REPORT

Environmental Impact Report: The Development of a 100MWp Photovoltaic (PV) Plant associated with the Tubatse Ferrochrome (TFC) Smelter, Fetakgomo Tubatse Local Municipality
DFFE Ref: 14/12/16/3/3/2/2079

Draft Environmental Impact Report

Client: Samancor Chrome Pty Ltd

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Royal HaskoningDHV

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Executive Summary

The rising electricity tariffs in South Africa, combined with the increasingly severe load shedding patterns experienced across the country, has a negative impact on the production and revenue of Samancor Chrome business. Climate change is also a concern for Samancor Chrome referring to the emissions of greenhouse gases (GHG) in the use of fossil fuel electricity. This has motivated Samancor Chrome to consider renewable energy generation at their smelter plants. Implementing solar Photovoltaic (PV) generation will result in improved availability of supply and reduced utility bills as well as going 'green' in terms of environmental considerations.

Samancor Chrome is therefore proposing the development of a 100 Megawatt peak (MWp) PV plant over five potential sites adjacent to the TFC Smelter in Steelpoort, Fetakgomo Tubatse Local Municipality.

Samancor Chrome appointed Royal HaskoningDHV (Pty) Ltd to undertake the required Environmental Impact Assessment (EIA) study for the project in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended) and the EIA Regulations 2014 (as amended).

Scope of the Study

The project area is located on opposite sides of the R555 and to the south of the Steelpoort River, Limpopo Province. The project area falls within the Sekhukhune District Municipality (SDM) and the Fetakgomo Tubatse Municipality within Ward 31. It is proposed that the PV plant be developed over the five (5) potential sites.

The main components of the PV plant will include the following:

- Solar fields comprising of solar PV panels/ modules that convert solar radiation directly into electricity through the PV effect.
- Inverter and transformer combination - each power block will have a centralised inverter which converts the direct current (DC) power generated by the PV panels, to alternating current (AC) power and a transformer which transforms the power to a higher voltage of 33kV to facilitate transmitting the power over longer distances to connect to the Tubatse East- and West Plant Substations.
- Grid connection infrastructure – the solar fields connect to the Tubatse East- and West Substations by mean of power corridors to evacuate the AC power. The power corridor will comprise of overhead lines or underground cables, or a combination thereof, at a voltage level of 33kV.
- The proposed connections onto the Tubatse East- and West Plant Substations will comprise of 33kV indoor switchgear blocks located next to these substations. The purpose of these blocks would be to collect the feeders from the solar fields and combine them into one or two feeders to be connected onto the existing 33kV substation infrastructure.

Associated infrastructure includes:

- Mounting structures for the solar panels in a fixed tilt configuration.
- Internal access road (4 – 6m wide).
- Battery Energy Storage System (BESS) - lithium-ion is the preferred technology.
- Instrumentation and control consisting of hardware and software for remote plant monitoring and operation of the facility.
- Fencing (approximately 1.8m in height), gates and access control.
- Construction camp and laydown area.
- Guard houses at each site with ablution (such as chemical toilets) facilities, a water storage tank at each guard house.
- Channelisation of two drainage lines on Site 5.

Objectives of the EIA Study

The objective of the EIA study is to, through a consultative process:

a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Environmental Scoping Report (ESR);
c) identify the location of the development footprint within the approved site as contemplated in the accepted ESR based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
d) determine the –
   (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
   (ii) degree to which these impacts can be reversed; may cause irreplaceable loss of resources, and can be avoided, managed or mitigated;
e) identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted ESR based on the lowest level of environmental sensitivity identified during the assessment;
f) identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted ESR through the life of the activity;
g) identify suitable measures to avoid, manage or mitigate identified impacts; and
h) identify residual risks that need to be managed and monitored.

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of environmental impacts and related legislation that were taken into consideration during this study and are elaborated on in this report.

The Department of Forestry, Fisheries and the Environment (DFFE) is the Competent Authority for this EIA study and the project needs to be authorised by this Department.

Key Findings of the EIA Study

a) Agriculture

The proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. This is substantiated by the facts that the proposed development will occupy land that cannot (and is not) currently be utilised for agriculture, that the proposed development poses a low risk in terms of causing soil degradation, and that the occupation is not permanent, allowing the land to potentially be used for agriculture after the proposed activity ceases.

From an agricultural impact point of view, it is recommended that the development be approved.

b) Hydrology

It is imperative that during the construction phase, stormwater management interventions are implemented particularly to manage sediment washing off the sites. The sediments result from the removal of vegetation, disturbance of the soils and stockpiling of materials. From all these sources, particles are transported during rainfall events and if not managed can cause a problem in receiving waterways.

