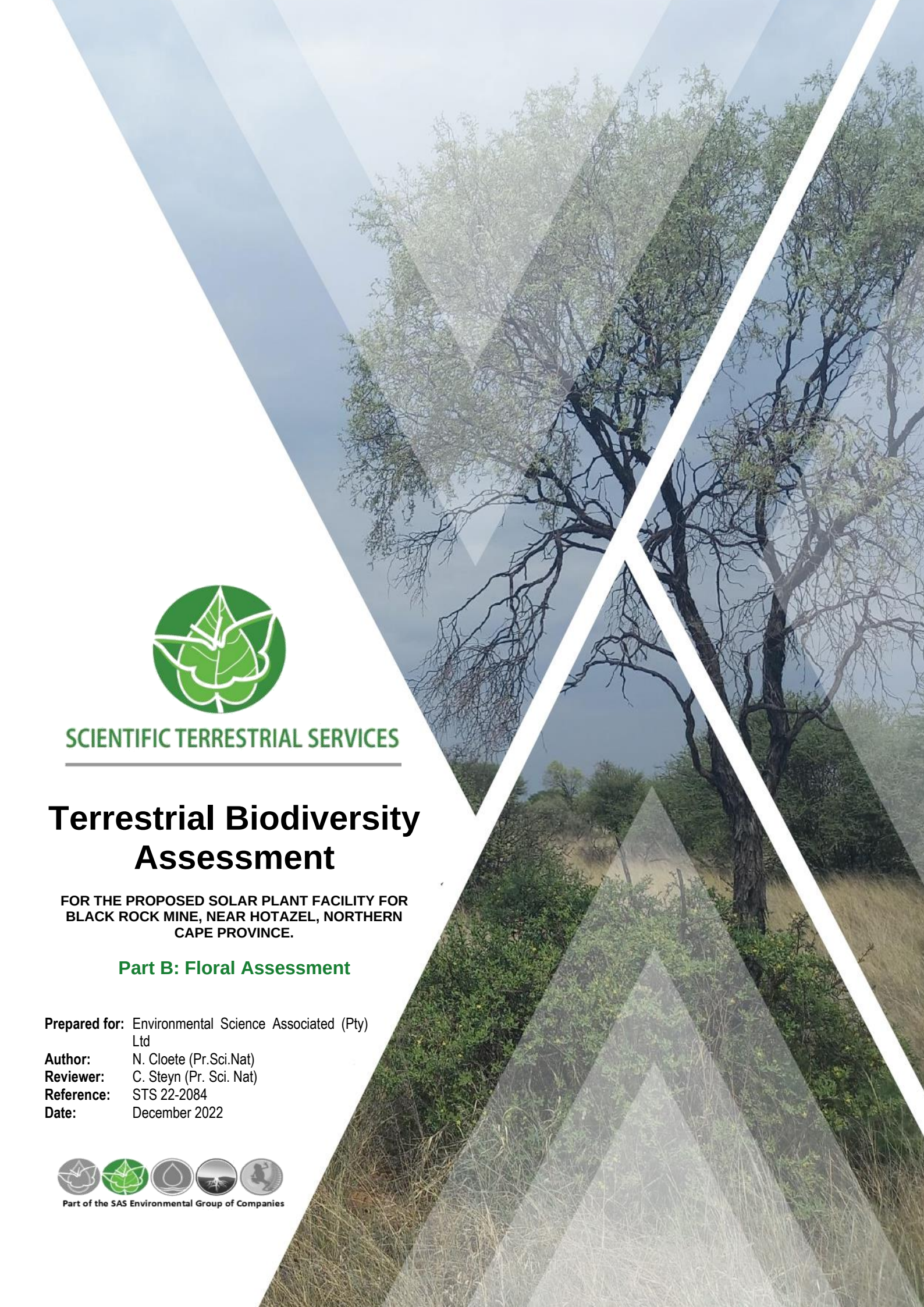

SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Biodiversity Assessment

FOR THE PROPOSED SOLAR PLANT FACILITY FOR BLACK ROCK MINE, NEAR HOTAZEL, NORTHERN CAPE PROVINCE.

Part B: Floral Assessment

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Date: December 2022

Part of the SAS Environmental Group of Companies

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LIST OF ACRONYMS

AIP	Alien and Invasive Plant
BGIS	Biodiversity Geographic Information Systems
BODATSA	Botanical Database of Southern Africa
BRMO	Black Rock Mine Operations
CBA	Critical Biodiversity Area
CR	Critically Endangered
DAEARDLR	Department: Agriculture, Environmental Affairs, Rural Development and Land Reform
DFFE	Department of Forestry, Fisheries, and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
FEPA	Freshwater Ecosystem Priority Area
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
GWC	Griqualand West Centre
Ha	Hectares
IEM	Integrated Environmental Management
IUCN	International Union for Conservation of Nature
km	kilometres
MRA	Mining Right Area
NCNCA	Northern Cape Nature Conservation Act, 2009 [Act No. 9 of 2009]
NEMBA	National Environmental Management: Biodiversity Act, 2004 [Act No.10 of 2004]
NFA	National Forest Act, 1998 [Act No. 10 of 1998]
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Square
RDL	Red Data Listed
ROM	Run of Mine
SACNASP	South African Council for Natural Scientific Professionals
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
STS	Scientific Terrestrial Services [Pty] Ltd
SWSA	Strategic Water Source Area
TOPS	Threatened or Protected Species
VU	Vulnerable

GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson et al. (2011), Hui and Richardson (2017), Wilson et al. (2017), Skowno et al. (2019), and SANBI (2016), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the associated Alien and Invasive Species Regulations, 2020].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Baseline (IEM Series)	Conditions that currently exist. Also called "existing conditions".
Baseline information (IEM Series)	Information derived from data that: - records the existing elements and trends in the environment; and - records the characteristics of a given project proposal.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biodiversity priority areas	Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, Priority Areas for land-based protected area expansion, and Focus Areas for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future. The different categories *are not mutually exclusive* and, in some cases, overlap, often because a particular area or site is important for more than one reason. They should be *complementary*, with overlaps *reinforcing the importance* of an area.
Biome - as per Mucina and Rutherford (2006)	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Community Characterisation	Comparisons can be made among communities using attributes such as species richness, species diversity, and evenness. - **Species richness** is simply the number of species in a community. - **Species diversity** is more complex and includes a measure of the number of species in a community, and a measure of the abundance of each species. - **Species evenness** is a description of the distribution of abundance across the species in a community. Species evenness is highest when all species in a sample have the same abundance. Evenness approaches zero as relative abundances vary. Source: https://tinyurl.com/2p9yr3j8
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.

Critically Endangered (CR) (IUCN[1] Red List category)	**Applied to both species/taxa and ecosystems**: A species is CR when the best available evidence indicates that it meets at least one of the five IUCN criteria for CR, indicating that the species is facing an extremely high risk of extinction. CR ecosystem types are at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. CR species are those considered to be at extremely high risk of extinction.
Development footprint (as per the NEMA definition)	"in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity"
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Ecological Condition	"ecological condition" means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of "natural". Various terminology can be used for precision of language: - Fair ecological condition: Areas that are moderately modified, semi-natural. An ecological condition class in which ecological function is maintained even though composition and structure have been compromised. Can apply to a site or an ecosystem. - Good ecological condition: Areas that are natural or near-natural. An ecological condition class in which composition, structure and function are still intact or largely intact. Can apply to a site or an ecosystem. - Poor ecological condition: Areas that are severely or irreversibly modified. An ecological condition class in which ecological function has been compromised in addition to structure and composition. Can apply to a site or an ecosystem.
Ecological processes	The functions and processes that operate to maintain and generate biodiversity. In order to include ecological processes in a biodiversity plan, their spatial components need to be identified and mapped.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Endangered (EN) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: A species is EN when the best available evidence indicates that it meets at least one of the five IUCN criteria for EN, indicating that the species is facing a very high risk of extinction. EN ecosystem types are at a very high risk of collapse. EN species are those considered to be at very high risk of extinction.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat	A place where a species or ecological community naturally occurs.

[1] International Union for Conservation of Nature (IUCN)

(As per the definition in NEMBA)	
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change in the composition, structure and functional characteristics of the ecosystem concerned.
Impact **(IEM Series, draft Offset policy, and NEMA)**	The positive or negative effects on human well-being and/or on the environment. Impact-related terminology: - Cumulative impact: Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities. - Impact Significant/significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e., intensity, duration, and likelihood). Impact significance is the value placed on the change by different affected parties (i.e., level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e., biophysical, social and economic). Such judgement reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts. - Residual negative impacts: Negative impacts that remain after the proponent has made all reasonable and practicable changes to the location, siting, scale, layout, technology and design of the proposed development, in consultation with the environmental assessment practitioner and specialists (including a biodiversity specialist), in order to avoid and minimise negative impacts, and/or rehabilitate and/or restore impacted areas within 30 years (*It is acknowledged that the time it takes for full restoration differs from ecosystem type to ecosystem type, as well as the local conditions. Given that there is no readily accessible information on the recovery times of the different ecosystem types in South Africa, a general timeframe had to be used. The 30-year general timeframe in the definition of "residual impact" reflects that the difficulty in restoring South African ecosystems once they have been disturbed. It is based on the risk-averse and cautious approach.*). - Significant impact: An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.
Indigenous vegetation **(As per the definition in NEMA)**	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed invasive species	All alien species that are regulated in South Africa under the NEMBA, Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species **(syn. indigenous species)**	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal

	(e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Near Threatened (according to IUCN)	Close to being at high risk of extinction in the near future.
Red Data Listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as provincially and nationally protected species of relevance to the project.
Threatened species	A species that has been classified as CR, EN or VU, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Vulnerable (VU) (Red List category)	**Applied to both species/taxa and ecosystems**: A species is VU when the best available evidence indicates that it meets at least one of the five IUCN criteria for VU, indicating that the species is facing a high risk of extinction. An ecosystem type is VU when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.

1 INTRODUCTION

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a terrestrial biodiversity assessment as part of the environmental authorisation process for the proposed Black Rock Solar Plant Facility, near Hotazel, Northern Cape Province. The Black Rock Solar Project consists of the Overhead Powerline (OHPL), Access Road, Proposed Substation and two solar project areas (e.g., western and eastern) collectively the layout will be referred to as the "study area".

The study area is located on the Remaining Extent of Farm Klipling 271, approximately 1.5 km north west from the nearest Hotazel infrastructure, and approximately 2.5km from centre to centre from the Hotazel town. The study area falls within the jurisdiction of the John Taolo Gaetsewe District Municipality, and the Joe Morolong Local Municipality. The extent and layout of the study area is illustrated in Figure 1.

Please refer to Part A for more detailed desktop and background information as well as a project description. Figure 1 depicts the proposed layout of the solar farm and OHPL.

This report, after consideration and the description of the ecological integrity of the proposed activities, must guide the Environmental Assessment Practitioner (EAP), the regulatory authorities and the developing proponent, by means of the presentation of the faunal results and recommendations as to the ecological viability of the proposed solar farm and OHPL.

The purpose of this report is to define the floral ecology associated with the study area, to identify areas of increased Ecological Importance and Sensitivity (EIS), as well as the mapping of such areas, and to describe the Present Ecological State (PES) of the study area. The primary objective of the floral assessment is not to compile an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of Species of Conservation Concern (SCC) and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

1.1 Scope of Work

Specific outcomes in terms of the report are as follows:

- To determine and describe habitat types, communities and the ecological state of the sites associated with the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To provide inventories of floral species as encountered within the study area;

- To identify and consider all sensitive landscapes such as indigenous forests, rocky ridges, wetlands and/ or any other special features such as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs);
- To conduct a Red Data Listed (RDL) floral species assessment as well as an assessment of other SCC, including the potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements, to allow regional and national biodiversity targets to be met, and the provision of ecological services in the local area is sustained.

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The floral assessment is confined to the study area as well as the areas immediately adjacent (approx. 50m) the study area which may be impacted upon from the proposed solar facility. Additional data for the surrounding areas was supplemented through a desktop assessment. The study area and immediate surroundings were, however, included in the desktop analysis of which the results are presented in **Part A: Section 3**; and
- Sampling by its nature means that not all individuals are assessed and identified. With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. As part of the assessment, a field investigation was undertaken during summer (31st October – 4th of November 2022) to determine the ecological status of the study area and to “ground-truth” the results of the desktop assessment. A more comprehensive assessment would require that assessments take place in all seasons of the year. To account for seasonal limitations, on-site data was significantly augmented with all available desktop data and background research.

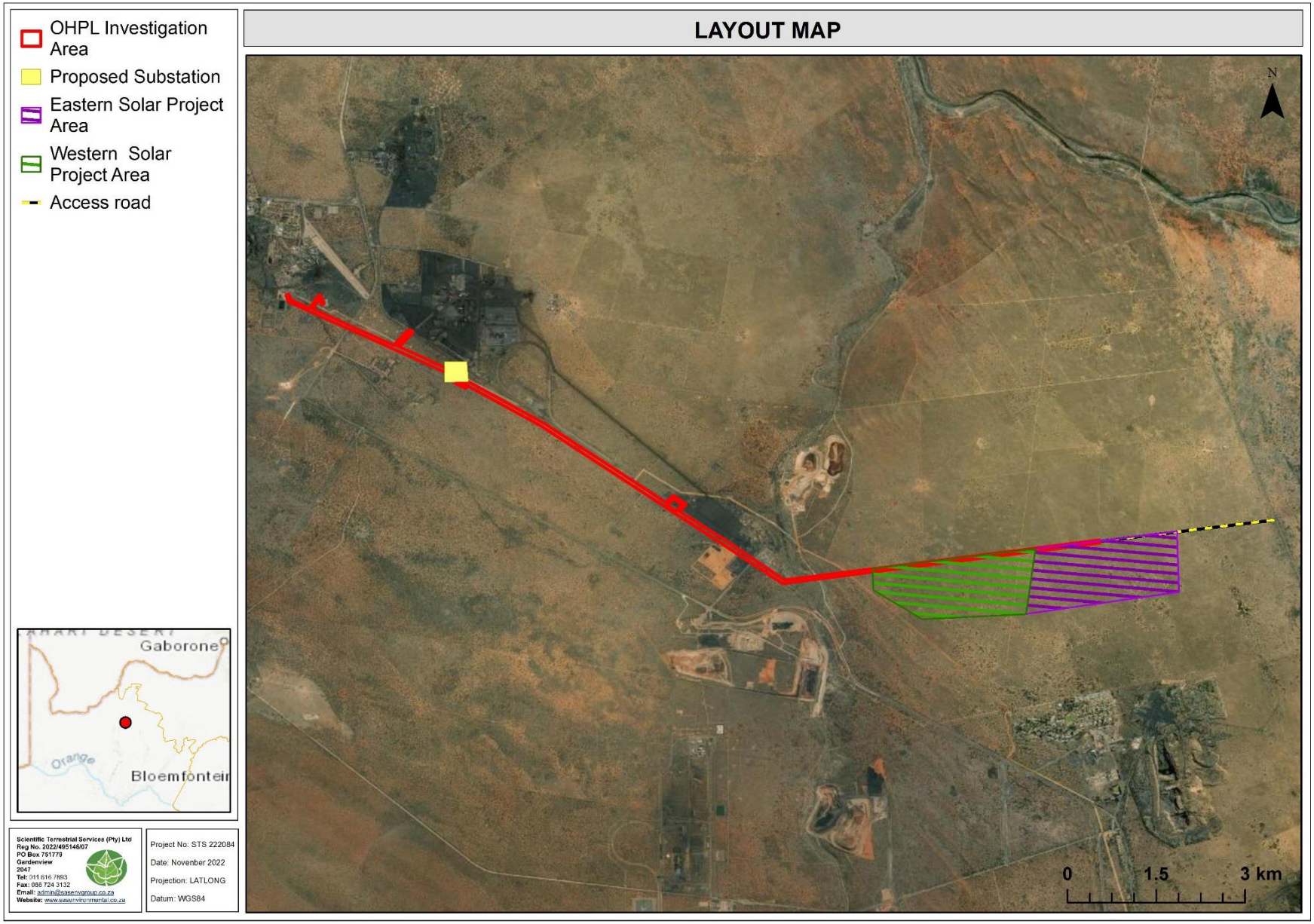


Figure 1: Proposed layout in relation to the surrounding area.

2 ASSESSMENT APPROACH

An on-site visual investigation of the assessment areas was conducted during to confirm and ground-truth the assumptions made during the consultation of the background maps and to determine whether the sensitivity of the terrestrial biodiversity associated with the assessment areas confirms the results of the National Web-based Environmental Screening Tool ("Screening Tool" hereafter).

2.1 General Approach

The vegetation surveys are based on the subjective sampling method, which is a technique where the specialist chooses specific sample sites within the area of interest based on their professional experience in the area and background research done prior to the site visit. This allows representative recordings of floral communities and optimal detection of SCC (refer to the methodology description in **Appendix A**).

