental. Reference: IA.23.015.
- Screening report for a proposed Solar PV plant near Boshoek, Northwest Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (September 2023). Report prepared for Atlantic Energy Partners.
- Plant and Terrestrial Biodiversity Assessment for a Powerline Corridor near Boshoek, Northwest Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (September 2023). Report prepared for Atlantic Energy Partners.
- Botanical Assessment and Motivation for a Mining Stockpile Area within a non-CBA zone on Farm Steinkopf no. 22 near Steinkopf, Northern Cape. (August 2023). Report prepared for Greenmined Environmental. Reference: IA.23.010.
- Botanical Impact Assessment: Development of portion 223 of Farm 559, Betty's Bay, Western Cape. (July 2023). Report prepared for Ohana Environmental. Reference: IA.23.007.
- Botanical Study and Assessment for a Housing Development, 2023. Proposed development of the development of Erf 397, Suiderstrand, Western Cape. Report prepared for RMS Environmental.
- Botanical Study and Assessment for a Mining Permit Application, 2023. Proposed development of a dolerite mine near Beaufort West, Western Cape. Report prepared for Greenmined Environmental (Pty) Ltd.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2022. Full Botanical Assessment for the proposed development of wind energy facilities south of Bethal, Mpumalanga Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Application (Expansion of mining footprint), and Final Basic Assessment and Environmental Management Plan for the proposed sand mine expansion on Portion 4 of the Farm Zandberg Fontein 97, Western Cape Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Proposed development of wind energy facilities on the farms Brussels, Driepoort (664-1 and 664-2), Kameelfontein, Lisbon, Nazareth, and Zwartkrans, near Vryburg, Northwest Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Botanical Study and Assessment: Proposed development of wind energy facilities on the farm Kluitjieskraal, Loeriesfontein, Northern Cape Province.

- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Botanical Study and Assessment: Proposed development of an access road to the authorised Sutherland 1 and Rietrug wind energy facilities near Sutherland.
- Specialist Botanical Assessment Report: Assessment of Damage and Rehabilitation Costs for Unauthorised Driving of a 4x4 Vehicle in the Big Bay Open Space System, Cape Town. Prepared for Hannes, Pretorius, Bock & Bryant Attorneys.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2019. Mining Permit, Final Basic Assessment & Environmental Management Plan for the proposed mining of Sillimanite, Aggregate and Stone Gravel on the Farm Koenabib 43, Northern Cape Province. Botanical Study and Assessment Report. Unpublished report prepared by Nkurenkuru Ecology and Biodiversity for GreenMined Environmental. Version 1.0, 30 January 2020
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2019. Mining Permit, Final Basic Assessment & Environmental Management Plan for the proposed mining of Sillimanite on the Farm Wortel 42, Northern Cape Province. Botanical Study and Assessment Report. Unpublished report prepared by Nkurenkuru Ecology and Biodiversity for GreenMined Environmental. Version 1.0, 30 January 2020
- Specialist Invasive Alien Plant Species Report: Prepared for: Mpact Corrugated, Kuils River (Western Cape), July 2019
- Proposed Township development, Country view, Gauteng: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015
- Colenso Anthracite Coal Mining and Power Station Project: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015