Site 1 will be free draining and will not require any stormwater infrastructure. Site 2 will be free draining and will not require any stormwater infrastructure within its footprint. Site 2 will require a protection berm and drain system along its southern perimeter to divert flows from the upstream sub-catchments draining

towards it. This drain will discharge to the environment *via* a release structure. Site 3 will be free draining with a protection berm and drain system on its eastern perimeter to divert flows from the upstream sub-catchments around it. Site 4 will be free draining and will not require any stormwater infrastructure. The main watercourse on Site 5 will be preserved in its natural condition and no riparian vegetation may be removed. The second minor drainage line will not require any infrastructure, but panels should be placed away from it, as per the current layout. The third drainage line shall be formalized into a trapezoidal channel that is concrete-lined and shall discharge *via* a release structure into the Steelpoort River. The fourth drainage line will be formalized into for example a trapezoidal Terrafix® or a similar lined channel.

Ongoing inspection and maintenance of drainage management measures should be carried out throughout the construction period. As the site changes during the progression of construction, the drainage system may need to be re-evaluated and altered.

The Steelpoort River is a major watercourse downstream of the sites. Samancor Chrome currently has a surface water monitoring program. It is recommended that monitoring of the water quality take place at the beginning of construction of the sites through to their completion and operation in order to identify impacts to the river water quality resulting from them.

c) Freshwater

No wetlands were identified on site or within 500m of the planned infrastructure, the freshwater ecosystems identified are best defined as watercourses with associated riparian zones of varying degrees of development. These systems are associated with the proposed Site 3,4 and 5 as such these watercourses will potentially be impacted upon, should the PV plant be approved.

The aquatic ecological assessment included three sites located on the Steelpoort River, site TS1 (upstream of the proposed construction), site TS2 (downstream of Sites 3, 4 and 5) and site TS3 (located downstream of the proposed construction). Water quality of the Steelpoort River was considered good at all three sites, with largely natural Electrical Conductivity (EC), pH and Dissolved Oxygen (DO) concentrations observed during the site assessment. Considering the Ecostatus Categories for both sites TS1 and TS2, the Macro-Invertebrate Response Assessment Index (MIRAI), Fish Response Assessment Index (FRAI), Riparian Vegetation Response Assessment Index (VEGRAI) and the Index of Habitat Integrity (IHI) classifications concur with the Resource Quality Objectives (RQO) of the Steelpoort River [Present Ecological State (PES) Category D]. The MIRAI classification of site TS3 also concurred with the RQO (FRAI, VEGRAI and IHI not applied to site TS3). The Integrated Ecological Category (IEC) for both sites TS1 and TS2 have resulted in Ecostatus scores of 73.7% (Category C: Moderately Modified) at site TS1, and 75.2% (Category C: Moderately Modified) at site TS2, respectively. Overall, the Steelpoort River is considered moderately modified (Class C), of high Ecological Importance and Sensitivity (EIS) and also considered a fish support area (*Opsaridium peringueyi*).

The outcome of the assessment indicated that the proposed construction of the PV plant would have an overall medium risk significance on the aquatic environment. The strict implementation of the stipulated mitigation measures as recommended in this report and EMPrs (***Appendix G - I***), with specific mention of limiting the potential of additional sediment to enter the watercourses, and limiting erosion from stormwater runoff, will enable the reduction of the perceived impacts.

Furthermore, with rehabilitation and long-term management of erosion and alien and invasive plant species the overall PES of the Steelpoort River and its associated watercourses will not be impacted by the PV plant.

Prudent monitoring including aquatic biomonitoring of the Steelpoort River will be required for the duration of the proposed project and into the operational phase, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage any potential impacts which may arise throughout the life of the proposed project.

d) Flora

Significant to moderate levels of deterioration are noticeable from changes to compositional and structural aspects of the flora on a local scale, to the extent that portions of the proposed sites no longer can be considered entirely representative of the regional ecological type. Despite the deteriorated nature of the flora, the presence of several conservation important plant species resulted in a moderate-high floristic sensitivity of much of the receiving environment. A review of the anticipated impacts from the proposed development on the floristic receiving environment indicates that none of the anticipated impacts (if managed and mitigated correctly) can be highlighted or construed to represent unacceptable or severe threats to sensitive floristic elements within the study areas and immediate surrounds. However, caution is advised in the manner that protected and conservation plant species are dealt with. While any impact on these species is subject to a permitting process, the removal and relocation of some species is advised as a minimum measure. While *ex situ* conservation measures are not always regarded as a suitable option, it is nonetheless recommended in this particular instance for the *Adenia fruticosa* that is a Vulnerable (IUCN) listed species.