The below list includes the steps followed during the preparation for and the conduction of the field assessments:

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to site, during which broad habitats, vegetation types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the direct footprint of the proposed project);
- All relevant resources and datasets as presented by the SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/), including the Northern Cape CBA Map (2016) and the Screening Tool, were consulted to gain background information on the physical habitat and potential floral diversity associated with the assessment areas;
- Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas were surveyed on foot, following subjective transects, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed. The SCC assessment included the below aspects:

- **Threatened species**. In terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), threatened species are Red Data Listed (RDL) species falling into the following categories of ecological status: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected in terms of the NEMBA Threatened or Protected Species (TOPS) Regulations (Government Notice (GN) R152 of 2007, as amended). Removal, translocation and/or destruction of these species require authorisation from the Department of Forestry, Fisheries, and the Environment (DFFE); and
- **Protected Species**. Species that do not necessarily fall in the above categories of ecological status, but that are deemed important from a provincial biodiversity perspective, e.g., Specially Protected Species (Schedule 1) (Section 49(1)) and Protected Species (Schedule 2) (Section 50(1)) of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). Activities are restricted for these species and may not occur without permits from the relevant provincial authorities. The List of Protected Tree Species (GN No. 536) as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 10 of 1998) (NFA) was also considered for the SCC assessment; and

➢ Photographs were taken of each vegetation community that is representative of typical vegetation structure of that community, as well as photographs of all detected SCC (except for sensitive species as identified by the DFFE's Screening Tool[2]).

Additional information on the method of assessment is provided in **Appendix A** of this report.

2.2 Definitions, descriptions, and taxon nomenclature

Scientific nomenclature for plant species in this report follows that of the SANBI's Red List of South African Plants Online, as it relates to the Botanical Database of Southern Africa (BODATSA) and BRAHMS Online. For alien species, the definitions of Richardson et al. (2011) are used. Vegetation structure is described as per Edwards (1983) (refer to Figure A1).

[2] The identity of sensitive species **may not appear** in the final EIA report **nor any of the specialist reports** released into the public domain.

2.3 Sensitivity Mapping

All the ecological features of the assessment areas were considered, and sensitive areas were assessed and delineated using a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery. The sensitivity map should assist the Environmental Assessment Practitioner (EAP) / proponent as to the suitability of the proposed development within the assessment areas.

3 RESULTS OF FLORAL ASSESSMENT

The results of the floral assessment are presented in the below sections.

3.1 Broad-scale vegetation characteristics

The study area occurs in two vegetation types based on spatial data from the 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland, namely the Kathu Bushveld and Gordonia Duneveld – both considered to be of Least Concern (LC) in terms of threat status. These vegetation types were used as the reference states against which the ground-truthed vegetation communities were compared (descriptions as per Mucina and Rutherford, 2006). It is however known that the vegetation types of the region are poorly assessed, and data is somewhat outdated. As such, the vegetation communities are not anticipated to be entirely representative of the reference state as described in literature.

3.2 Ground-truthed vegetation characteristics

Based on the results of the field investigations undertaken between 31 October and 4 November 2022, three broad habitat units with two sub-units were distinguished within the study area:

Thornveld Habitat:
Natural vegetation communities where species composition and vegetation structure have not deviated significantly from the reference states and only restricted disturbances were noted on site. The Thornveld Habitat unit includes two sub-units, namely:

- Open Thornveld; and
- Semi-closed Thornveld.

Although these two sub-units differed in vegetative structure and plant species composition, there were still some shared plants species between them.

Freshwater Habitat (Ga-Mogara Habitat)

This habitat unit is associated with the Ga-Mogara river system over which the proposed powerline will traverse. The habitat is dominated by alien plant species, particularly *Prosopis glandulosa* (Honey mesquite), which has formed dense and, in some instances, impenetrable thickets. Due to the encroached nature of this habitat unit, sensitive floral habitat is limited.

Transformed Habitat

This habitat encompasses the areas where vegetation clearance has taken place as part of excavation / construction activities of access roads or servitudes.

For a breakdown of the floral communities, habitat characteristics and conservation sensitivities associated with the above-mentioned habitat units, please refer to Section 3.2.1 – 3.2.2. Figures 2 to 6 below depict the full extent of the habitat units associated with the study area.

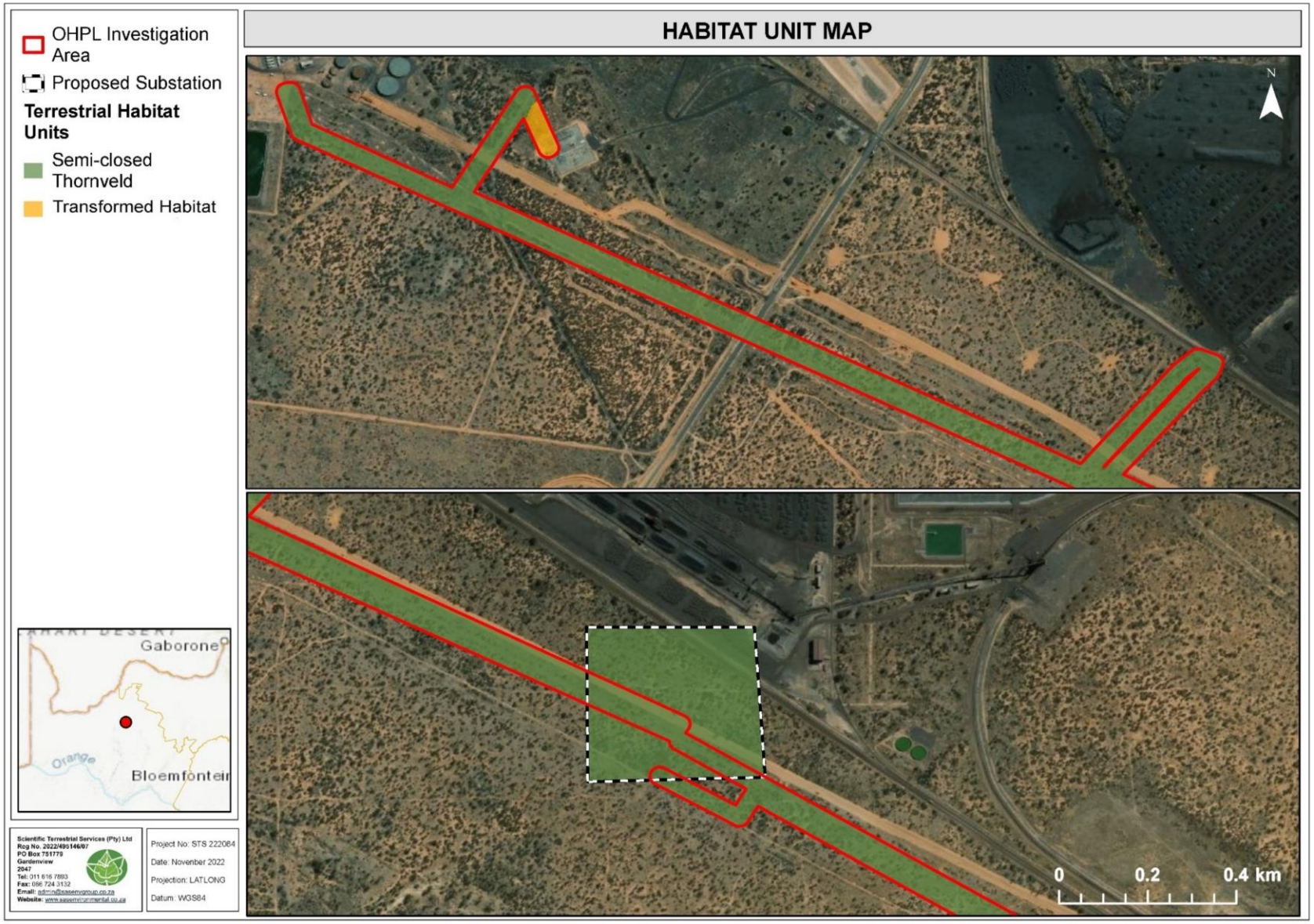


Figure 2: Habitat units associated with the study area.

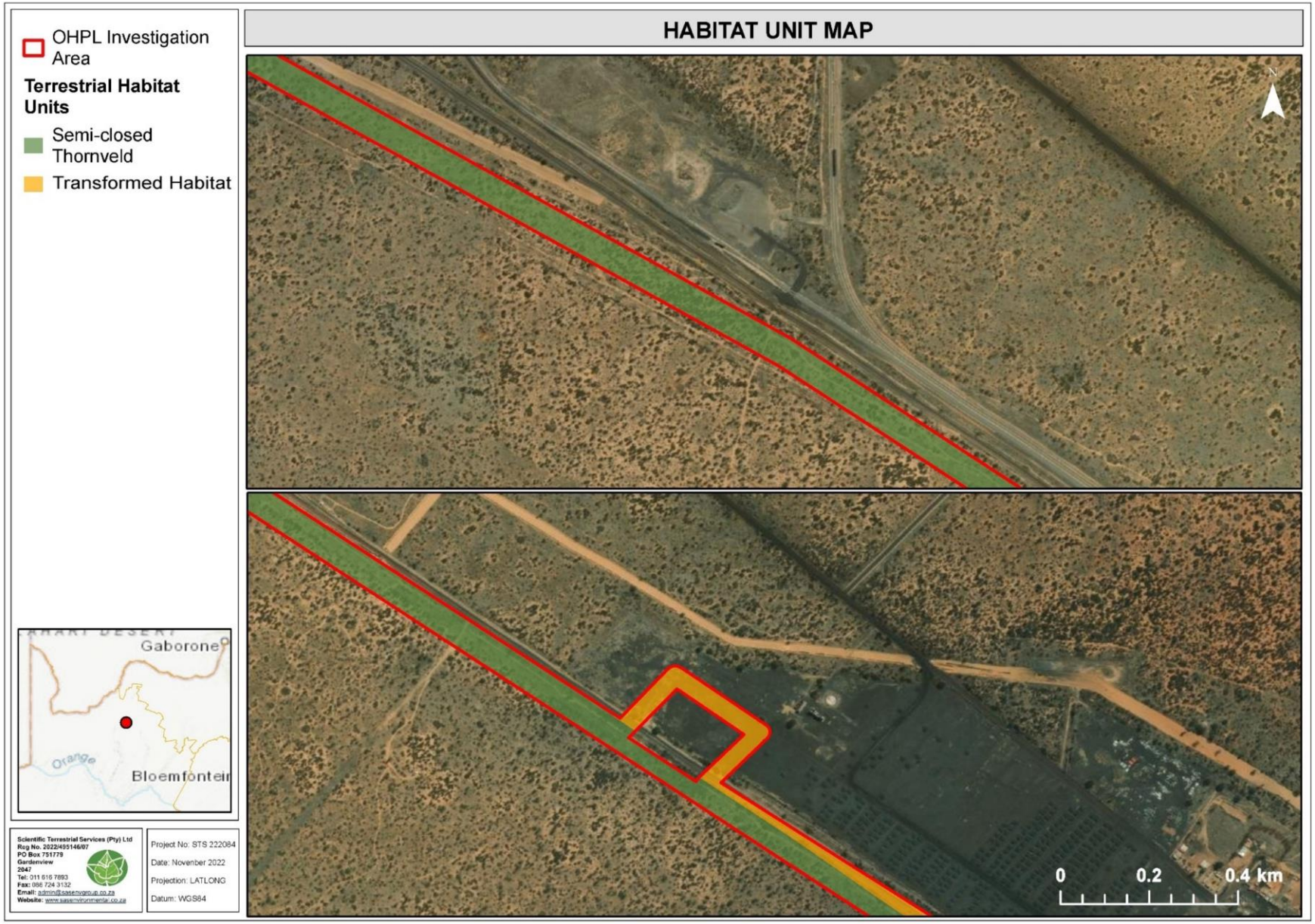


Figure 3: Habitat units associated with the study area.

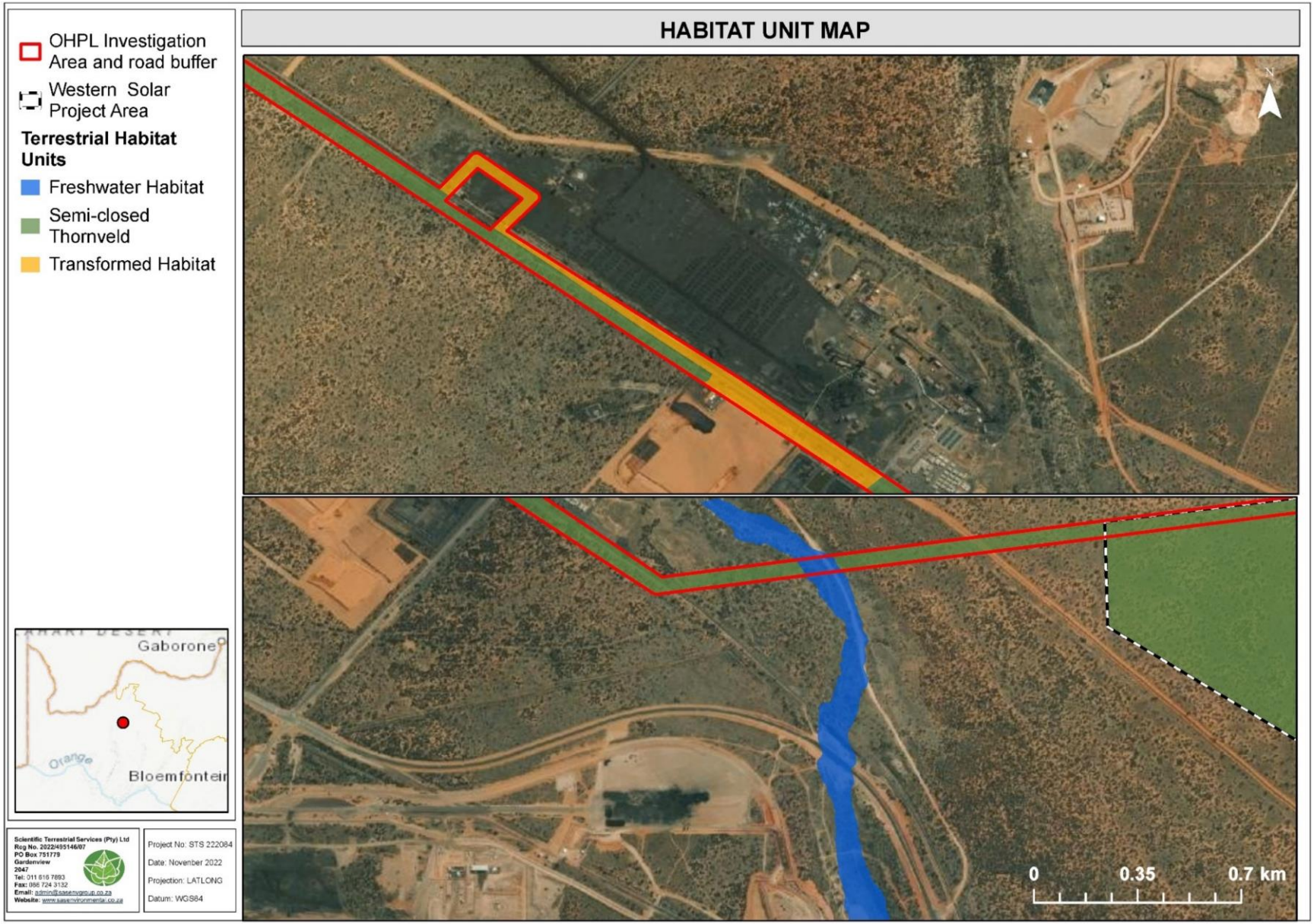


Figure 4: Habitat units associated with the study area.

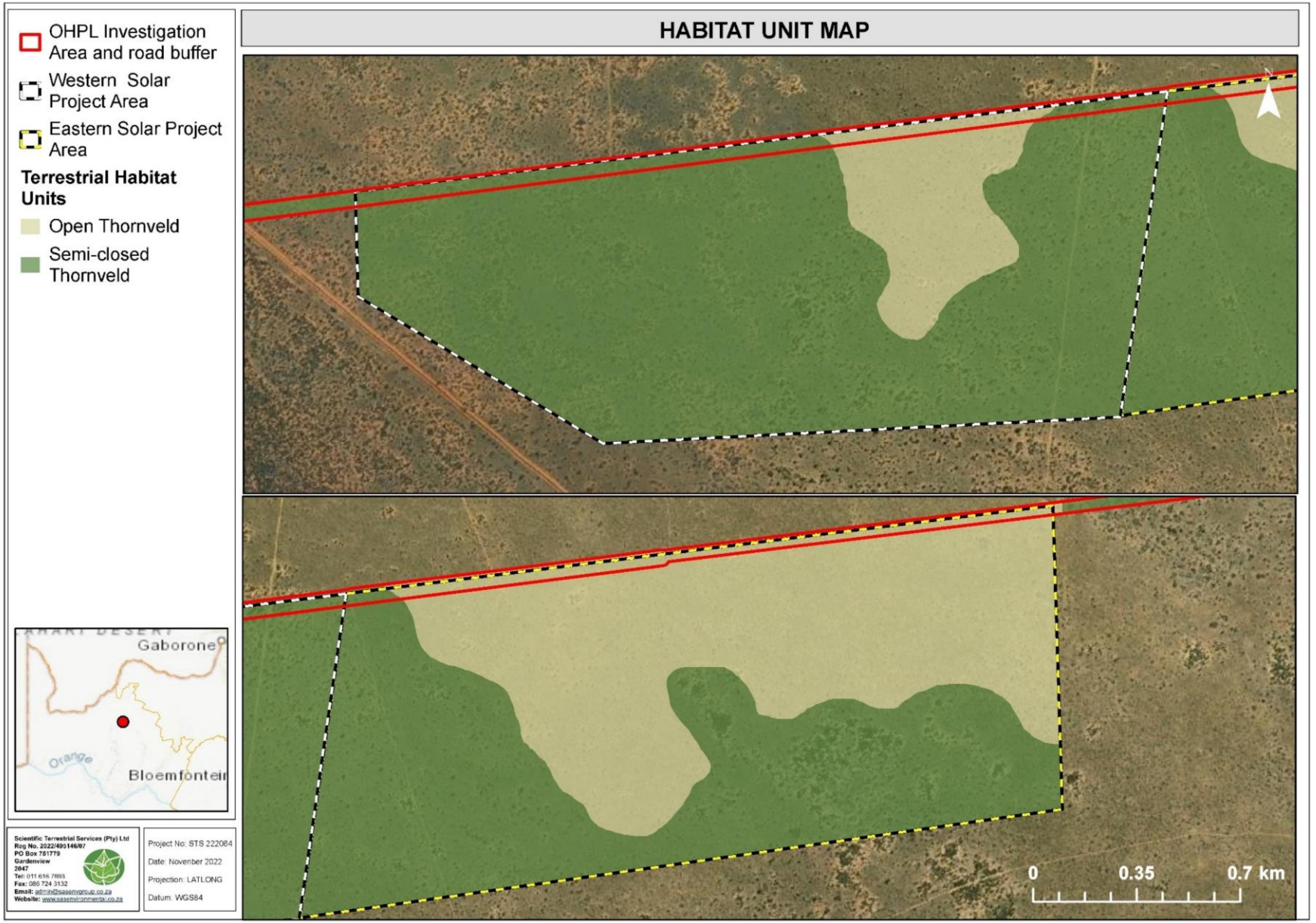


Figure 5: Habitat units associated with the study area.

