Appendix I.7: Baseline Environment

BASELINE ENVIRONMENT

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed Project is located. It is important to gain an understanding of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project (i.e., the current, or status quo, environment) against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The following characteristics of the receiving environment for the proposed Project area are described in **Table 0-1** below.

Table 0-1 - Characteristics of the receiving environment

RECEIVING ENVIRONMENT	CHARACTERISTICS
Physical	▪ Climate ▪ Topography and Land Use ▪ Geology ▪ Agriculture and Soils
Biophysical	▪ Terrestrial Biodiversity ▪ Avifauna ▪ Aquatic
Social and Economic	▪ Socio-Economic ▪ Heritage ▪ Palaeontology ▪ Landscape and Visual

PHYSICAL ENVIRONMENT

TOPOGRAPHY

The following is extracted from the Visual Assessment compiled by SLR Consulting and included as ***Appendix G.10***

The broader area surrounding the proposed Igolide EGI project area is largely characterised by undulating plains (**Figure 0-1**). Elevation increases northwards across the visual assessment area with increasing topographic diversity including more incised river valleys, steeper slopes and more prominent ridges. Maps showing the topography and slopes within and in the immediate vicinity of the assessment area are provided in **Figure 0-2** and **Figure 0-3**.

Figure 0-1 - View west towards the southern end of the Igolide EGI assessment corridor

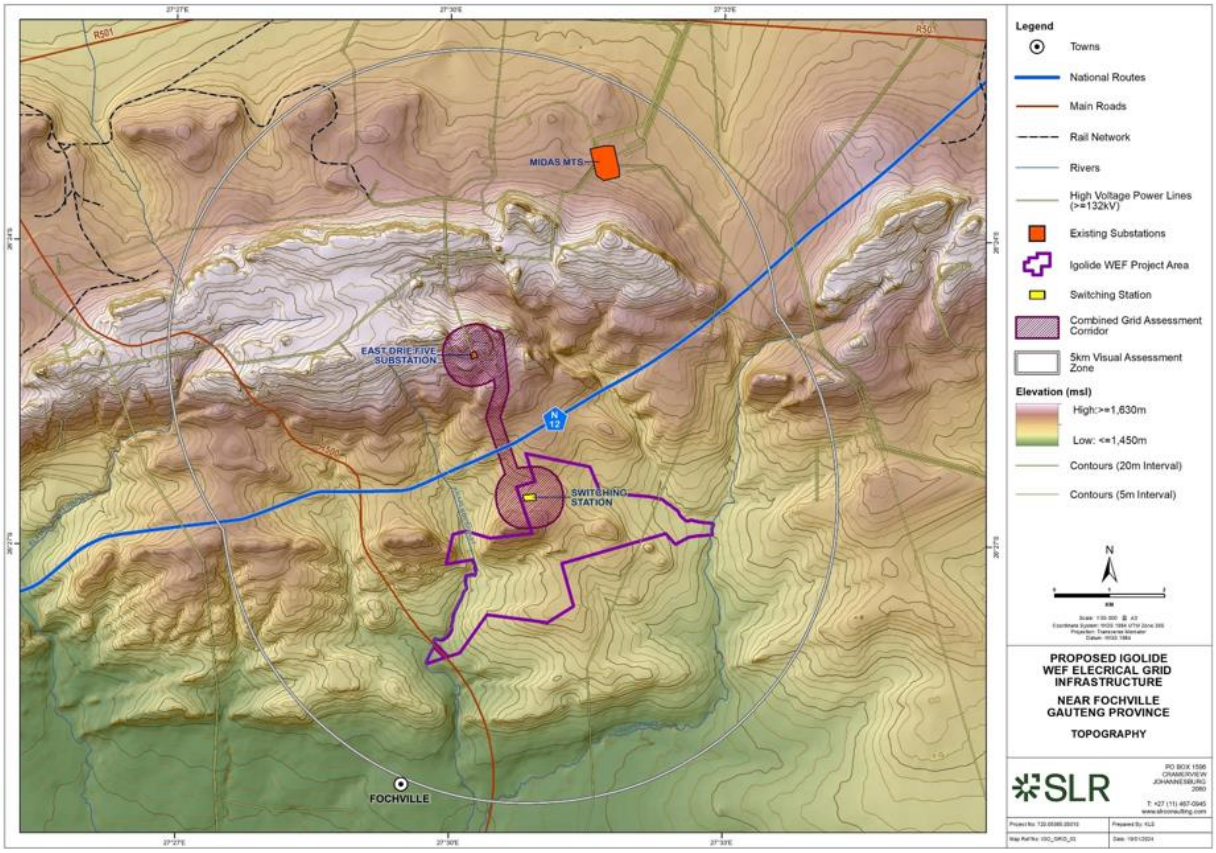

Figure 0-2 - Topography across the Igolide EGI study area

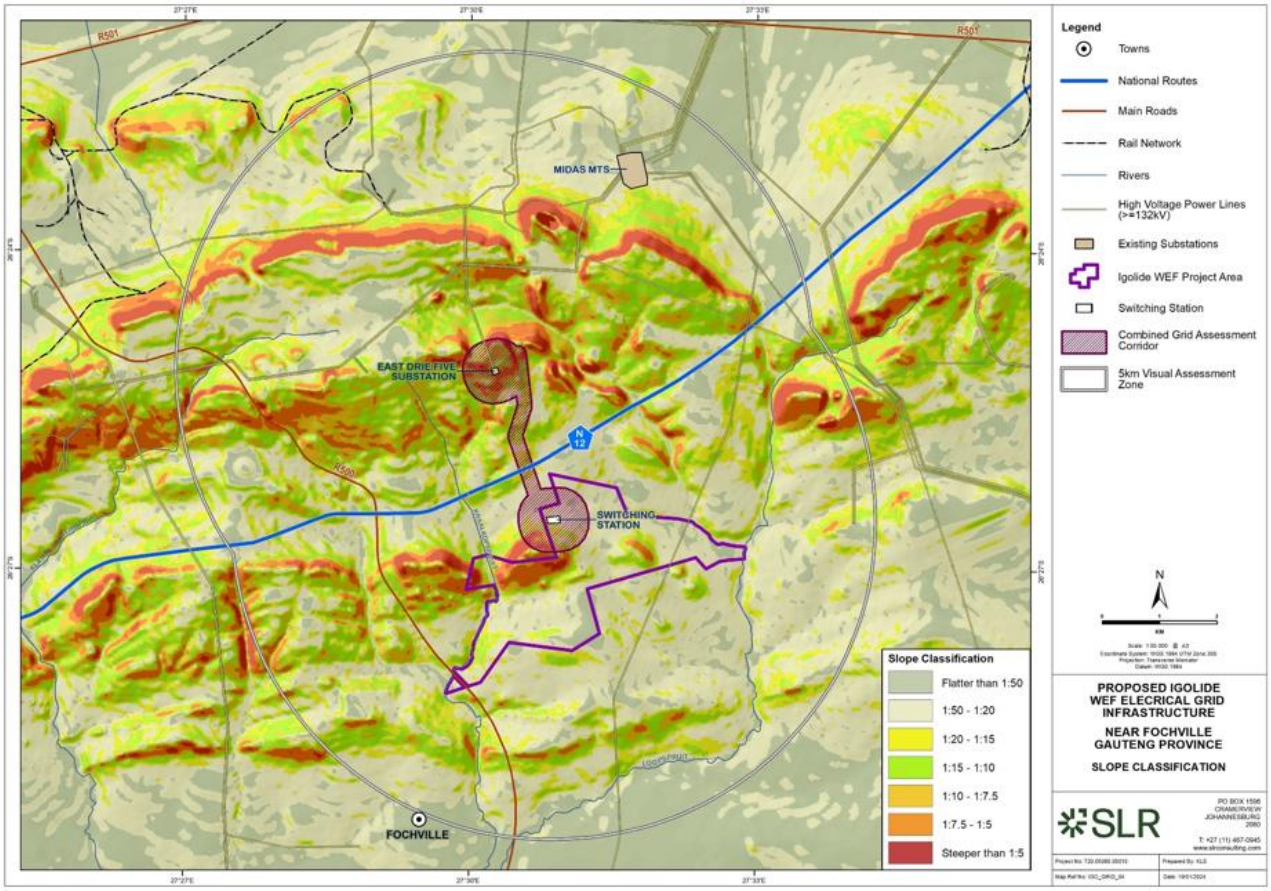

Figure 0-3 - Slope Classification within the Igolide EGI Study Area

VISUAL IMPLICATIONS

The nature of the topography and the position of the viewer within the landscape are strong factors influencing the types of vistas typically present. Wider vistas will typically be experienced from higher-lying areas or hilltops and as such the view will be directly dependent on whether the viewer is within a valley bottom or in an area of higher elevation. Importantly in the context of this study, the same is true of objects placed at different elevations and within different landscape settings. Objects placed on high-elevation slopes or ridge tops would be highly visible, while those placed in valleys or enclosed plateaus would be far less visible.

GIS technology was used to undertake a preliminary visibility analysis for the proposed powerline route alignment. This analysis was based on points at 150 m intervals along the centre line of the combined assessment corridor, and assumes a pylon height of 40 m. The resultant viewshed is shown in **Figure 0-4** and it indicates that elements of the EGI would be most visible from the central section of the 5 km assessment area, although large areas to the north, and south fall outside the viewshed. Localised topographic variations in these areas provide a screening effect, thereby limiting views of the EGI.

It is worth noting that the visibility analysis is based entirely on topography and does not consider any existing vegetation cover or built infrastructure which may screen views of the proposed development. In addition, detailed topographic data was not available for the broader study area and as such the visibility analysis may not include all possible localised topographic variations which may constrain views. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.

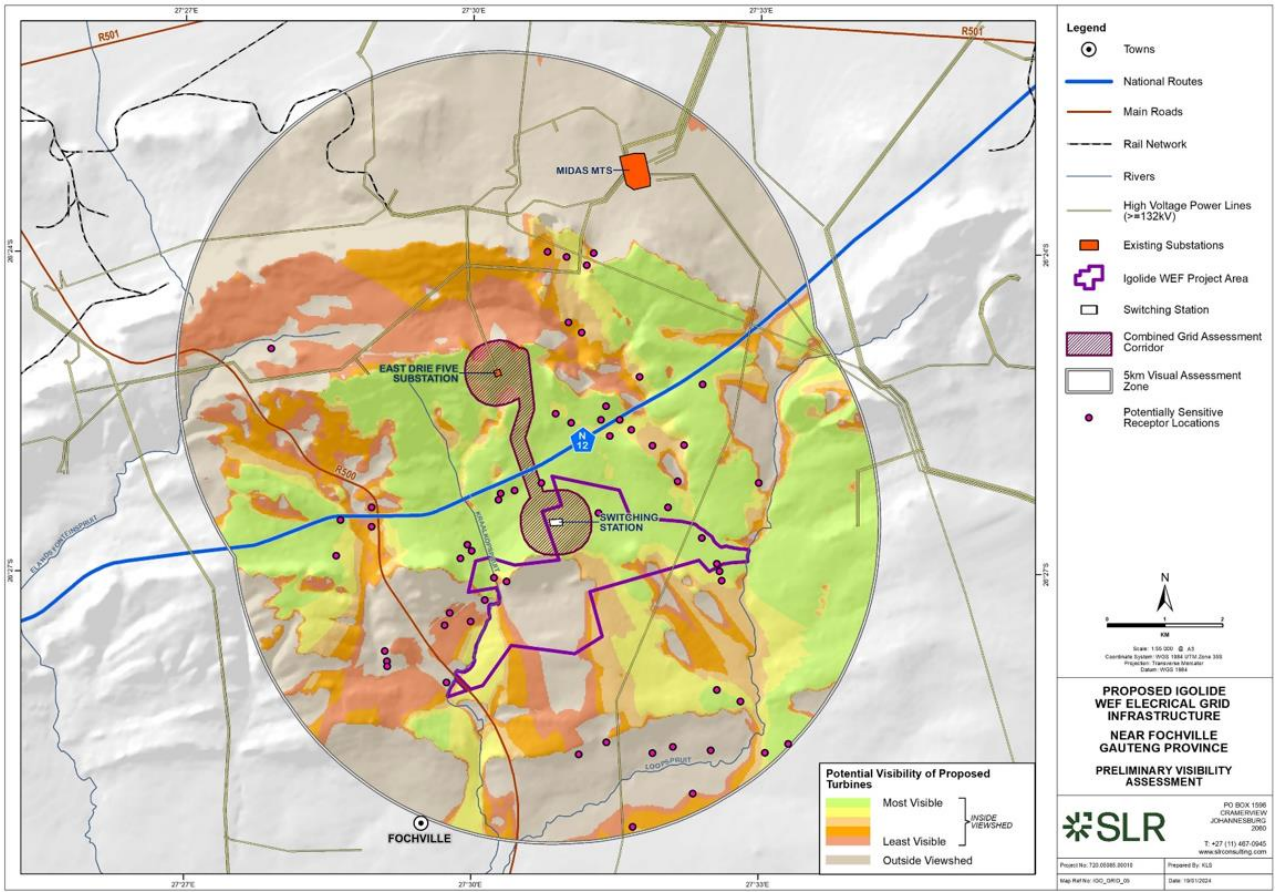

Figure 0-4 - Potential visibility of EGI

GEOLOGY

*The following is extracted from the Palaeontological Assessment compiled by Marion Bamford and included as Error! Reference source not found.**.***

The project lies in the Transvaal Basin with exposed strata of Transvaal Supergroup (**Figure 0-5**).

The Late Archaean to early Proterozoic Transvaal Supergroup is preserved in three structural basins on the Kaapvaal Craton. The Transvaal and Griqualand West Basins is located in South Africa and the Kanye Basin is located in southern Botswana.

The Griqualand West Basin is divided into the Ghaap Plateau sub-basin and the Prieska sub-basin. Sediments in the lower parts of the basins are very similar but they differ somewhat higher up the sequences. Several tectonic events have greatly deformed the south western portion of the Griqualand West Basin between the two sub-basins.

The Transvaal Supergroup comprises one of world's earliest carbonate platform successions. In some areas there are well preserved stromatolites that are evidence of the photosynthetic activity of blue green bacteria and green algae. These microbes formed colonies in warm, shallow seas.

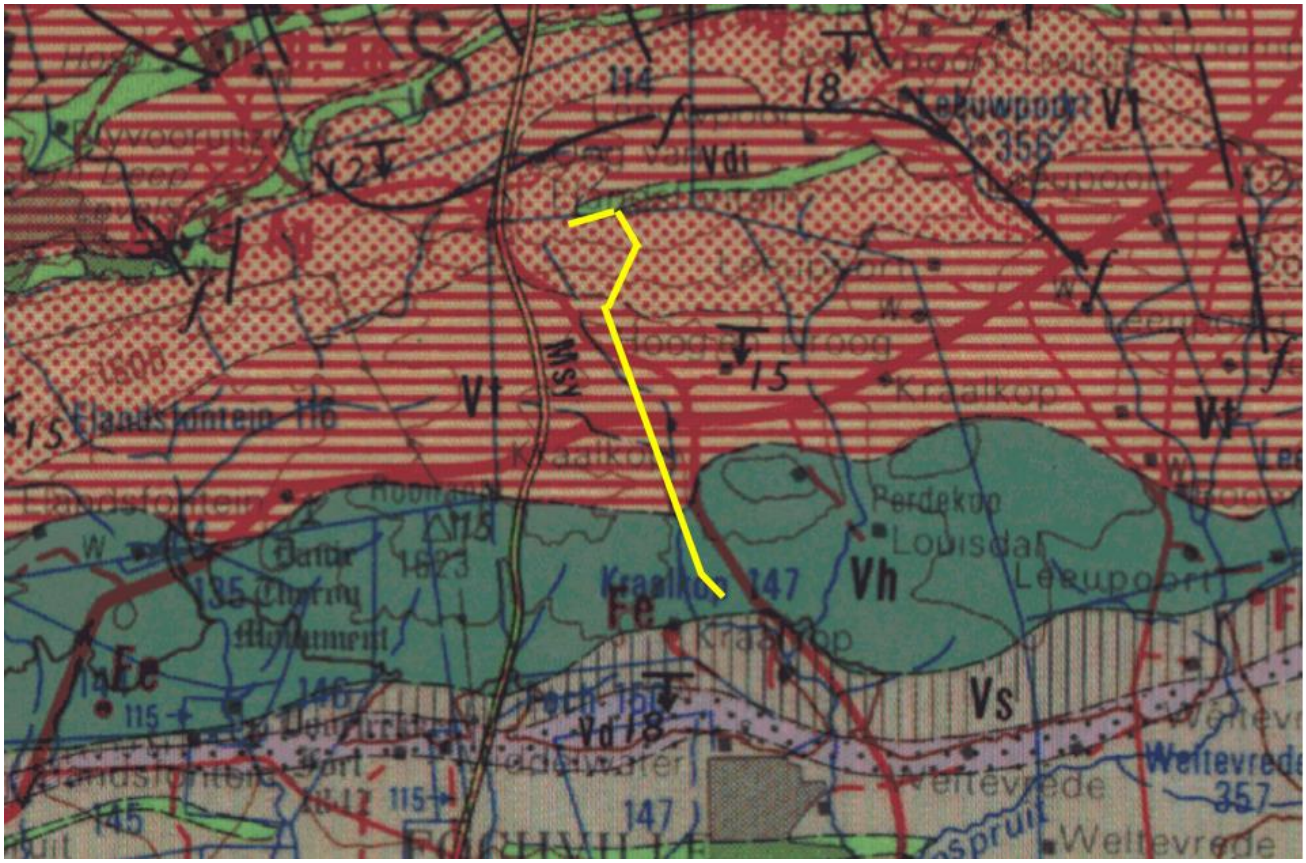

Figure 0-5 - Geological map of the area around the proposed Igolide EGI with the route indicated by the yellow line

Abbreviations of the rock types are explained in **Table 0-2**. Map enlarged from the Geological Survey 1: 250 000 map 2626 West Rand.

Table 0-2 - Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006; Zeh et al., 2020)

SYMBOL	GROUP/FORMATION	LITHOLOGY	APPROXIMATE AGE
Vdi	Diabase	Intrusive volcanic rocks	Post Transvaal SG
Vsi	Silverton Fm, Pretoria Group, Transvaal SG	Shale, carbonaceous in places, hornfels, chert	Ca 2202 Ma
Vd	Daspoort Fm, Pretoria Group, Transvaal SG	Sandstone, mudrock	Ca 2230 Ma
Vs	Strubenkop Fm, Pretoria Group, Transvaal SG	Shale, in places ferruginous	Ca 2242 Ma
Vdw	Dwaalheuvel Fm, Pretoria Group, Transvaal SG	Quartzite, chert, jaspilite	<2242 Ma
Vh	Hekpoort Fm, Pretoria Group, Transvaal SG	Volcanic rocks	Ca 2224 Ma

SYMBOL	GROUP/FORMATION	LITHOLOGY	APPROXIMATE AGE
Vt	Timeball Hill Fm Pretoria Group, Transvaal SG	Shale, siltstone, conglomerate in places; dotted = Quartzite	Ca 2316 – 2266 Ma

SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

In the Transvaal Basin, the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations). The Chuniespoort Group is divided into the basal Malmani Subgroup that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Duitschland Formation.

The lower Pretoria Group is made up of the Timeball Hill Formation and the Boshoek Formation. The Hekpoort, Dwaalheuwel, Strubenkop and Daspoort Formations form a sequence as the middle part of the Pretoria Group, Transvaal Supergroup, and represent rocks that are over 2060 million years old. The Hekpoort Formation is a massive lava deposit and is overlain by the Dwaalheuwel conglomerates, siltstone and sandstone (not present here). A hiatus separates the Strubenkop Formation slates and shales from the overlying quartzites of the Daspoort Formation. Upper Pretoria Group formations are the Silverton, Magaliesberg, Vermont, Lakenvalei, Nederhorst, Steenkampsberg and Houtenbek Formations

The Transvaal sequence has been interpreted as three major cycles of basin infill and tectonic activity with the first deep basin sediments forming the Chuniespoort Group, the second cycle deposited the lower Pretoria Group, and the sediments in this area are from the interim lowstand that preceded the third cycle. These sediments were deposited in shallow lacustrine, alluvial fan and braided stream environments.

The Pretoria Group is approximately 6-7km thick and is composed mostly of mudrocks alternating with quartzitic sandstones, significant interbedded basaltic-andesitic lavas and subordinate conglomerates, diamictites and carbonate rocks. These have been subjected to low grade metamorphism. The Bushveld Complex intrusion has affected the layering of the formations.

Overlying the Rooihoogte Formation is the Timeball Hill Formation which is composed of thick shales and subordinate sandstones that were deposited in a fluvio-deltaic basin-filling sequence. A number of facies are included in this formation. At the base is black shale facies associated with subsurface lavas and pyroclastic rocks of the Bushy Bend Lava Member. Above these are rhythmically interbedded mudstones/siltstones and fine-grained sandstones that have been interpreted as turbidite deposits. These fine-grained sediments grade up into the medial Klapperkop Quartzite Member that has been interpreted as fluvio-deltaic sandstones which fed the more distal turbidites (ibid). Above this is an upper shale member and rhythmite facies. In the east of the Transvaal Basin the Upper Timeball Hill shales have undergone extensive soft-sediment deformation caused by the onset of tectonic instability that led to the eventual fan deposits of the Boshoek Formation and the flood basalts of the Hekpoort Formation.

The Hekpoort Formation is composed of subaerial lavas that intruded into the Boshoek sandstones. These basaltic-andesitic lavas are thickest in the south of the Transvaal basin, thinning to the west and thinnest in the northeast.

The Dwaalheuwel Formation sandstones overlie the Hekpoort Formation volcanic deposits and form two lobes, one from the northeast and one from the northwest. These are sandy distal fan and fluvial braid-plain deposits and are absent from the south of the Transvaal Basin.

The Strubenkop Formation depositional setting has been interpreted as a lacustrine onemor, a shallow marine one. This formation comprises alternating mudstones and siltstones with subordinate interbedded, immature, fine-grained sandstones and is generally upward-coarsening.

There is an unconformity between the Strubenkop shales and the overlying Daspoort Formation. In the east of the Transvaal Basin the latter is composed of mature quartz arenites and subordinate mudrocks and ironstones, but in the west of the basin it is mostly made up of immature sandstones, pebbly arenites, conglomerates and mudrocks. This formation probably represents a fluvial setting succeeded by a shallow marine setting that was the precursor to a major transgression that formed the succeeding Silverton Formation. At the top of the Daspoort Formation are localised occurrences of stromatolitic carbonates and cherts.

Within the Silverton Formation are the lower Boven Shale Member, Machadorp Volcanic Member and upper Lydenburg Shale Member. The lower shales are alumina-rich and best represented in the eastern part of the Transvaal Basin. Shallow subaqueous eruptives formed the tholiitic basalts and then the tuffaceous shales that are high in CaO-MnO-MgO formed the Lydenburg Member. The Silverton Formation has been interpreted as a high-stand facies tract that reflected the advance of an epeiric sea onto the Kaapvaal Craton from the east, so the Daspoort Formation would represent a lowstand facies tract or a transgressive systems tract.

GEOTECHNICAL EVALUATION

The following is extracted from the Desktop Geotechnical Assessment by WSP Group Africa (Pty) Ltd and included as ***Appendix G.2.***

SURFACE DRAINAGE

Flooding affects flat lying areas, areas confined to drained channels and flood plains. Some non-perennial rivers pass through and around the site which can pose potential problems during wet periods especially in areas where shallow rock or clay is present. Stormwater management is recommended on areas of the site along these rivers to facilitate water run-off and to alleviate the possibility of standing water at the foundation positions.

EROSION

The slope on site, as well as the soil structure will influence the amount of erosion that occurs on site. The site is situated on an undulating gradient which makes the probability of erosion likely although this is reduced by the presence of tall grass that was observed to cover large portions of the site. Construction might increase the likelihood of erosion due to the disturbance of natural vegetation. This should be mitigated by revegetation after construction.

SUITABILITY OF IN-SITU MATERIAL FOR USE IN CONSTRUCTION

Shale rock can be used during construction as backfill and in layer-works. However, some shale material breaks down on exposure to air and water and this can cause severe problems. Should the shale be indicated for use as a construction material, its durability properties would need to be assessed.

Quartzite rock is generally inert and of use as a construction material. However, it is generally hard rock or harder in situ and blasting and crushing is generally required.

Quartzitic sand is of use in construction but is likely to be available only in very small quantities.

The soils developed on the Hekpoort Andesite Formation are unlikely to be suitable for use as a construction material due to their potential expansivity. The rock, however, is often used as general fill and in layer works, once crushed.

EXCAVATIBILITY

The assessment of the in-situ profile is indicated in **Figure 0-3** above.

Table 0-3 - Excavatability on Site

MATERIAL	EXCAVATION CLASS
Timeball Hill Formation	Soft excavation in residual shale, quartzite and hornfels and in very soft rock. Intermediate to hard excavation in medium hard and hard rock.
Hekpoort Andesite Formation	Soft excavation in residual andesite, agglomerate and tuff, and in very soft rock. Intermediate to hard excavation in medium hard and hard rock.

SLOPE STABILITY

Development on the site is unlikely to cause any slope instability as no significant cut slopes will be developed. Where excavations are required, up to a depth of 3m, excavations should be excavated at a batter of 1:1.5 in soil where no water or seepage is evident and to 1:2, or flatter, where water is encountered. Rock can be excavated at a batter of 1:0.5 or vertically in the temporary case up to a depth of 3m. Care should be taken when excavating through the Pretoria Group as this formation is prone to sliding.

“The Pretoria Group is generally dipping 20° to the south in the Igolide Grid area. The Pretoria Group sedimentary rocks, including the shale and quartzite, are notorious for instability in cut slopes. The rock is generally well bedded and, especially with the shale, some deterioration along the bedding planes has led to clay infill being present. Failure along the bedding planes and along the clay lubricated bedding planes is common. In general, any south facing slope should be assumed as being susceptible to failure until the rock has been assessed appropriately to determine the site-specific dip of the rock”.

SEISMIC HAZARD

According to the Seismic Hazard Map of South Africa (Kijko et al., 2003), the peak ground acceleration is between 0.16g and 0.20g for the site. The peak ground acceleration may be described as the maximum acceleration of the ground shaking during an earthquake, which has a 10% probability of being exceeded in a 50-year period (**Figure 0-6**).

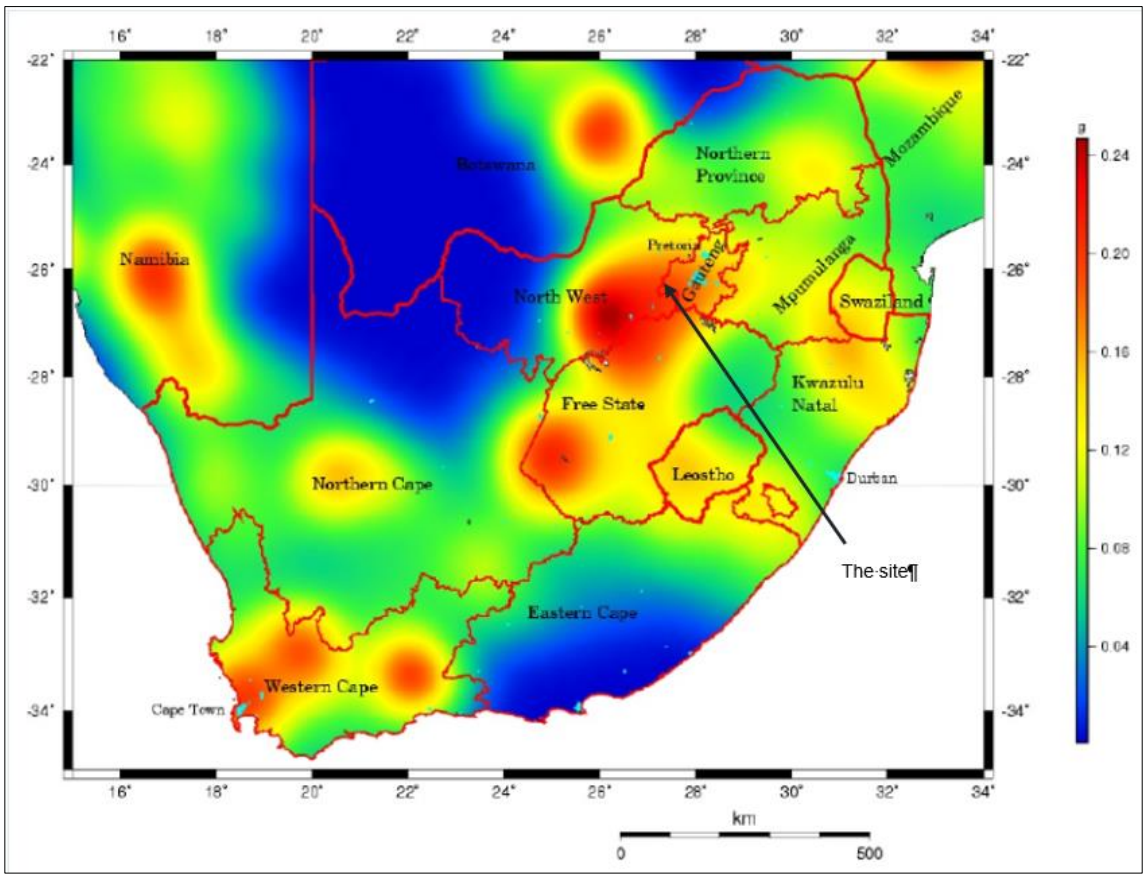

Figure 0-6 - Probabilistic seismic hazard map of South Africa

Mining induced seismicity is the failure of the earth's crust or rock mass as a result of mining induced changes in rock stress levels. Seismic events range in size from barely discernible ground motions to very large tremors. There are three types of mining induced seismicity namely:

- Failure at pre-existing geological weaknesses such as faults, dykes and joints which result in medium to large events often far away from workings.
- Failure of the intact rock mass in the form of shear fractures that result in larger events close to workings.
- Localized bursting or failure of brittle rock types often referred to as strain bursting or face bursting (small events at the working face).

According to SANS 10160-4:2017, and as shown in **Figure 0-7**, the site is situated in a zone were mining induced and natural seismic activity is possible. The last significant seismic event in the area was recoded on the 30th of July 2023 with a magnitude of 3.1 (Discovery, 2023). SANS 10160-4 2017 should be consulted to ensure structural design of the proposed grid infrastructure meets the minimum requirements for buildings in this seismic zone.

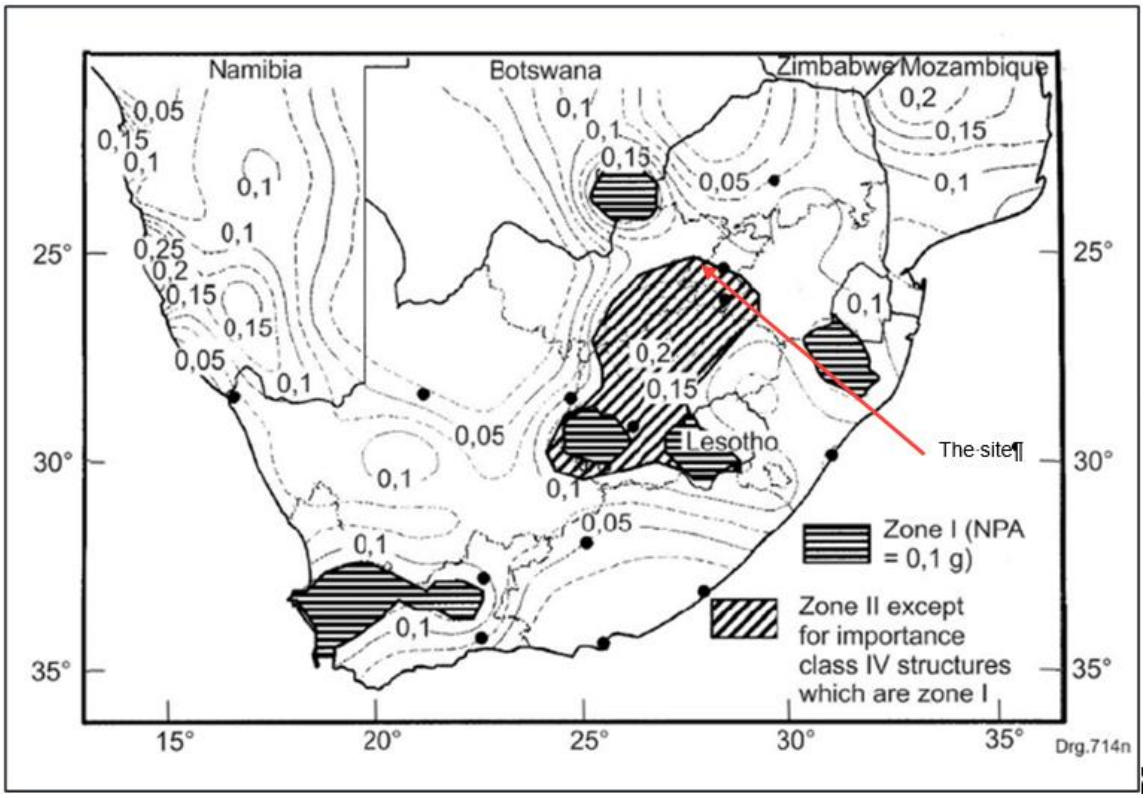

Figure 0-7 - Seismic zones of South Africa

UNDERMINING

Subsidence at surface in undermined areas is caused by the collapse and failure of the underground mining voids relatively close to the surface (Heath and Engelbrecht, 2011). The extent of mining activity in South Africa is shown in **Figure 6-8**, It can be seen from this figure that the site is located in an area with a significant number of gold mines.