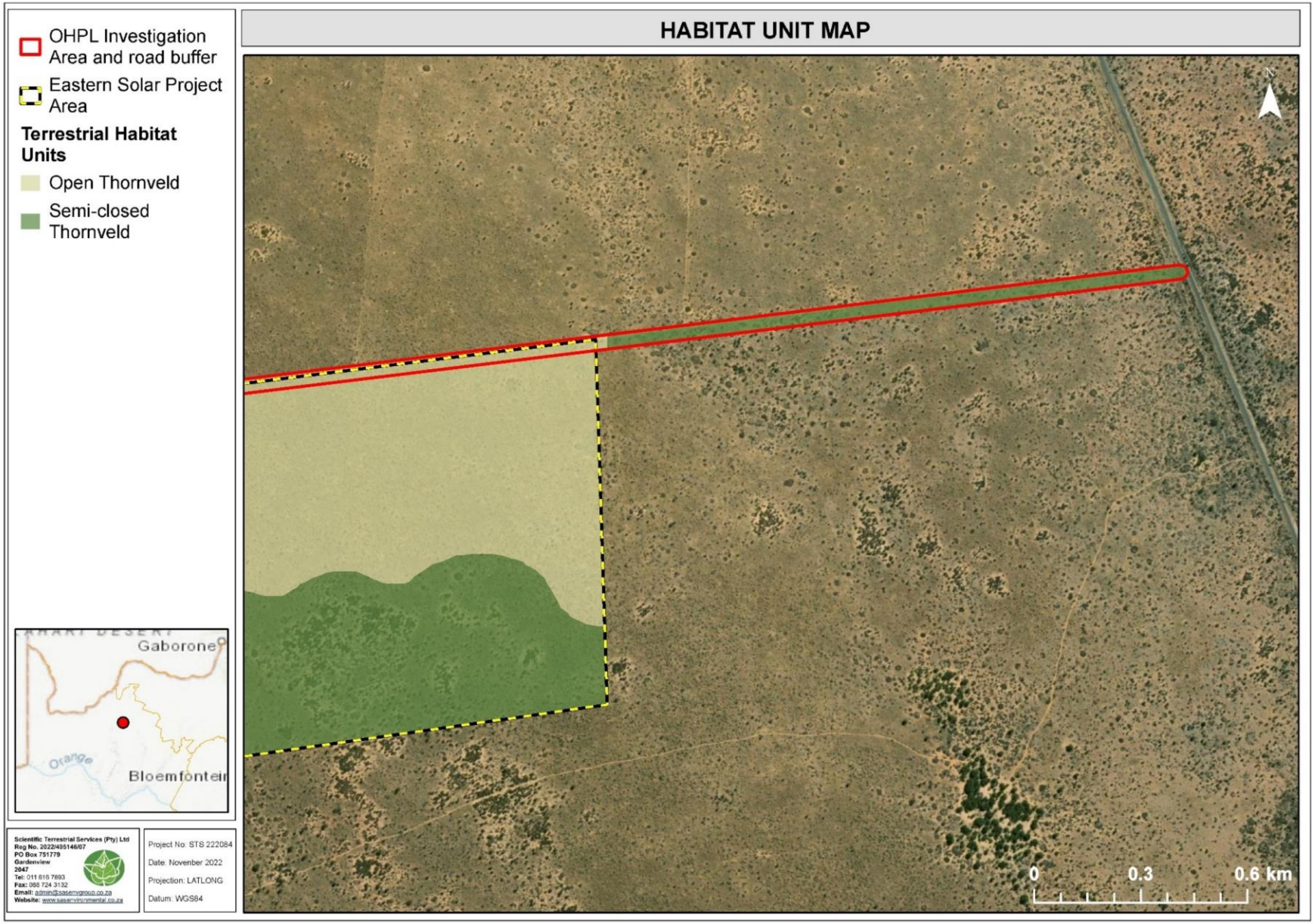


Figure 6: Habitat units associated with the study area.

3.2.1 Freshwater Habitat Unit (Ga-mogara Habitat)

HABITAT OVERVIEW
From a floral perspective, the sections of the Ga-mogara Habitat within the study area are regarded to be degraded and species-poor. The OHPL will traverse this habitat unit. No other freshwater ecosystem were noted within the solar PV facility study areas. The habitat is densely encroached by the invasive Prosopis glandulosa and the vegetation has taken on a short-to-tall, closed woodland structure. The Ga-mogara River is an ephemeral (or episodic) system which means that the river itself is most often dry but should flow for brief periods after heavy rainfall (Figure 12). The Ga-mogara River, however, has been without significant surface flows for a prolonged period due to, inter alia, the episodic nature of the river, the upstream dewatering and swallet formation by mine workings of the Sishen Iron Ore Mine , several diversions of the river (e.g., the river diversion for the Mokala mine being the closest to the study area), as well as prolonged dry conditions for the region. The Ga-mogara River itself has been altered throughout the years due to regional-scale impacts from historic and ongoing mining and agricultural activities along the greater extent of the river. More important to the vegetation communities of the Ga-mogara Habitat within the study area is the invasion by Prosopis glandulosa. The episodic nature of the resource, as well as the disturbances to vegetation, is likely to contribute to diminished capacity to provide certain ecological functions which would typically be provided by wetland or riverine resources. However, the opportunity to provide services such as sediment trapping, nutrient and toxicant assimilation and biodiversity maintenance are considered to be of moderate levels, particularly if upstream rehabilitation of the swallets and dewatered geological compartment is successful and flow patterns are restored. Although no species of conservation concern (SCC) were observed during the site assessment, , some protected floral species are known to occur on site, and therefore this was taken into account when assessing the biodiversity maintenance provision of the resource.    **Representative photographs of the Ga-Mogara River where the OHPL will traverse. The left photograph depicts the Ga-mogara Habitat within the study area (and stretching further south) where the heavily invaded *Prosopis glandulosa* woodland *is clearly visible.* The central and right photographs depict the encroached nature of this habitat and the lack of floral diversity within the woody, graminoid, and forb components.** The above-mentioned impacts on the Ga-mogara Habitat have placed cumulative pressures on the system and resulted in the current diminished habitat integrity of the Ga-mogara Habitat from a floral perspective. The Ga-mogara Habitat sub-unit is in a **poor ecological condition**, i.e., severely, or irreversibly modified and in which ecological function has been compromised in addition to structure and composition of the habitat. Ecological drivers are not entirely absent, however, with the significant alterations to the habitat within and along its greater extent, the functioning of the ecological drivers is not currently proving to favourably contribute to healthy (or unique) floral communities.

SPECIES OVERVIEW

As mentioned before, the Ga-mogara Habitat is associated with a species-poor floral community, largely comprising the invasive *Prosopis glandulosa*. The OHPL will traverse this habitat unit. No other freshwater ecosystem were noted within the solar PV facility study areas. AIPs are well-represented in this habitat sub-unit. In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) Listing Notices, the Ga-mogara Habitat can be described as indigenous vegetation[3] despite the extensive AIP coverage within this sub-unit.

Characteristic species of this habitat unit included:

- **Woody species**: With *Prosopis glandulosa* dominating the tree component, additional trees and/or tall shrubs like *Lycium hirsutum, Senegalia mellifera* subsp*. detinens, Vachellia erioloba* (NFA-protected), and *Ziziphus mucrunata* are more sparsely scattered within this habitat sub-unit. The remainder of the woody component is made up of dwarf and low shrubs such as *Chrysocoma ciliate, Felicia muricata,* and *Lasiosiphon polycephalus*;
- **Forb species:** The forb component was very species-poor but *Helichrysum argyrosphaerum* often formed a dense groundcover in this habitat sub-unit. Additional forbs in the Ga-mogara Habitat included two alien species, namely *Argemone ochroleuca* and *Verbesina encelioides,* with some additional native species sparsely occurring in this sub-unit, namely *Cullen tomentosum, Orthanthera jasminiflora* (NCNCA-protected), *Senecio consanguineous,* and *Senna italica* subsp. *arachoides*;
- **Succulent species:** None recorded at the time of assessment; and
- **Graminoid species**: This component was also largely lacking, but species such as *Cenchrus ciliata, Chloris virgata, Cynodon dactylon* and *Tragus racemosus* were often recorded either underneath denser tree cover or along the outer edges of the habitat sub-unit.

Refer to **Appendix B** for a more comprehensive floral inventory for this habitat sub-unit. Refer to section 3.4 for a more comprehensive AIP list.

FLORAL SCC OVERVIEW

No threatened species were recorded within the Ga-mogara Habitat and from a floral perspective the habitat is not suitable to sustain threatened species. The Screening Tool outcome further indicated that the Plant Species Theme is overall of a **low sensitivity**, thus, from a database perspective no threatened species are known from the area. The area is, however, known to be poorly sampled and a Probability of Occurrence (POC) assessment was undertaken for threatened species known from the Quarter Degree Square (QDS) 2722BB (refer to Appendix A for the method of assessment). No threatened species were found to be associated with the QDS, and thus the low sensitivity for the Plant Species Theme (from a RDL species perspective) is supported for the Ga-mogara Habitat.

Nationally protected tree species associated with the greater Ga-mogara Habitat included several sparsely scattered, large individuals of *Vachellia erioloba* (Camel Thorn) and *Vachellia haematoxylon* (Gray Camel Thorn). None of these protected tree species were recorded in the footprint area of the OHPL.

No provincially protected species that were recorded within the Ga-mogara Habitat associated with the study area; however, Schedule 2 protected flora such as *Nerine laticoma* and *Gymnosporia buxifolia* have been recorded in other stretches of the Ga-mogara river (notably within the vicinity of the nearby Mokala and Kudumane mining operations) and thus obtained high POCs. The above-mentioned species are not currently threatened, and their conservation status is Least Concern (LC). Their distributions are also not restricted to this habitat sub-unit, nor to the local or regional areas.

Permits from the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR) and authorisations from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to **Appendix C** for the complete floral SCC assessment results.

[3] NEMA Listing Notice definition of **indigenous vegetation:** Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

3.2.2 Thornveld Habitat Unit

OPEN THORNVELD	SEMI-CLOSED THORNVELD
The Open Thornveld sub-unit occurs in the central and south-western sections of the study area. The vegetation structure is an open thornveld (top and central photographs). Further discussions are provided in the below sections.   Overview of the open thornveld habitat with numerous graminoid and herbaceous floral species.	The Semi-closed Thornveld comprised the majority of the study area. The vegetation structure includes both a taller and often denser woody component than observed in the Open Thornveld sub-units. Further discussions are provided in the below sections.    Selected species more often associated with this sub-unit included top) General overview of the semi-closed thornveld habitat, *bottom left*) *Harpagophytum procumbens,* and bottom right) *Melhania burchellii.*

OPEN THORNVELD	
Habitat Overview	The Open Thornveld is largely associated with deep, well-drained soils (i.e., Ermelo/Clovelly soil form). The Open Thornveld had a uniform vegetation structure across its distribution within the study area, i.e., **a short, open shrubland** (as per Diagram A1 of Appendix A). The dominant woody component comprised of shrubs and low trees. This sub-unit can be characterised by a well-developed grass layer (largely continuous in cover) and a well-developed woody component (best represented by shrubs and smaller trees). Forb species were moderately represented, which is typical for the vegetation within this region. In terms of vegetation structure and species composition, this habitat unit shares a moderate affinity with the Kathu Bushveld reference vegetation type. Albeit less prominent, some elements of the Gordonia Duneveld reference state are present within this sub-unit, which indicates an ecotonal species composition. Generally, *Vachellia haematoxylon* was the dominant tree species within this sub-unit (often associated with *Crotalaria spartioides*), with individuals of *Vachellia erioloba* occasionally present. Although ecotonal floral communities are evident, this sub-unit more closely resembles the Kathu Bushveld than the Gordonia Duneveld reference states. Habitat integrity for the Open Thornveld was largely intact. Apart from some prospecting that has resulted in vegetation clearance in the northern portions of the study area, no other signs of degradation or modification to vegetation communities were noted within this sub-unit. This sub-unit is associated with a moderate species richness. As with the Gordonia Duneveld sub-unit the Open Thornveld sub-unit had limited alterations to natural ecological drivers. The sub-unit is considered to be in a **good ecological condition**, i.e., natural or near-natural and in which composition, structure and function are still intact or largely intact.
Species Overview	The Open Thornveld is associated with a moderate species-richness, where floral communities are representative of the reference Kathu Bushveld (with some affinities shared with the neighbouring Gordonia Duneveld). Across this sub-unit, 58 species were recorded (40% = woody, 37% = forbs, 2% = succulents, 21% = graminoids). In terms of the NEMA Listing Notices, the Open Thornveld sub-unit can be considered indigenous vegetation. Characteristic species of this habitat unit included: ➢ **Woody species**: *Berkheya ferox, Crotalaria spartioides, Diospyros lyciodes, Elephantorrhiza elephantina, Grewia flava, Hermannia burchellii, Melolobium canescens, Melolobium microphyllum, Senegalia mellifera* subsp. *detinens, Terminalia sericea, Vachellia erioloba* (NFA-protected), *Vachellia haematoxylon* (NFA-protected); ➢ **Forb species**: *Aptosimum procumbens, Cucumis africanus, Dicoma schinzii, Harpagophytum procumbens* (TOPS-protected), *Helichrysum argyrosphaerum, Hermannia comosa, Hermbstaedtia fleckii, Orthanthera jasminiflora* (NCNCA-protected), *Peliostomum leucorrhizum, Requienia sphaerosperma, Senna italica* subsp. *arachoides;* ➢ **Succulent species:** The succulent component was not abundant within this sub-unit and included *Acanthosicyos naudinianus,* and *Ruschia ruralis* (NCNCA-protected); ➢ **Graminoid species:** *Anthephora cf. argentea, Aristida stipitate, Enneapogon cenchroides, Eragrostis pallens, Eragrostis rigidior, Eragrostis trichophora, Melinis repens, Pogonarthria squarrosa, Schmidtia kalahariensis*; and ➢ At the time of assessment, alien and invasive plant (AIP) species were not a common or prominent feature within this sub-unit. Please refer to section 3.4 for more details.

SEMI-CLOSED THORNVELD	
Habitat Overview	The Semi-closed Thornveld is largely associated with deep, well-drained soils (i.e., Ermelo/Clovelly soil form). The vegetation structure of the Semi-closed Thornveld varied slightly across its distribution within the study area, where sections within the north-western portions of the study area had a denser arrangement of woody species than when compared to the rest of the sub-unit. Overall, the vegetation structure can be described as a **tall, open-to-closed thornveld**. This sub-unit can be characterised by a well-developed tree layer where *Grewia flava, Senegalia mellifera* subsp. *detinens,* and *Vachellia erioloba* were prominent features and made up the dominant tree layer. At the time of assessment, the grass cover was largely continuous within the Semi-closed Thornveld (this is a direct result of the increased rain received during the last two years). The vegetation structure and species composition were largely representative of the reference Kathu Bushveld vegetation type. The lack of *Boscia albitrunca* species (a dominant features for the reference state) may be due to the soil type, as it generally prefers more shallow soils. As with the Open Thornveld, the habitat integrity of this sub-unit is largely intact, and signs of disturbances were restricted to some prospecting activities and the current explosive yard in the south of the study area. Although some sections in the north-western part of this sub-unit was more heavily encroached than other sections, species richness was not noted to be much lower in such areas. Overall, a moderately species richness was associated with this sub-unit. As with the other two sub-units, limited alterations to natural ecological drivers have taken place (apart from altered herbivory). The sub-unit is considered to be in a **good ecological condition**, i.e., natural or near-natural and in which composition, structure and function are still intact or largely intact.
Species Overview	The Semi-closed Thornveld shared a similar species composition with the Open Thornveld. The main difference between the sub-units were the vegetation structure, where woody trees were more abundant in the Semi-closed Thornveld, with the shrubs more abundant in the Open Thornveld. Please refer to the Open Bushveld section for species overview. Appendix B presents a more comprehensive list of species for this sub-unit.

FLORAL SCC OVERVIEW

As mentioned before, as part of the SCC assessment, the following classes were considered **threatened species** as well as both nationally and provincially **protected species**. In support of the Screening Tool's **low sensitivity** outcome for the plant species theme, no threatened species were recorded in the Thornveld Habitat (or any of the sub-units). Based on the POC assessment, considering both RDLs known from the QDS 2722BB, as well as available habitat, no RDLs are anticipated to be present within this habitat unit.

The NEMBA TOPS protected species *Harpagophytum procumbens* (LC) was, however, recorded throughout the Thornveld Habitat unit. This species is also listed as a Schedule 1 protected species under the NCNCA. Though not currently threatened, the destruction/removal/relocation of this species is regulated by the DFFE, and permits would need to be obtained before any vegetation clearance can take place. Relocation attempts are recommended.

Several nationally protected tree species were associated with the Thornveld Habitat, namely *Vachellia erioloba* (Camel Thorn) and *Vachellia haematoxylon* (Grey Camel Thorn). No other NFA-protected trees were recorded in the assessed areas, and none are anticipated to be present. *Vachellia erioloba* is a more widespread species within South Africa (below photo - left three) than *Vachellia haematoxylon*, although its slow growth makes the tree sensitive to habitat loss. The *Vachellia haematoxylon* species are more restricted in their national distribution range and is a Kalahari endemic (refer to the below photographs - right three). Loss of habitat has a higher possibility to negative impact on *Vachellia haematoxylon* if these species are not either rescued and relocated or offset.




From left to right: Distribution map of *Vachellia erioloba*, adult *Vachellia erioloba,* characteristic thorns of *Vachellia erioloba*, distribution map for *V. haematoxylon*, adult *V. haematoxylon*, characteristic thorn and leaves of *V. haematoxylon.**Maps taken from the TheTreeApp SA (https://treeproapp.com/#how-it-works)

Several provincially protected species (both Schedule 1 and Schedule 2) were associated with the Thornveld Habitat unit. The below list presents the species recorded on site as well as species that have obtained a high POC score due to suitable habitat within this habitat unit.

- *Boophone disticha* (Schedule 2, LC, POC = High);
- *Crinum* sp. (Schedule 2, LC, POC = High);
- ***Harpagophytum procumbens* (Schedule 1, LC, POC = Confirmed);**
- *Lessertia frutescens* (Schedule 1, LC, POC = High);
- *Lapeirousia littoralis* (Schedule 2, LC, POC = High);
- *Moraea pallida* (Schedule 2, LC, POC = Medium);
- *Nemesia fruticans* (Schedule 2, LC, POC = High);
- *Nerine* sp. (Schedule 2, LC, POC = High);
- *Orthanthera jasminiflora* (Schedule 2, LC, POC = High);
- *Pergularia daemia* (Schedule 2, LC, POC = High); and
- *Ruschia* sp. (Schedule 2, LC, POC = Medium).

The above-mentioned species are all of LC in terms of threat status and are not locally restricted in their distribution. Permits from Northern Cape DAEARDLR and from the DFFE should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to **Appendix C** for the complete floral SCC assessment results.

3.3 Conservation Significance of the Habitat Units and Concluding Remarks

None of the vegetation communities associated with the study area are regarded as threatened vegetation types, nor are they considered endemic to the country. The study area and associated habitat units further occur outside of the refined boundary of the Griqualand West Centre of plant endemism (GWC). van Staden *et al*. (2020) have refined the borders of the GWC and the paper states that “The refined area... is strongly associated with mountainous habitats with their associated unique geology and cooler climate, implying that endemic plant species are absent from the warmer, sand-filled valleys. Thus, the mountains of GWC are identified as hotspots within the centre of endemism...”. Given this, none of the habitat units associated with the study area are deemed hotspots for endemic plants.

A very high sensitivity (in terms of terrestrial biodiversity theme) was triggered by the Screening Tool for the area associated with the Freshwater habitat (Ga-Mogara habitat) and the upper north western portion of the OHPL due to the presence of an ESA. The ESA is a buffered area associated with the Ga-mogara River and, as such, is important for maintaining ecological corridors and is of conservation significance. Much of the Ga-Mogara Habitat is degraded from a floral perspective and is significantly invaded by the invasive *Prosopis glandulosa*. However, the river system cannot be considered on a localised scale alone (being a connected system) and thus as a whole it is regarded a unique feature in the landscape as an ESA and further enjoys protection under the NWA and NEMA as a watercourse. The remainder of the study area was associated with a low sensitivity triggered by the screening tool.

Key considerations (if the proposed activities are authorised) and concluding remarks for the floral communities associated with the study area are listed below:

- The Open Thornveld, and Semi-closed Thornveld were found to be representative of the reference vegetation types for the area. The Ga-mogara Habitat has been invaded by invasive trees and the floral communities associated with it have deviated significantly from the reference state. Regardless, all four of the aforementioned habitats meet the definition of indigenous vegetation as per NEMA and clearing will require the necessary authorisation. The Transformed Habitat are not representative of the reference states and do not meet the definition of indigenous vegetation;
- The Screening Tool outcome of a low sensitivity for the Plant Species Theme is supported for all habitat units. The presence of RDL species was not confirmed on site

and suitable conditions for such species are lacking. Many national and provincial protected species were, however, recorded across the study area and these species will require permits from the Northern Cape DAEARDLR and the DFFE is any harm to such species will take place. Rescue and relocation attempts are recommended for herbaceous or succulent species, where trees are typically more difficult to transplant (especially given the sheer number of species on site). Harvesting of propagules of protected tree species is recommended prior to vegetation clearing activities. These propagules can be propagated under controlled nursery conditions and used as part of rehabilitation actions during the closure phase of the existing mining activities;

- The Screening Tool outcome for the mid-section of the study area indicated a high sensitivity for the Terrestrial Biodiversity Theme. This was triggered by the presence of an ESA linked to a buffered area surrounding the Ga-mogara River. As such, the sensitivity was confirmed for the Ga-mogara Habitat Unit. ESAs are recommended to be kept in natural and functioning conditions and if the proposed activities will be authorised, measures should be in place to allow connective corridors. The upper north eastern portion of the OHPL was indicated also as high sensitivity by the screening tool. This was not confirmed as vegetation alteration have already taken place in this portion of the OHPL due to existing infrastructure in the area; and
- Several sections within the study area are either associated with bush encroachment or AIP proliferation and this should be managed as part of the proposed activities.

3.4 Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson et al., 2020), with 327 plant species, most of which are invasive, listed in national legislation[4]. Many introduced species are beneficial, e.g., almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to “escape” from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa’s diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

[4] Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).

3.4.1 Legal Context

South Africa has released several articles of legislation that are applicable to the control of alien species. Currently, invasive species are controlled by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020. AIPs defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEMBA:

- **Category 1a** species are those targeted for urgent national eradication;
- **Category 1b** species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- **Category 2** species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders "*Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3*"); and
- **Category 3** are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Duty of care related to listed invasive species are referred to in NEMBA Section 73[5]. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e., the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

[5] Section 73(2): A person who is the owner of land on which a listed invasive species occurs must-
a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
c) take all the required steps to prevent or minimise harm to biodiversity.

3.4.2 Site Results

Apart from the Ga-mogara Habitat, the study area is not associated with increased abundance of AIPs. The density of most of the recorded AIPs within the study area was low; however, within the Ga-Mogara Habitat and some sections associated with the Transformed Habitat, the AIP abundance was medium-to-high.

Of most significant concern is the extent to which *Prosopis glandulosa* (Honey mesquite) has invaded the Ga-mogara Habitat. *Prosopis* species in general, utilise readily available ground-water and where they form dense stands, they can adversely affect the hydrology of the ecosystems they invade. This species is currently listed only as a Category 3 invader for the Northern Cape; however, the 2020 NEMBA Alien and Invasive Species Regulations state that "Any plant species identified as a Category 3 Listed Invasive Species that occur in riparian areas[6], must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species …".

Table 1 below lists the AIPs associated with the study area. The existing AIP control plan for BRMO should be updated to include the new proposed activities.

[6] In terms of the NEMBA 2020 Alien and Invasive Species Regulations, the term **"riparian area"** means within 32 metres of the edge of a river, lake, dam, wetland or estuary, or within the 1:100 year floodline, whichever is the greater

Table 1: Alien floral species identified during the field assessment with their invasive status as per NEMBA: Alien and Invasive Species Lists, GN R1003 of 2020. Within the table, the following acronyms are used: GH = Ga-mogara Habitat, OST = Open and Semi-closed Thornveld, and TDH = Transformed Habitat.

Scientific name (Common Name)	Origin	NEMBA Category	Environmental Impacts[7]			
			GH	OST	TH	
Argemone ochroleuca (White-flowered Mexican poppy)	Mexico	1b	x		x	Prolific in **disturbed sites** and competes with agricultural crops and indigenous species. This plant contaminates crop seed, and the spiny fruits and leaf tips can adhere to the wool of sheep. The seeds and parts of the plant are **poisonous** to humans and livestock.
Chenopodium cf. album (Goosefoot)	Cosmopolitan weed which is so widely distributed that its geographical origin is obscured	Not Listed			x	None recorded at the moment.
Prosopis glandulosa (Honey mesquite)	North and Central America	3 in Northern Cape **1b in watercourses**	x	x	x	*Prosopis* trees are **extravagant users of readily available groundwater** and dense stands could seriously **affect the hydrology of the ecosystems** they invade. Dense stands compete with and **replace indigenous woody and grassland species.** Dense stands produce few pods and thus replace natural pasturage without providing pods in return. Dense stands are virtually impenetrable, restricting the movement of domestic and wild animals and causing injuries
Verbesina encelioides (Cowpen daisy)	United States and Mexico	Not Listed	x		x	Poisonous and mildly toxic to small mammals, invades roadsides, sandy watercourses and open fields.

[7] Data sourced from the Invasive Species South Africa (ISSA) website: http://invasives.org.za/

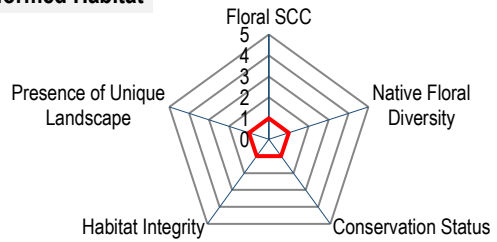
4 SENSITIVITY

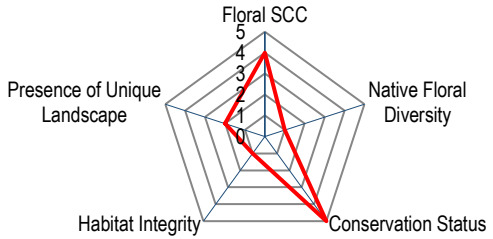
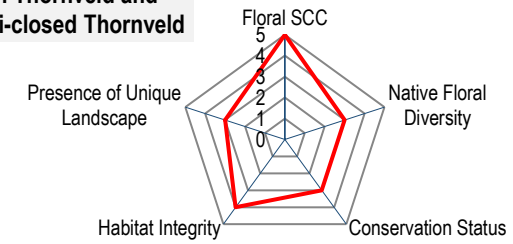
The Screening Tool identified the entire study area to be in a **low sensitivity** area for the Plant Species Theme (i.e., areas where no threatened flora are known or expected to occur). The low sensitivity for the Plant Species Theme was confirmed during the ground-truthing of the assessed areas. The section surrounding the Ga-Mogara Habitat was identified as a **very high sensitivity** area for the Terrestrial Biodiversity Theme (triggering features include an ESA). The ESA was confirmed on site and supported the high sensitivity assigned by the Screening Tool outcome.

Based on the ground-truthed results of the site visit, Table 2 below presents the site sensitivity of each identified habitat unit along with an associated conservation objective and implications for development. These sensitivities differ from the Screening Tool sensitivities as they consider different aspects, such as the presence or potential for floral SCC (both threatened species as well as protected species), habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type). Refer to Appendix A for the method of assessment.

Figures 7 - 9 conceptually illustrate the areas of varying ecological sensitivity and how they will be impacted by the proposed infrastructure development.

Table 2: A summary of the sensitivity of each habitat unit and implications for development.

Habitat Unit and Sensitivity	Conservation objective	Key habitat characteristics
Low **Transformed Habitat** 	Optimise development potential.	➢ Indigenous floral diversity and abundance low to largely absent; ➢ Where vegetation is present, the floral communities are homogenous and / or AIP species present; ➢ No floral SCC (either threatened or protected) were associated with this habitat unit. The low sensitivity assigned by the Screening Tool for the Plant Species Theme is supported for this unit; and ➢ No significant biodiversity features were confirmed for this habitat unit and the very high sensitivity assigned by the Screening Tool for the Terrestrial Biodiversity Theme is not supported for this unit..

Habitat Unit and Sensitivity	Conservation objective	Key habitat characteristics
Intermediate **Freshwater (Ga-mogara) Habitat**  **Open Thornveld and Semi-closed Thornveld**  	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	➢ Apart from the Ga-mogara Habitat, the Open Thornveld and Semi-closed Thornveld habitat sub-units are representative of the reference states; ➢ Species richness for the Ga-mogara Habitat was low, whereas for the Open Thornveld and Semi-closed Thornveld species richness was moderate; ➢ All the these sub-units meet the definition of indigenous vegetation as per NEMA Listing notices; ➢ The Ga-mogara Habitat is within the 1:100 year flood line of the Ga-mogara River and thus enjoys protection under the NEMA and NWA; ➢ None of the sub-units are associated with RDL species, nor are such anticipated to establish viable populations within these sub-units. The low sensitivity assigned by the Screening Tool for the Plant Species Theme is supported for these sub-units; ➢ The Ga-mogara Habitat included moderately low representation of NFA- and NCNCA-protected species, whereas the Open Thornveld, and Semi-closed Thornveld had a moderate to moderately high representation of NEMBA TOPS-, NFA-, and NCNCA-protected species; ➢ Significant biodiversity features were associated with the Ga-mogara Habitat. This unit is associated with an ESA. The very high sensitivity assigned by the Screening Tool for the Terrestrial Biodiversity Theme is thus supported for these two sub-units (where they coincide with the ESA); and ➢ No significant biodiversity features were confirmed for the Open Thornveld and the Semi-closed Thornveld, not occurring within the ESA. The very high sensitivity assigned by the Screening Tool for the Terrestrial Biodiversity Theme is not supported for these sub-units.

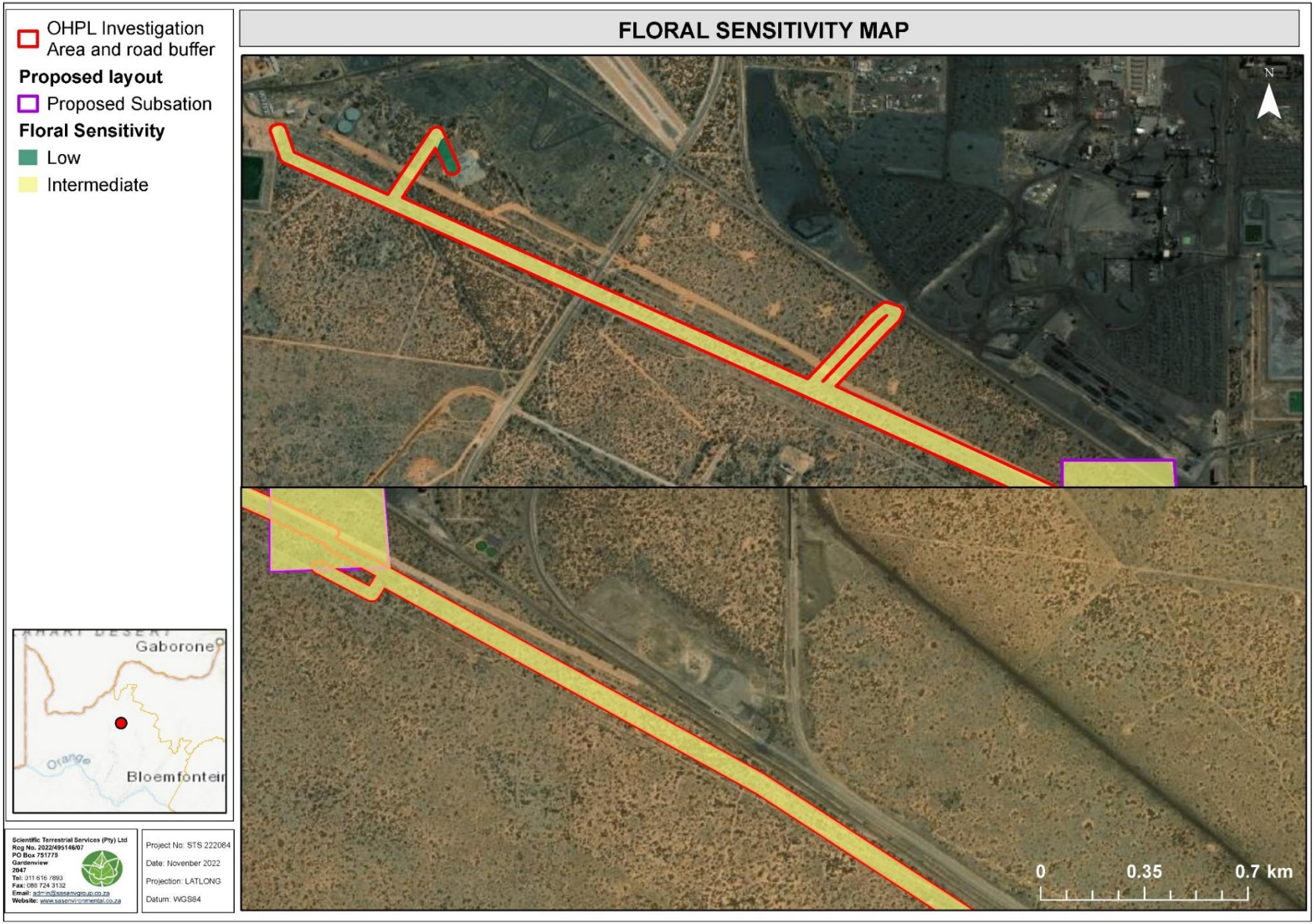


Figure 7: Habitat sensitivities associated with the study area (map 1).