Kloof mine is an underground gold mine located approximately 6km west of the site and could potentially pose problems for the proposed grid infrastructure with the possibility of a mine induced seismic event. The extent of any undermining below the site should be assessed, in detail, prior to development.

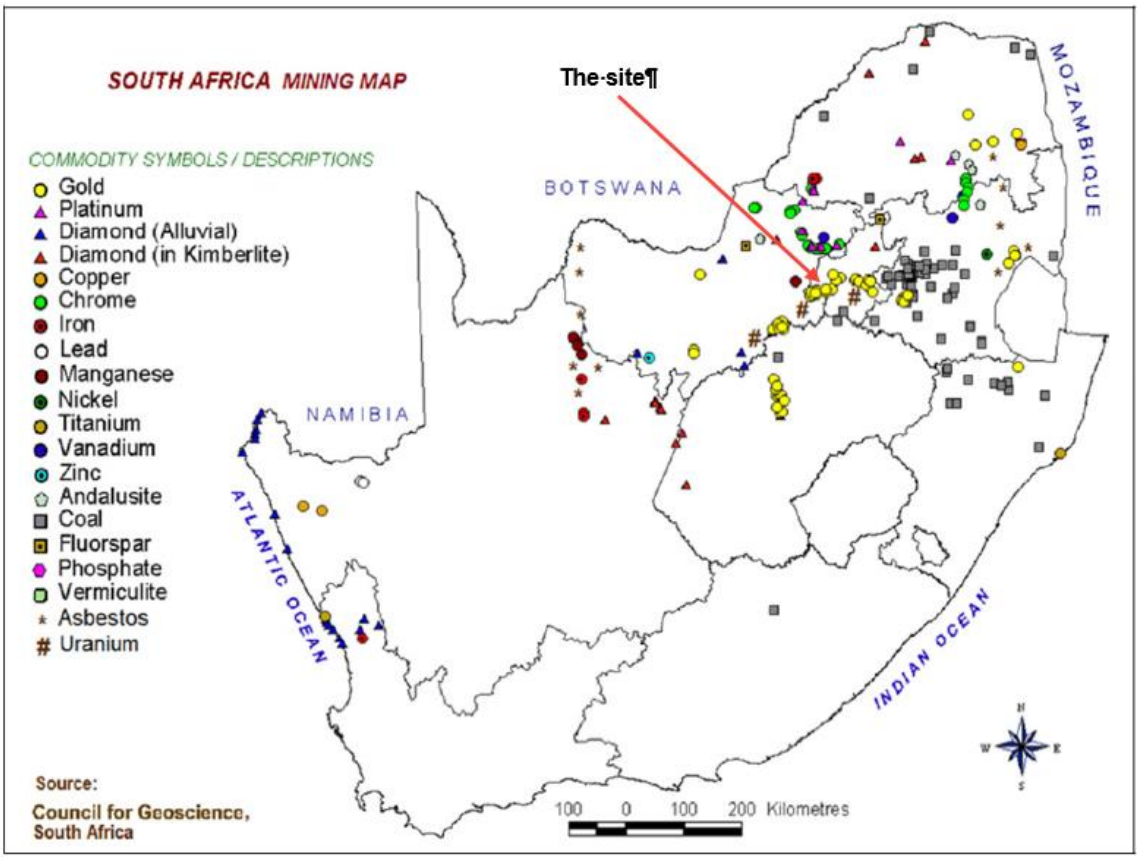

Figure 0-8 - Map indicating mining areas in South Africa

STRUCTURAL FOUNDATIONS

The grid and the associated infrastructure exert both a static load and a dynamic load on the founding material and competent material is required for founding to ensure stability and serviceability of the structures in the in the long term.

Outcrops and shallow rock are expected below parts of the site underlain by rocks of the Timeball Hill Formation. The depth to rock in those areas underlain by the Hekpoort Andesite Formation is expected to be highly variable over a very small distance.

Structure specific investigation is, therefore, required to determine the conditions below the footprint of the structures. Test pits will be required and possibly boreholes being required where the rock is at depth.

For lightly loaded and non-sensitive structures, shallow founding is likely to be possible. However, the potential expansiveness and compressibility of the residual clays and silts, residual of the shale and andesite, will need to be taken account of. Modified foundations and remediation of the subgrade may be required.

SOILS AND AGRICULTURAL POTENTIAL

The following is extracted from the Agricultural Compliance Statement by Johann Lanz and included as ***Appendix G.1***

BASELINE DESCRIPTION OF THE AGRO-ECOSYSTEM

Agricultural production potential, and particularly cropping potential, is one of three factors that determines the significance of an agricultural impact, together with size of footprint and duration of impact. However, in the case of a power line, one of the three factors, namely total footprint of land that will be lost to agriculture, is

negligible and therefore determines the significance of the impact as negligible, regardless of what the value of the other two factors might be. The agricultural production potential of the corridor is therefore irrelevant. In this case, the agricultural production potential of the land is limited to only being suitable as grazing land, anyway, and only used as such, which means that agricultural activity along the grid corridor is completely unaffected.

The switching station falls within an area that is classified as a Protected Agricultural Area (PAA). A PAA is a demarcated area in which the climate, terrain, and soil are generally conducive for agricultural production and which, historically, has made important contributions to the production of the various crops that are grown across South Africa. Within PAAs, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa. However, PAAs are demarcated broadly, not at a fine scale, and there may therefore be much variation of agricultural production potential within a PAA. All land within these demarcated areas is not necessarily of sufficient agricultural potential to be suitable for crop production, due to finer scale terrain, soil, and other constraints. The proposed development footprint is located on land that is not suitable for cropland. This land does not therefore deserve prioritised protection as agricultural production land, even though it is within a demarcated PAA.

ASSESSMENT OF THE AGRICULTURAL PRODUCTION POTENTIAL

Although cropping occurs in the area (on better soils that are off the ridge line), and occurred on the site many years ago, the cropping potential of the site is constrained predominantly by shallow, rocky soils that dominate the higher lying land on the ridge line where the switching station and turbines are situated. Due to these constraints, the site is unsuitable for viable rainfed crop production and its viable agricultural use is limited to grazing.
Although rain-fed cropping may have been done on the site in the past, it is no longer economically viable. It should be noted that cropping potential changes with a changing agricultural economy over time. Poorer lands that may have been cropped with economic viability in the past, are abandoned as cropland because they become too marginal for viable crop production in a more challenging agricultural economy, with increased input costs.

BIOLOGICAL ENVIRONMENT

TERRESTRIAL BIODIVERSITY

The following is extracted from the Terrestrial Biodiversity Assessment by Hawkhead Consulting and included as Error! Reference source not found..

REGIONAL ECOLOGICAL SENSITIVITY AND CONSERVATION SETTING

Nationally Threatened Ecosystems

Less than 1% of Gauteng Shale Mountain Bushveld is under statutory protection and about 24 % has been transformed by urbanisation, mining, farming and plantations. These authors therefore describe Gauteng Shale Mountain Bushveld as being vulnerable. According to the NEMBA Revised National List of Threatened Ecosystems (2022) however, this vegetation type is not listed as threatened (i.e., it is classed as Least Concern).

Terrestrial Critical Biodiversity Areas and Ecological Support Areas

Figure 0-10 shows the study area in relation to the spatial delineations of the Gauteng Conservation Plan (C-Plan) 3.3 (2011).

According to the C-Plan, a large patch of land in the far south of the study area is designated CBA - Important Areas' and a small patch is designated ESA. Large patches of land to the north of the N12 Highway are also delineated as ESA (**Figure 0-10**).

The CBA and ESA land in the study area forms part of a larger network of CBA and ESA land that stretches along the associated ridges. Triggering criteria include Orange List plant habitat, Red List invertebrate habitat and Primary Vegetation (C-Plan 3.3, 2011). It is noted that the current footprints of the proposed Project infrastructure do not impact the CBA land in the south of the study area. ESA land in the north of the study area will, however, be impacted. But anticipated impacts are considered unlikely to impair the functioning of ESA land.

Water Management

Strategic Water Source Areas

The study area is not located in a strategic water source area (SWSA) (**Figure 0-11**). The nearest SWSA (Far West Karst Region) is located to the north of the study area. SWSA's were not included as a receptor for the impact assessment or considered further in the assessment.

Freshwater Ecosystem Priority Area Sub-Catchment

Freshwater Ecosystem Priority Areas (FEPA) are rivers and wetlands required to meet biodiversity targets for freshwater ecosystems. Essentially, these areas were identified at a national level as priority areas for conserving freshwater ecosystems and supporting the sustainable use of water resources, as well as upstream catchment management areas. The study area is located in the Downstream Vaal Dam Subwater Management Area (**Figure 0-12**).

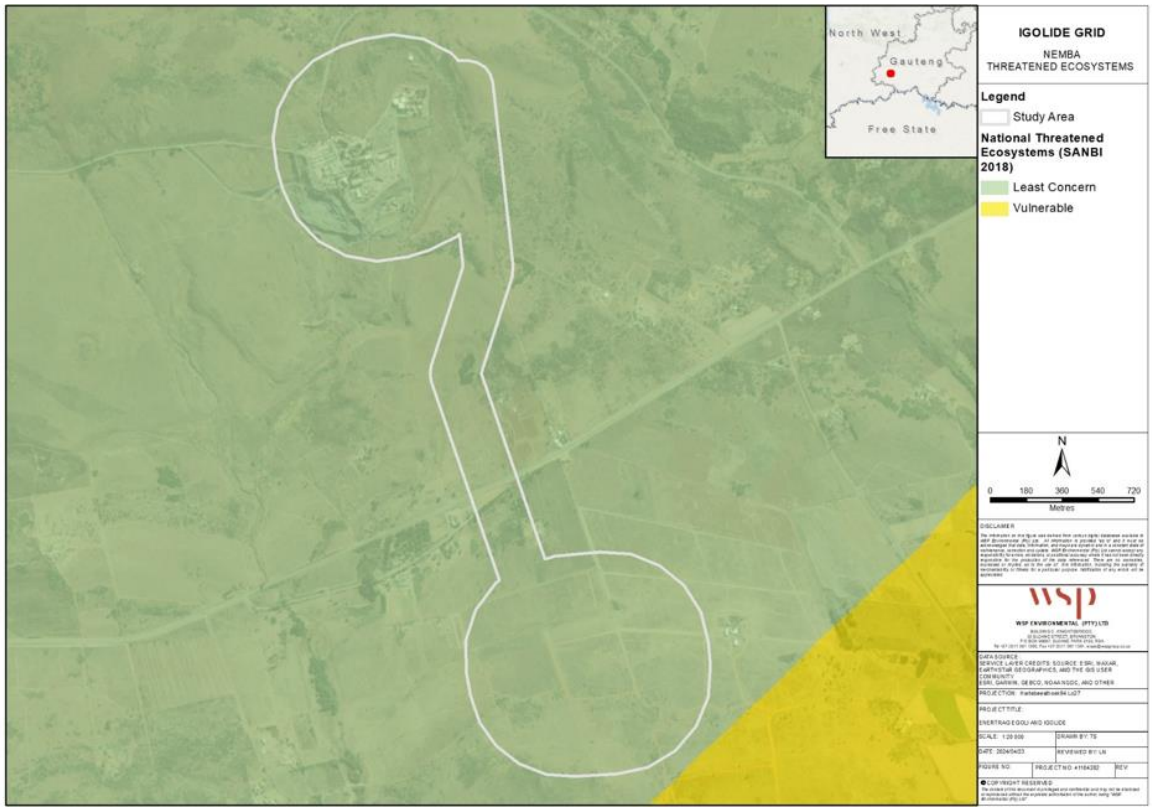

Figure 0-9 - Proposed Project infrastructure in relation to NEMBA Threatened Ecosystems

Figure 0-10 - Proposed Project infrastructure in relation to mapped Critical Biodiversity Areas and Ecological Support Areas

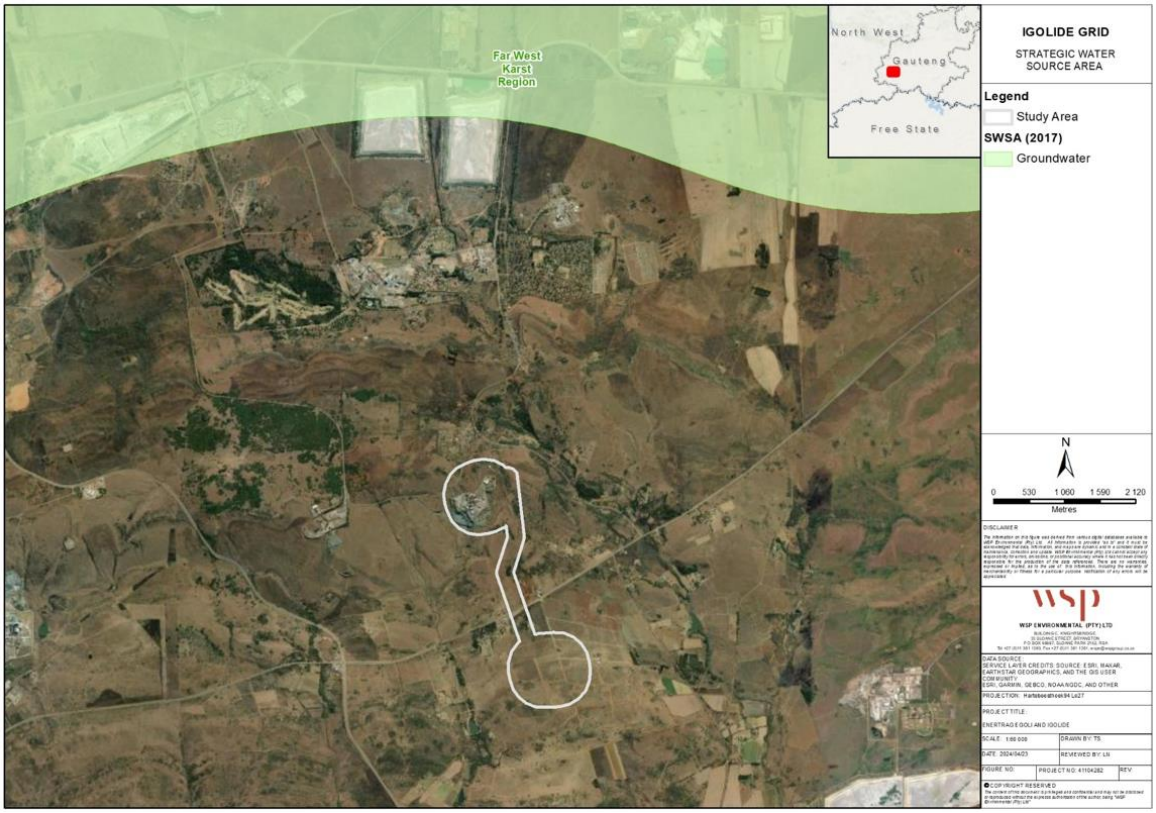

Figure 0-11 - Study area in relation to recognised Strategic Water Source Areas

Indigenous Forests

No indigenous forests occur in the study area. Indigenous forests were therefore not included as receptor for the impact assessment or considered further in the assessment.

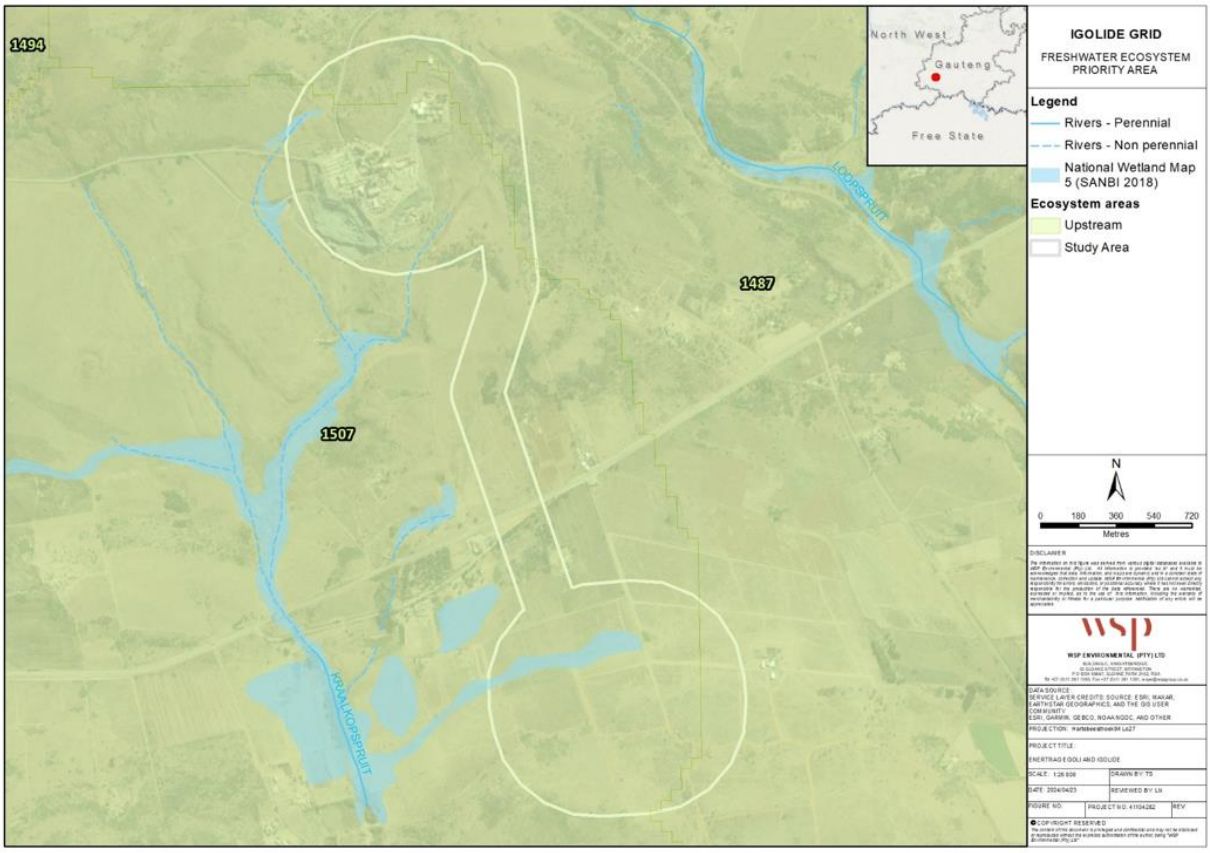

Figure 0-12 - Study area in relation to recognised Freshwater Ecosystem Priority Area

Protected Areas and Conservation Areas

The study area is not located within or in the vicinity of a protected area (**Figure 0-13**). Protected areas were therefore not included as receptor receptors for the impact assessment or considered further in the assessment.

Priority Focus Areas for Protected Area Expansion

Priority Focus Areas for protected area expansion are large, intact and unfragmented areas of high biodiversity importance, that are suitable for the creation/expansion of protected areas. Land-use planning and decision making should avoid fragmenting Priority Focus Areas, to prevent such areas from being excluded from future protected area expansion.

According to the National Protected Area Expansion Strategy (2018) mapping, portions of land in the far south of the study area are mapped as Priority Focus Area (**Figure 0-14**). These areas will not however, be impacted by proposed Project activities.

Important Bird Areas

The study area is not located within an Important Bird Area (IBA). IBA's were not included as receptor for the impact assessment or considered further in the assessment.

Gauteng Ridges

Ridge ecosystems are recognised as important biodiversity features, harbouring diverse flora and fauna communities, including several species of conservation concern. They also play an important role in many ecological (dispersal) and hydrological (water recharge) processes.

Most of Gauteng Province's ridges have been mapped and classified based on their degree of transformation (refer to **Table 0-4** for ridges classes).

Table 0-4 - Gauteng Ridge Classification

CLASS	DESCRIPTION
Class 1 Ridges	5% or less of the area has been transformed by human activity. Comprises approximately 58% of Gauteng's ridges.
Class 2 Ridges	More than 5% but less than 35% of the ridge has been transformed by human activity. Comprises approximately 23% of Gauteng's ridges.
Class 3 Ridges	Ridges that have been transformed by 35% or more, but less than 65% as a result of human activity. Comprises approximately 8% of Gauteng's ridges.
Class 4 Ridges	Ridges that have been transformed by 65% or more as a result of human activity. Comprises approximately 11% of Gauteng's ridges.
From: GDARD Biodiversity (2019)	

Figure 0-15 shows the classification of ridges associated with the study area. The ridges in the south of the study area are designated Class 1, while those in the north are designated Class 2. According to the Gauteng Ridge Guidelines, electricity network infrastructure, such as the proposed Project, is considered a low impact activity. With respects to Class 1 ridges, the guidelines indicate that low impact activities will be supported, provided <5% of the ridge buffer zone is affected. With respects to Class 2 ridges, the guidelines indicate that low impact activities will be supported, provided <5% of the property is affected.

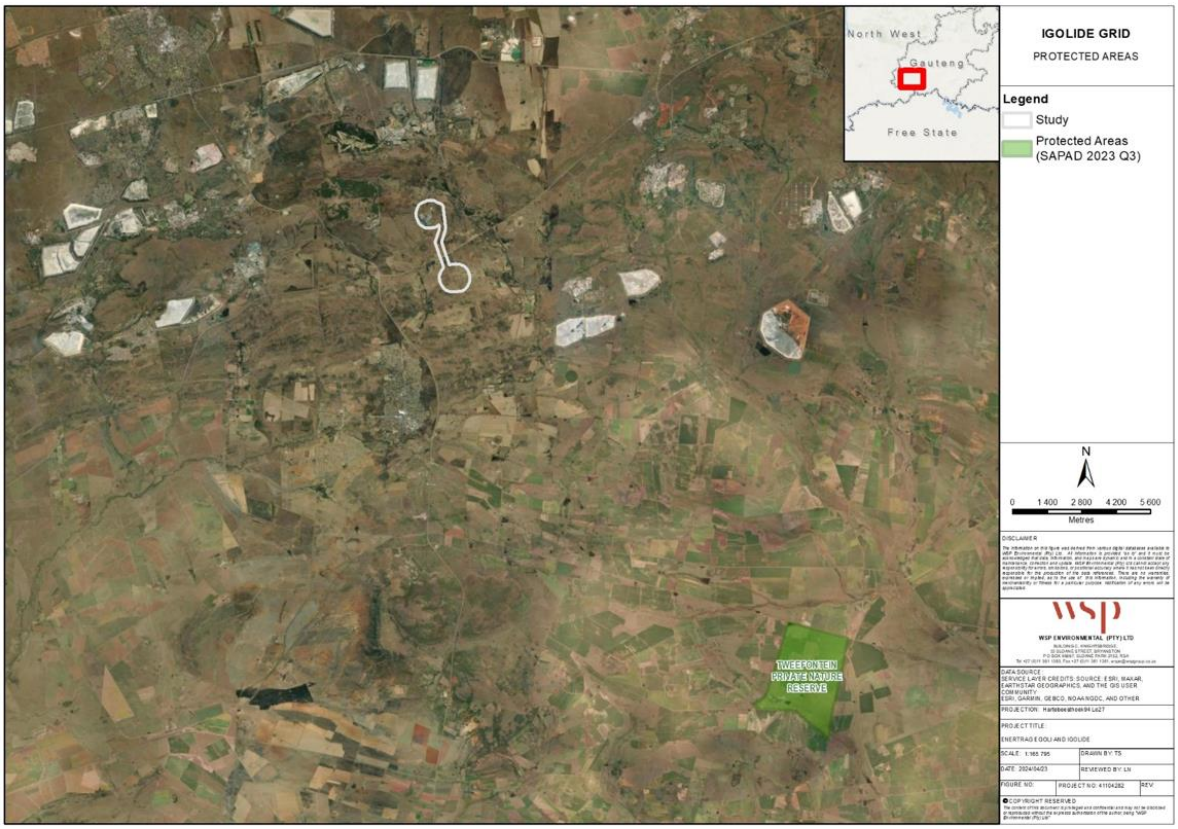

Figure 0-13 - Protected areas in the landscape surrounding the study area

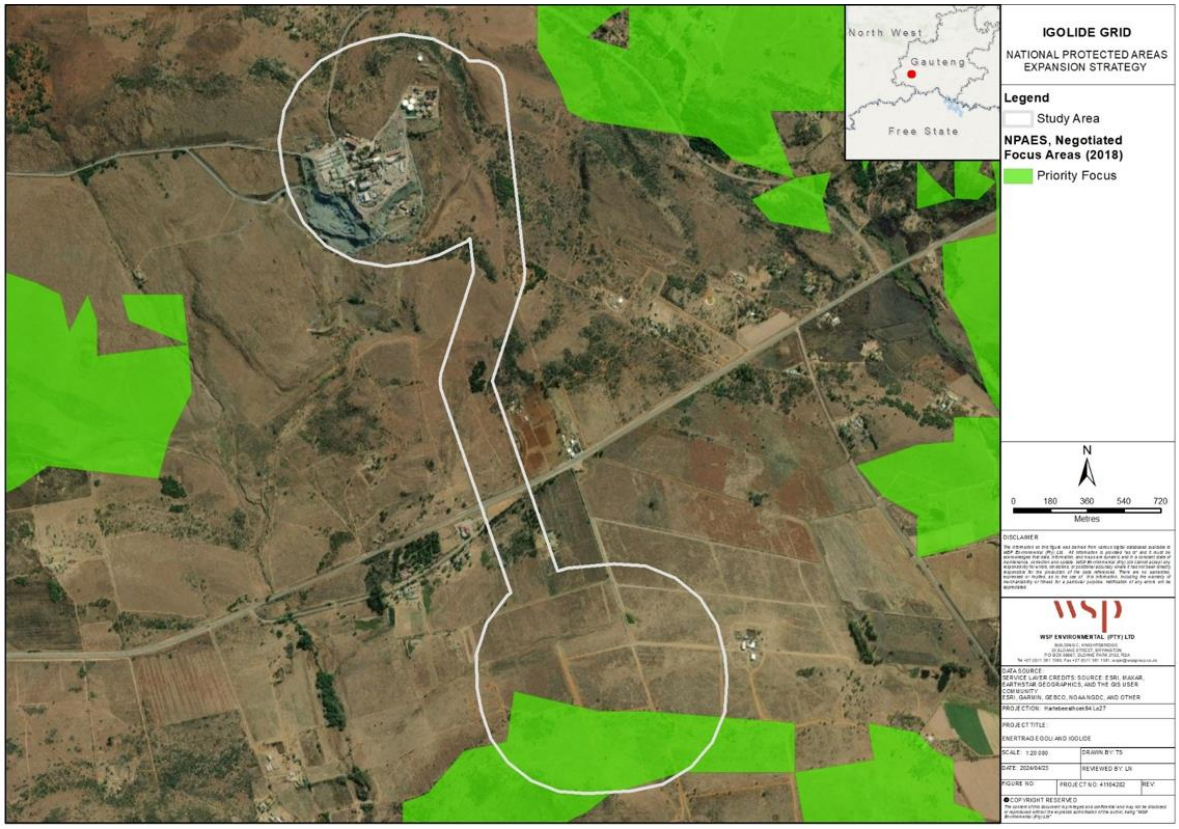

Figure 0-14 - Study area in relation to national Priority Focus Area, as per the National Protected Areas Expansion Strategy (2018)

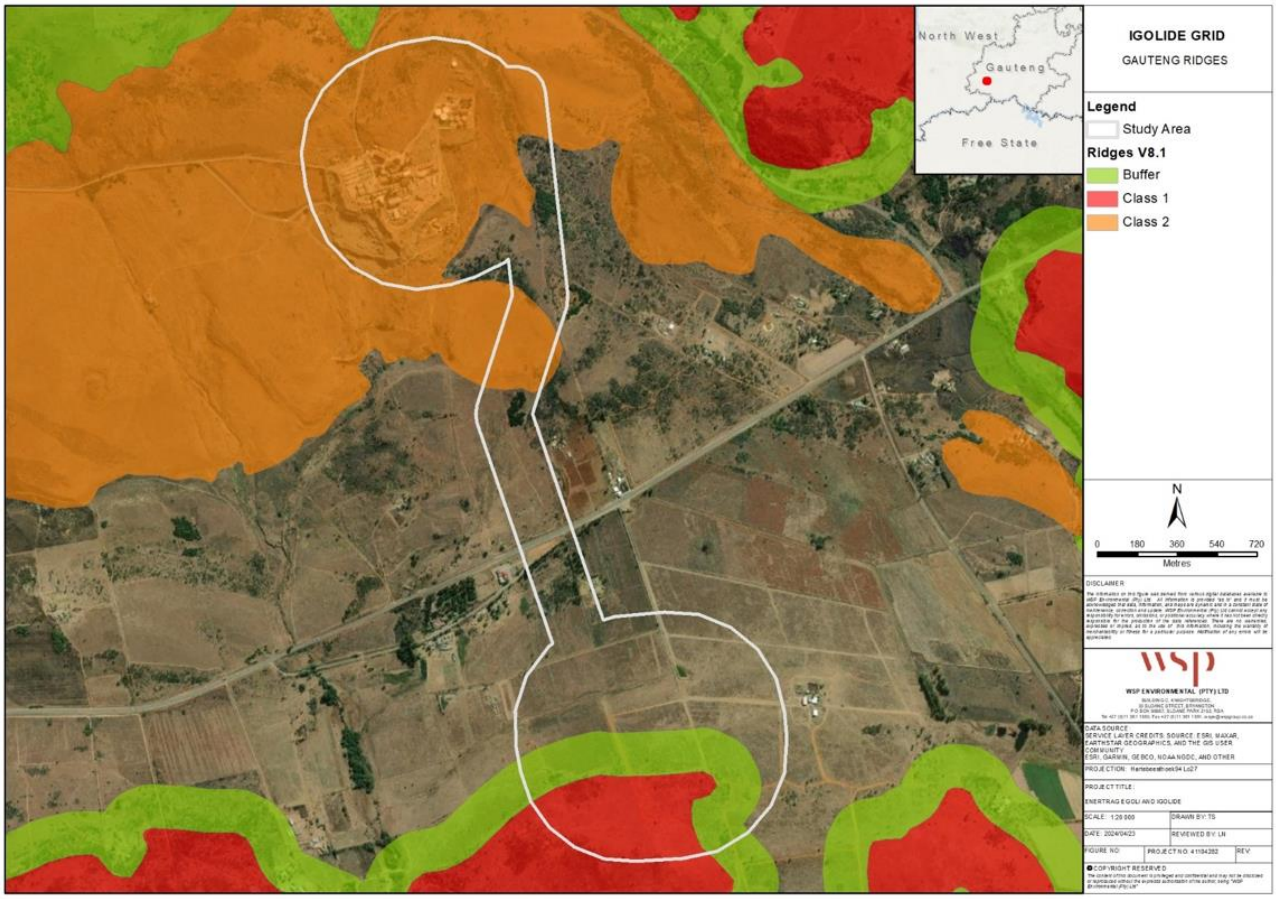

Figure 0-15 - Ridges mapped in the landscape surrounding the study area

FAUNA ATTRIBUTES OF THE STUDY AREA

The study area has a potentially rich fauna community. In terms of mammals, 29 species were documented for the landscape. These include several game farmed/managed taxa, but also many free-roaming species. Two out of the documented mammals are SCC namely:

- Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) - Endangered; and
- Black Wildebeest (*Connochaetes gnou*) - Protected (NEMBA ToPS List, 2007).

The variety and extent of available natural habitats also suggests that many species of bird, reptile, amphibian and invertebrate are likely to occur on-site. Indeed, data retrieved from SABAP 2 for the pentads encompassing the study area indicates that 315 bird species have previously been documented locally, while Virtual Museum records indicate that four amphibian, 21 reptile, 80 butterfly, 12 dragonfly, one scorpion and one spider species, have been recorded in the 2627BC QDS.

Habitat suitability assessments also indicate that several SCC potentially occur in the study area and therefore potentially will be impacted by proposed Project activities.

For additional information on fauna SCC occurring and potentially occurring in the study area, refer to **Section 0** of this report.