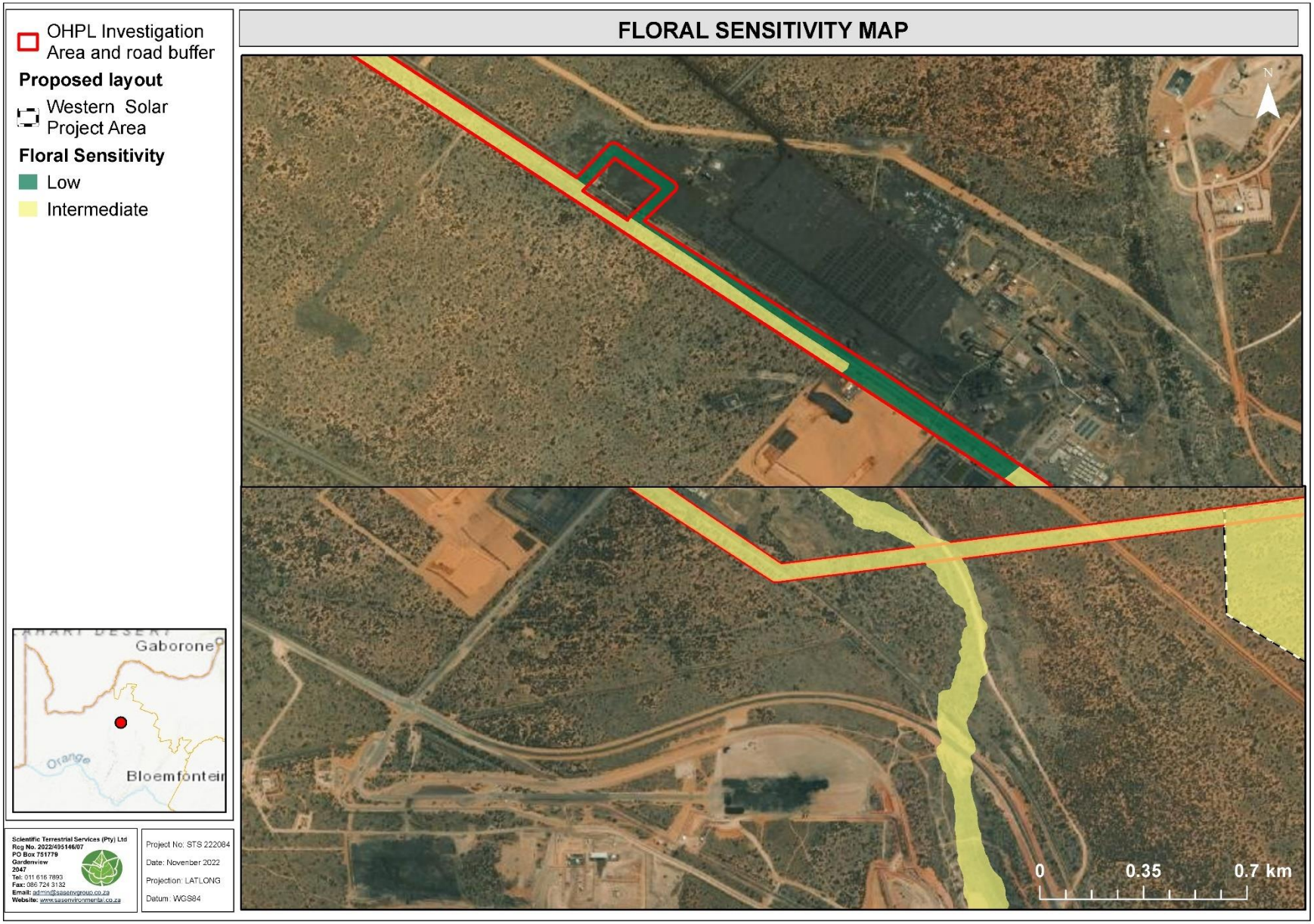


Figure 8: Habitat sensitivities associated with the study area (map 2).

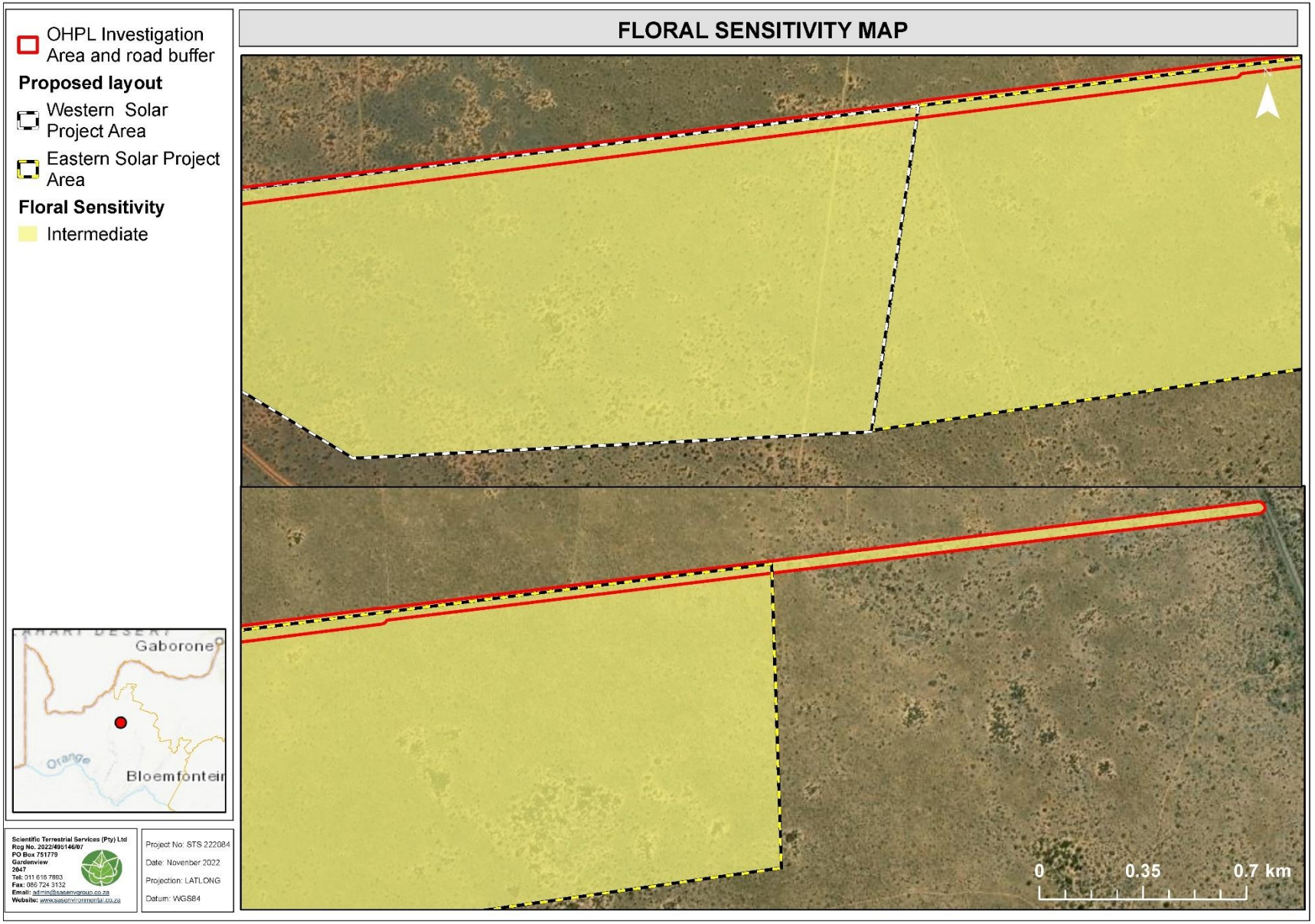


Figure 9: Habitat sensitivities associated with the study area (map 3).

5 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed activities within the study area. The impact assessment is based on the layout provided by the proponent as illustrated in Figure 1. For additional information regarding the project description and layout please see **Part A**.

An impact discussion and assessment of all potential i) planning phase and construction and ii) operational phase impacts are provided in Section 5.2 and 5.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.2.

5.1 Activities and Aspect Register

The register of activities and aspects for the proposed activities is presented in Table 3 below.

Table 3: Activities and Aspects likely to impact on the floral resources within the study area.

ACTIVITIES AND ASPECTS
Planning Phase
- Potential failure to obtain permits for nationally protected (as per the NFA and TOPS) and provincial protected (as per the NCNCA) floral species that are required prior to the commencement of the vegetation clearance phase for the relocation (where feasible) or destruction of such flora; and - Potential failure to develop a rescue and relocation plan for protected flora eligible for relocation, or to timeously harvest propagules of protected flora that will be impacted but that cannot be relocated (to be propagated in a plant nursery to form part of rehabilitation activities later down the line). - **Impact**: Avoidable or mitigatable loss of protected floral species within the approved footprint of the proposed activities.
- Potential failure to update any existing AIP Management/Control plans (or develop an AIP plan if such is not available yet) to include new activities before the commencement of activities, resulting in the spread of AIPs from the project footprint to surrounding natural habitat. - **Impact:** Spreading of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
- Potential inadequate design and management planning of stormwater and erosion, resulting in increased risk of erosion and loss of topsoil. - **Impact:** Loss of favourable floral habitat beyond the authorised footprint, leading to a decline in floral diversity.
Construction Phase (& Rehabilitation Phase)
- Potential failure to demarcate the authorised footprints prior to development commencing. - **Impact**: Increased size of planned footprints and loss of additional floral habitat and SCC.
- Site clearing and the removal of vegetation. - **Impact:** Loss of floral habitat, diversity, and the possible loss of floral SCC.
- Potential failure to have relocated or harvested propagules (where feasible) of all affected floral SCC prior to the commencement of site clearing activities. - **Impact:** Unmitigated loss of SCC individuals.
- Potential failure to monitor the success of relocated floral SCC (where applicable). - **Impact:** Unmitigated loss of SCC individuals.
- Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat. - **Impact:** Loss of favourable floral habitat outside of the direct project footprint, including a decrease in species diversity and a potential loss of floral SCC.
- Dumping of construction material within areas where no construction is planned, thereby leading to further habitat disturbance - allowing the establishment and spread of AIPs. - **Impact:** Loss of favourable floral habitat, diversity and SCC as AIPs outcome and replace these species.

ACTIVITIES AND ASPECTS
- Failure to rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increased erosion risks and/or the proliferation of AIPs. - **Impact**: Long-term loss of favourable habitat for the establishment of floral species. Loss of floral diversity and SCC. Fragmented landscapes.
- Dust generated during construction activities accumulates on the surrounding floral individuals, altering the photosynthetic ability of plants[8] and potentially further decreasing optimal growing /re-establishing conditions. - **Impact:** Declines in plant functioning leading to loss of floral species and habitat for optimal growth.
- Decreased ecoservice provision & decreased ability to support biodiversity by ESA due to vegetation and soil disturbance, as well as habitat fragmentation. - **Impact:** Loss or alteration of ESA Habitat and associated ecological functionality.
Operation phase
- Ineffective rehabilitation of exposed and impacted areas, increasing erosion risk, and AIP proliferation within the surrounding areas. - **Impact:** Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes left fragmented, resulting in reduced dispersal capabilities of floral species and an overall decrease in floral diversity; • Compacted soils limiting the re-establishment of natural vegetation; • Increased risk of erosion in areas left disturbed; and • Failed relocation of SCCs within rehabilitated areas. - **Impact:** Long-term (or permanent) loss of floral habitat, diversity, and SCC.
- Disturbance of soils as part of demolition activities. - **Impact:** Loss of favourable growing conditions for floral communities.

5.2 Floral Impact Assessment Results

Sections 5.2.1 – 5.2.3 indicate the perceived risks to the floral ecology associated with all phases of the proposed development activities. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

For the impacts associated with the Solar Farm footprints, only the impacts on the Thornveld habitat have been assessed, as the footprints do not impact on the Freshwater or Transformed habitat units.

Impacts associated with the OHPL have been assessed for all habitat units, as the OHPL will traverses all of the habitat units identified within the study area.

[8] Sett, R. (2017). Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).

5.2.1 Planning and Construction Phase impacts on floral habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of each table section.

Habitat Unit	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
IMPACT ON FLORAL HABITAT AND DIVERSITY																
Proposed Solar Farm																
Thornveld Habitat	5	3	3	3	3	8	9	72 Med-Low	5	3	3	3	2	8	8	64 Med Low
Proposed OHPL																
Thornveld Habitat	5	3	3	3	3	8	9	72 Med-Low	5	3	2	2	2	8	6	48 Low
Freshwater Habitat	4	3	3	2	3	7	8	56 Med-Low	2	3	2	1	2	5	5	25 Very Low
Transformed Habitat	2	1	1	1	2	3	4	12 Very Low	1	1	1	1	1	2	3	6 Very Low
IMPACT ON HABITAT CONNECTIVITY																
Proposed Solar Farm																
Thornveld Habitat	5	3	3	3	3	8	9	72 Med-Low	5	3	3	3	2	8	8	64 Med Low
Proposed OHPL																
Thornveld Habitat	2	3	2	3	3	5	8	40 Low	1	3	1	2	2	4	5	20 Very Low
Freshwater Habitat	2	3	2	2	3	5	7	35 Low	1	3	1	1	2	4	4	16 Very Low
Transformed Habitat	1	1	1	1	2	2	4	8 Very Low	1	1	1	1	1	2	3	6 Very Low
IMPACT ON SCC																
Proposed Solar Farm																
Thornveld Habitat	5	4	4	3	3	9	10	90 Med-High	5	3	3	3	2	8	8	64 Med Low

Habitat Unit	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
Proposed OHPL																
Thornveld Habitat	5	3	3	3	3	**8**	**9**	**72 Med-Low**	5	3	2	2	2	**8**	**6**	**48 Low**
Freshwater Habitat	4	3	3	2	3	**7**	**8**	**56 Med-Low**	2	3	2	1	2	**5**	**5**	**25 Very Low**
Transformed Habitat	5	1	1	1	2	**6**	**4**	**24 Very Low**	1	1	1	1	1	**2**	**3**	**6 Very Low**

The planning phase is essential in ensuring that activities associated with all phases of the project have the lowest possible impact on the receiving environment.

Habitat and Diversity:

- At all times, ensure that sound environmental management is in place during the planning phase;
- Minimise loss of indigenous vegetation and natural habitat where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies. Where ESA habitat will be impacted, layouts must be planned in such a way that habitat fragmentation is minimised, and movement and dispersal corridors are not entirely diminished/altered;
- It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of habitat units with increased sensitivity. At all times, ensure placement of infrastructure does not lead to increased habitat fragmentation (i.e., ensure temporary laydown areas and infrastructure placement be within already disturbed areas or as close to existing disturbances as possible);
- Access roads must be kept to existing roads as far as possible so as to reduce fragmentation of natural habitat outside of the authorised footprint. Where new roads are required, these must be planned in a manner to ensure habitat fragmentation is prevented (or limited);
- It is recommended that prior to the commencement of construction activities that the construction servitude be clearly demarcated to prevent footprint creep into areas beyond the authorised footprints;
- Develop a rehabilitation plan that will promote habitat reinstatement in disturbed sites and allow for increased habitat connectivity during the operation and decommissioning phases of the project;
- Ensure sound stormwater management planning; and
- AIP management plans should be in place before the development phase commences and AIP management should continue throughout all project phases.

Mitigation measures for floral SCC include:

- A walkdown to mark floral SCC has already taken place and, as such, the permitting requirements are already known. Based on the outcome of the walkdown, the following permit application will be necessary:
  - Where NFA-protected trees will be impacted (large quantities of *Vachellia erioloba,* and *Vachellia haematoxylon* are within the proposed footprints), relocation attempts are not feasible and a cut-and-destroy permit from the DFFE will be required. Due to the large quantity of affected trees, offsetting is highly likely to be a condition of the permit, if the DFFE authorises the removal of these trees. Therefore, harvesting of seed and propagules[9] from the NFA-protected trees on site must take place prior to the constrcution phase. It is important that seedlings, seed, and propagules be harvested from species within the study area or within a close proximity of the study area, so as to prevent alteration of population genetics. Harvested material must be propagated under nursery conditions for use in rehabilitation later down the line; and
  - Where NCNCA-protected species will be impacted (i.e., *Harpagophytum procumbens* (also TOPS-protected), permits from the Northern Cape DAEARDLR will be required. All of these species are eligible for rescue and relocation attempts and prior to the constrcution phase, a Rescue and Relocation Plan must be compiled and approved by the Northern Cape DAEARDLR.

[9] a vegetative structure that can become detached from a plant and give rise to a new plant, e.g. a bud, sucker, or spore.

5.2.2 Operational Phase impacts on floral habitat, diversity, and SCC from the proposed development activities. Required mitigation measures are presented at the bottom of each table section.

Habitat Unit	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
IMPACT ON FLORAL HABITAT AND DIVERSITY																
Proposed Solar Farm																
Thornveld Habitat	3	3	2	2	3	6	7	42 Low	2	2	2	1	2	4	5	20 Very Low
Proposed OHPL																
Thornveld Habitat	3	3	2	1	4	6	7	42 Low	1	3	2	1	4	4	7	28 Low
Freshwater Habitat	3	3	2	2	4	6	8	48 Low	1	3	2	1	4	4	7	28 Low
Transformed Habitat	2	1	1	1	4	3	6	18 Very Low	1	1	1	1	4	2	6	12 Very Low
IMPACT ON HABITAT CONNECTIVITY																
Proposed Solar Farm																
Thornveld Habitat	3	3	2	3	2	6	7	42 Low	2	3	2	2	2	5	6	30 Low
Proposed OHPL																
Thornveld Habitat	2	3	1	1	4	6	6	36 Low	1	3	1	1	4	4	6	24 Very Low
Freshwater Habitat	2	3	1	1	4	6	6	36 Low	1	3	1	1	4	4	6	24 Very Low
Transformed Habitat	2	1	1	1	4	3	6	18 Very Low	1	1	1	1	4	2	6	12 Very Low
IMPACT ON SCC																
Proposed Solar Farm																
Thornveld Habitat	3	3	2	2	4	6	8	48 Low	1	2	2	2	3	3	7	21 Very Low

Habitat Unit	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
Proposed OHPL																
Thornveld Habitat	2	3	2	1	4	**5**	**7**	**42 Low**	1	3	2	1	4	**4**	**7**	**28 Low**
Freshwater Habitat	2	3	2	1	4	**5**	**7**	**35 Low**	1	3	2	1	4	**4**	**7**	**28 Low**
Transformed Habitat	2	1	1	1	4	**3**	**6**	**18 Very Low**	1	1	1	1	4	**2**	**6**	**12 Very Low**

Floral Habitat and Diversity

- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved project footprint. Footprints to be clearly demarcated to avoid footprint creep into adjacent habitat;
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept small. Any temporary roads should be rehabilitated as soon as they are no longer in use to prevent habitat fragmentation;
- No collection of floral SCC or indigenous vegetation beyond the planned footprints must be allowed by construction or operational personnel;
- Informal fires by construction and operational personnel should be prohibited, and no uncontrolled fires whatsoever must be allowed;
- Care must be taken during the construction and operation of the proposed activities to limit edge effects to surrounding natural habitat. This can be achieved by:
    - Demarcating all footprint areas during construction activities;
    - All soils compacted because of construction activities should be ripped and profiled and reseeded;
    - Suppress dust to mitigate the impact of dust on flora within a close proximity of construction activities;
    - Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil; and
    - Manage the spread of AIP species, which may affect natural habitat outside of planned footprints;
- No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed because of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and
- Following heavy rains, access roads and areas adjacent to the development footprints are to be inspected for signs of erosion which, if found, must be immediately rectified through appropriate erosion control measures.

Alien Vegetation

- AIP proliferation, which may affect adjacent natural areas, must be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020). Management of AIPs during the construction-phase and operational-phase activities must be focused on limiting their introduction and preventing their spread;
- Ongoing AIP monitoring and clearing/control should take place throughout the operational phase of the proposed activities; a 30 m buffer surrounding the proposed activities should also be regularly monitored for AIP proliferation and instances thereof controlled appropriately. Disturbed areas should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas (until successfully rehabilitated);
- All cleared alien vegetation must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards, or at a garden refuse site; and

Habitat Unit	UNMANAGED								MANAGED							
	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance	Probability	Sensitivity	Severity	Spatial Scale	Duration	Likelihood	Consequence	Significance
- The AIP Management/Control Plan should be implemented by a qualified professional (i.e., the person must have a good record of experience in AIP management and control). No chemical control of AIPs to occur within 32 m of a watercourse, unless registered as safe for use in watercourses by the Working for Water group.																
Mitigation measures for floral SCC include:																
- No NFA-protected trees to be removed during the operationa; phase activities without 1) permits from the DFFE, and 2) all conditions of the permit are adhered to timeously; and																
- All rescue and relocation activities (successes, failures, exact number of species rescued) must be documented and monitored until it is evident that the species have successfully established within the relocated areas.																

5.3 Impact Discussion

The perceived impact significance of the proposed solar farm and the OHPL (prior to mitigation) on floral habitat, diversity, SCC and habitat connectivity ranges from medium high to very low significance impacts. Following mitigation, impacts can be reduced accordingly for the most part. It is noted that some impacts, such as vegetation clearance in the footprint areas, cannot be significantly reduced, as such clearance is required for the installation of the PV panels. Increased impact significance prior to mitigation is largely based on the assumption that mitigation measures will not be implemented, that areas outside of the proposed development footprint may be cleared / disturbed and that mitigation measures as stipulated won't be suitably implanted.

The most significant impacts to affect the floral habitat, species diversity, and floral SCC resulting from the proposed activities include, but are not limited to, the following:

- Clearance of habitat representative of the reference vegetation types;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species, which is of particular concern given that much of the surrounding areas are natural and intact, ecologically;
- Destruction, removal, or harvesting of floral SCC during construction and operational activities; and
- Potentially poorly implemented and monitored and/or rescue and relocation of SCC that will be affected by the proposed activities, leading to unmitigated impacts to, and loss of, SCC individuals.

The below sections provide a discussion of the impact assessment outcome in more detail.

5.3.1 Impacts on Floral Diversity and Habitat Integrity

The data gathered during the site visit indicate that the Transformed Habitat Unit is of **low sensitivity**, and the Freshwater (Ga-Mogara) Habitat, Open Thornveld, and Semi-closed Thornveld of **intermediate sensitivity**. The proposed activities will impact on these habitat units to varying degrees, as depicted in the below table.

Impacts on the Thornveld Habitat Unit:

Most of the proposed activities will occur within the Open Thornveld; most of which can be attributed to the proposed footprint aeras of the Solar PV panels. Considering biodiversity priority areas[10], no threatened plants will be lost within these habitat units and is not regarded an ESA. As such, loss of these habitat units will result in negative impacts to floral communities (with residual impacts) but is not regarded as a significant impact[11] and only local-scale loss of habitat is anticipated. Taking the current layout into account, avoidance of impacts to these habitat units is not possible. As such, mitigation of impacts should focus on minimisation through 1) adequate planning, 2) ensuring footprints remain within authorised areas, 3) edge effect management such as AIP and woody encroachment control, and 4) sound planning of stormwater management and erosion control. Rehabilitating of the solar PV panel footprint areas of this extent is unlikely to allow for reinstatement of the pre-development floral communities; however, the post-construction landscape would need to, as best possible, resemble a natural wilderness and blend in with the surrounding vegetation. From a floral habitat perspective, no offsetting of impacts will be necessary.

The direct impact of proposed activities on the floral ecology, without mitigation measures implemented, will result in **medium-low** impact significance during planning and construction phase for all habitat units. **Medium-high** significance is anticipated for the floral SCC impacts during the planning and construction phase should no permits and planning be done for the removal. Operational phase impacts is considered to be of **low** significance.

With mitigation measures adequately implemented, the planning and construction phase will yield **to mostly low** impact significance, with the exception of **medium low** impact significance associated with floral SCC, habitat diversity and connectivity associated with the solar PV facilities. For the operational phase, impact significance can only be reduced to a **low** and **very-low** significance.

[10] Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, Priority Areas for land-based protected area expansion, and Focus Areas for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future.

[11] An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.

Impacts on the Freshwater Habitat Unit:

Although the freshwater habitat is associated with an ESA, it is only the OHPL development that will affect this habitat. Direct impacts associated with the construction of the OHPL and positioning of the pylons will result in **medium-low** impacts should no mitigation measures be implemented, With the implementation of mitigation measures, such as the placement of the pylon positions outside of the 1:100-year floodline, delineated watercourse boundaries and the 32 m buffer zone will reduce the impact significance to **very low**.

5.3.2 Impacts on Floral SCC

No threatened species were recorded on site and their potential occurrence within study area is low, i.e., the habitat was not deemed suitable to support threatened floral species and this aligned with the outcome of the Screening Tool which produced a low sensitivity for the Plant Species Theme. The study area is, however, associated with habitat that supports provincially and nationally protected floral SCC. The proposed activities will therefore directly impact on these species' numbers within the footprint areas. The SCC recorded on site include species protected under the NCNCA (Schedule 1 and 2) and the NFA, as well as one NEMBA TOPS listed species. The habitat associated with all three sub-units of the Thornveld Habitat provides the most favourable conditions for these protected species and moderate to high abundances of these species were recorded on site (especially for the NFA-protected trees).

Where NFA-protected trees will be impacted (large quantities of *Vachellia erioloba* and *Vachellia haematoxylon* are within the proposed footprints), relocation attempts are not feasible and a cut-and-destroy permit from the DFFE will be required. It is recommended taht harvesting of seed and propagules from the NFA-protected trees on site must take place prior to the construction phase. It is important that seedlings, seed, and propagules be harvested from species within the study area or within a close proximity of the study area, so as to prevent alteration of population genetics. Harvested material must be propagated under nursery conditions for use in rehabilitation later down the line, and/or to form part of potential offsetting requirements.

Where NCNCA-protected species will be impacted (i.e., *Harpagophytum procumbens* (also TOPS-protected), permits from the Northern Cape DAEARDLR will be required. All of these species are eligible for rescue and relocation attempts and prior to the construction phase, a Rescue and Relocation Plan must be compiled and approved by the Northern Cape DAEARDLR. Following the guidelines from the Rescue and Relocation Plan, all NCNCA-protected species must be rescued and relocated upon receival of permits from the Northern

Cape DAEARDLR and prior to vegetation clearing activities commencing. It is further recommended that propagules and/or seed of the NCNCA-protected species be harvested and grown under nursery conditions to be used for 1) rehabilitation activities later down the line, and/or 2) to supplement unsuccessful relocation attempts.

All rescue and relocation activities (successes, failures, exact number of species rescued) must be documented and monitored until it is evident that the species have successfully established within the relocated areas.

Overall, impacts to the SCCs that are present on site, or that are anticipated to be present on site, will result in significant loss to population numbers if not mitigated and/or offset. Without mitigation implemented, the anticipated impact significance on floral SCC communities is anticipated to be medium-low (planning and construction phase for the Habitat associated with the OHPL. Medium high impact significance is expected for the Thornveld habitat associated with the solar development, due to the large number of protected trees found within this area.

With mitigation measures implemented, impact significance for the all habitat unites associated with the OHPL and the solar PV facilities can be reduced to **low** significance. The transformed habitat will remain as a **very low** impact significance with mitigation measures.

5.3.3 Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The study area will not impact on any CBAs or threatened vegetation types, threatened ecosystem, or protected areas. The activities will, however, impact on an ESA. This relates mostly to the Freshwater (Ga-Mogara) Habitat Unit as it is recognised as an important ecological corridor by provincial conservation datasets. The presence of the ESA confirms the outcome of the Screening Tool of Very High Sensitivity.

ESAs are areas that must be retained in a natural state to meet biodiversity targets for ecological processes that have not been met in CBAs or protected areas (i.e., to meet biodiversity targets for the representation of ecosystem types or species of special concern when it is not possible to meet them in CBAs, and to support ecological functioning of protected areas or CBAs or a combination of these). Within ESAs, development should be planned carefully, and activities undertaken in a way that minimises impact on ecological processes, e.g., limiting fragmentation of habitat. It is recommended that the ESA, which is already fragmented and transformed in several sections, be avoided as far as possible. The condition of the ESA must be improved through the management of AIPs and promoting habitat connectivity.

5.3.4 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of and altered floral species diversity;
- Edge effects such as further habitat fragmentation and AIP proliferation;
- Permanent loss of protected floral species and suitable habitat for such species;
- Ongoing bush encroachment in the adjacent natural vegetation communities; and
- Disturbed areas not rehabilitated to an ecologically functioning state with resulting significant loss of floral habitat, species diversity and SCC/protected floral species likely to be permanent.

5.3.5 Cumulative Impacts

The proposed project could further impact on the floral habitat and diversity as well as floral SCC through fragmentation of habitat of increased biodiversity importance and sensitivity (specific reference is made to ingoing disturbance and transformation of the ESA).

AIP spread can potentially become severe if these species are not monitored and managed, especially along linear developments that typically serve as a corridor for spread. These species can spread to adjacent natural areas, thus impacting on the indigenous biodiversity of the region. The abundance of *Prosopis glandulosa* within the Ga-Mogara Habitat, if not cleared and controlled, will continue to spread downstream and displace floral communities outside of the development footprint.

6 CONCLUSION

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a terrestrial biodiversity assessment as part of the environmental authorisation process for the proposed Black Rock Solar Plant Facility, near Hotazel, Northern Cape Province. The Black Rock Solar Project consists of the Overhead Powerline (OHPL), Access Road, Proposed Substation and two solar project areas (e.g., western and eastern) collectively the layout will be referred to as the "study area".

Habitat summaries and sensitivities:

Based on the results of the field investigations undertaken between 31 October and 4 November 2022, three broad habitat units with two sub-units were distinguished within the study area:

Thornveld Habitat:
Natural vegetation communities where species composition and vegetation structure have not deviated significantly from the reference states and only restricted disturbances were noted on site. The Thornveld Habitat unit includes two sub-units, namely:

- Open Thornveld; and
- Semi-closed Thornveld.

Although these two sub-units differed in vegetative structure and plant species composition, there were still some shared plants species between them.

Freshwater Habitat (Ga-Mogara Habitat)
This habitat unit is associated with the Ga-Mogara river system over which the proposed powerline will traverse. The habitat is dominated by alien plant species, particularly *Prosopis glandulosa* (Honey mesquite), which has formed dense and, in some instances, impenetrable thickets. Due to the encroached nature of this habitat unit, sensitive floral habitat is limited.

Transformed Habitat

This habitat encompasses the areas where vegetation clearance has taken place as part of excavation / construction activities of access roads or servitudes.

The Screening Tool identified the entire study area to be in a **low sensitivity** area for the Plant Species Theme (i.e., areas where no threatened flora are known or expected to occur). The low sensitivity for the Plant Species Theme was confirmed during the ground-truthing of the assessed areas. The section surrounding the Ga-Mogara Habitat was identified as a **very high sensitivity** area for the Terrestrial Biodiversity Theme (triggering features include an

ESA). The ESA was confirmed on site and supported the high sensitivity assigned by the Screening Tool outcome.

From the sensitivity scoring it can be concluded that the transformed habitat has a low sensitivity and the Thornveld Habitat (open and semi-closed thornveld) and Freshwater (Ga-Mogara) Habitat

Impact summary

Most of the proposed activities will occur within the Open Thornveld; most of which can be attributed to the proposed footprint aeras of the Solar PV panels. Considering biodiversity priority areas[12], no threatened plants will be lost within these habitat units and is not regarded an ESA. As such, loss of these habitat units will result in negative impacts to floral communities (with residual impacts) but is not regarded as a significant impact[13] and only local-scale loss of habitat is anticipated. Taking the current layout into account, avoidance of impacts to these habitat units is not possible. As such, mitigation of impacts should focus on minimisation through 1) adequate planning, 2) ensuring footprints remain within authorised areas, 3) edge effect management such as AIP and woody encroachment control, and 4) sound planning of stormwater management and erosion control. With mitigation measures adequately implemented, the planning and construction phase will yield **to mostly low** impact significance, with the exception of **medium low** impact significance associated with floral SCC, habitat diversity and connectivity associated with the solar PV facilities. For the operational phase, impact significance can only be reduced to a **low** and **very-low** significance.

Although the freshwater habitat is associated with an ESA, it is only the OHPL development that will affect this habitat. Direct impacts associated with the construction of the OHPL and positioning of the pylons will result in **medium-low** impacts should no mitigation measures be implemented, With the implementation of mitigation measures, such as the placement of the pylon positions outside of the 1:100-year floodline, delineated watercourse boundaries and the 32 m buffer zone will reduce the impact significance to **very low.**

[12] Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, Priority Areas for land-based protected area expansion, and Focus Areas for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future.

[13] An impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds, or targets.

Overall, impacts to the SCCs that are present on site, or that are anticipated to be present on site, will result in significant loss to population numbers if not mitigated and/or offset. Without mitigation implemented, the anticipated impact significance on floral SCC communities is anticipated to be medium-low (planning and construction phase for the Habitat associated with the OHPL. Medium high impact significance is expected for the Thornveld habitat associated with the solar development, due to the large number of protected trees found within this area.

With mitigation measures implemented, impact significance for the all habitat unites associated with the OHPL and the solar PV facilities can be reduced to **low** significance. The transformed habitat will remain as a **very low** impact significance with mitigation measures.

The most significant impacts to affect the floral habitat, species diversity, and floral SCC resulting from the proposed activities include, but are not limited to, the following:

- Clearance of habitat representative of the reference vegetation types;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint;
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species, which is of particular concern given that much of the surrounding areas are natural and intact, ecologically;
- Destruction, removal, or harvesting of floral SCC during construction and operational activities; and
- Potentially poorly implemented and monitored and/or rescue and relocation of SCC that will be affected by the proposed development activities, leading to unmitigated impacts to, and loss of, SCC individuals.

It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

7 REFERENCES

BRAHMS Online Copyright © 1985 - 2020 Department of Plant Sciences, University of Oxford. Online available: http://posa.sanbi.org/sanbi/Websites.

Bromilow, C. 2001. Problem Plants of South Africa Revised Edition, First Impression. Briza Publications, Pretoria, RSA.

Edwards, E., 1983. A broad-scale structural classification of vegetation for practical purposes. Bothalia, 14(3/4), pp.705-712.

Frisby, A.W., Siebert, S.J., Struwig, M. and Cilliers, D.P., 2019. Plant endemism in Griqualand West, South Africa. South African Journal of Botany, 124, pp.127-137.

Fuller, M.R., Doyle, M.W. and Strayer, D.L., 2015. Causes and consequences of habitat fragmentation in river networks. Annals of the New York Academy of Sciences, 1355(1), pp.31-51.