KEY ECOLOGICAL ATTRIBUTES AND PROCESSES

Habitat Corridors, Resources and Refugia

In Gauteng Province, rocky ridges are recognised as both biodiversity hotspots and as vital functional habitats for various ecological processes and for many flora and fauna SCC. Indeed, 65% of Gauteng Provinces Red List flora species have been recorded growing on ridges.

It is noted that despite the presence of linear infrastructure, including the N12 Highway, several farm roads/tracks, and numerous farm- and game fences, and patches of modified habitat, the landscape in which the study area is located is characterised by extensive tracts of natural and semi-natural grassland and bushveld habitats. The degree of natural habitat connectivity across the landscape therefore remains high, and this will have a positive effect on maintaining many local flora and fauna communities, including SCC populations.

It is anticipated that the proposed project is likely to cause some habitat disturbances, which may impact local habitat connectivity through habitat loss and fragmentation.

Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on terrestrial biodiversity and ecological processes

Alien Invasive Species Colonisation

In total, 31 declared NEMBA AIS have been recorded in or adjacent to the study area during the current study or by Ekotrust (2023). AIS have the capacity to spread into areas of natural habitat, where they can potentially shade-out and competitively exclude indigenous flora species, including flora SCC. Both *Acacia dealbata* and *Acacia mearnsii* were observed in the study area and are noted to be particularly aggressive invaders, capable of spreading into adjacent areas of undisturbed habitat.

The spread of alien invasive vegetation is therefore considered a potentially significant driver of change in the study area, and one that is capable of negatively impacting local flora SCC populations. The earthworks, machinery movements and soil disturbances during the construction phase of the proposed project may facilitate AIS colonisation.

Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes.

Wildfires have several key ecological effects, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination/flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for terrestrial biodiversity. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences) and fire-sensitive flora species, and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources and reduce biodiversity.

Fire is considered an important driver of change in the study area. However, it is anticipated that the proposed Project is unlikely to impact fire frequency across the study area.

Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation. Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland and savanna habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity, which can negatively affect local fauna communities. Excessive cattle grazing and trampling can also cause soil erosion and gully formation, and modify and homogenise vegetation structure, which can potentially impact sensitive fauna species that have specific life-cycle habitat requirements.

Evidence of both cattle and game grazing were noted in the study area and are likely to be important local drivers of change. This notwithstanding, it is anticipated that the proposed project is unlikely to impact herbivore grazing patterns across the study area.

SITE ECOLOGICAL IMPORTANCE

The site ecological importance (SEI) of identified habitat units in the study area were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology of the specialist study). The results of the assessment are presented in **Table 0-5**, and illustrated in **Figure 0-16.**

Table 0-5 - Site Ecological Importance of habitat unit in the study area

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Hyparrhenia hirta – Eragrostis chloromelas Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Migrations still possible across some modified or degraded natural habitat. Several minor and major current negative ecological impacts (=past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (~ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Moist Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Several minor and major current negative ecological impacts (=earth works, past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (~ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW
Lopholaena corifolia Rocky Ridge/Outcrop Grassland	HIGH: Confirmed and highly likely occurrence of CR, EN, VU species (=Adromischus umbraticola subsp. umbraticola, NT).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Mixed Rocky Grassland	MEDIUM: Confirmed or highly likely occurrence of NT, CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional	MEDIUM	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the	MEDIUM

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
		ecological corridors. Only minor current negative ecological impacts (=alien invasive flora, past cultivation) with limited signs of major past disturbance and good rehabilitation potential.		receptor functionality	
Vachellia karroo – Senegalia caffra Bushveld	MEDIUM: Highly likely populations of SCC or range-restricted species. >50% of receptor contains natural habitat to support SCC	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM
Mixed Rocky Ridge Bushveld	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and	HIGH

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
		functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.		functionality of the receptor functionality	
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Transformed and Degraded Sites	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW

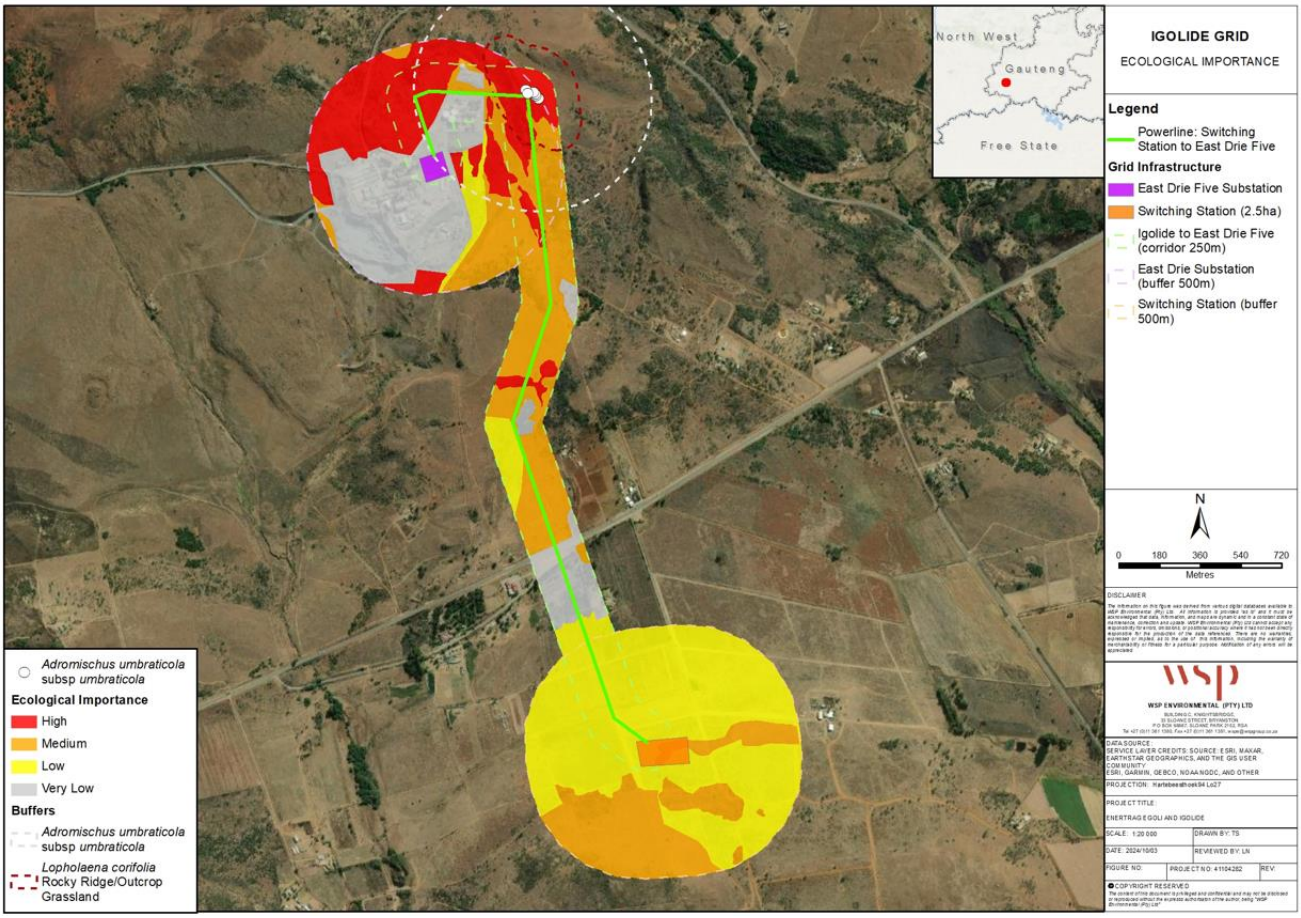

Figure 0-16 - Site Ecological Importance of the study area, showing current proposed layout of the Project infrastructure

TERRESTRIAL PLANT SPECIES

The following is extracted from the Plant Species Assessment by Hawkhead Consulting and included as ***Appendix G.5.***

REGIONAL VEGETATION CHARACTERISTICS

The study area is located in the Savanna Biome. According to SANBI's regional mapping of South Africa's vegetation types (2018), Gauteng Shale Mountain Bushveld (SVcb 10) is the prevailing vegetation type.

The general characteristics of the Savanna Biome and Gauteng Shale Mountain Bushveld is discussed further below.

Savanna Biome

The savanna biome is the largest biome in South Africa, covering approximately 35% of the country's land surface. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, yet distinct woody plant component. Primary determinants of savanna composition, structure and functioning are fire, a distinct seasonal climate, substrate type, and browsing and grazing by large herbivores.

Compositionally, Africa's savannas are distinguished as either fine-leafed savannas or broad-leafed savannas. The distribution of these forms is based primarily on soil; fine-leafed savannas occur on nutrient rich soils and are dominated by microphyllous woody species of the Fabaceae family (most commonly indigenous Acacia's). These savannas have a productive and diverse herbaceous layer that is dominated by grasses and can

support large populations of mammalian herbivores. Conversely, broad-leafed savannas usually occur on nutrient poor soils and are dominated by macrophyllous woody species from the Combretaceae family (common genera: Combretum & Terminalia). Compared to fine-leafed savannas, broad-leafed savannas are less productive and support a lower herbivore biomass.

Gauteng Shale Mountain Bushveld

Gauteng Shale Mountain Bushveld occurs in a narrow band along a series of low, rocky ridges of varying steepness from Carletonville-Westonaria-Lenasia.

Vegetation is characterised by short, semi-open thicket consisting of a variety of fine- and broad-leaf woody species. The field layer is normally dominated by grasses. The underlying geology comprises shale with some coarser clastic sediments and andesite from the Pretoria Group. Soils are shallow to deep Mispah.

In Mucina and Rutherford's (2011) regional vegetation type descriptions, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type. They recognise the following species as important taxa in Gauteng Shale Mountain Bushveld:

Trees: *Dombeya rotundifolia, Celtis africana, Combretum molle, Cussonia spicata, Englerophytum magalismontanum, Protea caffra, Rhus leptodictya, Vangueria infausta, Senegalia caffra, Vachellia karroo, Zanthoxylum capense* and *Ziziphus mucronata*.

Shrubs: *Asparagus laricinus, Canthium gilfillanii, Chrysanthemoides monilifera, Dichrostachys cinerea, Diospyros austro-africana, Diospyros lycioides* subsp. *lycioides, Ehretia rigida* subsp*. rigida, Grewia occidentalis, Gymnosporia polyacantha* and *Olea europaea*.

Grasses: *Hyparrhenia dregeana, Cymbopogon caesius, Digitaria eriantha* and *Eragrostis curvula*.

Herbs: *Dicoma zeyheri, Helichrysum nudifolium, Helichrysum rugulosum, Hermannia lancifolia, Selaginella dregei, Senecio venosus, Vernonia natalensis, Vernonia oligocephala, Cheilanthes hirta, Pellaea calomelanos* and *Scadoxus puniceus*.

Threat Status of Gauteng Shale Mountain Bushveld

According to Mucina & Rutherford (2011), less than 1% of Gauteng Shale Mountain Bushveld is under statutory protection, and about 24 % has been transformed by urbanisation, mining, farming and plantations. These authors therefore describe Gauteng Shale Mountain Bushveld as being vulnerable. According to the NEMBA Revised National List of Threatened Ecosystems (2022) however, this vegetation type is not listed as threatened (i.e., it is classed as Least Concern) (Refer to **Figure 0-18**).

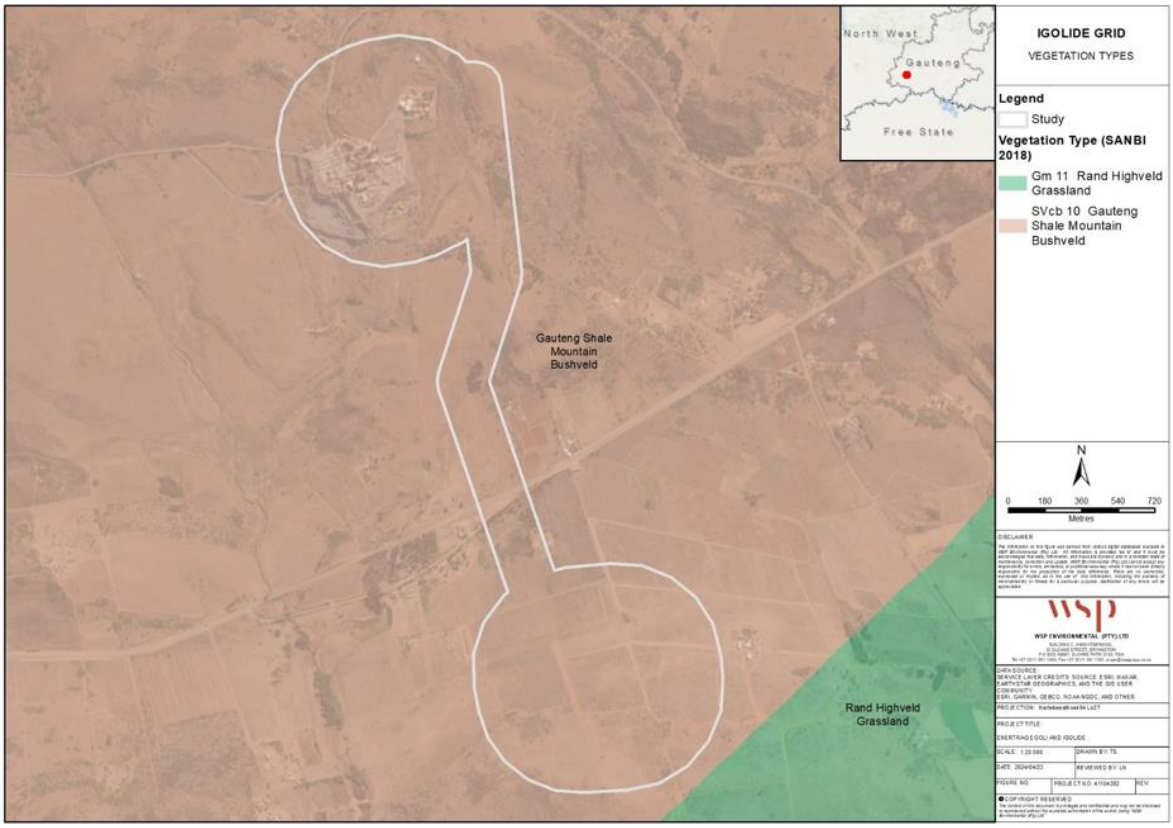

Figure 0-17 - Study area in relation to the SANBI (2018) vegetation types

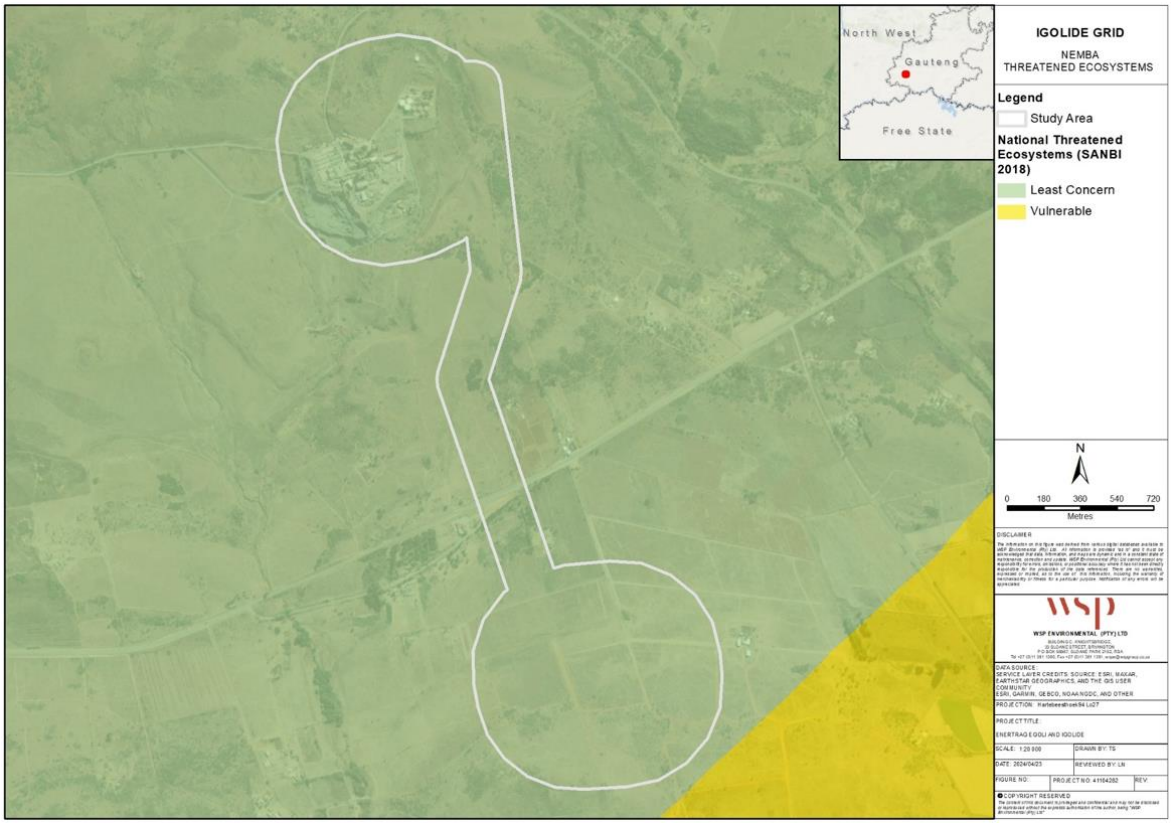

Figure 0-18 - Study area in relation to delineations of the National Red List of Terrestrial Ecosystems

LANDSCAPE CONTEXT AND EXISTING IMPACTS ON BIODIVERSITY

The following notes summarise key existing impacts (anthropogenic activities and infrastructure) observed in the study area and in the surrounding landscape during the field survey:

- The dominant anthropogenic feature in the study area is the Sibanye Driefontein Gold 5 Shaft complex. This site is completely transformed and dominated by various mine facilities and infrastructure;
- The N12 Highway bisects the study area on an east-west axis. The N12 is a major arterial route linking Johannesburg in the east to Potchefstroom in the west;
- Across the landscape surrounding the study area, other existing impacts noted include:
    - Scattered alien tree stands, windrows and hedgerows;
    - Agricultural fields;
    - Residential dwellings (both formal and informal); and
    - Various forms of linear infrastructure, including gravel roads and informal vehicle tracks, farm and game fences, and existing electricity powerlines.

VEGETATION AND FLORA ASSESSMENT

Habitat Units in the Study Area

Based on data collected during the field survey, eight habitat units were identified in the study area **(Figure 6-19)**, including four grassland-type units, two savanna-type units, and two modified habitat units. These are:

- *Hyparrhenia hirta – Eragrostis chloromelas* Grassland;
- Moist Grassland;
- *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland;
- Mixed Rocky Grassland;
- *Vachellia karroo – Senegalia caffra* Bushveld;
- Mixed Rocky Ridge Bushveld;
- Alien Tree Plantations; and
- Transformed and Degraded Sites.

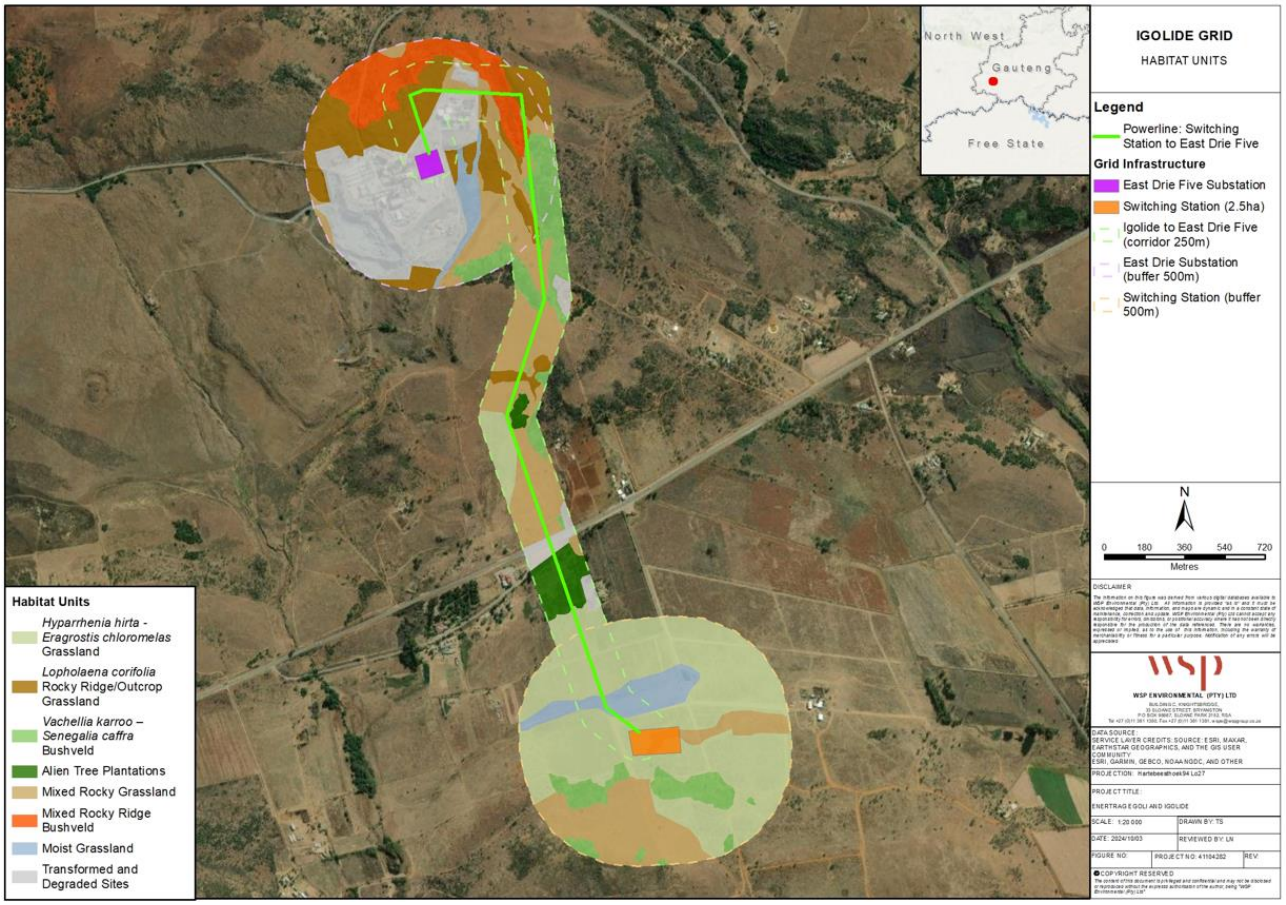

Figure 0-19 - Habitat unit map of the study area

Hyparrhenia hirta - Eragrostis chloromelas Grassland

This habitat unit is located in the south of the study area and characterises patches of land that were formerly cultivated fields and have regenerated to secondary grassland (i.e., old lands).

In line with Edwards (1983) structural classification, structurally this community is defined as low open grassland. In terms of composition, these grasslands are generally species poor and dominated by dense stands of the tall thatching grass *Hyparrhenia hirta* (**Figure 0-20**). Other recorded grasses include *Aristida congesta* subsp. *congesta, Cynodon dactylon, Digitaria eriantha, Eragrostis curvula, Eragrostis chloromelas* and *Eragrostis gummiflua.* Common forbs recorded in this habitat unit include *inter alia; Bidens bipinnata*, Cirsium vulgare*, Helichrysum rugulosum, Hermannia depressa, Ipomoea ommaneyi, Nidorella anomala, Richardia brasiliensis*, Verbena bonariensis** and *Verbena brasiliensis** (*indicates alien taxa).

Woody species are not abundant in this unit and occur as scattered individual small trees and shrubs within the herbaceous layer. The following species were noted; *Diospyros lycioides, Vachellia karoo, Ziziphus mucronata* and *Seriphium plumosum* – with the latter frequently abundant.

Three NEMBA declared alien invasive were recorded in *Hyparrhenia hirta - Eragrostis chloromelas* Grasslands including *Cirsium vulgare, Verbena bonariensis* and *Verbena brasiliensis.* These are all listed as Category 1b.

No flora SCC were recorded in this habitat unit, and it is considered unlikely that such species are present.

Figure 0-20 - *Hyparrhenia hirta – Eragrostis chloromelas* Grassland

Moist Grassland

This habitat unit is associated with the moist soils of both natural and anthropogenic drainage features (i.e., water discharge channel from the Sibanye Driefontein Gold 5 Shaft complex) in the study area and incorporates the *Eragrostis plana – Trisetopsis imberbis* wetlands/floodplains community. Anthropogenic disturbance levels in this unit are high.

Vegetation structure ranges from low- to tall closed grassland (**Figure 0-21**). Compositionally, shorter grasses tend to dominate most temporarily and seasonally wet areas, while the taller rush Typha capensis and the reed Phragmites australis dominate more permanently wet locations (**Figure 0-22**).

Figure 0-21 - Moist grassland habitat in the south of the study area

Figure 0-22 - Moist grassland habitat associated with water discharge from the Sibanye Driefontein Gold 5 Shaft complex

Lopholaena corifolia Rocky Ridge/Outcrop Grassland

This habitat unit occurs on small rocky outcrops and along larger south-facing ridge/hillsides in the north of the study area and is characterised by the visible prevalence of large protruding rocks. In line with Edwards (1983), structurally, vegetation is defined as low open grassland, with woody vegetation occurring only as scattered individual small trees and shrubs (refer to **Figure 0-23** and **Figure 0-24**).

The herbaceous layer is well-developed between rocks and is grass dominated. Commonly recorded graminoids in this habitat unit include, *inter alia; Aristida aequiglumis, Bulbostylis burchellii, Chrysopogon serrulatus, Cymbopogon caesius, Elionurus muticus, Eragrostis chloromelas, Loudetia simplex, Melinis repens* and *Tristachya rehmannii*.

Other common herbaceous species recorded include various forbs such as *inter alia; Anthospermum hispidulum, Clematis villosa, Indigofera hilaris, Indigofera melanadenia, Hemizygia canescens, Helichrysum setosum, Plectranthus ramosior, Polydora poskeana* and *Tephrosia capensis;* and ferns including *Cheilanthes hirta, Selaginella dregei* and *Pellaea calomelanos* var. *calomelanos.*

Woody species recorded include the often-abundant small shrubs *Lopholaena coriifolia and Searsia magalismontana* subsp*. magalismontana*, as well as scattered larger trees, such as *Senegalia caffra, Brachylaena rotundata, Mundulea sericea, Vangueria infausta* and the dwarf shrub *Elephantorrhiza elephantina.* Several succulents were noted to occur in this community including *Aloe davyana, Aloe verecunda, Cotyledon orbiculata, Crassula setulosa, Kalanchoe paniculata* and *Kalanchoe thyrsiflora.*

No NEMBA declared alien invasive were recorded in this habitat unit, although it is likely that such species are present across the broader unit. In terms of SCC, one suspected Red List flora species was recorded, namely *Adromischus umbraticola* subsp*. umbraticola* (Near Threatened). The provincially protected *Aloe verecunda* and *Cussonia paniculata* were also recorded in this unit.

Figure 0-23 - *Lopholaena coriifolia* Rocky Ridge/Outcrop Grassland in the north of the study area

Figure 0-24 - *Lopholaena coriifolia* is a prominent woody species in this habitat unit

Mixed Rocky Grassland

Mixed Rocky Grassland is a variable habitat unit, and an expansion of the *Cymbopogon caesius - Elionurus muticus* rocky grasslands described by Ekotrust (2023). This unit occurs on shallow rocky soils to the north- and south of the N12 highway. Structurally, mixed rocky grasslands are characterised by low closed grassland (**Figure 0-25**).

Floristically, this unit comprises a mixture of grasses and forb species. Commonly recorded grass species include *Aristida aequiglumis, Cymbopogon caesius, Elionurus muticus, Eragrostis chloromelas, Eragrostis racemosa, Hyparrhenia hirta, Loudetia simplex, Panicum natalense, Sporobolus africanus, Themeda triandra, Triraphis andropogonoides* and *Urelytrum agropyroides;* while recorded forbs include *inter alia; Chamaecrista comosa, Cleome monophylla, Clematis villosa, Eriosema cordatum, Geigeria burkei, Helichrysum nudifolium* var. *nudifolium, Helichrysum rugulosum, Helichrysum setosum, Selago densiflora, Senecio coronatus* and *Tephrosia capensis* var. *capensis.*

Woody species generally occur at low abundances and as scattered small trees and shrubs in this habitat unit. The following indigenous species were noted; *Diospyros lycioides, Lopholaena coriifolia, Pollichia campestris, Seriphium plumosum* and *Vachellia karroo*. The dwarf tree *Elephantorrhiza elephantina* was also noted to grow in localised aggregations in this unit. *Seriphium plumosum* is a common encroacher species in areas of this unit that have been disturbed **(Figure 6-26)** (Figure 0-59).

In terms of NEMBA declared alien invasive species, scattered alien wattle species (*Acacia dealbata* and *Acacia mearnsii*) were noted in this habitat unit. Provincially protected plant species recorded in this unit include *Crinum graminicola.*

Figure 0-25 - Mixed Rocky Grassland

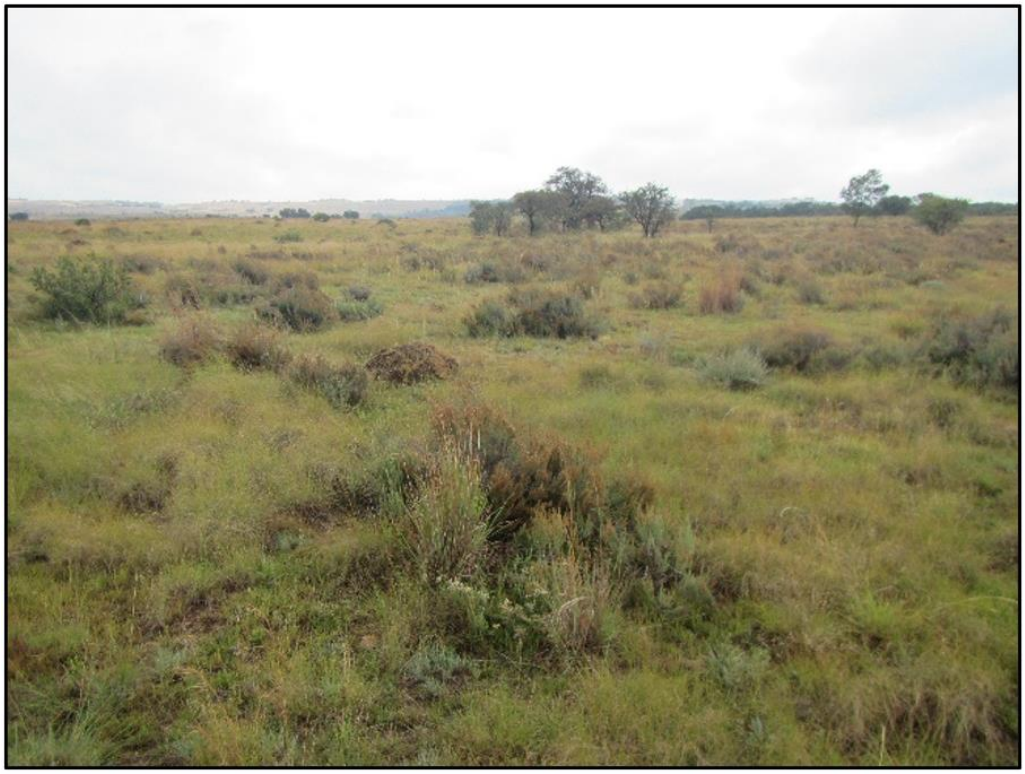

Figure 0-26 - Abundance of Seriphium plumosum

Vachellia karroo – Senegalia caffra Bushveld

Excluding alien tree plantations, this is one of two indigenous woody habitat units identified in the study area, and incorporates the *Vachellia karroo – Ehretia rigida* Bushveld described by Ekotrust (2023) in the south of the study area.

Vegetation structure ranges from low open woodland to short closed woodland, as per Edwards (1983) structural classification (**Figure 0-27** and **Figure 0-28**).

The woody species composition of this unit is dominated by fine-leafed woody species, with the thorn trees *Senegalia caffra* and in particular, *Vachellia karoo,* dominant. Other less abundant woody species recorded include *Asparagus laricinus, Buddleja saligna, Celtis africana, Diospyros lycioides, Ehretia rigida, Gymnosporia polyacanthus* subsp. *vaccinifolia, Osyris lanceolata, Searsia lancea, Searsia leptodictya, Searsia pyroides, Vangueria infausta* and *Ziziphus mucronata*.