Government Notice 864 Alien and Invasive Species Regulations as published in the Government Gazette 40166 of 2016 as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).

Gunamani T, Gurusamy R, Swamynathan K. 1991. Effect of dust pollution on the dermal appendages and anatomy of leaves in some herbaceous plants. J Swamy Boli Club. 1991;8(3–4):79–85.

Henderson, L. 2001. Alien Weeds and Invasive plants – A Complete Guide to Declared Weeds and Invaders in South Africa. Plant Protection Research Institute, Agricultural Research Council Handbook No 12. Pretoria.

Holness, S., and Oosthuysen, E., 2016. Critical Biodiversity Areas of the Northern Cape: Technical Report.

Hui C, Richardson DM. 2017. Invasion dynamics. Oxford University Press, Oxford. https://doi.org/10.1093/acprof:oso/9780198745334.001.0001

IUCN. 2020. http://www.iucnredlist.org/.

Low, A.B. and Rebelo, A.G. (eds). 1998. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs & Tourism, Pretoria

Mucina, L. and Rutherford, M.C. (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.,(South African National Biodiversity Institute: Pretoria, South Africa). Memoirs of the Botanical Survey of South Africa.

Naik DP, Ushamani, Somasekhar RK. 2005. Reduction in protein and chlorophyll contents in some plant species due to some stone quarrying activity. Environ Polln Cont J. 2005; 8:42–44.

National Water Act, 1998 (Act No. 36 of 1998) (NWA).

NCDENC. 2016. Northern Cape Department of Environment and Nature Conservation - 2016 Northern Cape Critical Biodiversity Areas [Vector] 0. Available from the SANBI Biodiversity GIS website (http://bgis.sanbi.org/SpatialDataset/Detail/658).

Oosthuysen, E (DENC) & Holness s., 2016. Northern Cape. CBA Map.

PHD 2007. Investigation into “sinkholes” in and adjacent to the Gamagara River and their impact on flow conditions in the River near the Sishen Iron Ore Mine (Prepared for: Sishen Iron Ore Mine).

Pyšek, P., Richardson, D.M., Rejmánek, M., Webster, G.L., Williamson, M. and Kirschner, J., 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. Taxon, 53(1), pp.131-143.

Raimondo, D., von Staden, L., Foden, W., Victor, J.E, Helme, NA., Turner, R.C, Kamundi, DA. & Manyama, PA. (eds). 2009. Red List of South African Plants Strelitzia 25. South African National Biodiversity Institute, Pretoria. Version 2014.1.

Richardson, D.M., Pyšek, P., Rejmánek, M., Barbour, M.G., Panetta, F.D. and West, C.J., 2000. Naturalization and invasion of alien plants: concepts and definitions. Diversity and distributions, 6(2), pp.93-107.

Richardson DM, Pyšek P, Carlton JT., 2011. A compendium of essential concepts and terminology in invasion ecology. In: Richardson DM (ed) Fifty years of invasion ecology. The legacy of Charles Elton. Wiley-Blackwell, Oxford, pp 409–420. https://doi.org/10.1002/9781444329988. ch30.

Richardson, D.M., Foxcroft, L.C., Latombe, G., Le Maitre, D.C., Rouget, M. and Wilson, J.R., 2020. The biogeography of South African terrestrial plant invasions. Biological invasions in South Africa, pp.67-96.

SANBI, 2006-2018. The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/SpatialDataset/Detail/18, Version 2018.

SANBI. 2018a. 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website.

SANBI. 2018b. Terrestrial ecosystem threat status and protection level - remaining extent [Vector] 2018. URL: http://bgis.sanbi.org

SANBI. 2018c. Terrestrial ecosystem threat status and protection level layer [Vector] 2018. URL: http://bgis.sanbi.org

SANBI. 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.

SANBI. 2021. Ecosystem Guidelines for the Savanna Biome. South African National Biodiversity Institute, an entity of the Department of Forestry, Fisheries and the Environment, Pretoria. http://hdl.handle.net/20.500.12143/7500

SANBI BGIS. 2022. The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org as retrieved in 2021.

Sett, R. 2017. Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).

Skowno, Andrew & C.J., Poole, & Raimondo, Domitilla & K.J., Sink, & Van Deventer, Heidi & Van Niekerk, Lara & Harris, Linda & Smith-Adao, Lindie & Tolley, Krystal & Zengeya, Tsungai & W.B.,, Foden, & G.F., Midgley, & Driver, Amanda. 2019. National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report.

Smith, G.F., Burgoyne, P., Chesselet, P., Hammer, S., Hartmann, H., Klak, C., Kurzweil, H., Van Jaarsveld, E.J. and Van Wyk, B.E., 1998. Mesembs of the world. Pretoria: Briza.

The National Environmental Management Act, 1998 (Act No. 107 of 1998).

The National Environmental Management: Biodiversity, 2004 (Act No. 10 of 2004).

van Oudtshoorn, F. (1999). Guide to Grasses of Southern Africa. 2nd Ed. Briza Publications, Pretoria.

van Rooyen, N., Bezuidenhout, H. and Kock, E., 2001. Flowering plants of the Kalahari dunes. Natal Region, Department of Agricultural and Water Affairs, South Africa: Pretoria, South Africa.

van Staden, N., Siebert, S.J., Cilliers, D.P., Wilsenach, D. and Frisby, A.W., 2020. Floristic analysis of semi-arid mountain ecosystems of the Griqualand West centre of plant endemism, Northern Cape, South Africa.

van Wilgen BW, Wilson JR (eds) (2018) The status of biological invasions and their management in South Africa in 2017. S Afr Nat Biodiv Inst, Cape Town and DST-NRF Cent Excel Invas Biol, Stellenbosch.

van Wilgen, B.W., 2020. A brief, selective history of researchers and research initiatives related to biological invasions in South Africa. In Biological Invasions in South Africa (pp. 33-64). Springer, Cham.

Wilson JRU, Gaertner M, Richardson DM et al (2017) Contributions to the national status report on biological invasions in South Africa. Bothalia 47: a2207. https://doi.org/10.4102/abc.v47i2.2207.

APPENDIX A: Floral Method of Assessment

The methods outlined in this document are aligned with the assessment guidelines provided by the South African National Biodiversity Institute (SANBI) (SANBI, 2020). SANBI is the regulatory body within South Africa that is responsible for ensuring sustainable development through facilitating access to biodiversity data, generating information and knowledge, building capacity, providing policy advise, and showcasing and conserving biodiversity in respective botanical and zoological gardens.

As the regulatory body for biological data, SANBI provides assessment and reporting protocols. These protocols provide a minimum set of assessment and reporting criteria that must form the basis of specialist investigations required for many of the country's environmental processes. As such, the proposed methodology, as described below, is in accordance with in-country standardised field assessment methodologies.

Vegetation Surveys

Various field sampling methods are available for the purpose of collecting floristic data. Generally, the selection of chosen field methods is dependent on serval factors, including the size of the area to be assessed, the heterogeneity of the vegetation/habitat present, time and budget allocated for field assessments, the scale and magnitude of potential project impacts, and the scope of work to be assessed.

When planning the timing of a floristic survey, it is important to remember that the primary objective is not an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of SCC and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020). An understanding of the location and extent of vegetation types of increased sensitivity, and the location of areas of increased importance for various species of SCC, will focus efforts for the identification and marking of SCC during detailed planning walkdown efforts.

Given the restricted time frames in which the proposed field surveys need to be conducted and the combined objective of accurately demarcating sensitive habitats within the area of interest, the method chosen needs to allow for:

I. Rapid, accurate data collection; and
II. The optimisation of time spent in habitats that are likely to sustain SCC.

Several survey methods, known as rapid biological assessments (Larsen, 2016)[14], can be employed. Example of rapid biological assessments include plot-based assessments or transect-based assessments. SANBI (2020) recommends the use of a transect-based approach, namely timed-meander searches (TMS; Goff et al., 1982[15]). The vegetation surveys presented below are a modified version of the TMS methods (hereafter referred to as modified-meander searches (MMS)). The TMS and MMS are subjective sampling methods which employs techniques where the specialist chooses specific sample sites within the area of interest, based on their professional experience in the area and background research done prior to the site visit. This allows representative recordings of floral communities and optimal detection of SCC.

The difference in the TMS and MMS is that the MMS is not timed. The below list presents the reasons for selection of a modified approach:

- Time, access, and safety constraints are often unpredictable and cannot be planned for prior to a site assessment, especially within remote areas and areas where local communities may not provide consent to specialist to survey their lands. As such, a timed approach may result in disproportionate efforts in some pre-defined habitats.

[14] Larsen, T.H. ed., 2016. Core standardized methods for rapid biological field assessment. Conservation International.
[15] Goff, F.G., Dawson, G.A. and Rochow, J.J., 1982. Site examination for threatened and endangered plant species. Environmental Management, 6(4), pp.307-316.

- Vegetation surveys are conducted at the same time as the SCC assessments which limits the potential for timed assessments as SCC often occur either sporadically, or are difficult to detect and hence, longer surveys in certain areas are necessary (skewing the timed approach). This is especially true for the pre-defined broad habitats within more sensitive areas such as the Sekhukhune Centre of Plant Endemism where desktop databases may not be a true reflection of on-site habitat extent and heterogeneity. Micro habitats where SCC are often found, are often difficult to detect on digital satellite imagery. As such, timing the surveys according to unverified field data will increase the risk of overlooking importance SCC data or habitat integrity features.
- Subjective decisions need to be made on-site that would otherwise interfere with a times-meander approach.

The employment of the presented field methods is beneficial because they allow for rapid data collection and subjective placement (based on professional experience and previous fieldwork knowledge) of the MMSs in habitats that have a higher likelihood of sustaining SCC. Furthermore, this method allows for extensive coverage of the subject property, thus increasing the probability of SCC and micro habitat detection. Extensive coverage of the area of interest will also be advantageous where properties are of large extents that need to be assessed.

Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas are surveyed on foot, following the subjective MMT, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed. Photographs are taken of each vegetation community that is representative of typical vegetation structure of that community, as well as PHOTOGRAPHS of all detected SCC (sensitive species will not be presented in the report).

Vegetation structure has been described following the guideline in Edwards (1983). Refer to Figure B1 below:

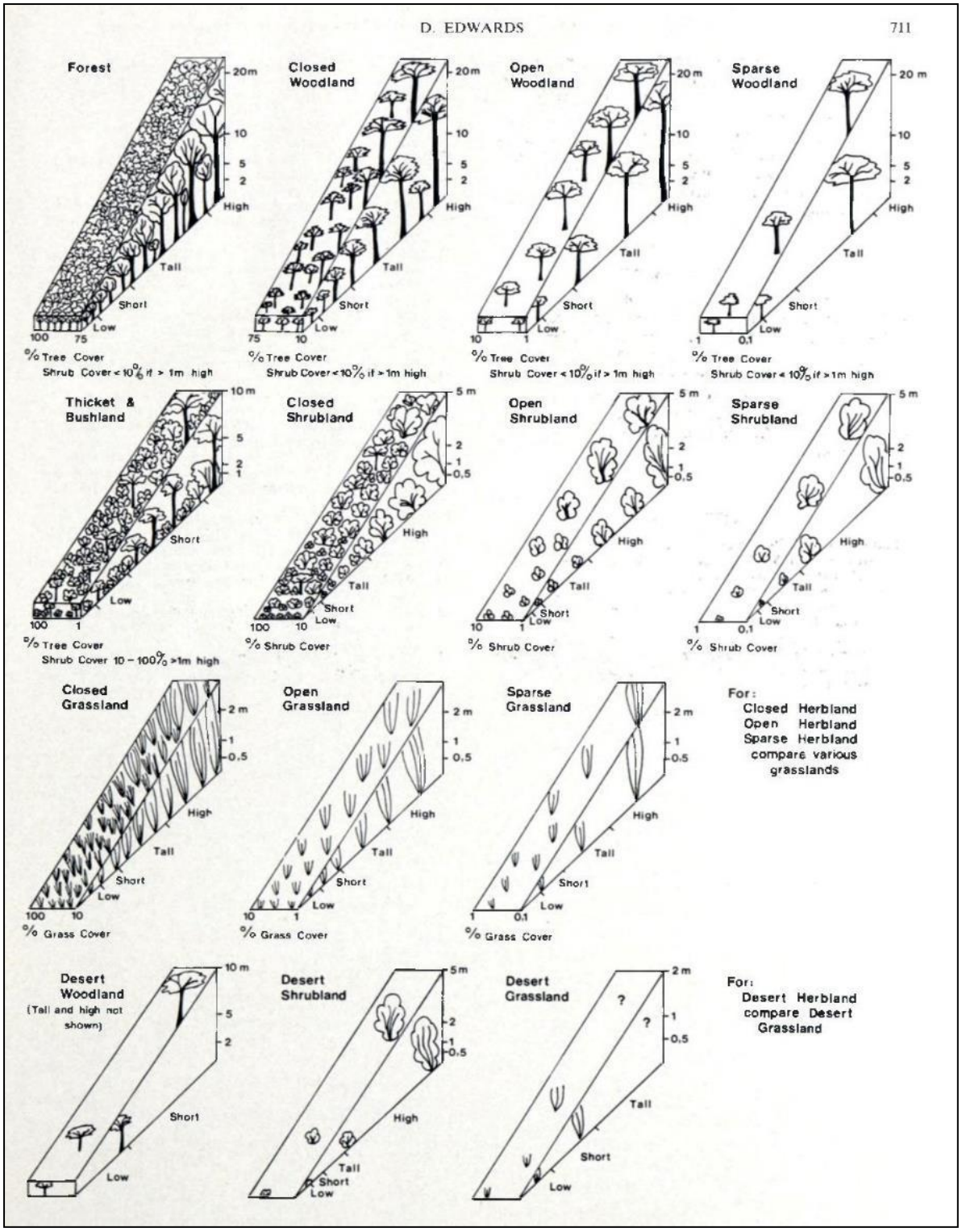


Figure A1: Diagrammatic representation of structural groups and formation classes. Only dominant growth forms are shown. Note that woodland and/or shrubland may be replaced with terms such as "thornveld" where it is deemed more appropriate for the assessed vegetation community.

Floral Species of Conservational Concern Assessment

Prior to the site visit, a record of floral SCC and their habitat requirements was developed for the study area, which includes consulting the National Web-based Environmental Screening Tool. Because not all SCC have been included in the Screening Tool layers (e.g., NT and DD taxa), it remains important for the specialist to be on the lookout for additional SCC. For this study, two several sources were consulted and are described below.

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the study area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, "*low*," "*medium*," "*high*" and "*very high*" sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g., for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below[16]:

- **Very High**: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.
- **High**: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confiNorthern Cape DAEARDLRe level of less than 250 m with segments of remaining natural habitat.
- **Medium**: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
- **Low**: Areas where no SCC are known or expected to occur.

BRAHMS Online Website

The Botanical Database of Southern Africa (BODATSA) is accessed to obtain plant names and floristic details (http://posa.sanbi.org/) for species of conservation concern within a selected boundary;

- This website provides access to South African plant names (taxa), specimens (herbarium sheets) and observations of plants made in the field (botanical records). Data is obtained from the BODATSA, which contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH).

[16] More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website: https://screening.environment.gov.za/screeningtool/#/pages/welcome

- Information on habitat requirements etc. is obtained from the SANBI Red List of South African Plants website (http://redlist.sanbi.org/).
- Typically, data is extracted for the Quarter Degree Square (QDS) in which the study area is situated but where it is deemed appropriate, a larger area can be included.

NEMBA TOPS Species

The Threatened or Protected Species (TOPS) Regulations (R 152 of 2007) under Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were taken into consideration.

Provincial: Specially Protected and Protected Species

The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA), provides a list of Specially Protected Species (Schedule 1) (Section 49(1) of the NCNCA) and Protected Species (Schedule 2) (Section 50(1) of the NCNCA) for the Northern Cape Province. These species formed part of the SCC assessment.

Nationally Protected Trees

The National Forest Act, 1998 (Act No. 10 of 1998) (NFA), affords protection to a list of tree species. All nationally protected trees, whose distribution overlap with the study area, were included as SCC in this report.

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

The Probability of Occurrence (POC) for each floral SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

Low POC	Medium POC	High POC	Confirmed

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Consideration and application of the precautionary approach

The precautionary principle is defined by Tickner & Raffensperger (1999) as follows:

"*When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically*".

Given time and resource constraints within the field, it is not always feasible to definitively state the presence or absence of particular Species of Conservation Concern (SCC) or sensitive habitats. In such instances, the precautionary principle should be applied (SANBI, 2020). By applying such principles, a preventative action is taken in the face of uncertainty. Furthermore, for cryptic species that are often difficult to detect, it is not always easy to provide undeniable proof that a species occurs within a particular area within a subject property. As such, if suitable habitat is identified within the subject property and there is potential eviNorthern Cape DAEARDLRe to suggest the species did or can occur within the subject property (i.e., confirmed sightings in adjacent properties), then the precautionary principle will be to assume that the species does indeed occur within the area of interest. Appropriate mitigation and management efforts would then need to follow accordingly.

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. In order to present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

Table A1: Floral habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimizing development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Floral Species List

Table B1: Dominant floral species encountered during the field assessment. Alien species identified during the field assessment are indicated with an asterisk (*). Protected species are emboldened.