In the more open areas of this unit, the herbaceous layer is generally well-developed and grass dominated. In more densely wooded locations, the herbaceous layer is poorly-developed. Commonly recorded grasses include *Cymbopogon caesius, Cynodon dactylon, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Hyparrhenia hirta, Melinis repens*, *Setaria sphacelata, Sporobolus africana* and *Themeda triandra*. Common forbs recorded include a mixture of indigenous and naturalised alien taxa such as *inter alia; Achyranthes aspera*, Bidens bipinnata*, Conyza canadensis*, Helichrysum rugulosum, Hermannia depressa, Indigofera* species*, Kyphocarpa angustifolia, Plectranthus hereroensis, Schkuhria pinnata*, Selago densiflora, Tagetes minuta** and *Zinnia peruviana*.*

Several NEMBA declared alien invasive were recorded in this habitat unit including the woody species *Acacia dealbata, Acacia mearnsii, Acacia melanoxylon, Melia azedarach, Solanum mauritianum,* the succulent *Opuntia ficus-indica* and the forb *Verbena brasiliensis.*

In terms of flora SCC, two provincially protected plant species were recorded in this unit, namely *Protea caffra* and *Scadoxus puniceus*.

Figure 0-27 - *Vachellia karroo – Senegalia caffra* Bushveld in the south of the study area

Figure 0-28 - *Vachellia karroo – Senegalia caffra* Bushveld in the north of the study area

Mixed Rocky Ridge Bushveld

This habitat unit occurs on the north- and east-facing ridge/hillsides in the north of the study area, and like the *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland unit, is characterised by the abundance of large

protruding rocks. It is noticeably dissimilar to the grassland unit by the abundance of larger woody taxa (shown in **Figure 0-29** and **Figure 0-30**).

Vegetation structure ranges from low to short open woodland (*sensu*. Edwards, 1983). Woody species composition is variable, with both fine- and broad-leafed woody species locally prevalent, including the thorn trees *Senegalia caffra*, *Vachellia karoo a*nd *Vachellia robusta,* as well as the broad-leafed *Celtis africana*, *Diospyros lycioides, Ehretia rigida, Euclea crispa, Gymnosporia polyacanthus* subsp. *vaccinifolia, Heteromorpha arborescens, Searsia lancea, Searsia leptodictya, Searsia magalismontana* subsp. *magalismontana, Searsia pyroides, Vangueria infausta* and *Ziziphus mucronata*.

The herbaceous layer shares many of the same grass, forb and herb species as the *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland unit, including the grasses *Aristida aequiglumis, Aristida congesta* subsp. *congesta, Cymbopogon caesius, Cynodon dactylon, Digitaria eriantha, Eragrostis chloromelas, Eragrostis curvula, Loudetia simplex and Melinis repens;* and forbs including *inter alia, Clematis villosa, Indigofera melanadenia, Hemizygia canescens* and *Plectranthus ramosior.* Succulents noted include *Aloe davyana* and *Kalanchoe paniculata.*

NEMBA declared alien invasive were recorded in this habitat unit include *Acacia melanoxylon, Melia azedarach, Solanum mauritianum, Trichocereus spachianus* and *Opuntia ficus-indica.*One provincially protected plant species was recorded in this unit, namely *Scadoxus puniceus,* and it is considered probable that other SCC are present in this unit.

Figure 0-29 - Stand of *Acacia mearnsii* trees. Note: absence of undergrowth vegetation

Figure 0-30 - Stand of *Eucalyptus camaldulensis* trees

Transformed and Degraded Sites

Transformed and Degraded Sites comprise all areas that have been permanently transformed or are significantly degraded as a result of anthropogenic activities. At such sites, little- to no vegetation remains present and where vegetation is present, it is typically characterised by weedy ruderal species. Examples of Transformed and Degraded Sites in the study area include all mine (Sibanye Driefontein) infrastructure and associated facilities, residential dwellings and infrastructure, and the N12 Highway.

FLORISTICS ANALYSIS

Flora Species of Conservation Concern

At a provincial level, 50 Red List flora species are known to occur in Gauteng:

- 22 are threatened and comprise one Extinct species;
- 1 Critically Endangered species;
- 6 Endangered species;
- 15 Vulnerable species;
- 22 species listed as Near Threatened;
- 9 as Declining;
- 4 are Rare/Rare-Sparse; and
- 1 is Data Deficient.

Also included in this section are flora species that are listed as threatened or protected according to national and/or provincial environmental legislation; specifically, flora listed on the NEMBA ToPS List (2007) and under

Gauteng Province's Nature Conservation Ordinance (12 of 1983) (as amended). As per the relevant legislation, these taxa require specific conservation management.

Red List Flora Species Occurring and Potentially Occurring in the Study Area

Several suspected *Adromischus umbraticola* subsp*. umbraticola* (refer to **Figure 0-31**) plants were recorded in an area of *Lopholaena corifolia* Rocky Ridge/Outcrop Grassland in the study area. *Adromischus umbraticola* subsp*. umbraticola* is listed as Near Threatened on the national Red List and is a South African endemic, where it is restricted to Gauteng and North West provinces. This species has an EOO of 14 600 km^2 and is known from 14 locations. It grows in rock crevices on south-facing slope ridges. Note: Positive identification of *Adromischus umbraticola* subsp*. umbraticola* requires examination of its flowers, which are typically emergent between September and January. As a precautionary measure, it is crucial to manage and conserve these plants as if they are *Adromischus umbraticola* subsp*. umbraticola* until definitive identification is achieved. This approach aligns with the precautionary principle, ensuring potential harm is minimized while awaiting conclusive evidence of identification.

Figure 0-31 - Suspected *Adromischus umbraticola* subsp. *umbraticola* (Near Threatened)

Adromischus umbraticola subsp*. umbraticola* is listed in priority group A2 in Gauteng Province. According to GDARD Biodiversity (2018), the recommended buffer for flora species listed in priority group A2 is 500 m. The presence of a buffer is required to reduce edge-effects and protect potential ecological processes (e.g., pollinator movement) that are important to the maintenance of SCC populations. It is motivated in this report, that this buffer can be reduced.

Refer to **Table 0-6** for co-ordinates of the suspected *Adromischus umbraticola* subsp*. umbraticola* plants recorded during the field survey. The location of the recorded plants relative to proposed infrastructure is shown in **Figure 6-35**.

Table 0-6 - Location of suspected *Adromischus umbraticola* subsp. umbraticola plants in the study area

CO-ORDINATES	NO. OF OBSERVED PLANTS
S26 24.951 E27 30.509	1
S26 24.962 E27 30.539	1
S26 24.956 E27 30.531	3
S26 24.951 E27 30.529	2
S26 24.947 E27 30.525	1
S26 24.942 E27 30.505	2

Based on reviewed literature and data sources, an additional eight flora species that that are known to occur in the region in which the study area is located, are listed as threatened/Near Threatened on the national Red List. These are listed in Table 0-6 **Table 6-7**, along with their conservation statuses, habitat preferences and a 'probability of occurrence', based on findings of habitat suitability assessments.

Although neither species was observed on-site during the field survey, it is noted that suitable habitat is present in the study area for both taxa highlighted by the environmental screening report for the study area, *viz*. *Khadia beswickii* and Sensitive species 1248, refer to **Table 6-7**Table 0-6 for habitat preferences and 'probability of occurrences.

Figure 0-32 - *Aloe vercunda* (Protected, GP)

Protected Flora Species Occurring and Potentially Occurring in the Study Area

Five flora species that are listed as Protected at a provincial level, according to the Gauteng Nature Conservation Ordinance (12 of 1983), were recorded during the 2024 field survey, including *Aloe verecunda*, *Cussonia paniculata*, *Crinum graminicola, Protea caffra* and *Scadoxus puniceus* (Refer to **Figure 0-32** to **Figure 0-34**).

During their field work, Ekotrust (2023) recorded one additional provincially Protected taxon *viz., Gladiolus permeabilis.* Reviewed literature indicates that several other provincially protected flora species may occur in the study area. These are listed in **Table 6-8**Table 0-7.

No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the study area.

Figure 0-33 - *Scadoxus puniceus* (Protected, GP)

Figure 0-34 - *Crinum graminicola* (Protected, GP)

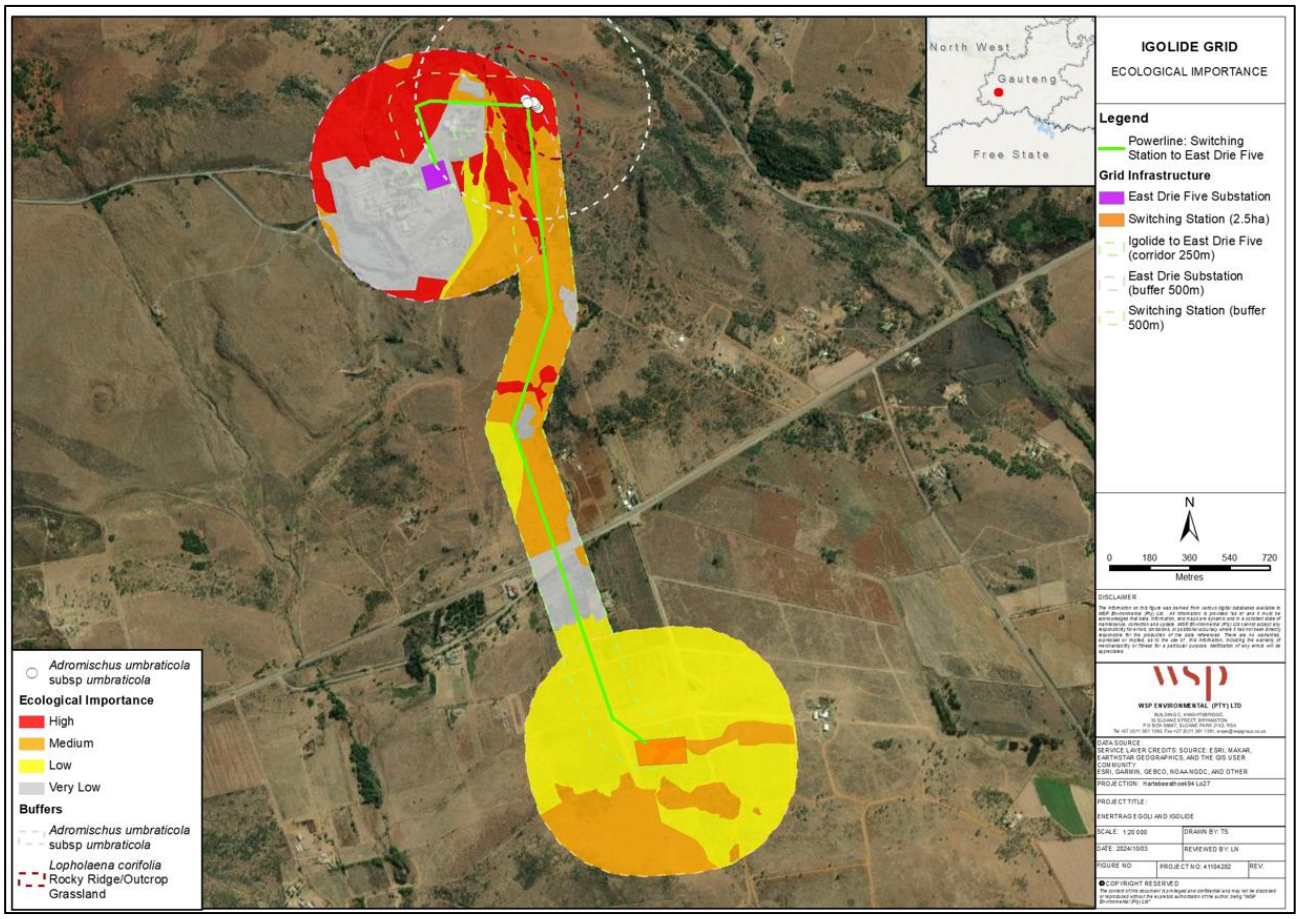

Figure 0-35 - Site Ecological Importance of the study area. The observed locations of the suspected *Adromischus umbraticola* subsp. umbraticola plants (white dots) are shown, along with a 500 m (white dotted line) and a 100 m buffer (red dotted line)

Table 0-7 - Regionally or provincially threatened and Near Threatened flora species that occur or potentially occurring in the study area

FAMILY	SCIENTIFIC NAME	REGIONAL RED LIST STATUS	GAUTENG STATUS	HABITAT PREFERENCES	PROBABILITY OF OCCURRENCE
Aizoaceae	*Khadia beswickii*	Vulnerable	-	Species has an EOO of only 475 km^2 and an AOO of 3-7 km^2. It is known from only ten locations, mostly across Gauteng Province, but also scattered sites in Mpumalanga. Favours open shallow soils, over rocks in grassland (Victor and Pfab, 2005).	Probable –suitable habitat present.
Aizoaceae	*Frithia pulchra*	Rare	Protected	A range-restricted, but locally abundant species, with and EOO estimated at 325 km^2. Favours course, shallow quartzitic soils on sandstone in Gauteng and North West provinces (Pfab *et al*., 2016)	Probable – suitable habitat present.
Aizoaceae	*Lithops lesliei*	Vulnerable	Protected	This species has a widespread distribution, but is experiencing local losses due to urbanisation. This species favours rocky locations in arid grassland habitat (Mtshali, et al., 2023)	Probable – suitable habitat present.
Asphodelaceae	*Kniphofia typhoides*	Near Threatened	Protected	Kniphofia typhoides occurs in the black clay soils of low-lying wetlands and seasonally wet habitats in Themeda triandra grasslands (von Staden and Victor, 2005)	Unlikely – no suitable habitat present.

FAMILY	SCIENTIFIC NAME	REGIONAL RED LIST STATUS	GAUTENG STATUS	HABITAT PREFERENCES	PROBABILITY OF OCCURRENCE
Asteraceae	*Cineraria austrotransvaalensis*	Near Threatened	-	Known from 12 locations across a EOO of 20 000 km^2 spanning Gauteng, Mpumalanga and North West provinces. Occurs amongst rocks beneath trees, or on the edges of bush on steep hills and ridges, between 1400-1700 m (Cron, *et al.,* 2006).	Probable – suitable habitat present.
Asteraceae	*Gnaphalium nelsonii*	Near Threatened	-	Widespread species, with an estimated EOO of 29 356 km^2, but occurs in 10 scattered locations. Favours seasonally wet habitats and dry water courses in grassland and savanna (Von Staden, 2016).	Unlikely – limited suitable habitat present.
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*	Near Threatened	-	Species has an EOO of 14 600 km^2 and is known from 14 locations. Grows in rock crevices on south-facing slope ridges. (Helme and Raimondo, 2006).	Recorded
Hyacinthaceae	*Drimia sanguinea*	Near Threatened	-	This species favours open veld and scrubby woodland across northern South Africa (Willaims, et al., 2008).	Possible – limited suitable habitat present.
-	*Sensitive species 1248*	Vulnerable	-	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes. No EOO for this species is listed, but its AOO is estimated at 30.70 km^2 (SANBI, 2020).	Probable – suitable habitat present.

Table 0-8 - Provincially protected species that occur or potentially occurring in the study area

FAMILY	SCIENTIFIC NAME	REGIONAL RED LIST STATUS	GAUTENG STATUS	FIELD RECORDS
Amaryllidaceae	*Nerine laticoma*	Least Concern	Protected	
Amaryllidaceae	*Scadoxus puniceus*	Least Concern	Protected	Recorded
Amaryllidaceae	*Crinum graminicola*	Least Concern	Protected	Recorded
Apocynaceae	*Brachystelma circinatum*	Least Concern	Protected	
Apocynaceae	*Brachystelma oianthum*	Least Concern	Protected	
Apocynaceae	*Ceropegia rendallii*	Least Concern	Protected	
Apocynaceae	*Orbea lutea*	Least Concern	Protected	
Apocynaceae	*Orbea lutea subsp. lutea*	Least Concern	Protected	
Apocynaceae	*Riocreuxia polyantha*	Least Concern	Protected	
Araliaceae	*Cussonia paniculata subsp. sinuata*	Least Concern	Protected	Recorded
Araliaceae	*Cussonia spicata*	Least Concern	Protected	
Asphodelaceae	*Aloe subspicata*	Least Concern	Protected	
Asphodelaceae	*Aloe transvaalensis*	Least Concern	Protected	
Asphodelaceae	*Aloe verecunda*	Least Concern	Protected	Recorded
Asphodelaceae	*Kniphofia porphyrantha*	Least Concern	Protected	
Colchicaceae	*Littonia modesta*	Least Concern	Protected	

FAMILY	SCIENTIFIC NAME	REGIONAL RED LIST STATUS	GAUTENG STATUS	FIELD RECORDS
Ericaceae	*Erica alopecurus var. alopecurus*	Least Concern	Protected	
Gesneriaceae	*Streptocarpus vandeleurii*	Least Concern	Protected	
Hyacinthaceae	*Eucomis autumnalis subsp. clavata*	Least Concern	Protected	
Hyacinthaceae	*Eucomis montana*	Least Concern	Protected	
Iridaceae	*Babiana bainesii*	Least Concern	Protected	
Iridaceae	*Gladiolus permeabilis*	Least Concern	Protected	Recorded (Ekotrust, 2023)
Iridaceae	*Gladiolus antholyzoides*	Least Concern	Protected	
Iridaceae	*Gladiolus crassifolius*	Least Concern	Protected	
Nymphaeaceae	*Nymphaea nouchali var. caerulea*	Least Concern	protected	
Orchidaceae	*Bonatea antennifera*	Least Concern	Protected	
Orchidaceae	*Disperis micrantha*	Least Concern	Protected	
Orchidaceae	*Eulophia hians var. hians*	Least Concern	Protected	
Orchidaceae	*Eulophia ovalis var. ovalis*	Least Concern	Protected	
Orchidaceae	*Habenaria galpinii*	Least Concern	Protected	
Orchidaceae	*Orthochilus leontoglossa*	Least Concern	Protected	
Proteaceae	*Protea caffra*	Least Concern	Protected	Recorded

Declared Alien Invasive Species

Fifteen NEMBA declared alien invasive species (AIS) were recorded in the study area during the field visit. These are listed in **Table 0-9** along with their growth form and NEMBA category. Also listed in **Table 0-9** are an additional 16 declared AIS that were recorded by Ekotrust (2023).

Table 0-9 - Declared alien invasive species recorded in the study area

SCIENTIFIC NAME	COMMON NAME	GROWTH FORM	NEMBA CATEGORY	FIELD VISIT (2024)
Acacia dealbata	Silver Wattle	Tree	2	x
Acacia mearnsii	Black Wattle	Tree	2	x
Acacia melanoxylon	Australian Blackwood	Tree	2	x
Argemone ochroleuca	White-flowered Mexican Poppy	Herbaceous forb	1b	
Araujia sericifera	Moth Catcher	Herbaceous forb	1b	
Campuloclinium macrocephalum	Pompom Weed	Herbaceous forb	1b	
Cestrum parqui	Chilean cestrum	Tree	1b	
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b	x
Cuscuta campestris	Common Dodder	Parasitic plant	1b	
Cortaderia selloana	Pampas Grass	Graminoid	1b	x
Datura ferox	Large Thorn Apple	Herbaceous forb	1b	
Eucalyptus camaldulensis	Gum	Tree	1b or 2	x
Trichocereus spachianus	Torch Cactus	Succulent Tree	1b	x
Ipomoea purpurea	Morning Glory	Herbaceous forb	1b	x
Melia azedarach	Seringa	Tree	1b	
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b	x
Phytolacca octandra	Forest Inkberry	Herbaceous forb	1b	
Phytolacca dioica	Belhambra	Tree	1b	
Populus canescens	Grey poplar	Tree	2	
Pyracantha angustifolia	Yellow Firethorn	Tree	1b	x
Pyracantha crenulata	Himalayan Firethorn	Tree	1b	
Ricinus communis	Castor-oil Plant	Tree	1b	
Robinia pseudoacacia	Black Locust	Tree	1b	
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b	
Solanum mauritianum	Bugweed	Tree	1b	x
Solanum pseudocapsicum	Jerusalem Berry	Herbaceous forb	1b	x
Solanum sisymbriifolium	Wild Tomato	Herbaceous forb	1b	x
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b	x

SCIENTIFIC NAME	COMMON NAME	GROWTH FORM	NEMBA CATEGORY	FIELD VISIT (2024)
Verbena brasiliensis	Brazilian Verbena	Herbaceous forb	1b	x
Xanthium spinosum	Spiny Cocklebur	Herbaceous forb	1b	
Xanthium strumarium	Large Cocklebur	Herbaceous forb	1b	

Flora of Medicinal Value

Seventeen flora species recorded in the study area have recognised medicinal value. These are listed in **Table 6-10**, accompanied by a description of their purported use, as per Van Wyk et al., (2009).

Table 0-10 - Flora species recorded in the study area that have recognised medicinal value

SCIENTIFIC NAME	MEDICINAL USE*
Asparagus laricinus	Rhizomes and fleshy roots are used for a variety of ailments including tuberculosis, kidney complaints and rheumatism.
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Cotyledon orbiculata	Leaves are applied to warts to remove them, and eaten as a vermifuge.
Elephantorrhiza elephantina	Taken as a remedy for diarrhoea, dysentery, stomach disorders and haemorrhoids.
Gomphocarpus fruticosus	Dried leaves are ground and used as snuff to treat headaches and tuberculosis.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Heteromorpha arborescens	Plant is used to treat tuberculosis, abdominal pains and colic. Also used for mental disorders.
Hilliardiella oligocephala	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Olea europaea	Used to treat high blood pressure and to enhance renal function.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos	Used to treat boils and abscesses and for internal parasites
Rumex crispus	Plant is used to treat internal parasites.
Scadoxus puniceus	Used to treat coughs and gastrointestinal ailments.

SCIENTIFIC NAME	MEDICINAL USE*
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
Vachellia karroo	Barks and leaves used to treat diarrhoea and dysentery. Gum, barks and leaves also used to treat colds and oral thrush.
Zanthoxylum capense	Widely used as a remedy for flatulent colic, stomach ache and fever.
Ziziphus mucronata	Bark and leaves are used as an expectorant in coughs and chest ailments, while roots extracts are used to treat diarrhoea and dysentery.
*Medicinal use, as per Van Wyk, et al. (2009).	

KEY ECOLOGICAL ATTRIBUTES AND PROCESSES

Habitat Corridors, Resources and Refugia

Rocky outcrops and ridges are recognised for their high biodiversity importance, and for their role as landscape corridors, refugia and as critical hydrological features (Pfab, 2001). The combination and interaction of several factors including altitude, aspect, slope, geology, soils, light and hydrological patterns create highly diverse and unique micro-habitats that significantly increase local- and landscape-scale habitat heterogeneity. This in turn, promotes a high degree of both flora and fauna diversity (Pfab, 2001).
In Gauteng Province, rocky ridges are recognised as both biodiversity hotspots and as vital functional habitats for various ecological processes and for many flora and fauna SCC. Indeed, 65% of Gauteng Provinces Red List flora species have been recorded growing on ridges (Pfab, 2001).
It is noted that despite the presence of linear infrastructure, including the N12 Highway, several farm roads/tracks, and numerous farm- and game fences, and patches of modified habitat, the landscape in which the study area is located is characterised by extensive tracts of natural and semi-natural grassland and bushveld habitats. The degree of natural habitat connectivity across the landscape therefore remains high, and this will have a positive effect on maintaining many local flora and fauna communities, including SCC populations.
It is anticipated that the proposed Project is likely to cause some habitat disturbances, which may impact local habitat connectivity through habitat loss and fragmentation.

Dynamic Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on the character of terrestrial vegetation and flora in the study area.

Alien Invasive Species Colonisation

In total, 31 declared NEMBA AIS have been recorded in or adjacent to the study area during the current study or by Ekotrust (2023). AIS have the capacity to spread into areas of natural habitat, where they can potentially shade-out and competitively exclude indigenous flora species, including flora SCC. Both *Acacia dealbata* and *Acacia mearnsii* were observed in the study area and are noted to be particularly aggressive invaders, capable of spreading into adjacent areas of undisturbed habitat.

The spread of alien invasive vegetation is therefore considered a potentially significant driver of change in the study area, and one that is capable of negatively impacting local flora SCC populations. The earthworks, machinery movements and soil disturbances during the construction phase of the proposed project may facilitate AIS colonisation.

Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes.

Wildfires have several key ecological effects on vegetation and flora species. These include *inter alia*: removing moribund vegetation and enhancing plant primary productivity, stimulating germination/ flowering of fire-adapted flora species (e.g., certain orchid species), and, controlling the encroachment of both alien and indigenous woody plant species and weeds into grassland and wetland habitats. Too frequent or intense wildfires can, however, have negative consequences, such as the direct killing of flora species, including SCC, that are poorly adapted to fire.

Fire is considered an important driver of change in the study area. However, it is anticipated that the proposed project is unlikely to impact fire frequency across the study area.

Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and associated trampling by large ungulates are common causes of dryland degradation. Both occur when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that can be linked to selective overgrazing, at least in part, is a change in plant species composition. In grassland and savanna habitats, this typically manifests as decreases in palatable grass species abundances, overall species richness, and primary productivity.

Trampling can damage individual plants, resulting in a reduction in vegetive cover and associated increases in erosion. Herbivore grazing and trampling is therefore considered an important ecosystem driver, that can impact vegetation dynamics and the viability of local flora SCC populations.

Evidence of both cattle and game grazing were noted in the study area and are likely to be important local drivers of change. This notwithstanding, it is anticipated that the proposed project is unlikely to impact herbivore grazing patterns across the study area.

ANALYSIS OF SITE ECOLOGICAL IMPORTANCE

The site ecological importance (SEI) of identified habitat units in the study area were assessed using the SANBI (2020) protocol (refer to Section 3.7 and Appendix B for the methodology of the specialist study). The results of the assessment are presented in **Table 0-11** and illustrated **Figure 0-35**.
Also shown in **Figure 0-35** are the locations of the observed *Adromischus umbraticola* subsp. *umbraticola* plants, and both a 500 m buffer and a 100 m buffer.

Table 0-11 - Site Ecological Importance of habitat unit in the study area

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Hyparrhenia hirta – Eragrostis chloromelas Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Migrations still possible across some modified or degraded natural habitat. Several minor and major current negative ecological impacts (=past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW
Moist Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Several minor and major current negative ecological impacts (=earth works, past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW
Lopholaena corifolia Rocky Ridge/Outcrop Grassland	HIGH: Confirmed and highly likely occurrence of CR, EN, VU species (=Adromischus umbraticola subsp. umbraticola, NT).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Mixed Rocky Grassland	MEDIUM: Confirmed or highly likely occurrence of NT, CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts (=alien invasive flora, past cultivation) with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM
Vachellia karroo – Senegalia caffra Bushveld	MEDIUM: Highly likely populations of SCC or range-restricted species. >50% of receptor contains natural habitat to support SCC	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Mixed Rocky Ridge Bushveld	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Transformed and Degraded Sites	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality	VERY LOW

TERRESTRIAL ANIMAL SPECIES

The following is extracted from the Animal Species Assessment by Hawkhead Consulting and included as Error! Reference source not found..

MAMMALS

Mammal Species Richness and Habitat Availability

In their study, Ekortrust (2023) recorded 23 mammal species based on landowner reports and visual observations (listed in **Table 0-12**). During the 2024 survey, six mammal species were recorded in the study area (**Table 0-12**), including two species not recorded by Ekotrust (2023), namely the Jameson's Red Rock Rabbit (*Pronolagus randensis*) and a Rock Sengi (probably the Eastern Rock Sengi *Elephantulus myurus*). **Figure 0-36** and **Figure 0-37** showing photographs of some of the evidence of mammal presence documented in the study area during the 2024 field survey.

A large proportion of the mammal species listed in **Table 0-12** are medium-sized and large ungulates that are part of managed game populations and are not free roaming. Up to 78 mammal species, most of which are free-roaming, potentially occur in the region. Considering the availability of suitable and variable habitat on-site, and across the surrounding landscape, it is anticipated that several additional mammal species may therefore be present in the study area.

Table 0-12 - Mammal species recorded in the study area

			RECORDS	
FAMILY	SCIENTIFIC NAME	COMMON NAME	EKOTRUST (2023)	FIELD SURVEY (2024)
Bovidae	*Aepyceros melampus melampus*	Impala	x	x
Bovidae	*Tragelaphus oryx*	Eland	x	x
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	x	
Bovidae	*Antidorcas marsupialis*	Springbok	x	
Bovidae	*Connochaetes gnou*	Black Wildebeest	x	
Bovidae	*Connochaetes taurinus taurinus*	Blue Wildebeest	x	
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	x	
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*	Common Waterbuck	x	
Bovidae	*Oryx gazella*	Gemsbok	x	
Bovidae	*Raphicerus campestris*	Steenbok	x	
Bovidae	*Redunca fulvorufula fulvorufula*	Mountain Reedbuck	x	

			RECORDS	
FAMILY	SCIENTIFIC NAME	COMMON NAME	EKOTRUST (2023)	FIELD SURVEY (2024)
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	x	
Canidae	*Canis mesomelas*	Black-backed Jackal	x	
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	x	
Equidae	*Equus quagga*	Plains Zebra	x	
Felidae	*Caracal caracal*	Caracal	x	
Giraffidae	*Giraffa giraffa giraffa*	Giraffe	x	
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	x	x
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	x	
Leporidae	*Lepus saxatilis*	Scrub Hare	x	x
Leporidae	*Pronolagus randensis*	Jameson's Red Rock Rabbit		x
Macroscelididae	*Elephantulus myurus*	Eastern Rock Sengi		x
Sciuridae	*Xerus inauris*	Cape Ground Squirrel	x	
Suidae	*Phacochoerus africanus*	Warthog	x	

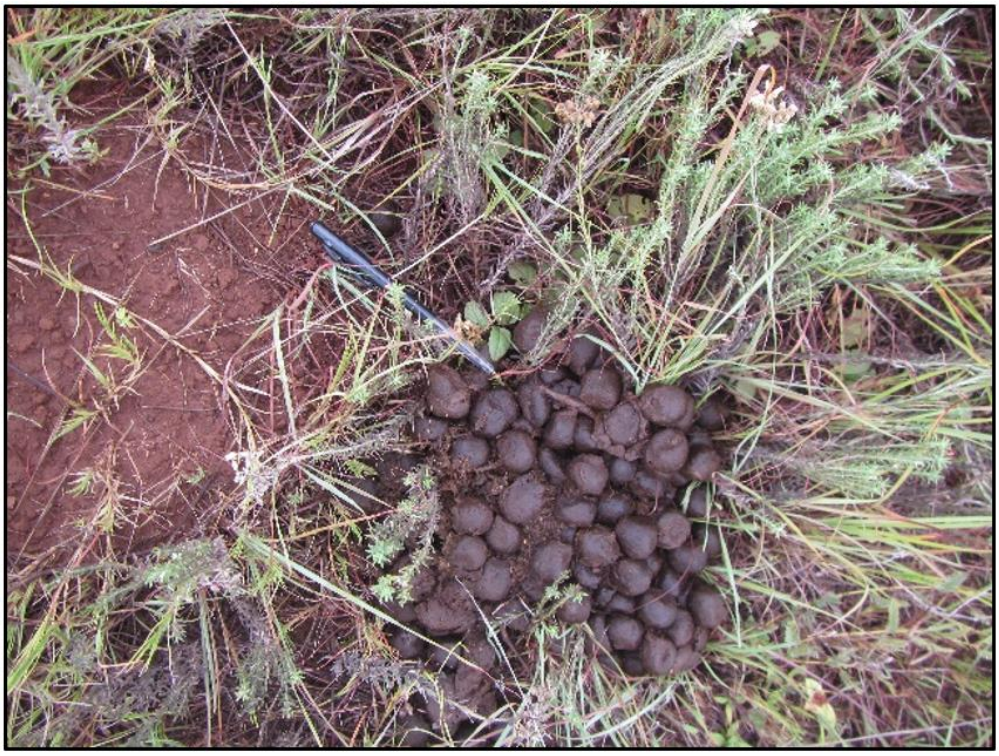

Figure 0-36 - Eland (*Tragelaphus oryx*)

Figure 0-37 - Jameson's Red Rock Rabbit (*Pronolagus randensis*)

Mammal Species of Conservation Concern

No mammal SCC were recorded in the study area during the 2024 field survey. Ekotrust (2023) however, documented one threatened taxon (*viz*., the Mountain Reedbuck *Redunca fulvorufula fulvorufula*) and one protected taxon (Black Wildebeest *Connochaetes gnou*) – based on anecdotal evidence.

The web-based screening tool highlighted the Maquassie Musk Shrew (*Crocidura maquassiensis*) and the Spotted-necked Otter (*Hydrictis maculicollis*) as a potential sensitive feature for the study area.

Reviewed literature and datasets indicate that an additional 28 mammal SCC potentially occur in the study area. These are listed in **Table 0-13**, along with their national and provincial conservation statuses, habitat preferences and a 'probability of occurrence', based on field observations and/or habitat suitability assessments. It is noted that a number of mammal taxa recorded by Ekotrust (2023) are listed as Protected at a provincial level, according to Gauteng's Nature Conservation Ordinance (12 of 1983).