Scientific name	Ga-mogara Habitat	Open and Semi-closed Thornveld	Transformed Habitat
**Prosopis glandulosa*	x	x	x
Aptosimum elongatum		x	x
Aptosimum spinescens			x
Asparagus sp.		x	
Berkheya ferox		x	
Chrysocoma ciliata	x		
Crotalaria spartioides		x	
Diospyros lyciodes		x	
Elephantorrhiza elephantina		x	
Felicia muricata	x	x	x
Grewia flava		x	x
Helichrysum zeyheri		x	
Melolobium canescens		x	
Melolobium microphyllum		x	
Rhigozum trichotomum		x	x
Salsola tuberculata			x
Senegalia mellifera subsp. *detinens*	x	x	x
Tarchonanthus camphoratus			x
Terminalia sericea		x	
***Vachellia erioloba* (NFA-protected)**	x	x	x
***Vachellia haematoxylon* (NFA-protected)**		x	x
Vachellia hebeclada subsp. *hebeclada*	x	x	x
Ziziphus mucrunata	x	x	x
Zygophyllum pubescens	x		x
**Argemone ochroleuca*	x		x
**Chenopodium cf. album*			x
**Verbesina encelioides*	x		x
Albuca seineri			
Aptosimum procumbens			
Ceratotheca triloba		x	
Commelina benghalensis		x	
***Crinum* sp. (NCNCA-protected)**			
Cucumis africanus			
Cullen tomentosum	x		x
Dicoma schinzii			
***Harpagophytum procumbens* (TOPS-protected) (NCNCA-protected)**		x	
Hebenstretia sp.			x
Helichrysum argyrosphaerum	x	x	x
Heliotropium ciliatum		x	

Scientific name	Ga-mogara Habitat	Open and Semi-closed Thornveld	Transformed Habitat
Hermannia comosa		x	x
Hermannia tomentosa		x	
Hermbstaedtia fleckii		x	
Hirpicium echinus		x	
Indigofera alternans			x
Ledebouria sp.			
Leobordea sp.		x	
Melhania burchellii		x	
Merremia verecunda		x	
Ornithoglossum vulgare			
Peliostomum leucorrhizum			x
Polygala hottentotta			
Pomaria burchellii subsp. *burchellii*		x	
Selago sp.			x
Senecio consanguineus	x	x	x
Senna italica subsp. *arachoides*	x	x	x
Trachyandra sp.		x	
Tribulus terrestris			x
Wahlenbergia sp.			x
Xenostegia tridentata		x	
Acanthosicyos naudinianus		x	x
Citrullus lanatus			x
Anthephora cf. argentea		x	
Aristida congesta subsp. *congesta*			x
Aristida stipitata		x	
Cenchrus ciliata	x		x
Chloris virgata	x		
Cynodon dactylon	x		
Digitaria eriantha			x
Enneapogon cenchroides		x	
Enneapogon sp.			
Eragrostis lehmanniana		x	
Eragrostis pallens		x	
Eragrostis rigidior		x	
Eragrostis trichophora		x	x
Melinis repens		x	
Pogonarthria squarrosa		x	x
Schmidtia kalahariensis		x	
Stipagrostis amabilis		x	
Stipagrostis uniplumis		x	
Tragus racemosus	x		x

APPENDIX C: Floral SCC Assessment Results

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. Due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction but may nonetheless be of high conservation importance. Because the Red List of South African plants is used widely in South African conservation practices such as systematic conservation planning or protected area expansion, we use an amended system of categories designed to highlight those species that are at low risk of extinction but of conservation concern.

Definitions of the national Red List categories

Categories marked with **N** are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

- **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW)** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
- **Regionally Extinct (RE)** A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
- **Critically Endangered, Possibly Extinct (CR PE)** Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
- **Critically Endangered (CR)** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN)** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
- **Vulnerable (VU)** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
- **Near Threatened (NT)** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
- [N]**Critically Rare** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
- [N]**Rare** A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:
  - Restricted range: Extent of Occurrence (EOO) <500 km^2, OR
  - Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR
  - Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
  - Small global population: Less than 10 000 mature individuals.
- **Least Concern** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in **Plants of southern Africa: an online checklist** are species that do not qualify for

national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

POC Results for RDL Floral SCC obtained from BODATSA and the Online National Environmental Screening Tool

For this aspect of the POC assessment, a list of RDL species previously recorded within the QDS 2722BB, 2722BD, 2723AA, and 2723AC were pulled from BODATSA / newPOSA (http://posa.sanbi.org/) – refer to the below image (Figure C1). This list was further cross-checked with the Screening Tool outcome as well as the NCNCA (2009) flora list (Schedule 1 and Schedule 2) to identify provincially protected species previously recorded for the area.

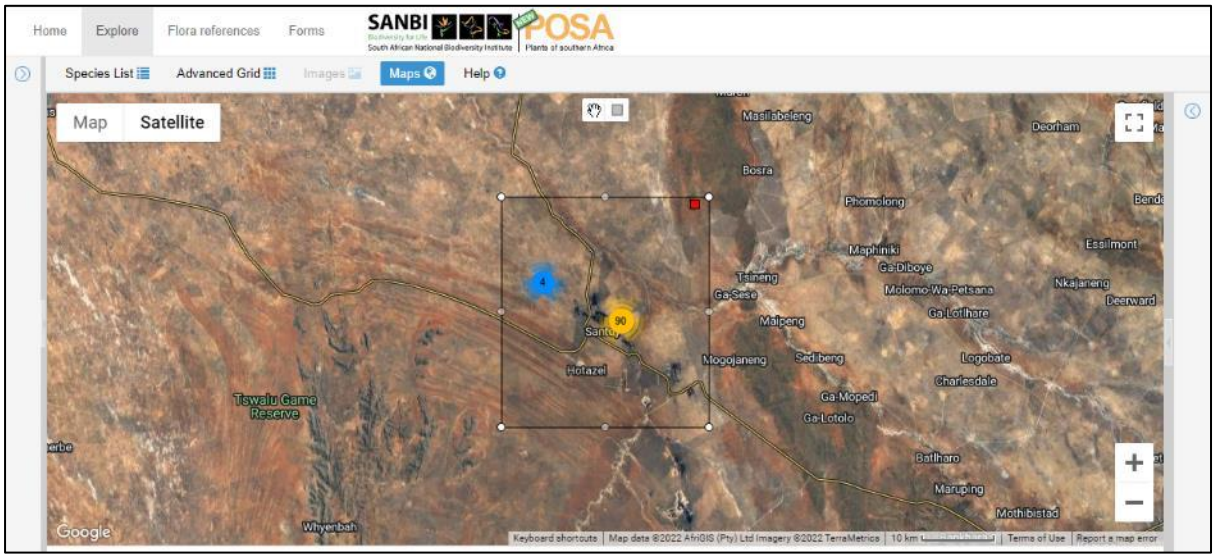


Figure C1: Species list pulled from BODATSA and newPOSA for the QDS 2722BB.

Table C1: POC assessment results for threatened species as identified for the assessed area by the Screening Tool, the BODATSA/newPOSA database. Additionally, the below table provides the POC assessment results for provincially protected floral species as per the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA).

****Threatened status and additional information on species habitat and distribution was obtained from The Red List of South African Plants (http://redlist.sanbi.org/index.php). The POC of these floral SCC within the study area is also provided.**

Family	Species	Triggered Schedule	IUCN	Description	POC
Aizoaceae	*Ruschia* sp.	Schedule 2	LC	Indigenous succulent. *Ruschia ruralis* recorded within the Thornveld Habitat.	Medium
Amaryllidaceae	*Nerine* sp.	Schedule 2	LC	Indigenous. *Nerine laticoma* is known from the region and likely to be present within the Thornveld Hbaitat.	High
Apocynaceae	*Orthanthera jasminiflora*	Schedule 2	LC	Indigenous. Recorded within the Gordonia Duneveld and Ga-mogara Habitat.	High

Family	Species	Triggered Schedule	IUCN	Description	POC
Apocynaceae	*Pergularia daemia*	Schedule 2	LC	Indigenous. Recorded across the study area.	High
Euphorbiaceae	*Euphorbia avasmontana*	Schedule 2	LC	Indigenous succulent. Major habitats: Desert, Nama Karoo, Succulent Karoo Description: Arid rocky slopes. No suitable habitat within the study area.	Low
Fabaceae	*Lessertia frutescens*	Schedule 1	LC	Indigenous. Recorded within the Thornveld Habitat	High
Iridaceae	*Lapeirousia littoralis*	Schedule 2	LC	Indigenous. Recorded within the Gordonia Duneveld.	High
Iridaceae	*Moraea longistyla*	Schedule 2	LC	Indigenous; Endemic geophyte; herb. Major habitats: Fynbos Description: Mainly clay soils, renosterveld or arid fynbos. No suitable habitat within the study area.	Low
Iridaceae	*Moraea pallida*	Schedule 2	LC	Indigenous geophyte; herb. Description: Open grassland and bushveld, sometimes in wetlands or rocky sites.	Medium
Pedaliaceae	*Harpagophytum procumbens*	Schedule 1	LC	Indigenous. Recorded throughout the study area.	Confirmed
Scrophulariaceae	*Nemesia fruticans*	Schedule 2	LC	Indigenous. Recorded throughout the study area.	High

LC = Least Concern; **NE** = Not evaluated; **POC** = Probability of Occurrence.

NFA Protected Trees

Table C2: Protected trees as defined by The National Forest Act, 1998, (Act No. 84 of 1998) (NFA) for the assessed areas. Additional information on species threat status as defined in The Red List of South African Plants (http://redlist.sanbi.org/index.php) is presented.

Family	Scientific Name	IUCN	Growth form	POC
Brassicaceae	*Boscia albitrunca*	LC	Tree	**Medium**
Fabaceae	*Vachellia erioloba*	LC	Tree	**Confirmed**
Fabaceae	*Vachellia haematoxylon*	LC	Tree	**Confirmed**

NEMBA TOPS List for South Africa[17]

Table C3: TOPS list for South Africa – plant species.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Adenia wilmsii	No common name	**Low**	**Provincial distribution**: Mpumalanga **Range**: Lydenburg to Waterval Boven **Description**: Dolerite outcrops or red loam soil, in open woodland, 1300-1500 m.	**EN; P**
Adenium swazicum	Swaziland Impala Lily	**Low**	**Range**: Kruger National Park to Swaziland along the Lebombo Mountains and adjacent areas in south-western Mozambique.	**VU**
Adenium swazicum	Swaziland Impala Lily	**Low**	**Provincial distribution**: Mpumalanga	**VU**
Aloe albida	Grass Aloe	**Low**	**Provincial distribution**: Mpumalanga **Range**: Aloe albida has a restricted range in the mountains south of Barberton, Mpumalanga, extending to Malolotja in north-western Swaziland.	**NT**
***Aloe pillansii* (now *Aloidendron pillansii*)**	False Quiver Tree	**Low**	**Provincial distribution**: Northern Cape **Range**: Richtersveld and southern Namibia.	**EN**
Aloe simii	No common name	**Low**	**Provincial distribution**: Mpumalanga **Range**: This species is endemic to a small area in the transition area between the Mpumalanga Lowveld and Escarpment, where it occurs from Sabie southwards to White River and around Nelspruit.	**EN; P**
Clivia mirabilis	"Oorlogskloof' Bush Lily	**Low**	**Provincial distribution**: Northern Cape, Western Cape	**VU; P**
Diaphananthe millarii	Tree Orchid	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal **Range**: East London and Durban.	**VU**
Disa macrostachya	No common name	**Low**	**Provincial distribution**: Northern Cape	**EN; P**
Disa nubigena	No common name	**Low**	**Provincial distribution**: Western Cape	**Rare; P**
Disa physodes	No common name	**Low**	**Provincial distribution**: Western Cape	**CR; P**
Disa procera	No common name	**Low**	**Provincial distribution**: Western Cape	**EN; P**
Disa sabulosa	No common name	**Low**	**Provincial distribution**: Western Cape	**EN; P**
Encephalartos aemulans	Ngotshe Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos altensteinii	Bread **Palm**	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**VU; P**
Encephalartos arenarius	Dune Cycad	**Low**	**Provincial distribution**: Eastern Cape	**EN**
Encephalartos brevifoliolatus	Escarpment Cycad	**Low**	**Provincial distribution**: Limpopo	**EW**
Encephalartos caffer	Breadfruit Tree	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos cerinus	Waxen Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos cupidus	Blyde River Cycad	**Low**	**Provincial distribution**: Limpopo, Mpumalanga	**CR**
Encephalartos dolomiticus	Wolkberg Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**
Encephalartos dyerianus	Lowveld Cycad	**Low**	**Provincial distribution**: Limpopo	**CR; P**
Encephalartos eugene-maraisii	Waterberg Cycad	**Low**	**Provincial distribution**: Limpopo	**EN**

[17] National Environmental Management: Biodiversity Act 10 of 2004 - Threatened or Protected Species Regulations, 2007. Government Notice R152 in Government Gazette 29657 dated 23 February 2007. Commencement date: 1 June 2007 [GN R150, Gazette no. 29657], as amended.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Encephalartos friderici-guilielmi	No common name	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos ghellinckii	No common name	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**VU; P**
Encephalartos heenanii	Woolly Cycad	**Low**	**Provincial distribution**: Mpumalanga **Description**: Open areas of montane grasslands amidst scarp forest in deep valleys and ravines.	**CR**
Encephalartos hirsutus	Venda Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**
Encephalartos horridus	Eastern Cape Blue Cycad	**Low**	**Provincial distribution**: Eastern Cape	**EN**
Encephalartos humilis	No common name	**Low**	**Provincial distribution**: Mpumalanga **Description:** Montane and mistbelt grassland, rocky sandstone slopes.	**VU; P**
Encephalartos inopinus	Lydenburg Cycad	**Low**	**Provincial distribution**: Limpopo	**CR**
Encephalartos laevifolius	Kaapsehoop Cycad	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga	**CR**
Encephalartos lanatus	No common name	**Low**	**Provincial distribution**: Gauteng and western Mpumalanga	**NT; P**
Encephalartos latifrons	Albany Cycad	**Low**	**Provincial distribution**: Eastern Cape	**CR**
Encephalartos lebomboensis	Lebombo Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal, Mpumalanga	**EN**
Encephalartos lehmannii	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Encephalartos longifolius	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Encephalartos middelburgensis	Middelburg Cycad	**Low**	**Provincial distribution**: Gauteng, Mpumalanga	**CR**
Encephalartos msinganus	Msinga, Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**CR**
Encephalartos natalensis	Natal Giant Cycad	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**NT; P**
Encephalartos ngoyanus	Ngoye Dwarf Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**VU**
Encephalartos nubimontanus	Blue Cycad	**Low**	**Provincial distribution**: Limpopo	**EW**
Encephalartos paucidentatus	No common name	**Low**	**Provincial distribution**: Mpumalanga.	**VU; P**
Encephalartos princeps	No common name	**Low**	**Provincial distribution**: Eastern Cape	**VU; P**
Encephalartos senticosus	No common name	**Low**	**Provincial distribution**: KwaZulu-Natal	**VU; P**
Encephalartos transvenosus	Modjadje Cycad	**Low**	**Provincial distribution**: Limpopo	**LC; P**
Encephalartos trispinosus	No common name	**Low**	**Provincial distribution**: Eastern Cape	**VU; P**
Encephalartos woodii	Wood's Cycad	**Low**	**Provincial distribution**: KwaZulu-Natal	**EW**
Euphorbia clivicola	No common name	**Low**	**Provincial distribution**: Limpopo	**CR; P**
Euphorbia meloformis	No common name	**Low**	**Provincial distribution**: Eastern Cape	**NT; P**
Euphorbia obesa	No common name	**Low**	**Provincial distribution**: Eastern Cape	**EN; P**
Harpagophytum procumbens	Devil's Claw	**Confirmed**	**Provincial distribution**: Free State, Limpopo, Northern Cape, North West	**LC; P**
Harpagophytum zeyherii	Devil's Claw	**Low**	**Provincial distribution**: Gauteng, Limpopo, Mpumalanga, North West	**LC; P**
Hoodia currorii	Ghaap	**Low**	**Provincial distribution**: Limpopo	**P**
Hoodia gordonii	Ghaap	**Low**	**Provincial distribution**: Free State, Northern Cape, Western Cape	**DDD; P**
Jubaeopsis caffra	Pondoland Coconut	**Low**	**Provincial distribution**: Eastern Cape	**EN**

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	**Common Name**	**POC**	**Provincial Distribution**	**Conservation Status**
Merwilla plumbea	Blue Squill	**Low**	Provincial distribution**:** KwaZulu-Natal, Mpumalanga Major habitats: Grassland	**NT**
Newtonia hildebrandtii* var. *hildebrandtii	Lebombo Wattle	**Low**	**Provincial distribution**: KwaZulu-Natal	**Now LC**
Protea odorata	Swartland Sugarbush	**Low**	**Provincial distribution**: Western Cape	**CR; P**
Siphonochilus aethiopicus	Wild Ginger	**Low**	**Provincial distribution**: KwaZulu-Natal, Limpopo, Mpumalanga **Range**: Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa.	**CR**
Stangeria eriopus	No common name	**Low**	**Provincial distribution**: Eastern Cape, KwaZulu-Natal	**VU; P**
Warburgia salutaris	Pepper-bark Tree	**Low**	**Provincial distribution**: KwaZulu-Natal, Limpopo, Mpumalanga **Range**: North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Also occurs in Swaziland, Mozambique and Zimbabwe and Malawi.	**EN**
Zantedeschia jucunda	Yellow Arum Lilly	**Low**	**Provincial distribution**: Limpopo	**VU**

CR = Critically Endangered**, EN** = Endangered**, EW** = Extinct in the Wild**, NT** = Near Threatened**, VU** = Vulnerable**, P** = Protected, **POC** = Probability of Occurrence.