Mountain Reedbuck

The Mountain Reedbuck is listed as Endangered on the regional Red List. This medium-sized grazing antelope favours rolling grassy hillsides and mountain slopes above 1 500 m. Mountain Reedbuck are territorial and gregarious, and found in small herds ranging from 3 to 6 individuals. The estimated regional population size of Mountain Reedbuck is between 10 217 and 13 669 mature individuals, with purported densities in protected areas ranging from 10 to 1 150 individuals per 100 km^2. It is noted that no data are cited for private agriculture land. Moreover, no data are available on the EOO or AOO of this species. The primary threats to Mountain Reedbuck include poaching, increased natural predation, and disturbances from cattle herders and livestock. This species was reported by Ekotrust (2023) but was not observed during the current study.

Black Wildebeest

The Black Wildebeest is a large antelope species that occurs in open grassland plains and arid shrubland. Historically, this species was hunted close to extinction, however it has recovered significantly over the last several decades, and recent population estimates indicate that its population size could be around 9 564 - 11 158 individuals. Accordingly, the Black Wildebeest is listed as Least Concern on the national mammal Red List, but it is listed as protected on the NEMBA ToPS (2007) List. Black Wildebeest was reported by Ekotrust (2023). It is expected that local populations are part of actively farmed herds and are not free roaming.

Maquassie Musk Shrew

Maquassie Musk Shrew (Vulnerable) is a rare shrew species. The EOO is estimated at 284 735 km^2; however, it is thought to be patchily distributed and, based on its preference for wetland habitats, its AOO is inferred at between 40 496 to 47 246 km^2 and 1 790-2 089 km^2 (based on a 500 and 32 m buffer around wetland habitat, respectively). The population size of Maquassie Musk Shrew is estimated at 179 000 individuals. This species appears to favour moist grassland habitats in savanna and grassland ecosystems. Limited suitable and undisturbed habitat is present in the study area. It is therefore considered unlikely that Maquassie Musk Shrew is present.

Spotted-necked Otter

Spotted-necked Otter is listed as Vulnerable on the regional Red List. This species has a widespread distribution, but is restricted to areas of permanent, large open-water bodies. The estimated range of Spotted-necked Otter totals 31 407 km of river, resulting in an estimated population size (taking into account both undisturbed and disturbed river habitats), of 17 117 individuals. There is no suitable habitat for Spotted-necked Otter in the study area, and therefore it is unlikely that this species is present.

Table 0-13 - Mammal species of conservation concern occurring or potentially occurring in the study area.

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIONAL RED LIST STATUS (2016)	NEMBA TOPS LIST (2007)	GAUTENG PROTECTED STATUS	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern	-	Protected	Open savanna and woodland.	Recorded (Ekotrust, 2023).
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern	Protected	Protected	Open grassland plains and arid shrubland.	Recorded (Ekotrust, 2023).
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*	Common Waterbuck	Least Concern	-	Protected	Associated with riparian habitats in savanna and woodlands.	Recorded (Ekotrust, 2023).
Bovidae	*Tragelaphus oryx*	Eland	Least Concern	-	Protected	Wide range of habitats, from desert to woodland savanna and montane grassland.	Recorded (Ekotrust, 2023).
Bovidae	*Pelea capreolus*	Grey Rhebok	Near Threatened	-	Protected	Sourveld grassland and scrubland in hills and mountainous areas.	Possible – suitable habitat present.
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern	-	Protected	Range of habitats, including grassland and savanna.	Recorded (Ekotrust, 2023).
Bovidae	*Redunca arundinum*	Southern Reedbuck	Least Concern	Protected	Protected	Savanna and grassland habitats in mountainous areas.	Possible – suitable habitat present.

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIONAL RED LIST STATUS (2016)	NEMBA TOPS LIST (2007)	GAUTENG PROTECTED STATUS	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Bovidae	*Redunca fulvorufula fulvorufula*	Mountain Reedbuck	Endangered	-	Protected	Rolling grassy hillsides and mountain slopes.	Recorded (Ekotrust, 2023).
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Protected	-	Range of habitats, including grassland and arid savanna.	Possible – suitable habitat present.
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	Near Threatened	-	-	Sandy soils in grassland areas.	Unlikely – limited suitable habitat present.
Chrysochloridae	*Chrysospalax villosus*	Rough-haired Golden Mole	Vulnerable	Critically Endangered	-	Sandy soils in grassland areas.	Unlikely – limited suitable habitat present
Equidae	*Equus quagga*	Plains Zebra	Least Concern	-	Protected	Open grassland and savanna.	Recorded (Ekotrust, 2023).
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	Near Threatened	Protected	Protected	Range of habitats, including grassland and savanna.	Probable – suitable habitat present.
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable	Protected	-	Open short grass areas in savanna and grassland habitats.	Possible – suitable habitat present.
Felidae	*Leptailurus serval*	Serval	Near Threatened	Protected	-	Wetland, tall grassland and well-watered savanna habitats.	Possible – suitable habitat present.

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIONAL RED LIST STATUS (2016)	NEMBA TOPS LIST (2007)	GAUTENG PROTECTED STATUS	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Felidae	*Acinonyx jubatus*	Cheetah	Vulnerable	-	-	Occurs in a wide-range of habitats including savanna, grassland, thicket and karoo shrublands.	Unlikely – suitable habitat present, but a persecuted species.
Felidae	*Panthera pardus*	Leopard	Vulnerable	Vulnerable	-	Wide range of habitats, including grassland and savanna.	Unlikely – suitable habitat present, but a persecuted species.
Hipposideridae	*Cloeotis percivali*	Short-eared Trident Bat	Endangered	-	-	Savanna and woodland habitats, with caves or mine adits present.	Possible – suitable habitat present
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	Near Threatened	Protected	Protected	Savanna and grassland habitats.	Unlikely – suitable habitat present, but a persecuted species.
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern	-	Protected	Savanna and grassland habitats.	Possible – suitable habitat present
Muridae	*Dasymys robertsii*	Robert's Marsh Rat	Vulnerable	-	-	Moist grassland and wetland habitats.	Unlikely – limited suitable habitat present
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Protected	-	Riparian habitats, with permanent water.	Unlikely – no suitable habitat present

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIONAL RED LIST STATUS (2016)	NEMBA TOPS LIST (2007)	GAUTENG PROTECTED STATUS	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable	Protected	-	Riparian habitats, favouring large, open water bodies.	Unlikely – no suitable habitat present
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern	Protected	-	Savanna and grassland habitats	Probable – suitable habitat present
Nesomyidae	*Mystromys albicaudatus*	White-tailed Rat	Vulnerable	-	-	Grassland habitats, as well as succulent karoo and fynbos.	Possible – suitable habitat present
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern	-	Protected	Savanna and grassland habitats.	Probable – suitable habitat present
Soricidae	*Crocidura maquassiensis*	Maquassie Musk Shrew	Vulnerable	-	-	Moist grassland habitats in savanna and grassland ecosystems.	Unlikely – limited suitable habitat present
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened	-	-	Reedbeds, wetlands and thick moist grassland in riverine habitats.	Unlikely – limited suitable habitat present
*Habitat preferences as per Stuart and Stuart (2007) and Child et al., (2016).							

BIRDS

Bird Species Richness and Habitat Availability

A separate Avifaunal Specialist Assessment has been undertaken for the proposed Project. This section therefore provides only a high-level characterisation of bird species, and specifically SCC potentially occurring on-site.

The study area is not located within an Important Bird Area (IBA), but the region has a rich bird assemblage. Data retrieved from SABAP 2 for the pentads encompassing the study area indicates that 315 bird species have previously been recorded.

Bird Species of Conservation Concern

Based on the SABAP 2 records, 16 bird species that have previously been documented in the landscape surrounding the study area are of conservation concern. These are listed in **Table 6-14**, along with their national conservation status, habitat preferences and a 'probability of occurrence' - based on field observations or habitat suitability assessments.

The national web-based screening tool highlighted the African Grass Owl (*Tyto capensis*) and the White-bellied Bustard (*Eupodotis senegalensis*) as potentially sensitive features for the study area. These are discussed in more detail below:

African Grass Owl

African Grass Owl is listed as Vulnerable on the regional bird Red List and on the NEMBA ToPS List (2007). This species occurs in central, east and southern Africa. The regional population estimate for African Grass Owl is between 2 500-7 500 mature individuals. The AOO is estimated at 3 153.92 km^2. This species occurs in tall rank grassland and short dense grassland, where it typically favours stands of *Imperata cylindrica* and *Cyperus* species as nesting sites. No suitable habitat is present in the study area, and it is therefore unlikely that African Grass Owl is present.

White-bellied Bustard

The White-bellied Bustard is listed as Vulnerable on the regional bird Red List. It is patchily distributed across West Africa and eastern South Africa and has a AOO of 67 249 km^2. White-bellied Bustard favours tall dense grassland and occasionally ecotones between savanna and fynbos. It has also been known to occur in cultivated grass pastures and recently harvested crop fields. In suitable habitat it has an estimated population density of 2-2.5 birds per km^2. Suitable habitat is present in the study area, and it is therefore probable that White-bellied Bustard is present.

Table 0-14 - Bird species of conservation concern recorded / potentially occurring in the study area

FAMILY	SCIENTIFIC NAME	COMMON NAME	REGIONAL RED LIST (2015)	NEMBA TOPS LIST (2007)	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Accipitridae	*Circus maurus*	Black Harrier	Endangered	-	Riparian and wetland habitats.	Unlikely – limited suitable habitat present.
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	Endangered	-	Range of habitats, including savanna.	Possible – suitable habitat present.
Accipitridae	*Aquila verreauxii*	Verreaux's Eagle	Vulnerable	-	Mountainous and rocky habitats.	Possible – suitable habitat present.
Accipitridae	*Gyps coprotheres*	Cape Vulture	Endangered	Endangered	Savanna and grassland habitats.	Possible – suitable habitat present.
Anatidae	*Oxyura maccoa*	Maccoa Duck	Near Threatened	-	Deep water bodies with emergent vegetation.	Unlikely – limited suitable habitat present.
Ciconiidae	*Ciconia abdimii*	Abdims Stork	Near Threatened	-	Range of habitats including grassland and cultivated fields.	Possible – suitable habitat present.
Ciconniidae	*Mycteria ibis*	Yellow-billed Stork	Endangered	-	Seasonal and permanent wetland habitats	Unlikely – no suitable habitat present
Coraciidae	*Coracias garrulus*	European Roller	Near Threatened	-	Open woodland.	Probable – suitable habitat present.
Falconidae	*Falco biarmicus*	Lanner Falcon	Vulnerable	-	Range of habitats, including open grassland and savanna.	Probable – suitable habitat present.

FAMILY	SCIENTIFIC NAME	COMMON NAME	REGIONAL RED LIST (2015)	NEMBA TOPS LIST (2007)	HABITAT PREFERENCES*	PROBABILITY OF OCCURRENCE
Falconidae	*Falco naumanni*	Lesser Kestrel	Least Concern	Vulnerable	Favours wooded habitats, but has been recorded in croplands.	Probable – suitable habitat present.
Falconidae	*Falco peregrinus*	Peregrine Falcon	Least Concern	Vulnerable	Favour mountainous and riparian habitats, close to cliffs.	Possible – suitable habitat present.
Glareolidae	*Glareola nordmanni*	Black-winged Pratincole	Near Threatened	-	Grassland and wetland habitats.	Possible – suitable habitat present.
Otididae	*Eupodotis senegalensis*	White-bellied Bustard	Vulnerable	-	Tall dense grassland and savanna.	Probable – suitable habitat present.
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	Near Threatened	-	Shallow wetland habitats and saltpans.	Unlikely – no suitable habitat present.
Sagittariidae	*Sagittarius serpentarius*	Secretarybird	Vulnerable	-	Open grassland and scrub with scattered trees.	Probable – suitable habitat present.
Tytonidae	*Tyto capensis*	African Grass Owl	Vulnerable	Vulnerable	Tall rank grassland and short dense grassland.	Unlikely – no suitable habitat present
*Source: Habitat preferences as per Roberts VII Multimedia App. and Taylor, et al., (2015)						

HERPETOFAUNA

Herpetofauna Richness and Habitat Availability

The distribution maps presented in Du Preez and Carruthers (2009) and Bates et al., (2014) indicate that up to 18 amphibian- and 57 reptile species are known from the region in which the study area is located (listed in Appendix E).
Virtual Museum records (i.e., FrogMAP and ReptileMAP) indicate that only four amphibian species and 21 reptile species have been recorded in the 2627BC QDS. The low amphibian count is likely due to under-sampling / reporting. The taxa documented for the QDS on the Virtual Museum database are common species, with generally widespread distributions.
Considering the availability of suitable habitat, it is expected that several herpetofauna taxa are likely to be present in the study area.

Herpetofauna Species of Conservation Concern

Of herpetofauna potentially occurring in the study area, one amphibian and one reptile SCC potentially occur on-site, namely the Giant Bullfrog (*Pyxicephalus adspersus*) and the South African Rock Python (*Python natalensis*) – these are discussed below:

Note: All reptile species, excluding all snakes and the two *Varanus* species, are protected in Gauteng Province, according to Nature Conservation Ordinance.

Giant Bullfrog

The Giant Bullfrog is not listed as threatened on regional Red List, but it is listed as Protected on the NEMBA ToPs list (2007) and on the Gauteng Nature Conservation Ordinance (12 of 1983). This species inhabits seasonally shallow pans, wetland and rained-filled depressions in savanna and grassland ecosystems (Du Preez and Carruthers, 2009). There is limited such habitat present in the study area, and it is therefore unlikely that Giant Bullfrog are present.

South African Rock Python

The Southern African Rock Python is also not listed as threatened on regional Red List, but it is listed as Protected according to both the NEMBA ToPS list (2007) and the Gauteng Nature Conservation Ordinance (12 of 1983). This species is endemic to the southern half of Africa, and occurs in a wide variety of habitats but generally favours riverine and rocky areas (Alexander, 2017). Rocky wooded habitat is present in the study area, and it is therefore probable that Southern African Rock Python are present.

INVERTEBRATES OF CONSERVATION CONCERN

Potchefstroom Blue

The Potchefstroom Blue is a butterfly species that is listed as Rare in South Africa, and is endemic to the country. It is a habitat specialist that is known from only a few locations across an EOO of 93 799 km2 (Dobson & Dobson, 2018). This species favours rocky areas in grassland, where it is dependent on the presence of the larval host plant *Ocimum obovatum*, and potentially also a host ant, viz., *Camponotus* species (Dobson & Dobson, 2018). The Potchefstroom Blue thrives in grasslands subject to annual winter fires (Dobson & Dobson, 2018). *Ocimum obovatum* was not recorded on-site, but it is considered possible that the Potchefstroom Blue is present in the study area.

Highveld Nimble Blue

The Highveld Nimble Blue is listed as Endangered on the regional Red List. This is a range-restricted habitat-specialist species known from Gauteng, Free State and North-West provinces. It has a EOO of 1336 km^2 and an AOO of 44 km^2, and is known from only four locations. Preferred habitat for the Highveld Nimble Blue is rocky grassed south-facing slopes, between 1500 m and 1750 m. Like the Potchefstroom Blue, the host plant for this species is *Ocimum obovatum* and it is also dependent on a host ant. *Ocimum obovatum* was not recorded on-site, and but it is possible that the Highveld Nimble Blue is present in the study area.

Uvarov's Clonia

This species is listed as Vulnerable. It is endemic to the South African highveld, and has only been recorded in Gauteng and the North-West Province, where it known from only five locations. It's EOO is small and estimated at approximately 5 000 km^2. No population data are available. *Uvarov's Clonia* favours tall woodland and savanna. Limited tall woodland is available in the study area, and it is therefore considered unlikely that it is present in the study area.

Golden Star-dust Baboon Spider

This species is listed as protected at a provincial level, according to Gauteng Nature Conservation Ordinance (12 of 1983) and at a national level, according to the NEMBA ToPS (2007) List. According to the distribution maps in Dippenaar-Schoeman (2014) is known from grassland and savanna habitats. It is therefore probable that the Golden Star-dust Baboon Spider is present in the study area.

KEY ECOLOGICAL ATTRIBUTES AND PROCESSES

Habitat Corridors, Resources and Refugia

Rocky outcrops and ridges are recognised for their high biodiversity importance, and for their role as landscape corridors, refugia and as critical hydrological features. The combination and interaction of several factors including altitude, aspect, slope, geology, soils, light and hydrological patterns create highly diverse and unique micro-habitats that significantly increase local- and landscape-scale habitat heterogeneity. This in turn, promotes a high degree of both flora and fauna diversity.

In Gauteng Province, rocky ridges are recognised as both biodiversity hotspots and as vital functional habitats for various ecological processes and for many flora and fauna SCC.

It is noted that despite the presence of linear infrastructure, including the N12 Highway, several farm roads/tracks, and numerous farm- and game fences, and patches of modified habitat, the landscape in which the study area is located is characterised by extensive tracts of natural and semi-natural grassland and bushveld habitats. The degree of natural habitat connectivity across the landscape therefore remains high, and this will have a positive effect on maintaining many local fauna communities, except probably larger taxa (e.g., antelope) that are likely to be restricted by game fences.

It is anticipated that the proposed Project is likely to cause some habitat disturbances, which may impact local habitat connectivity through habitat loss and fragmentation.

Dynamic Ecological processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on terrestrial fauna and in particular SCC.

Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in savanna and grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfire's have several key ecological effects with respects to fauna, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores;
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for fauna populations. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences), and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources.

The study area comprises grassland and savanna habitats that is likely to be maintained by frequent burning during the dry season. Fire is therefore considered an important driver of change in the study area. It is anticipated that the proposed project is unlikely to impact fire frequency across the study area.

Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation. Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland and savanna habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity, which can negatively affect local fauna communities. Excessive cattle grazing and trampling can also cause soil erosion and gulley formation, and modify and homogenise vegetation structure, which can potentially impact sensitive fauna species that have specific life-cycle habitat requirements.

Evidence of both cattle and game grazing were noted in the study area and are likely to be important local drivers of change. This notwithstanding, it is anticipated that the proposed project is unlikely to impact herbivore grazing patterns across the study area.

ANALYSIS OF SITE ECOLOGICAL IMPORTANCE

The site ecological importance (SEI) of identified habitat units for fauna in the study area were assessed using the SANBI (2020) protocol. The results of the assessment are presented in **Table 0-15 and** shown in **Figure 0-38**.

Table 0-15 - Site Ecological Importance of habitat unit in the study area

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Hyparrhenia hirta – Eragrostis chloromelas Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Migrations still possible across some modified or degraded natural habitat. Several minor and major current negative ecological impacts (=past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality.	LOW
Moist Grassland	LOW: No confirmed or highly likely populations of SCC or range-restricted species. Limited potential to support SCC.	LOW: Several minor and major current negative ecological impacts (=earth works, past cultivation).	LOW	HIGH: Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality	LOW

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Lopholaena corifolia Rocky Ridge/Outcrop Grassland	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Mixed Rocky Grassland	MEDIUM: Confirmed or highly likely occurrence of NT, CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts (=alien invasive flora, past cultivation) with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Vachellia karroo – Senegalia caffra Bushveld	MEDIUM: Highly likely populations of SCC or range-restricted species. >50% of receptor contains natural habitat to support SCC	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	MEDIUM	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	MEDIUM
Mixed Rocky Ridge Bushveld	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species.	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH

HABITAT UNIT	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Transformed and Degraded Sites	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remains.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality.	VERY LOW

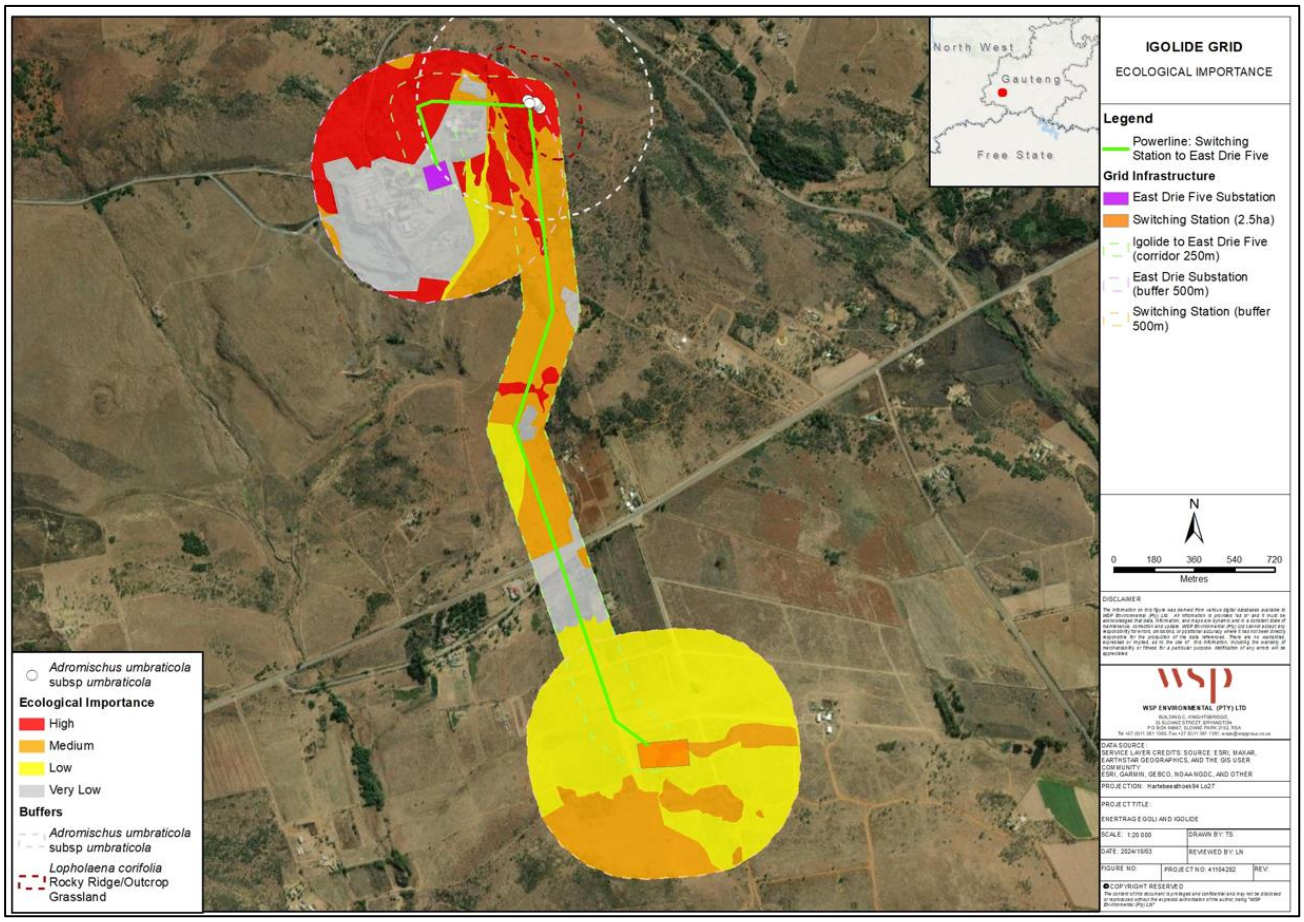

Figure 0-38 - Site Ecological Importance of the study area

AVIFAUNA

The following is extracted from the Animal Species Assessment by WSP Group Africa and included as ***Appendix G.7.***

BIOMES AND VEGETATION TYPES

The Project Area of Influence (PAOI) is situated along an ecotone between the Savanna and Grassland Biomes but falls mainly within the Grassland Biome (**Figure 0-39**). According to the 2018 SANBI Vegetation Map, the PAOI falls within the Central Bushveld Bioregion (northern half of PAOI) and the Mesic Highveld Grassland Bioregion (southern half of PAOI). The natural vegetation at the PAOI consists predominantly of Gauteng Shale Mountain Bushveld and Rand Highveld Grassland (**Figure 0-40**).

The typical landscape associated with Rand Highveld Grassland is highly variable, containing extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most of the grasses on the plains belong to the *genera Themeda, Eragrostis*, *Heteropogon* and *Elionurus*. A high diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges consist of open woodlands with *Protea caffra* subsp. *caffra*, *Protea welwitschii*, *Senegalia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* is most prominent. The Gauteng Shale Mountain Bushveld is represented by woody vegetation and a grass dominated herbaceous layer. Depending on local conditions, trees form semi-open to closed thickets or woodlands, and can range

from short deciduous bush cover to a medium-tall +5m tree cover of mostly *Senegalia* sp. and *Vachellia* sp. trees.

The First Southern African Bird Atlas Project (SABAP1) recognises six primary vegetation divisions (biomes) within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest. The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. Using this classification system, the natural vegetation in the PAOI is classified as Grassland.

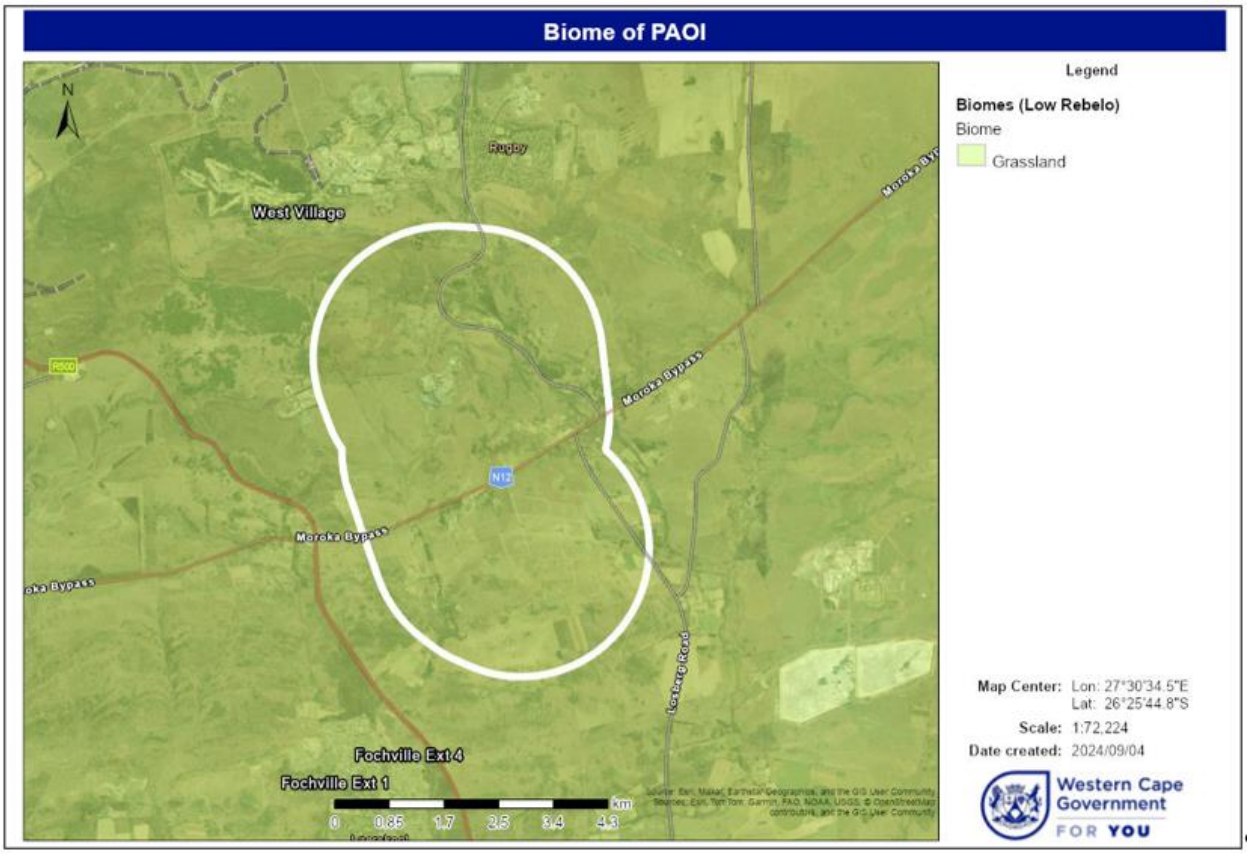

Figure 0-39 - The Igolide WEF Electrical Grid Infrastructure PAOI (outlined in white) falls within the Grassland Biome

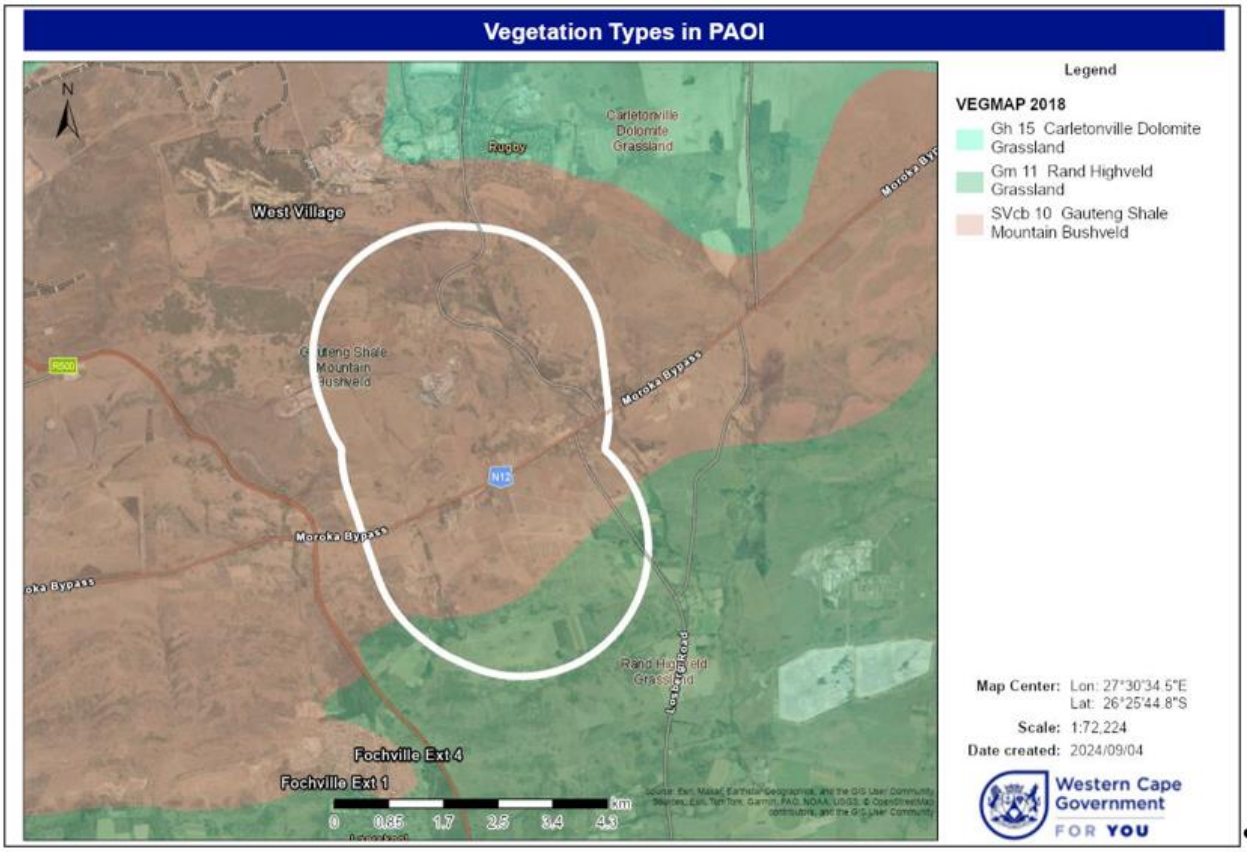

Figure 0-40 - Vegetation Map of the Igolide WEF Electrical Grid Infrastructure PAOI (outlined in white)

HABITAT CLASSES AND LAND-USE WITHIN THE PAOI

Natural Grassland

This habitat feature is described above under **Section 0** (**Figure 0-41**).

Disturbed Grassland

The PAOI contains fallow land and old agricultural fields that have converted back to grassland. Vegetative composition is generally characterised by lower cover and is comprised of pioneer grass, forbs, and other herbaceous plant species. Avian use is generally limited to habitat generalist species. EGI sensitive species that could utilise this habitat are listed in **Table 0-16**.

Figure 0-41 - Natural Grassland habitat within the PAOI

Figure 0-42 - Disturbed grassland habitat within the PAOI

Open Woodland

The PAOI contains Gauteng Shale Mountain Bushveld which is represented by woody vegetation (trees and shrubs) and a grass-dominated herbaceous layer (**Figure 0-43**). Depending on local conditions, trees form semi-open to closed thickets or woodlands, and can range from short deciduous bush cover to a medium-tall *Senegalia sp*. and *Vachellia sp*. trees.

Figure 0-43 - Open woodland habitat within the PAOI

Drainage Lines and Wetlands

Drainage lines and wetlands are important habitats, especially for several EGI sensitive species. Raptors may also use these areas to hunt other bird species and the African Grass Owl could potentially be attracted to some of the grass in the wetland areas. There are drainage lines with associated wetlands and farm dams that transect the PAOI. The Broader Area also contains several drainage lines, seeps, and wetlands (**Figure 0-44**). EGI sensitive species that could utilise this habitat are listed in **Table 0-16**.

Figure 0-44 - Drainage line within the PAOI

Dams

Surface water is important to several avifauna for drinking, bathing, and foraging. There are six dams located within or near the PAOI (**Figure 0-45**).

Figure 0-45 - Large dam near the PAOI

Agriculture

Agricultural activity present within the PAOI comprises cultivated commercial annuals crops, predominately dedicated towards planted pastures (**Figure 0-46**). Avian species richness in these areas is likely to be low. However, periods of ploughing, seeding, and harvesting are likely to create foraging opportunities for certain avian species. EGI sensitive species that could utilise this habitat are listed in **Table 0-16**.

Figure 0-46 - Large dam near the PAOI

High Voltage Power lines

High voltage (HV) power lines are present within the northern section of the PAOI (**Figure 6.47**). Birds often use HV power lines as perching and/or roosting sites, and some birds may even construct their nests on HV power line structures (e.g., Pied Crow). EGI sensitive species that could utilise this habitat are listed in **Table 0-16**.

Figure 0-47 - High voltage overhead power lines within the PAOI

PROTECTED AREAS IN/AROUND THE PAOI

Important Bird Areas (IBAs)

The PAOI does not fall within an Important Bird Area (IBA). The closest IBA, the Suikerbosrand Nature Reserve (SA022), lies 63km east of the Igolide WEF Electrical Grid Infrastructure PAOI. It is not expected that the avifauna in the Suikerbosrand Nature Reserve (SA022) will be impacted by the development due to the distance from the PAOI.

National Protected Areas and National Protected Areas Expansion Strategy (NPAES) Focus Areas

The PAOI does not fall within a protected area or an NPAES focus area.

The Renewable Energy Development Zones (REDZ)

The PAOI is not located in a REDZ.

AVIFAUNA WITHIN THE PAOI

A total of 307 species could potentially occur within the Broader Area where the Project Site is located (see Appendix E of the specialist study). Of these, 81 are classified as priority species for EGI developments (i.e. EGI sensitive species). Of the 81 EGI sensitive species, 40 have a medium to high likelihood of regular occurrence within the PAOI. The PAOI was defined as a 2km zone around the proposed EGI.

Of the 81 EGI sensitive species, 18 were recorded during the on-site field surveys. Eleven (11) EGI sensitive species recorded in the Broader Area are also Species of Conservation Concern (SCC). Two (2) SCC were recorded during the on-site surveys, namely Secretarybird (Globally Endangered and Regionally Vulnerable) and Lanner Falcon (Regionally Vulnerable). There is also confirmed habitat for African Grass Owl (Regionally Vulnerable) within the PAOI.

See Appendix E of the specialist study for a list of species potentially occurring within the Broader Area. The likelihood of EGI sensitive species occurring in the PAOI, habitat classes, and potential long-term impacts of the proposed EGI are listed in **Table 0-16** below.

Table 0-16 - EGI sensitive species which could occur in the PAOI, habitat classes within the PAOI, and the potential impacts of the EGI Project on avifauna

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Abdim's Stork	*Ciconia abdimii*	0,00	0,75	-	NT		L	x				x	x						x
African Black Duck	*Anas sparsa*	21,60	1,50	-	-	x	H				x	x							x
African Darter	*Anhinga rufa*	28,31	0,75	-	-		H				x	x							x
African Fish Eagle	*Haliaeetus vocifer*	1,45	0,75	-	-		M				x	x					x		
African Grass Owl	*Tyto capensis*	0,00	0,75	-	VU		L	x			x				x	x	x		x
African Harrier-Hawk	*Polyboroides typus*	0,73	0,75	-	-		L			x		x			x	x	x		
African Hawk-eagle	*Aquila spilogaster*	0,36	0,00	-	-		L			x		x			x		x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
African Sacred Ibis	*Threskiornis aethiopicus*	26,32	3,01	-	-	x	H				x	x	x				x		x
African Spoonbill	*Platalea alba*	7,08	0,75	-	-		M				x	x							x
African Swamphen	*Porphyrio madagascariensis*	6,72	1,50	-	-		M				x	x							
Amur Falcon	*Falco amurensis*	1,63	2,26	-	-	x	M	x	x				x	x	x		x		
Black Harrier	*Circus maurus*	0,18	0,00	EN	EN		L	x							x		x		
Black Heron	*Egretta ardesiaca*	0,73	0,75	-	-		L				x	x							x
Black Kite	*Milvus migrans*	0,00	0,75	-	-		L			x		x	x		x	x	x		
Black Sparrowhawk	*Accipiter melanoleucus*	1,45	0,00	-	-	x	M			x					x	x	x		
Black-chested Snake Eagle	*Circaetus pectoralis*	0,18	0,00	-	-		L	x	x	x		x	x	x	x	x	x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Black-crowned Night Heron	*Nycticorax nycticorax*	2,36	0,75	-	-		L				x	x							x
Black-headed Heron	*Ardea melanocephala*	30,31	1,50	-	-	x	H	x	x		x	x	x				x		x
Black-winged Kite	*Elanus caeruleus*	47,19	13,53	-	-	x	H	x	x	x			x	x	x	x	x		
Blue-billed Teal	*Spatula hottentota*	0,18	0,00	-	-		L				x	x							x
Booted Eagle	*Hieraaetus pennatus*	0,36	0,75	-	-		L	x	x	x		x		x	x		x		
Cape Shoveler	*Spatula smithii*	0,36	0,75	-	-		L				x	x							x
Cape Teal	*Anas capensis*	0,00	0,75	-	-	x	L				x	x							x
Cape Vulture	*Gyps coprotheres*	0,18	0,00	VU	EN		L	x	x	x		x		x	x		x	x	x
Common Buzzard	*Buteo buteo*	7,80	2,26	-	-	x	M	x	x	x		x	x	x	x		x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Common Moorhen	*Gallinula chloropus*	66,79	2,26	-	-		H				x	x							
Egyptian Goose	*Alopochen aegyptiaca*	51,36	4,51	-	-		H				x	x	x	x			x		x
European Honey-buzzard	*Pernis apivorus*	0,91	0,00	-	-		L	x	x				x	x			x		
Gabar Goshawk	*Micronisus gabar*	5,99	0,00	-	-		M	x	x				x	x			x		
Glossy Ibis	*Plegadis falcinellus*	22,69	1,50	-	-		H				x	x							x
Goliath Heron	*Ardea goliath*	0,36	0,75	-	-		L				x	x							x
Great Crested Grebe	*Podiceps cristatus*	0,00	0,75	-	-		L				x	x							x
Great Egret	*Ardea alba*	0,91	0,75	-	-		L				x	x							x
Greater Flamingo	*Phoenicopterus roseus*	0,00	0,75	-	NT		L					x							x

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Greater Kestrel	*Falco rupicoloides*	1,09	0,75	-	-		L	x	x					x	x	x	x		
Grey Heron	*Ardea cinerea*	13,79	0,75	-	-		H				x	x							x
Hadada Ibis	*Bostrychia hagedash*	94,74	14,29	-	-		H	x	x		x	x	x				x		x
Hamerkop	*Scopus umbretta*	19,24	1,50	-	-		H				x	x					x		x
Helmeted Guineafowl	*Numida meleagris*	82,03	14,29	-	-	x	H	x	x				x				x		
Indian Peafowl	*Pavo cristatus*	0,36	1,50	-	-		L		x				x				x		x
Intermediate Egret	*Ardea intermedia*	0,18	0,75	-	-		L				x	x							x
Jackal Buzzard	*Buteo rufofuscus*	0,54	0,75	-	-		L	x	x	x		x	x	x	x	x	x		
Lanner Falcon	*Falco biarmicus*	0,36	0,75	-	VU	x	M	x	x	x		x	x	x	x	x	x		
Lesser Kestrel	*Falco naumanni*	1,27	0,00	-	-		L	x	x				x	x	x		x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Little Egret	*Egretta garzetta*	9,26	0,75	-	-		M				x	x							x
Little Grebe	*Tachybaptus ruficollis*	39,02	1,50	-	-		H				x	x							x
Little Sparrowhawk	*Accipiter minullus*	1,45	0,75	-	-		L	x	x								x		
Long-crested Eagle	*Lophaetus occipitalis*	0,73	0,75	-	-		L	x		x		x		x	x	x	x		
Maccoa Duck	*Oxyura maccoa*	0,00	0,75	EN	NT		L				x	x							x
Mallard	*Anas platyrhynchos*	47,91	0,75	-	-		H				x	x							x
Marsh Owl	*Asio capensis*	1,27	1,50	-	-	x	M	x			x				x	x	x		x
Martial Eagle	*Polemaetus bellicosus*	0,00	0,75	EN	EN		L	x	x	x		x		x	x		x		
Northern Black Korhaan	*Afrotis afraoides*	54,08	4,51	-	-	x	H	x	x						x	x			x

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Ovambo Sparrowhawk	*Accipiter ovampensis*	1,81	0,75	-	-		L			x							x		
Pale Chanting Goshawk	*Melierax canorus*	3,81	0,75	-	-	x	M	x	x	x		x		x	x	x	x		
Pied Crow	*Corvus albus*	57,53	14,29	-	-	x	H		x				x	x			x		
Purple Heron	*Ardea purpurea*	25,77	1,50	-	-		H				x	x							x
Red-billed Teal	*Anas erythrorhyncha*	21,42	1,50	-	-		H				x	x							x
Red-knobbed Coot	*Fulica cristata*	69,33	3,01	-	-		H				x	x							x
Reed Cormorant	*Microcarbo africanus*	66,79	3,76	-	-		H				x	x							x
Rock Kestrel	*Falco rupicolus*	0,36	0,75	-	-		L	x	x					x			x		
Secretarybird	*Sagittarius serpentarius*	0,18	0,00	EN	VU	x	L	x	x	x		x			x	x			x

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Shikra	*Accipiter badius*	0,18	0,75	-	-		L			x	x						x		
South African Shelduck	*Tadorna cana*	4,54	0,75	-	-	x	M				x	x							x
Southern Pochard	*Netta erythrophthalma*	0,36	0,75	-	-		L				x	x							x
Spotted Eagle-Owl	*Bubo africanus*	11,98	0,75	-	-	x	H	x	x	x		x	x		x	x	x		x
Spur-winged Goose	*Plectropterus gambensis*	19,24	0,75	-	-		H				x	x	x						x
Squacco Heron	*Ardeola ralloides*	3,45	0,75	-	-		L				x	x							x
Striated Heron	*Butorides striata*	2,72	0,00	-	-		L				x	x							x
Verreaux's Eagle	*Aquila verreauxii*	3,09	2,26	-	VU		L	x	x	x		x		x	x		x		
Verreaux's Eagle-Owl	*Bubo lacteus*	0,00	0,75	-	-		L			x		x			x	x	x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Western Barn Owl	*Tyto alba*	9,80	0,75	-	-		M	x	x				x				x		x
Western Cattle Egret	*Bubulcus ibis*	61,71	9,02	-	-		H	x	x				x				x		x
Western Osprey	*Pandion haliaetus*	0,18	0,75	-	-		L					x					x		
White Stork	*Ciconia ciconia*	1,63	1,50	-	-	x	M	x	x				x		x				x
White-backed Duck	*Thalassornis leuconotus*	0,00	0,75	-	-		L				x	x							x
White-breasted Cormorant	*Phalacrocorax lucidus*	6,53	0,75	-	-		M				x	x							x
White-faced Whistling Duck	*Dendrocygna viduata*	8,35	2,26	-	-		M				x	x							x
Yellow-billed Duck	*Anas undulata*	61,71	3,01	-	-		H				x	x							x
Yellow-billed Kite	*Milvus aegyptius*	0,18	0,75	-	-		L	x	x				x	x			x		

Species Name	Scientific Name	SABAP2 Reporting Rate %		Global Conservation Status	Regional Conservation Status	Recorded During Monitoring	Likelihood Of Regular Occurrence	Natural Grassland	Disturbed Grassland	Open Woodland	Drainage Lines and Wetlands	Dams	Agriculture	HV Lines	Displacement - Habitat Transformation	Displacement - Disturbance (Breeding)	Electrocution - Substation	Electrocution - 132kv Power Line	Collision – 132kV Power Line
		Full Protocol	Ad Hoc Protocol																
Yellow-billed Stork	*Mycteria ibis*	0,00	0,75	-	EN		L				x	x							x

High Sensitivity

Due to the potential presence of several EGI sensitive species, including SCC, which could utilise the whole PAOI and Broader Area, including the Igolide WEF EGI Development Area, for foraging, roosting, and nesting, the entire PAOI has been assessed to be a High Sensitivity zone (**Figure 0-48)** from a collision impact perspective and an electrocution risk perspective. Although the PAOI is classified as High sensitivity it is not considered a No-Go zone, however, the mitigation measures as outlined in this report should be strictly implemented.

Collisions Risk Zones

- **Natural grassland:**

  Development in the remaining natural grassland in the PAOI must be limited as far as possible. Where possible, infrastructure must be located near margins, with the shortest routes taken from the existing roads. The grassland is a potential breeding, roosting and foraging habitat for a variety of SCC. These include African Grass Owl (Globally Least Concern, Regionally Vulnerable), and Secretarybird (Globally Endangered, Regionally Vulnerable). The entire 132kV power line should be marked with Bird Flight Diverters according to the applicable Eskom Standard to reduce the risk of collisions.

  There are wetlands, dams, and drainage lines within the PAOI. Wetlands (including dam margins) are important breeding, roosting and foraging habitat for a variety of Species of Conservation Concern (SCC), most notably for African Grass Owl (Regionally Vulnerable), Greater Flamingo (Regionally Near Threatened), Maccoa Duck (Globally Vulnerable, Regionally Near Threatened), and Yellow-billed Stork (Regionally Endangered). These SCC have all been recorded in the Broader Area through the Southern African Bird Atlas Project (SABAP2). It should also be noted that any road and/or grid line crossings across these features should be restricted to what is unavoidable. **EGI sensitive species moving between these habitat features would be at risk of colliding with the 132kV power line, therefore the entire 132kV power line should be marked with Bird Flight Diverters (BFDs) according to the applicable Eskom Standard.**

- **Electrocution Risk Zones:**

  Cape Vultures have been recorded in the Broader Area (SABAP2 Data). Cape Vultures would be at risk of electrocutions on the 132kV power line as they are large enough to bridge the gap between the live components of the power line. **A vulture-friendly pole design must be used to minimise the electrocution risk. The final pole design must be signed off by an avifaunal specialist.**

  Figure 0-48 below is a sensitivity map, indicating sensitivity areas identified for development.

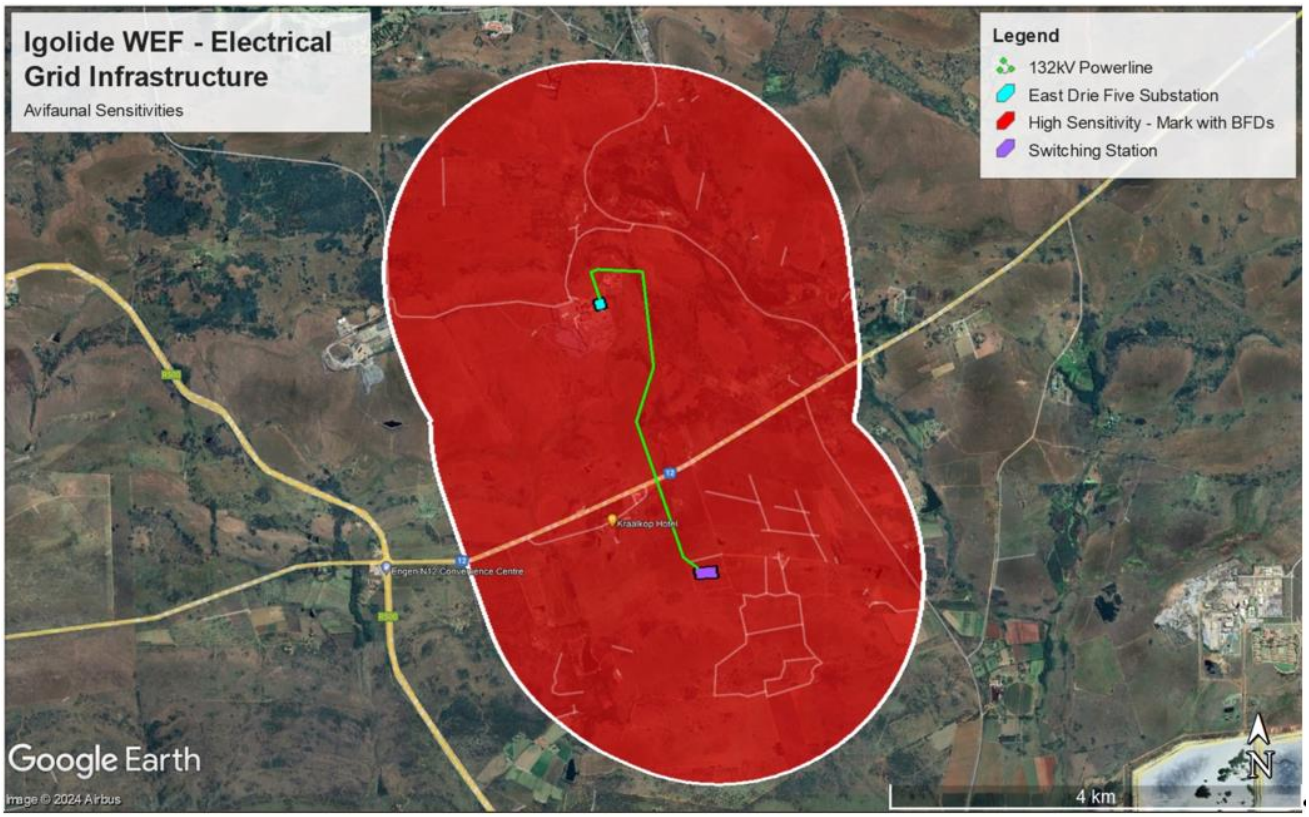

Figure 0-48 - Avifaunal Sensitivities Map for the Igolide WEF Electrical Grid Infrastructure

**The entire PAOI is considered a high sensitivity zone from a collision impact and electrocution impact perspective. BFD = Bird Flight Diverters*

AQUATIC

*The following is extracted from the Aquatic Biodiversity Assessment by WSP Group Africa and included as Error! Reference source not found.***.**

REGIONAL BIODIVERSITY CONTEXT

The Study Area lies within the C23J quaternary catchment of the primary drainage region C within the Vaal Water Management Area (WMA). The Kraalkopspruit Sub-Quaternary Reach (SQR) C23J-01507 drains the Study Area to the west, while the perennial Loopspruit SQR C23J-01487 drains the Study Area on the east (**Figure 0-49**).

The Kraalkopspruit SQR is a first order stream which flows for approximately 10 km in a southward direction before joining the Loopspruit. The Loopspruit SQR is also a first order stream which flows for approximately 17 km in the southwest direction.

STRATEGIC WATER RESOURCES AREAS

The Study Area is located downstream of the Far West Karst Region SWSA (**Figure 0-50**). SWSAs are defined as land that either supply large volume of mean annual surface water runoff in relation to their size or have relatively high groundwater recharge, and so are considered nationally important. A SWSA is one where the water that is supplied is considered to be of national or sub-national importance for water security.

FRESHWATER ECOSYSTEM PRIORITY AREAS (FEPA) SUB-CATCHMENTS

The Study Area in relation to FEPA sub-catchments and mapped National Freshwater Ecosystem Priority Areas (NFEPA) wetlands is illustrated on **Figure 0-51** and **Figure 0-52**, respectively. FEPA sub-catchment areas provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. Areas mapped as FEPA sub-catchments provide direction on which watercourses should remain in a natural or near natural condition to support the water resource protection goals of the National Water Act.

NATIONAL WETLAND MAP 5 - WETLANDS

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa. The proposed development footprint in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated on **Figure 0-53**. Based on NWM5, the Project intercepts an unchanneled valley bottom wetland towards the south of the Project area, and another unchanneled valley bottom wetland in the northern section of the Project area within the Sibanye Driefontein Gold 5 Shaft Complex.

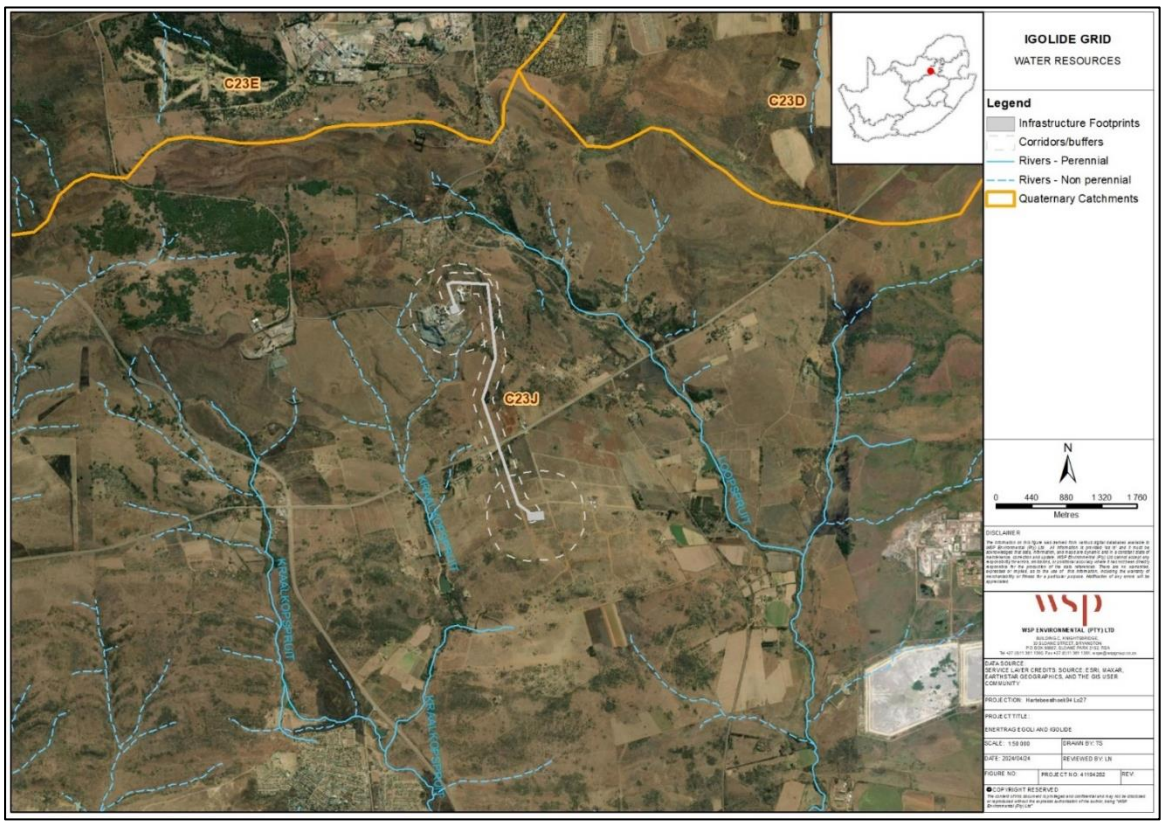

Figure 0-49 - Water Resources in the Study Area

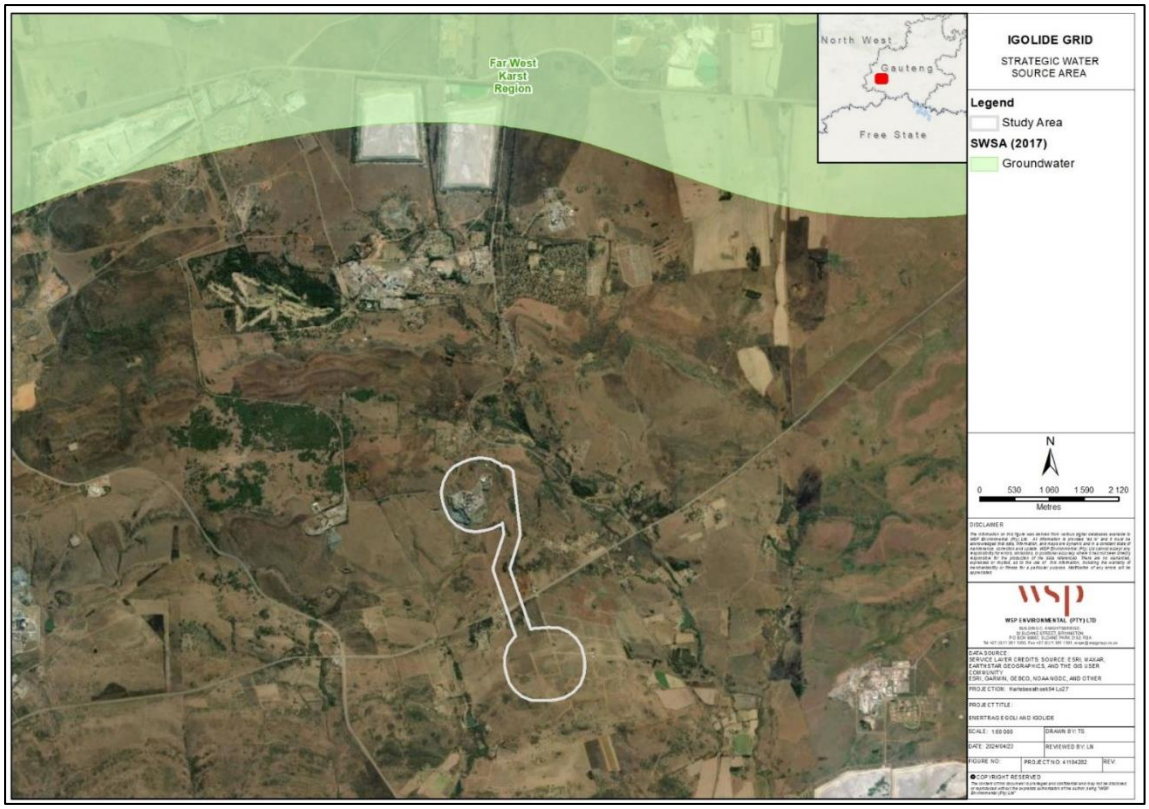

Figure 0-50 - Study Area in relation to SWSA

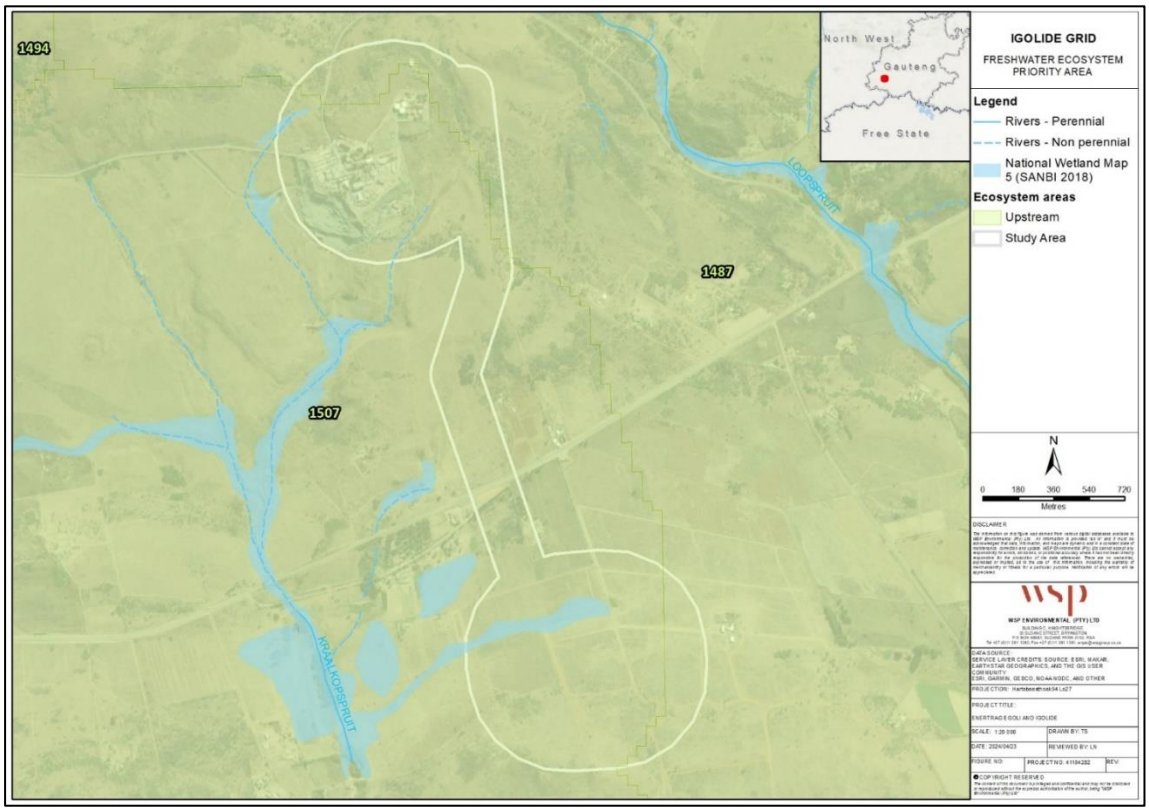

Figure 0-51 - FEPA Sub-Catchments in relation to the Study Area

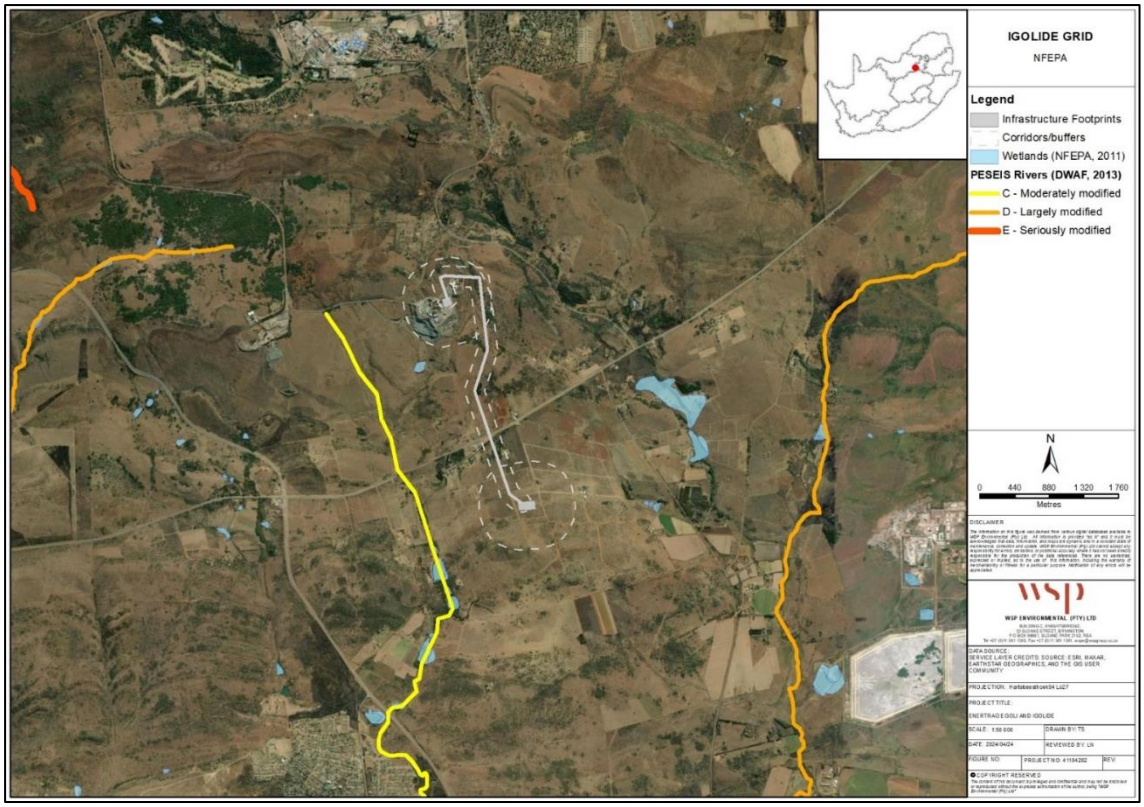

Figure 0-52 - NFEPA Wetlands and Rivers within the Study Area

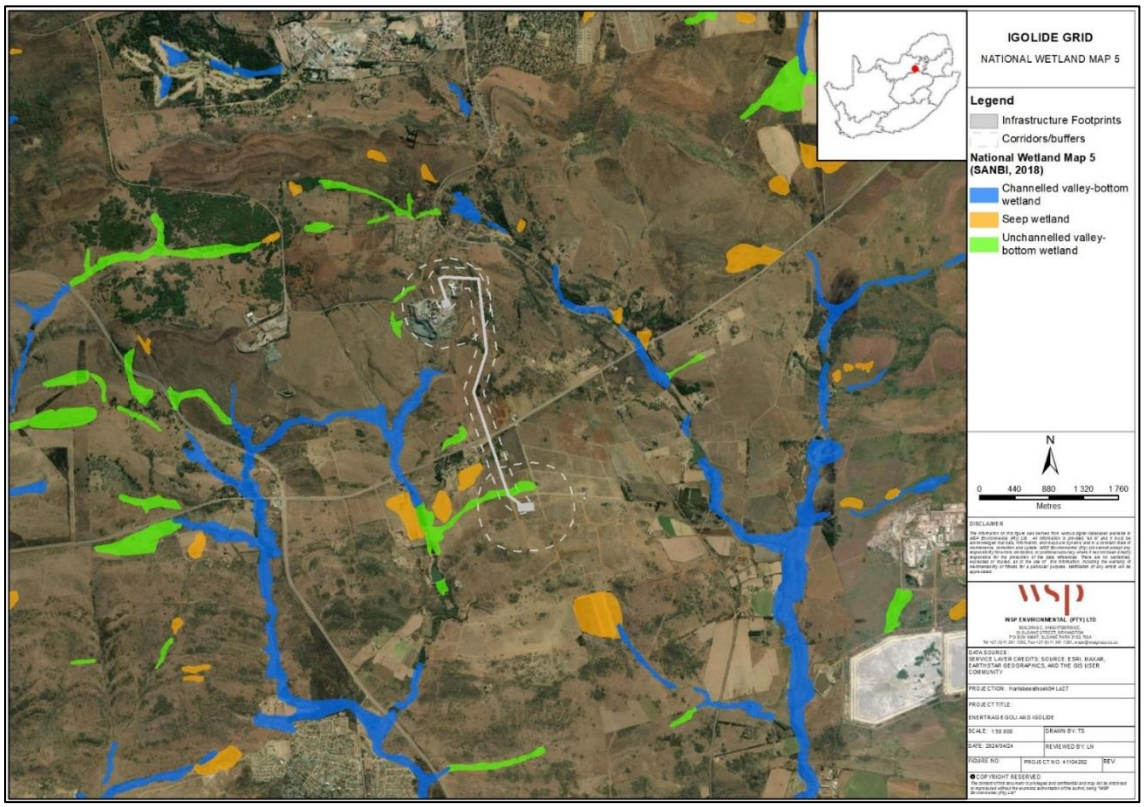

Figure 0-53 - National Wetland Map 5 Wetlands within the Study Area

WETLAND CLASSIFICATION AND ASSESSMENT

The proposed powerline traverses a Hillslope seepage (Seep) wetland in the south of the study area (**Figure 0-55**). Hillslope seepage wetlands are created and maintained by infiltration processes that occur in the surrounding non-wetland areas within the catchment. This type of system typically contributes to flow in the watercourses, even if this contribution is only on a seasonal basis. The hillslope seepage wetlands were dominated by hygrophilous grasses, such as *Eragrostis plana* with some wetter areas characterised by wetland plant species such as *Juncus effesus* and *Cyperus marginatus (***Figure 0-54***).*

Figure 0-54 - Characteristics of the Seep wetland on site

Figure 0-55 - Hillslope seepage wetland identified within the study area

WETLAND ASSESSMENT

Present Ecological State

The Seep wetland was considered to be in a Moderately Modified PES category (**Table 0-17**). This was largely attributed to the current impacts identified on site such as impoundment of flow at the upstream dam, alien invasive species, animal and vehicle tracks cutting through the wetland.
Based on the PES assessment, the hydrology and geomorphological impacts on the wetland are the main contributing factor to the Moderately modified state. This is due to the presence of dams which interrupt the surface hydrology and impound surface flow, as well as access roads that cut through the wetland. The PES score for the wetlands in the study area is presented in **Table 0-17**.

Table 0-17 - Summary of Impact Scores and PES Class

WETLAND UNIT	SIZE (HA)	HYDROLOGY IMPACT CATEGORY	GEOMORPHOLOGY IMPACT CATEGORY	WATER QUALITY IMPACT CATEGORY	VEGETATION IMPACT CATEGORY	OVERALL PES CATEGORY
Seep wetland	6.51	C	C	A	B	C-Moderately Modified

Ecoservices

The importance scores for the ecosystem services provided by the seep wetland within the study area are illustrated in the spider diagram presented in **Figure 0-56**.

The majority of the ecosystem services were rated as very low in terms of demand. The supply of regulating and supporting services such as sediment trapping, phosphate assimilation and toxicant assimilation was considered to be at a moderate level for the wetland. The wetlands also supply ecosystem services such as harvestable wood and occurrence of game for tourism and recreation opportunities to a moderate extent, as the wetland is located within a game farm.

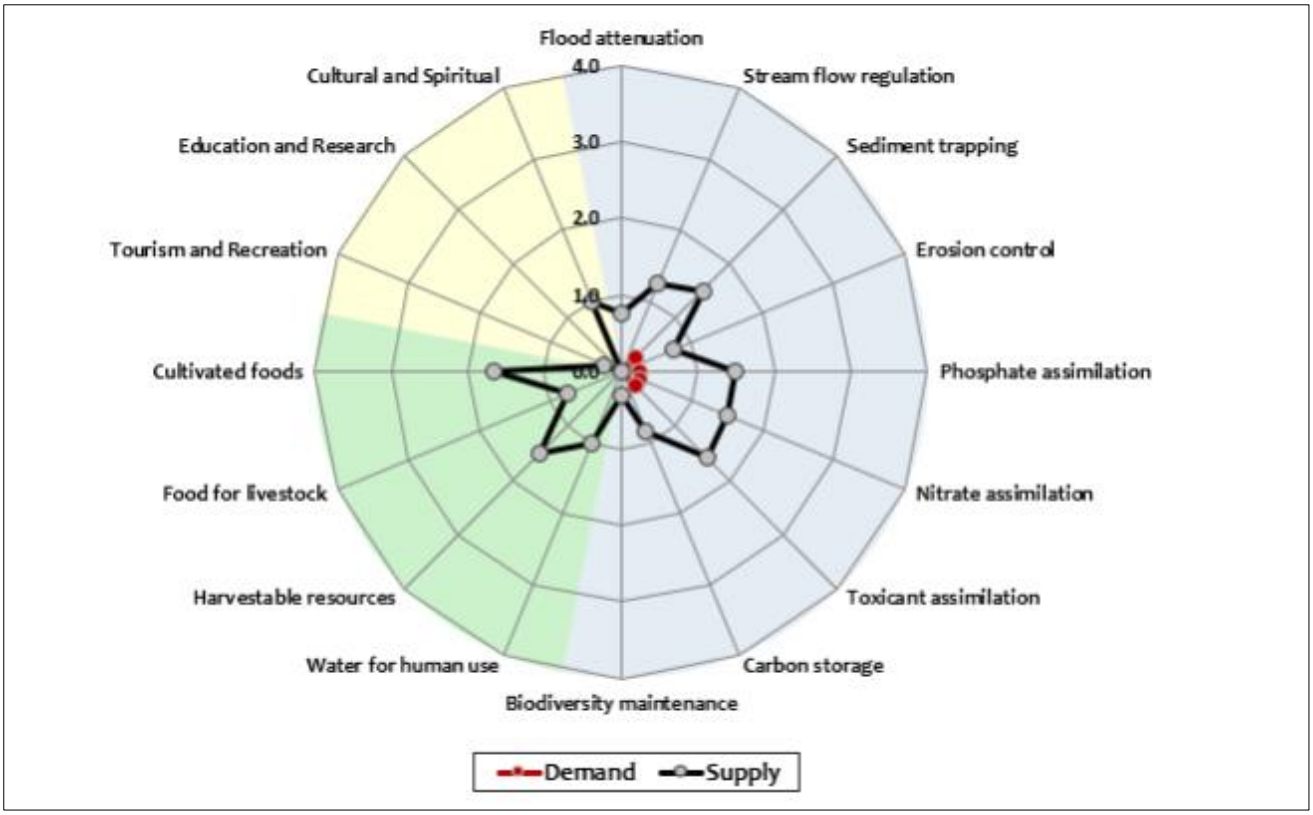

Figure 0-56 - Ecosystem Services supplied by/demanded from the seep wetland

Ecological Importance and Sensitivity

The ecological importance and sensitivity (EIS) of the wetland was Low/Marginal (**Table 6-18**). Although considered to be of Low/Marginal EIS, the wetland delivers water-based ecosystem services (hydrological functions) such as sediment trapping, phosphate assimilation, and erosion control, as well as some direct human benefits such as tourism and recreation, and associated livelihoods provided by the game farm.

Table 0-18 - Summary of wetland EIS scores and ratings

WETLAND UNIT	SIZE (HA)	ECOLOGICAL IMPORTANCE AND SENSITIVITY SCORE	HYDROLOGICAL FUNCTIONS SCORE	DIRECT HUMAN BENEFIT SCORE	INTEGRATED EIS SCORE	OVERALL EIS CLASS
Seep wetland	6.51	0.6	0.6	0.5	0.6	Low/Marginal

SOCIAL ENVIRONMENTS

ARCHAEOLOGICAL AND CULTURAL HERITAGE

*The following is extracted from the Heritage Impact Assessment compiled by WSP Group Africa and included as **Appendix G.8**.*

DESKTOP STUDY

The Anglo-Boer War – or Second South African War – was an important aspect of local history in many parts of South Africa. In the vicinity of the present study area there were a few skirmishes. Most notably, in 1900, Boer military leader Daniel Theron was killed in action near present day Fochville. In present day Hillshaven, east of Fochville, a small battle was waged on the farm Modderfontein at the end of January 1901. Boer General Smuts defeated a small British force posted at Modderfontein. A few days later General Cunninghame arrived with his force and was unable to dislodge the Boers from their defensive position. On the 4th of February, however, he was successful, and the Boers retreated southwards (Conan Doyle 1901 in AngloBoerWar.com 2023).

Fochville was initially laid out on farms Kraalkop and Leeuspruit during World War I but was only formally proclaimed as a town on 15 November 1920. The town is named after the commander-in-Chief of the Allied Forces in France during World War I, Ferdinand Foch (Raper 2004). East Village is a mining town developed after 1968. Aerial photography (**Figure 0-57**) shows it to have been fully developed prior to 1991.

SITE VISIT

The site visit showed that Late Iron Aage (LIA) settlements were present in the study area. Three of them were found, one on a hill in the far north, one at the foot of the steep slope in the northeast, and another just overlapping into the eastern edge of the corridor midway along its length. These sites consisted only of stone-walled enclosures. Further details regarding potential deposit and the presence of artefacts such as pottery could not be determined due to the dense grass and generally overgrown nature of the areas in which these sites occurred. Also found were three elongated stone walls, one running west to east in the far northwest of the study area and another running north to south in the northeast of the corridor and immediately adjacent to a LIA settlement and a third which had a gentle curve was located in a grassy area in the central part of the corridor. The purpose and age of these walls is unknown, but they are probably LIA. Two isolated circular enclosures were seen on aerial photography to the west of the corridor. They were not visited.

Also found were some small historical stone ruins in the central part of the corridor. They were very poorly preserved and, due to the presence of cement on some stones and only modern rubbish, they are assumed to not be very old.

It should be noted that many more archaeological sites were located in the area at the southern end of the corridor. These have been reported on in Orton and Van der Walt (2023) and, because none are affected by the present project, these are not discussed further here. The nearest is about 120 m south of the onsite substation.

A single historical house was seen just outside the eastern edge of the corridor in the south at waypoint 4304. Although the original dwelling pre-dates 1938 (as is evident from aerial photography; **Figure 6-57**), it has been added to many times over the years (**Figure 6-58**) and has lost almost all of its heritage value. The western wall is of modern facebrick, as is the veranda, and a modern stone wall has been built at the western end of the veranda.

Figure 0-57 - Aerial view showing the existence of the house at waypoint 4304 in 1938

Figure 0-58 - Aerial view showing the many additions to the house at waypoint 4304

Other historical structures were noted from aerial photography to occur in the area but they are 280 m east (house) and 440 m west (Kraalkop Hotel) of the edge of the proposed grid corridor and will not be affected.

GRAVES

No graves were seen. None are expected, although it is possible that still born children may have been buried within the Iron Age settlements. These remains would likely never be found due to their obvious fragility which would prevent preservation.

CULTURAL LANDSCAPES AND SCENIC ROUTES

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: “The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result”. Cultural landscapes are thus areas containing multiple ‘sites’ and which have been shaped by the interaction of natural processes and anthropogenic activities such as construction and agriculture. Scenic routes are well-travelled roads that pass through natural or cultural landscapes with aesthetic value and that often have iconic or visually attractive views.

The landscape has several different land uses. The land use at the southern end of the corridor is agriculture and livestock/game grazing, while the remaining land further north may be used for occasional grazing but this was not obviously the case at the time of the site inspection. This land is, nonetheless, rural in character. The other main land use is the mine in the north which provides an industrial layer to the landscape. Other gold mines as well as the towns of Fochville (to the south) and East Village (to the north) also occur within a few kilometers of the corridor. Existing high voltage (HV) powerlines occur in the area as does the substation to which the project would connect. These other land uses alter the overall sense of place of the rural environment.

Historical aerial photography from 1938 shows that the amount of ploughed land has remained fairly consistent with the land north of the N12 generally having never been ploughed aside from a small area just east of the corridor. Several farmsteads and/or buildings were present in 1938, as was the N12 (although following a different alignment past the Kraalkop Hotel to the west of the corridor). The various gold mines and associated slimes dams scattered around the wider area have appeared in more recent decades, adding an industrial layer to the landscape. These observations show a continually evolving cultural landscape with modern industrial uses (i.e. mining) becoming visually prominent on the landscape.

Another aspect of the cultural landscape is the older Iron Age landscape. This is an archaeological feature and relates to the very large number of Iron Age sites that occur in the wider area.

PALAEONTOLOGICAL

The following is extracted from the Palaeontological Impact Assessment compiled by WSP Group Africa and included as ***Appendix G.9****.*

The palaeontological sensitivity of the EGI route under consideration are presented in **Figure 0-59**. The southern section of the route is on moderately fossiliferous Hekpoort Formation (green on SAHRIS and orange in the DFFE map) and the northern section is on the highly fossiliferous Timeball Hill Formation (SAHRIS orange; DFFE dark orange).

The North West Province Palaeotechnical Report indicates that the Silverton Formation is highly sensitive as there are stromatolites, but no evidence has been supplied and the geological records do not support this conclusion. Stromatolites and microbial mats are usually formed in shallow, low energy environments.

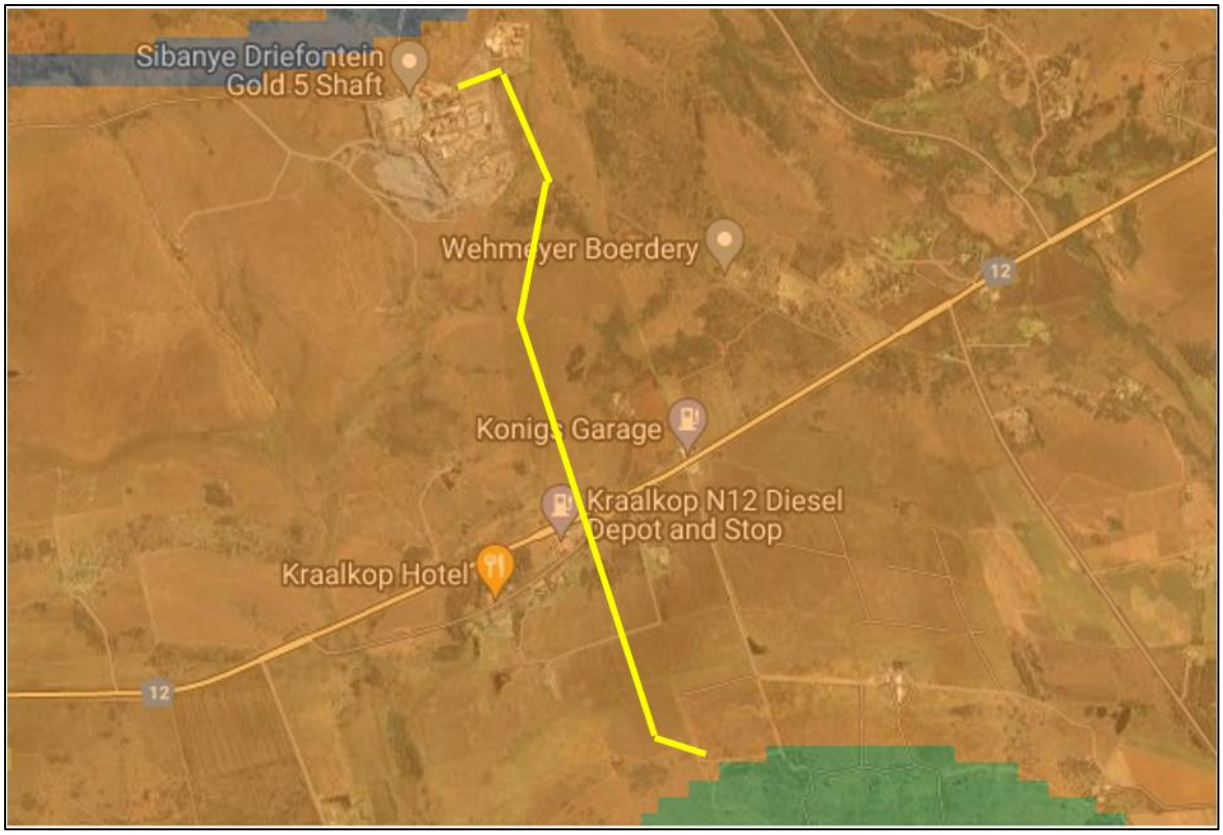

Figure 0-59 - SAHRIS palaeosensitivity map for the site for the proposed Igolide WEF EGI route indicated by the yellow line

Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

The Hekpoort Formation is predominantly composed of basaltic andesite and pyroclastic rocks and this type of rock does not preserve fossils. This is noted in the Palaeotechnical Report but they advise that caves or solution cavities could occur and these might have fossils. No fossiliferous caves are known from this area and for geological and engineering reasons, it is unlikely that the electrical grid infrastructure would be placed over cave sites.

Although the Hekpoort Formation is indicated as moderately sensitive in the Gauteng Palaeotechnical Report this is based on “no fossils recorded”. The paleosol in a road cutting near Waterval Onder contains urn-shaped microfossils measuring 1 x 0.2mm. He named the putative fossils Diskagma buttoni. Lenhardt et al. (2020) are very sceptical about the “fossils” and the reconstruction of the fossils from the thin-sections are extremely fanciful.

SOCIAL

The following is extracted from the Social Impact Assessment compiled by Tony Barbour and included as ***Appendix G.11****.*

KEY LAND USES

the broader study area is mining and agriculture. The broader study area forms part of Far West Witwatersrand gold fields, of which Carltonville is the premier mining centre. It forms part of historically the most productive gold fields in the world. The landscape context is dominated by historic and ongoing mining activities. The world’s deepest mine, Mponeng gold mine (~4 km) is located approximately 7 km west of the proposed line. The proposed line would feed into an existing substation at Sibanye’s Driefontein East mine. Driefontein West mine is located ~2.5 km west of the proposed line.

The study area is located in the western Highveld. The area around Fochville is mainly comprised of grassveld, but also includes mountain bushveld. Livestock farming predominates in the immediate study area. Cropping activities are concentrated in the vicinity of natural watercourses such as the Kraalkopspruit and Loopspruit. Fodder and cash crops such as maize and soy are grown, mainly under irrigation. The study area is considered good cattle country. Small stock is also kept. Veld carrying capacities are high, 6 ha per head of cattle. Game is kept on several properties in the study area, but commercial hunting appears to be restricted to Metjan on the Igolide WEF site (see below). The veld is very susceptible to veld fires, especially in winter. The grazing resource may take more than one growing season to recover to full productivity. The study area rural settlement pattern is concentrated along public and mining roads (N12, the R500, Sibanye access road, Losberg Road), and the courses of the Kraalkopspruit and Loopspruit. A small loose mixed node is located along the short service road south of the N12 immediately to the west of the proposed line. The node includes a construction company (Lomo), the Kraalkop Hotel, Kraalkop Diesel Depot and Stop and a few dwellings.

A butchery (Lethabong Inn) and fuel station (Konigs Garage) are located along the N12 ~360 m east of the proposed line crossing (**Figure 0-60**). Tourism facilities in the study area mainly cater to local and regional (Rand) patrons and passing traffic. As indicated, the broader landscape context is dominated by historic and ongoing mining. It is therefore less sensitive to visual and sense of place impacts. No protected natural areas are located in significant proximity to the site. Facilities in significant proximity (2 km) of the proposed line are Metjan Holiday Resort, and the Kraalkop Hotel (**Figure 0-61**).

Figure 0-60 - Kraalkop Petrol station on N12

Figure 0-61 - View looking south from N12 towards site with lodge in middle ground

Given the widespread presence of large mines, there are numerous Eskom lines in several corridors in the broader study area, but especially affecting the area to the north of the N12 (**Figure 0-62**). Leeuwpoort 356/11 and 356/77 are currently affected by 2 x 132 kV lines feeding onto Driefontein East substation from the north. None of the other study properties are affected by existing lines. The nearest existing N12 line crossing is located 4.7 km east of the proposed Igolide line crossing. No renewable energy facilities are currently located in the immediate study area – the nearest is a PV plant at South Deep mine ~13 km east of the proposed line.

Figure 0-62 - Eskom power lines in the general study area

AFFECTED PROPERTIES

The proposed Igolide WEF 132 kV line directly affects 7 properties (N12 road parcel excluded), namely (south to north) Kraalkop 147/20, 147/45, 147/31, 147/68, 147/46, Leeuwpoort 356/77 and 357/11

(**Figure 6-63**). The switching station is proposed on 147/20. The power would be fed into the existing substation at Driefontein East mine, called the East Drie Five Substationon 356/77 from the north. Assessment buffers of 500 m are associated with the substations and 250 m width corridor (125 lateral from midline). Nine additional properties are affected by the buffers, namely Kraalkop 147/7/RE, Leeuwpoort 356/8, 356/65, 356/66 and Kraalkop 147/24/RE south of the N12, and Kraalkop 147/65, Leeuwpoort 356/48, 356/45 and 356/15 to the north.

Figure 0-63 - Igolide Tx line (light blue line), switching station (orange fill), East Drie Five substation (green fill) and buffers (grey lines) in relation to Igolide WEF site (pink outline), directly affected properties (yellow outlines), properties affected by buffer only (white outlines), residential and other receptors, key roads (red) and existing Eskom lines (orange)

Kraalkop 147/20 (substation site), Leeuwpoort 356/8, 356/66 and 356/65 form part of Metjan Estate on which the Igolide WEF is proposed (**Table 0-19**). The property is used for farming, commercial hunting, tourism, and residential purposes. Commercial hunting (only May-August) accounts for 56-70% of income. Metjan also processes and sells meat at Lethabong Inn butchery along the N12. Metjan Resort offers self-catering chalets (20 guests) at a dam. Other facilities include a pool and private church. The Resort is popular with local and regional anglers (dam), and for 'break-aways.' The dwellings and chalets are in a valley and are screened from the project.

Table 0-19 - Overview of properties affected by proposed infrastructure and buffers (south to north)

PROPERTY[1]	LAND USE	KEY RECEPTORS	COMMENT
Kraalkop 147/20	Residential; Metjan Resort& hunting estate; Extensive grazing	Holiday Resort; Hunting area; Farmstead; Private church	Proposed switching station 2.5 ha; Proposed line segment: 230 m; Part of Igolide WEF site
Leeuwpoort 356/8		Stores	Substation buffer only
Leeuwpoort 356/66		Main stores	Substation buffer only
Leeuwpoort 356/65		n.a.	Substation buffer only
Kraalkop 147/7/RE	Residential; Grazing	Farmstead	Line& substation buffers only Line buffer segment 300 m
Kraalkop 147/45	Residential; Business; Grazing	Built complex	Proposed line distance: 200 m; Lomo Labor Construction; MSP (water pumps supplier)
Kraalkop 147/31	Residential	Farmstead	Proposed line distance: 480 m Farmstead leased out
Kraalkop 147/24/RE	Residential; Grazing (potential)	Farmstead	Line& substation buffers only Line buffer segment 540 m
Kraalkop 147/68	Vacant	n.a.	Proposed line distance: 40 m
N12			
Kraalkop 147/65	Residential; Small orchard	Farmstead	Line buffer only – segment: 380 m
Kraalkop 147/46/RE	Driefontein East mine (small portion); Residential; Extensive grazing	Farmstead	Proposed line distance: 1.2 km Farmstead located near the N12
Leeuwpoort 356/48	Residential; Grazing	Farmstead	Line buffer only – segment: 240 m
Leeuwpoort 356/77	Driefontein East mine East 5 shaft complex	n.a.	Proposed line distance: 910 m; Driefontein East substation; Existing 2 x 132 kV lines
Leeuwpoort 356/45	Residential; Grazing	n.a.	Line& substation buffers; Line buffer segment 380 m
Leeuwpoort 356/15	Grazing	n.a.	Line& substation buffers Line buffer segment 200 m

[1] Shading indicates directly affected properties.

PROPERTY[1]	LAND USE	KEY RECEPTORS	COMMENT
Leeuwpoort 356/11	Driefontein East mine reservoirs; Residential; Grazing	Farmstead	Proposed line distance: 740 m; Existing 2 x 132 kV lines;

Kraalkop 147/45, 147/31, 147/24/RE (south) and 147/65 (north) bordering onto the N12 and N12 service road are largely used for rural-residential purposes. Grazing is associated with 147/7/RE and 147/45, and a small orchard with 147/65. The offices of a construction company (Lomo Labour) and a water pump supplier (MSP) are located on 147/45 along the service road. Plans to develop a wedding venue between the proposed Tx line and the property's eastern boundary have been shelved (Vierra, pers. comm). Kraalkop 147/68 is a small parcel of vacant land at the northern junction of the N12 and service road next to the Diesel Depot and Truck Stop.

North of the N1, Kraalkop 147/46 and Leeuwpoort 356/77 form part of the premises of Sibanye's Driefontein East mine. The mine (shaft 5) complex occupies most the eastern portion of 356/77, extending slightly into the northern portion of 147/46. The balance of the Sibanye properties consists of veld, likely leased out for grazing. A farmstead is located near the N12 in the south-western corner of 147/46. The balance of directly affected properties (356/11) and properties affected by the line buffers (356/48, 356/45, 356/15) north of the N1 are used for grazing and residential (apart from 356/15) purposes. The dwellings on these properties are located near the N12 and the 'Sibanye access road', i.e. on property portions the furthest away from the buffer. Driefontein East mine's water treatment plant and reservoirs are located on a portion of 356/11.

RELATIONSHIP WITH RECEPTORS

Transmission line and buffers

With the exception of Leeuwpoort 356/11, the proposed line and associated buffers affect the peripheral portions of properties (i.e., near cadastral boundaries). With the exception of Kraalkop 147/45, Leeuwpoort 356/77 and 356/11, the impacts would be confined to linear impacts near boundaries. The affected portion of 147/45 is part of a larger camp used for limited grazing. The affected portions of 356/77 and 356/11 form part of the Driefontein East mine and associated built complex. No significant land fragmentation issues are therefore associated with the line. The lateral buffers are in general further away from boundaries, i.e. less desirable.

Properties would be affected over relatively short distances, namely 40 m-540 m (see **Table 0-19** above) for the properties south of the N12, and 200 m – 1.2 km to the north. The only landowners affected over a distance of more than 500 m are the two Sibanye mining properties 147/46/RE (1.2 km) and 356/77 (910 m), and 356/11 (740 m). The affected portion of 356/11 accommodates the mine's water treatment plant and reservoirs on the mine's northern periphery.

The line and western line buffer would physically impact only undeveloped land, mostly veld actively or potentially used for grazing. The eastern line buffer also largely consists of veld, but also includes a portion of the yard (garden around farmstead) on Kraalkop 147/24/RE adjacent to the south of the N12, the entire sole access road to 147/24/RE, and a portion of the sole access road to 147/45 north of the N12. The orchard on 147/45 is not affected by the buffer. No footprint land use issues are therefore associated with the line and western buffer. Potential issues are however associated with regard to receptors on 147/24/RE and 147/65 adjacent to the N12 affected by the eastern buffer.

In terms of visual and sense of place impacts, the line is located in the immediate vicinity (<250 m) of two receptors, namely the farmsteads on Kraalkop 147/24/RE (140 m) and 147/65 (170 m), both to the east

of the line (Table 3.2). The nearest receptor to the west is the farmstead on 147/31 (300 m) south of the N12. Kraalkop 147/24/RE and 147/31 both benefit from tree screening relative to the line (and less so buffers). All other receptors on both sides of the line are located >500 m.

Table 0-20 - Overview of infrastructure in relation to receptors on properties directly affected or by buffer zones and significant nearby receptors (south to north, west to east)

PROPERTY[2]	RECEPTOR	LINE KM[3]	BUF KM[4]	SS KM[5]	BUF KM[6]	COMMENT
Kraalkop 147/20	Resort	1.4	1.3	1.3	0.84	Directly: 230 m; Part of Igolide WEF site
	Farmstead	1.5	1.3	1.4	0.94	
	Church	1.3	1.2	1.2	0.7	
Kraalkop 147/7/RE	Farmstead	1.6	1.5	1.6	1.2	Line buffer: 300 m
Kraalkop 147/45	Built node	0.56	0.46 West	0.86	0.39	Directly: 200 m
Kraalkop 147/31	Farmstead	0.3	0.17 West	0.76	0.26	Directly: 480 m; Existing tree screening
Kraalkop 147/24/RE	Farmstead	0.14	0.01 East	0.65	0.16	Line buffer: 540 m Existing tree screening; Access road within buffer
Kraalkop 147/40	Kraalkop Hotel	0.56	0.44 West	0.94	0.44	Located along N12
N12						
Kraalkop 147/65	Farmstead	0.17	0.04 East	1.3	0.82	Line buffer: 380 m Access road within buffer
Kraalkop 147/46	Farmstead	0.57	0.44 West	1.4	0.92	Directly: 1.2 km
Leeuwpoort 356/48	Farmstead	0.79	0.68	1.7	1.2	Line buffer: 240 m
Leeuwpoort 356/15	Farmstead	1.2	1	2	2.5	Line buffer: 200 m
Leeuwpoort 356/11	Farmstead	1.4	1.2	2.5	1.3	Directly: 740 m

The same three receptors within 250 m of the line are also within 250 m of the line buffer, at closer proximity. The two receptors associated with the eastern buffer are particularly close to the buffer boundary, namely ~10 m (147/24/RE) and ~40 m (147/65), while the single receptor associated with the western buffer, the farmstead on 147/31, would be ~170 m from the buffer boundary. With regard to all study properties, the proposed line alignment is further away from receptors than the nearest buffer.

Only two tourism receptors are located in meaningful proximity to the proposed line, namely the Kraalkop Hotel to the west and Metjan Resort. The hotel is located 560 m west of the proposed line (440 m of western buffer). The hotel backs onto the N12. The context is rural-residential-business. The hotel is not located in immediate proximity (<250 m) of the line or buffer and is moreover not deemed a visually

[2] Shading indicates directly affected properties.
[3] Shading indicates receptors within 250 m of line (midline).
[4] Shading indicates receptors within 250 m of line buffer.
[5] Shading indicates receptors within 500 m of switching substation.
[6] Shading indicates receptors within 500 m of switching substation.

sensitive receptor. The Metjan Resort and dam on 147/20 are located in a significant depression, so would be screened from the proposed infrastructure. All Metjan receptors, including the private church are located >1.3 km of the line, and >1.2 km of the buffer. No significant impacts on tourism receptors are therefore anticipated.

Switching station and buffer

The switching station site is located in the north-westernmost part of Metjan estate, approximately 180 m south of the estate boundary, and near the existing access road off the N12 to Metjan's main store complex on Leeuwpoort 356/8 and 356/65. The site would occupy approximately 2.5 ha. The relevant area is currently used as grazing. Given the peripheral location, it would be possible to isolate the portion of the property for security purposes and from hunting activities. The substation location is acceptable to the owner (Botha, pers. comm).

The substation is not located in immediate proximity (<500 m) of any receptors. The nearest is the farmstead on Kraalkop 147/24/RE ~650 m to the north. Four receptors are located within 500 m of the buffer, all to the north, namely 147/45 (390 m), 147/31 (260 m), 147/24/RE (160 m) and the Kraalkop hotel (440 m). Northward movement of the site within the buffer is therefore less desirable.

Construction traffic would make use of the existing access road to Metjan estate's main store complex off the N12. The road serves only Metjan. The Resort and farmyard on 147/20 are accessed via another road off the N12 further to the west. The store complex is also accessible via internal roads, and off the Losberg/ Leeuwpoort gravel road which traverses the easternmost portion of the estate to the east of the project. No significant impacts on access property access are therefore anticipated.

Feed-in substation

The proposed feed-in substation is the existing substation at Driefontein East mine. No additional impacts (to the existing) are therefore anticipated.

VISUAL CHARACTER AND SENSITIVITY

The following is extracted from the Visual Impact Assessment by SLR Consulting (South Africa) Pty Ltd and included as ***Appendix G.10****.*

LAND USE

According to the South African National Land Cover dataset (Geoterraimage 2020), much of the visual assessment area is classified as "Grassland" interspersed with significant areas of Cultivated land. Small tracts of forested land and numerous water bodies are scattered throughout the study area (**Figure 0-64**).

Commercial agriculture is the dominant activity in the study area, the main focus being maize cultivation (**Figure 0-65**) with some limited livestock/ dairy and game farming. There are multiple farm portions in the study area, resulting in a relatively moderate density of rural settlement with many scattered farmsteads in evidence. Built form in much of the study area comprises of farmsteads, ancillary farm buildings and workers' dwellings, grain silos, gravel access roads, power and telephone lines and fences.

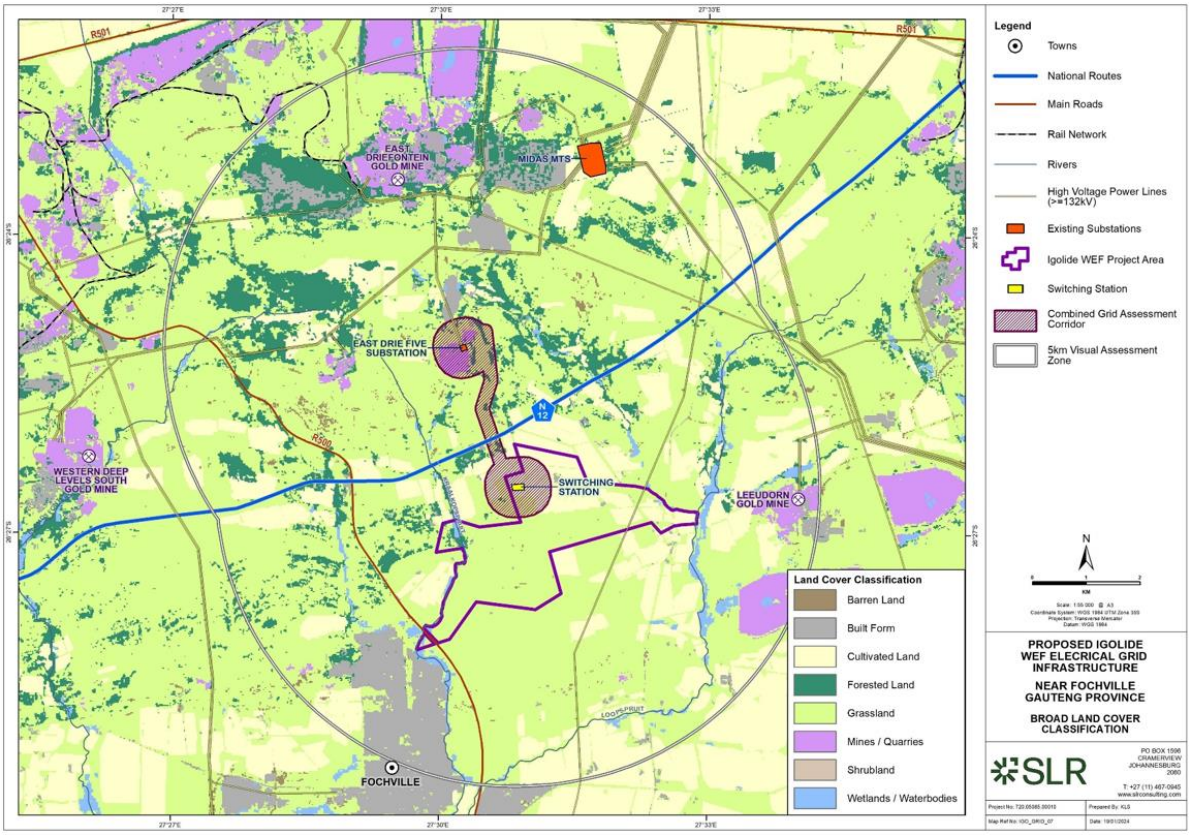

Figure 0-64 - Land Cover Classification

Figure 0-65 - Maize cultivation and agricultural infrastructure to the east of the Igolide EGI assessment corridor

High levels of human influence are however visible in parts of the study area which are dominated by mining activity related to several large mining operations, including the Western Deep Levels, Driefontein and Sibanye Stillwater mines in the north and Leeudorn Gold Mine in the east. Large slime dams, mine dumps, stockpiles and other elements of mining infrastructure (including asscociated residential development) have resulted in significant transformation in the landscape (**Figure 6-66**). This mining activity forms part of the greater gold mining complex centred around Carletonville to the north-west of the study area where mining activity and associated urban and industrial development dominate the landscape. High voltage power lines, contribute further to the overall transformation of the landscape in this area, with a network of 132kV, 275kV and 400kV lines and associated substations traversing the study area.

Further transformation has occurred in and around the small town of Fochville and the adjacent Greenspark Township, located on the south-west boundary of the study area. Urban development and associated road and electricity infrastructure has significantly altered the visual character of this sector of the study area (**Figure 6-67**).

Other significant anthropogenic features in the area include the N12 National Route (**Figure 6-68**) as well as the R500 Main Road.

Figure 0-66 - East Driefontein Mine to the north of the Igolide EGI project area

Figure 0-67 - View of Greenspark Township east of the R500

Figure 0-68 - View south east from the N12 showing the national route and existing powerlines

Visual Implications

The predominance of cultivated land in conjunction with the remaining natural grassland cover across much of the study area would give the viewer the general impression of a largely rural / pastoral setting. Thus, the proposed Igolide EGI development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present in these areas.

High levels of human transformation and visual degradation are however evident across the northern sector of the study area where mining activity and associated infrastructure dominate the landscape. In addition, urban development to the south-west and powerline and road infrastructure have further degraded the visual character of the study area to some degree. This transformation has already altered the visual character across these sectors of the study area, thus reducing the level of contrast of the proposed development.

VISUAL CHARACTER

The physical and land use-related characteristics of the study area as described above contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure including buildings, roads, and other objects such as telephone or electrical infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural, or urban which results in a uniqueness, distinctiveness, or strong identity.

The predominant land use in the area (maize cultivation) has significantly transformed the natural landscape across much of the study area. In addition, the landscape becomes progressively more transformed towards the northern section of the study area where mining activities and high voltage powerlines have resulted in a high degree of visual degradation. The more industrial character of the landscape is an important factor in this context, as the introduction of the proposed grid connection infrastructure would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in form. As such, although the pastoral landscape and undulating plains in parts of the study area are important features that could increase the visual appeal and visual interest in the area, this would be reduced by the degree of transformation already present in the landscape. In addition, there aren’t any tourism or nature-based facilities or recognised tourism routes in the study area.

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of ‘cultural landscape’ is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment. In this instance, the rural / pastoral landscape represents how the environment has shaped the predominant land use and economic activity practised in the area, as well as the patterns of human habitation and interaction. Mining activity in the broader region has also played an important role in shaping the present-day landscape.

In light of this, it is important to assess whether the introduction of new grid connection infrastructure into the study area would be a degrading factor in the context of the prevailing character of the cultural landscape. Broadly speaking, visual impacts on the cultural landscape in the area around the proposed

development would be reduced by the fact that the visual character in much of the area has been significantly transformed and degraded by mining and infrastructural development.

VISUAL SENSITIVITY ANALYSIS AND VERIFICATION

Based on the criteria in the matrix (**Table 0-21**), the visual sensitivity of the area is classified according to the categories described below:

- High - The introduction of a new development such as powerlines and switching stations is likely to be perceived negatively by receptors in this area. It would be considered to be a visual intrusion and may elicit opposition from these receptors.
- Moderate – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
- Low - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

Table 0-21 - Environmental factors used to define visual sensitivity of the study area

FACTORS	DESCRIPTION	RATING									
		1	2	3	4	5	6	7	8	9	10
Pristine / natural / scenic character of the environment	Study area is largely pastoral with some areas of scenic value, although some areas are significantly transformed.										
Presence of sensitive visual receptors	No sensitive receptors have been identified in the study area, although potentially sensitive receptors are present										
Aesthetic sense of place / visual character	Visual character is a typical rural / pastoral landscape, although significantly transformed by mining activity.										
Irreplaceability / uniqueness / scarcity value	Few areas of scenic value were found within the study area.										
Cultural or symbolic meaning	Much of the area is a typical rural / pastoral landscape, although some areas are significantly transformed.										
Protected / conservation areas in the study area	No protected or conservation areas were identified in the study area.										
Sites of special interest present in the study area	No sites of special interest were identified in the study area.										
Economic dependency on scenic quality	No tourism / leisure-based facilities in the area										
International / regional / local status of the environment	Study area is typical of rural / pastoral landscapes, although significantly transformed by mining activity										
**Scenic quality under threat / at risk of change	Introduction of EGI will alter the visual character and sense of place, giving rise to significant cumulative impacts										

**Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low (<33)			Moderate (34-66)				High (67 – 100)		
0-10	11-20	21 -30	31 -40	41-50	51 -60	61 -70	71 -80	81-90	91 -100

Table 0-21 above outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Based on the above factors, the total score for the study area is 26, which according to the scale above, would result in the area being rated as having a LOW visual sensitivity. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts and is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. No protected areas or sensitive receptor locations were identified in the study area (i.e., within 5 km of the EGI assessment corridor).

Specialist Sensitivity Assessment and Verification

As part of the visual sensitivity assessment, a screening exercise was undertaken with the aim of indicating any areas that should be precluded from the proposed development footprint. From a visual perspective, these are areas where the establishment of grid connection infrastructure would result in the greatest probability of visual impacts on any sensitive or potentially sensitive visual receptors. The results of the exercise undertaken in respect of the proposed Igolide EGI are provided below and the identified areas of sensitivity in **Figure 0-69**.

Using GIS-based visibility analysis, it was possible to determine which sectors of the EGI assessment corridor would be visible to the highest numbers of receptors in the study area. This analysis confirmed that areas of higher elevation are visible to greater numbers of potentially sensitive receptors. Hence the visual prominence of a tall structure such as a powerline pylon would be exacerbated if located on any ridges or relatively higher-lying plateaus. It is noted that the northern section of the assessment corridor is located on an area of relatively higher elevation that could be seen as an area of potentially high visual sensitivity. However, due to the relatively low number of potentially sensitive receptors in the area, the presence of existing powerlines, road infrastructure and mining activity as well as the fact that the study area as a whole is rated as having a low visual sensitivity, the sensitivity rating of these areas would be reduced to Medium.

In determining visual sensitivity, consideration must be given to the direct visual impact of the EGI on any farmsteads or receptors located in, or within 500m of, the assessment corridor. Accordingly, a 500m zone of potential visual sensitivity has been delineated around six receptor locations that were found to be within 500m of the assessment corridor. However, one of these receptor locations, namely VR127 is within the Igolide WEF project area, and as the owners of this property are involved in the development, they are not expected to view the proposed EGI in a negative light. The remaining five receptor locations are all located in relatively close proximity to the N12 National Route. These factors are expected to reduce the visual impacts on these receptor locations resulting from the Igolide EGI project. Hence the zones of potential visual sensitivity (**Figure 0-69**). Potential visual sensitivity in relation to the proposed project , are not considered to be “no go areas”, but rather should be viewed as zones of potential visual sensitivity, with a sensitivity rating of Medium.

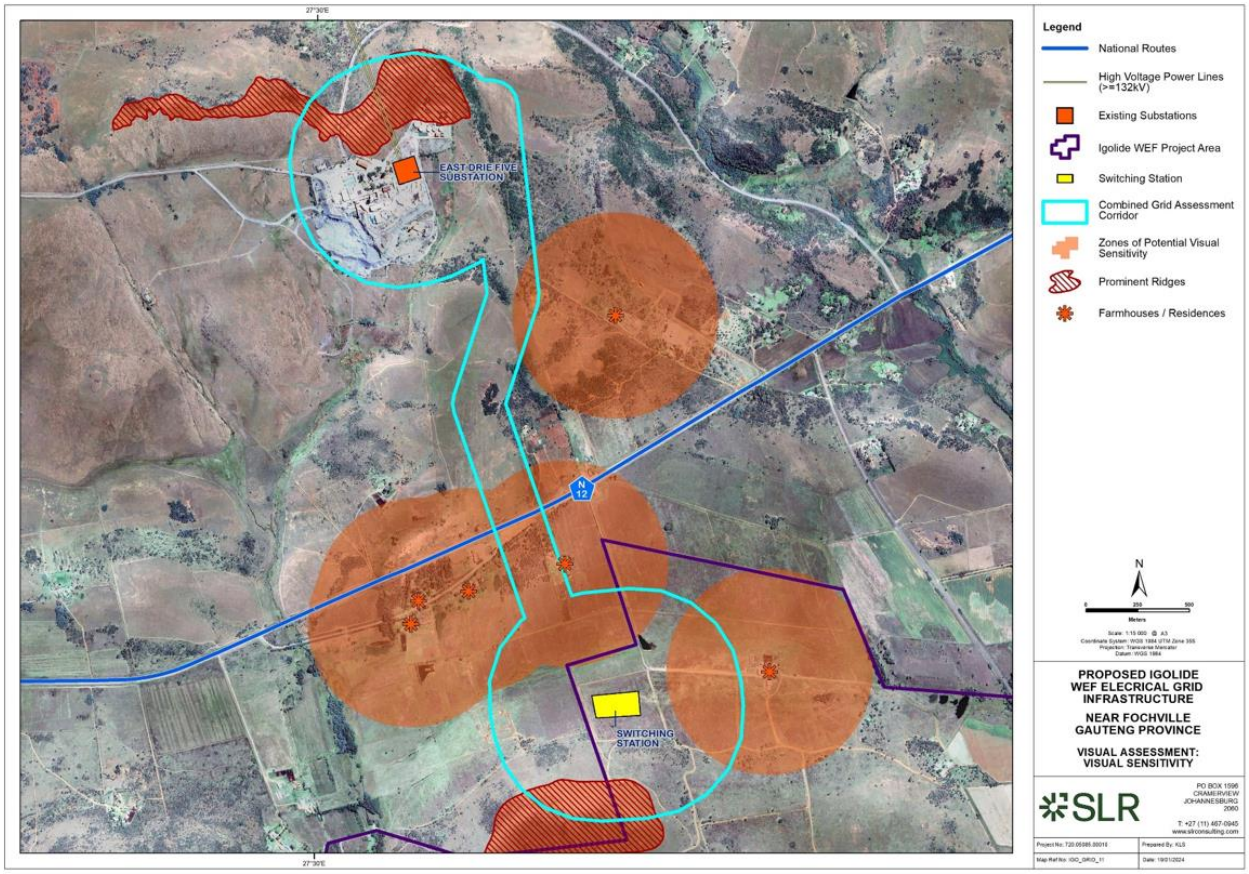

Figure 0-69 - Potential visual sensitivity in relation to the proposed Igolide EGI assessment corridor

Sensitivities Identified by the National Screening Tool

In assessing visual sensitivity, the proposed development was examined in relation to the Landscape Theme of the National Environmental Screening Tool to determine the relative landscape sensitivity for the development of grid connection infrastructure. The tool does not however identify any landscape sensitivities in respect of the proposed OHL or switching station.

Sensitivity Analysis Summary

A site sensitivity verification exercise has been conducted in respect of the VIA for the proposed Igolide EGI based on a desktop-level assessment supported by field-based observation. This exercise has verified the absence of any areas identified as visually sensitive during the course of the specialist VIA.

VISUAL ABSORPTION CAPACITY

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

Although the undulating topography and the areas of cultivation and grassland would reduce the visual absorption capacity, this would be offset to some degree by the presence of mining activity and urban and infrastructural development in the vicinity of the proposed Igolide EGI project. Visual absorption capacity in the study area is therefore rated as Moderate.

TYPICAL VISUAL IMPACTS ASSOCIATED WITH GRID CONNECTION INFRASTRUCTURE

132kV powerlines and Switching Stations

Powerline pylons and switching stations are large structures and are thus highly visible. According to the project description as outlined above, the maximum pylon height envisaged for the proposed powerline is 40m (equivalent in height to a thirteen-storey building). Although a pylon structure would be less visible than a building, the height of the structure means that the tower would still typically be visible from a considerable distance. Visibility would be increased by the fact that the proposed powerline comprises a series of towers typically spaced approximately 200m to 250m apart in a linear alignment.

The degree of visibility of an object informs the level and intensity of the visual impact, but other factors also influence the nature of the visual impact. The landscape and aesthetic context of the environment in which the object is placed, as well as the perception of the viewer are also important factors. In the context of an OHL, the type of pylon used as well as the degree to which the pylons would impinge upon or obscure a view is also a factor that will influence the experience of the visual impacts.

As described above, a powerline or a switching station could be perceived to be highly incongruous in the context of a largely natural landscape. The height and linear nature of the powerline will exacerbate this incongruity, as the pylons may impinge on views within the landscape and the industrial nature of the switching station results in a change in local aesthetics. In addition, the practice of clearing any taller vegetation from areas within the grid connection servitude can increase the visibility and incongruity of the infrastructure. In a largely natural, bushier setting, vegetation clearance will cause fragmentation of the natural vegetation cover, thus making the infrastructure more visible and drawing the viewer's attention to the servitude.

Sensitivity to visual impacts is typically most pronounced in areas set aside for conservation of the natural environment (such as protected natural areas or conservancies), or in areas in where the natural character or scenic beauty of the area attracts visitors (tourists). In this instance however, the area is not typically valued for its tourism significance and no formal protected areas, leisure-based tourism activities or recognised tourism routes were identified in the area.

Conversely, the presence of other anthropogenic objects associated with the built environment may "degrade" the visual environment and thus the introduction of a new powerline and switching station into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible. In this context therefore, the presence of existing high voltage powerlines traversing the study area is expected to lessen the visual contrast associated with the introduction of new grid connection infrastructure. Other factors, as listed below, can also affect the nature and intensity of a potential visual impact associated with grid connection infrastructure:

- The location of the development in the landform setting – i.e., in a valley bottom or on a ridge top. In the latter example the development would be much more visible and would "break" the horizon;
- The presence of macro- or micro-topographical features, built form or vegetation that would screen views of the development from a receptor location;
- The presence of existing, similar features in the area and their alignment in relation to the proposed new development; and
- Temporary factors such as weather conditions (presence of haze, rainfall or heavy mist) which would affect visibility.

In this instance, the proposed powerline and switching station are intended to serve the proposed Igolide WEF. As such, the grid infrastructure will only be built if the WEF is developed. The grid infrastructure is therefore likely to be perceived to be part of the greater the overall WEF project and the visual impact will be relatively minor when compared to the visual impact associated with the facility as a whole.

Associated Infrastructure

Infrastructure associated with the proposed EGI includes termination point upgrades (expansion of facilities at East Drie Five Substation), lighting, fencing, operations buildings, security fencing and gating, parking area, concrete batching plant (if required), waste storage/disposal and storerooms). and access roads. Visual impacts associated with this infrastructure largely result from surface clearance during construction that could increase the visual prominence of these features, thus increasing the level of contrast with the surrounding landscape.

As with the powerlines and switching station, the additional infrastructure is likely to be perceived as part of the greater Igolide WEF project and the visual impact will be relatively minor when compared to the visual impact associated with the development as a whole.

SENSITIVE VISUAL RECEPTORS

A sensitive visual receptor location is defined as a location where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion which alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced will however vary from one receptor to another, as it is largely based on the viewer's perception.
A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.
The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from I&APs, as raised during the public participation process conducted as part of the EIA study.

As the visibility of the development would diminish exponentially over distance (Section 9.4), receptor locations which are closer to the EGI would experience greater adverse visual impacts than those located further away.
The degree of visual impact experienced will however vary from one inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area.
- The viewer's sentiments toward the proposed development. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape).
- Degree to which the viewer will accept a change in the typical character of the surrounding area.

RECEPTOR IDENTIFICATION

Preliminary desktop assessment of the study area for the proposed Igolide EGI did not identify any formal protected areas or leisure-based tourism activities in the study area for the proposed development. Although several accommodation / restaurant / wedding venue facilities were identified in the study area, these were not considered sensitive due to the type of services being offered and the location of the facilities in relation to areas of existing transformation.

Multiple farmsteads and residences were however identified within a five km radius of the Igolide EGI assessment corridor. In general, farmsteads and residences could be regarded as potentially sensitive visual receptors as they are located within a mostly rural setting with pastoral / natural vistas that will likely be altered by the proposed development. However, not all of these homesteads and residences would be sensitive to the proposed development and given the number of farmsteads, it was not possible to confirm the presence of receptors at all the identified locations. Notwithstanding these limitations, all the identified receptor locations were assessed as part of the VIA as they are still regarded as being potentially sensitive to the visual impacts associated with the proposed development. None of these receptor locations was found to be sensitive.

As a result, the receptor assessment includes fifty-eight potentially sensitive receptor locations, forty-six of which are inside the viewshed for the proposed EGI. Five receptor locations are within the Igolide WEF project area and it is known that these landowners have signed agreements with the Igolide WEF Project Company regarding the establishment of the proposed WEF and associated infrastructure. None of the receptor locations was found to be sensitive.

It was noted that residential areas within and adjacent to the town of Fochville and also the residential area of East Village are located within the Igolide EGI study area. While these could be considered as receptors, they are not considered to be sensitive due to their location within built-up, heavily transformed areas.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfares in the study area are the N12 National Route and the R500 Main Road. The N12 is a major route, linking Johannesburg in the east with Kimberley in the west, before travelling south to the Western Cape Province. The R500 traverses the study area in a north-east to-south-west direction, linking Carletonville with Parys to the south.

The sections of these roads traversing the study area are not considered part of designated scenic routes, although these routes are important links and are likely to be utilised, to some extent, by tourists en route to the Northern Cape or to the resorts located in Parys or along the Vaal River. As a result, they are considered to be potentially sensitive receptor roads – i.e., roads being used by motorists who may object to the potential visual intrusion of the proposed EGI.

Other thoroughfares in the study area, including the Losberg Road are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

Potentially sensitive visual receptor locations identified within the study area for the proposed Igolide EGI are indicated in **Figure 0-70**.

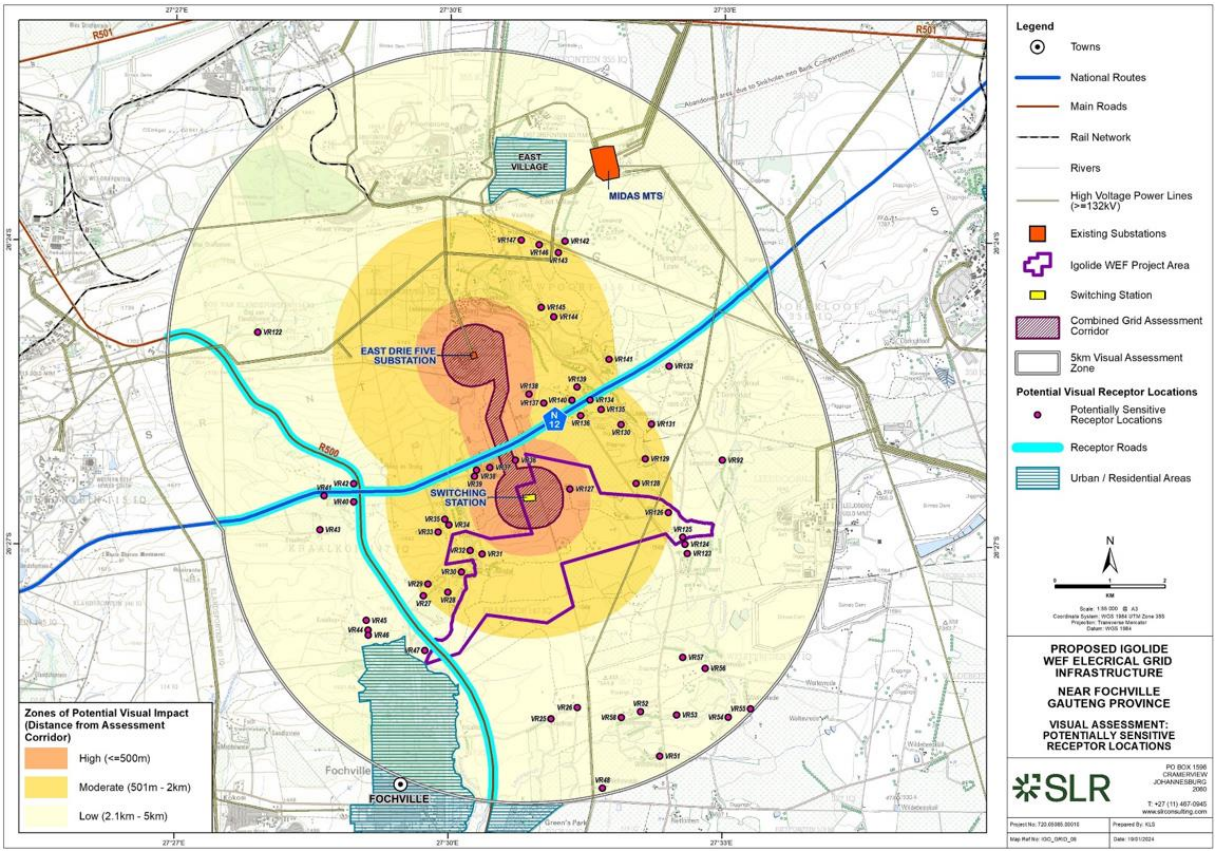

Figure 0-70 - Potentially sensitive receptor locations within 5km of the Igolide EGI

RECEPTOR IMPACT RATING

Distance

As described above, the distance of the viewer / receptor location from the development is an important factor in the context of experiencing visual impacts which will have a strong bearing on mitigating the potential visual impact. A high impact rating has been assigned to receptor locations that are located within 500m of the EGI assessment corridor. The visual impact of a powerline or switching station will diminish beyond 5 km as the structures would appear to merge with the elements on the horizon. Any visual receptor locations beyond this distance limit have therefore not been assessed as they fall outside the study area and would not be visually influenced by the proposed development.

At this stage of the process, zones of visual impact for the proposed EGI have been delineated according to distance from the EGI assessment corridor. Based on the height and scale of the project, the distance intervals chosen for the zones of visual impact, as shown in Figure 17 are as follows:

- 0 – 500 m (high impact zone)
- 500 m – 2 km (moderate impact zone)
- 2 km – 5 km (low impact zone)

Screening Elements

The presence of screening elements is an equally important factor in this context. Screening elements can be vegetation, buildings and topographic features. For example, a grove of trees, a series of low hills or a mine dump located between a receptor location and an object could completely shield the object from the receptor.

Visual Contrast

The visual contrast of a development refers to the degree to which the proposed development would be congruent with the surrounding environment. This is based on whether or not the development would conform to the land use, settlement density, structural scale, form and pattern of natural elements that define the structure of the surrounding landscape. Visual compatibility is an important factor to be considered when assessing the impact of the development on visual receptors within a specific context. A development that is incongruent with the surrounding area could have a significant visual impact on visual receptors as it may change the visual character of the landscape.

In order to determine the likely visual compatibility of the proposed development, the study area was classified into the following zones of visual contrast (**Figure 0-71**):

- High –
  - undeveloped / natural / rural areas.
- Moderate –
  - areas within 500m of existing power lines (>=132kV);
  - areas within 500m of main roads;
  - areas within 500m of railway infrastructure;
  - areas within 500m of cultivated land, commercial forest plantations and urban smallholdings.
- Low –
  - areas within 500m of urban / industrial / built-up areas; and
  - areas within 500m of mines / quarries etc.

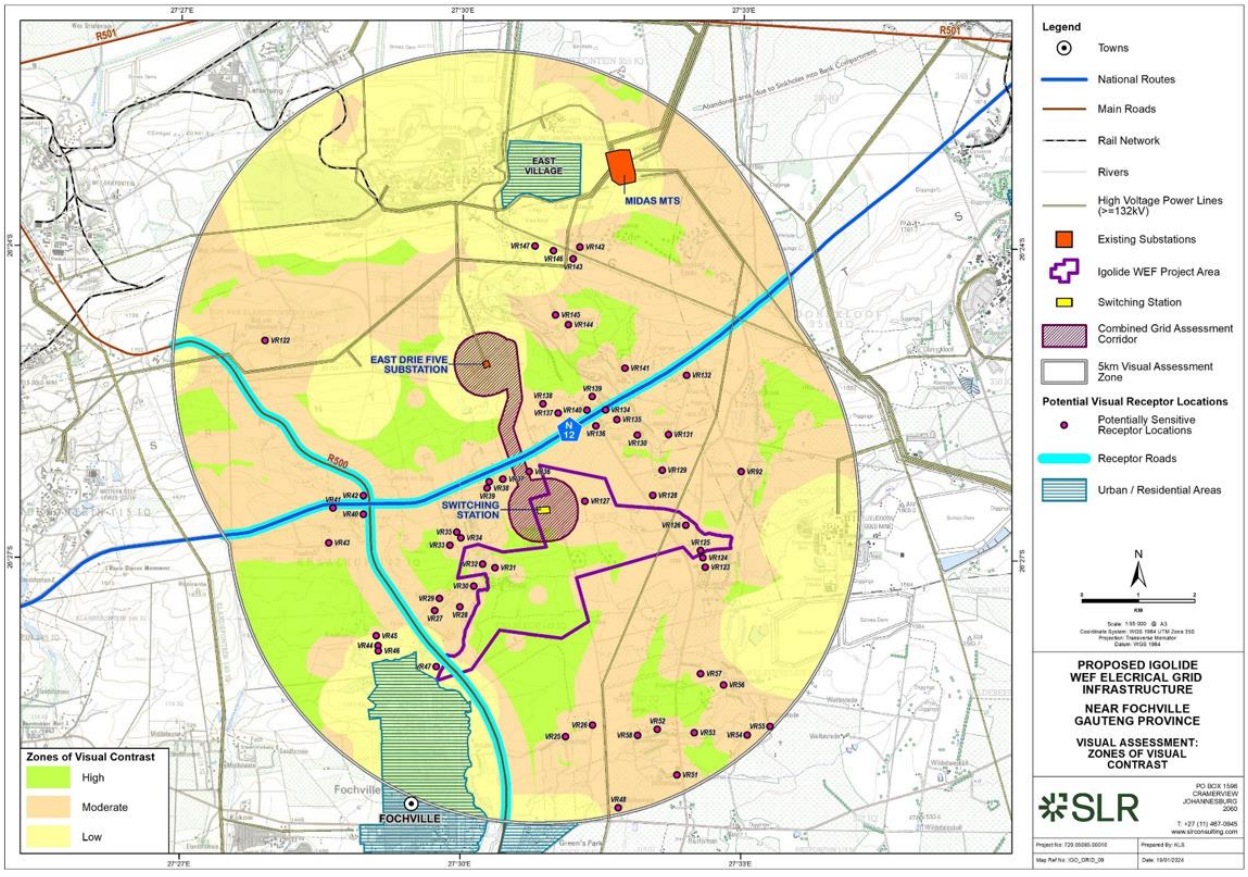

Figure 0-71 - Zones of visual contrast within the study area

NIGHT-TIME IMPACTS

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed EGI at night.

The town of Fochville, located approximately 6 km south-west of the Igolide EGI assessment corridor, together with the adjacent townships of Greenspark and Kokosi are the main source of light within the study area. In addition, the large mining operations and associated residential areas to the north of the EGI assessment corridor are expected to have a significant impact on the night scene in the northern sector of the study area. Other light spill in the broader area would largely emanate from the many farmsteads dotted across the study area, and from vehicles travelling along the main roads. Overall, the visual character of the night environment within the study area is considered to be affected by a moderate level of light pollution and will therefore not be regarded as pristine.

Powerlines and associated pylons are not generally lit up at night and, thus light spill associated with the proposed EGI is only likely to emanate from the proposed switching station. Lighting from this facility is therefore expected to intrude on the nightscape to some degree. As the EGI will only be constructed if the associated Igolide WEF is developed, the lighting impacts from the proposed switching station would be subsumed by the glare and contrast of the lights associated with the WEF. As such, the grid infrastructure alone is not expected to result in significant lighting impacts.