It is therefore the considered opinion, based on results of the botanical investigation, that no specific objections are raised to the proposed development. This opinion is based on the explicit understanding that the recommended mitigation approach is timeously and comprehensively implemented and also adhered to during all stages of the development.

d) Fauna

The general faunal assemblages on the study area were mainly represented by widespread taxa that show large distribution ranges across the Savanna Biome. Charismatic and threatened animal taxa were in general uncommon on the respective sites, apart from the regular occurrences of the Vulnerable Lanner Falcon (*Falco biarmicus*) at Site 5 and Site 3, and the occurrence of an overlooked sub-population of the endangered Southern Mountain Reedbuck (*Redunca f. fulvorufula*) near Site 2. However, the preservation of habitat with a high ecological connectivity, for example all drainage lines and the riparian thicket corridor along the Steelpoort River is regarded as a high priority in order to maintain and facilitate extant animal dispersal corridors across the study area. Nevertheless, most of the project sites are located and surrounded by industrial infrastructure and areas where human activities are relatively of high frequency, which collectively contributed over time to the formation of short open deteriorated woodland habitat or habitat that are fragmented, thereby containing unspecialised and generalist taxa.

It is predicted that the impacts on the faunal component of the study area were likely to be of medium significance (prior to mitigation) at most of the proposed project sites, although the loss of habitat and dispersal corridors (e.g. Site 5) is regarded to be of high significance (prior to mitigation). The implementation of the suggested mitigation approach is expected to result in the amelioration of the anticipated impacts to an acceptable level, with priority given to the natural dispersal of animals between and among habitat units in the wider study area. Therefore, no specific objections to the project are raised, but with the understanding that the suggested mitigation protocol is timeous and comprehensively implemented.

e) Biodiversity Monitoring Programme

It is proposed that an Annual Biodiversity Monitoring Programme be undertaken for the project. Through implementation and execution of a Biodiversity Monitoring Programme, the anticipated and actual impacts

of the proposed activities can be established and monitored. Collated information data and results will contribute towards a responsive management approach to minimize the impact footprints and associated spheres of influence.

f) Avifauna

The avifaunal assemblage in the study area has been studied and assessed, and it can be concluded that the development of the PV plant will not have highly significant impacts on the avifaunal environment in a wider study area context despite more significant localised impacts. The exclusion of certain sensitive areas from the development footprint, especially the riparian corridors on the site is a critical mitigation measure that in association with the active protection of these and other areas of residual woodland on the development sites will minimise the impacts of habitat loss and which will ensure that habitat connectivity is maintained.

A series of mitigation measures have been stipulated, and provided these are implemented, the development can proceed without resulting in significant impacts on the avifaunal assemblage on the site, in particular on priority species and other sensitive species such as raptors.

It is advised that monitoring be conducted in the pre-construction and post-construction phases of the project.

g) Heritage and Palaeontology

During the field work several heritage features and resources were identified and logged. A total of 57 points of interest were logged that resulted in the delineation and identification of 24 separate heritage sites. These consist of five burial grounds with a High heritage significance and a heritage grading of IIIA. There are nine historic recent structures that vary in significance from medium to low and a grading of IIIB. The archaeological finds consisting of nine archaeological sites has in most cases a rating of Medium significance and a grading varying between IIIC and IIIA at the highest. Site 5-8 represents a possible memorial now in disuse it was rated as having a Low heritage significance but with a possible local significance.

Burial grounds have a high heritage rating and a heritage grading of IIIA. According to the SAHRA graves management policy a buffer of at least 30-meters, as No-Go area, must be kept around burial grounds and graves.

The identified archaeological sites have a low to high heritage significance. Sites 2, 3 and 5 will have the least impact on identified archaeological sites, although mitigation work will be required for Sites 3 and 5. The archaeological site identified on Site 4 will require extensive mitigation work to mitigate the impact before any development. If any of the identified archaeological site are to be disturbed a Phase 2 archaeological mitigation process must be implemented.

The SAHRIS Palaeo-sensitivity Map rates the palaeontological sensitivity of the geology as low and will only require the inclusion of a chance finds procedure in the EMPrs. Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

h) Visual

As the proposed development consists of five separate parcels of land on which solar power arrays are proposed to be constructed that are distributed around the existing TFC Smelter, along with various sets of

powerline corridors that would be associated with the five sites, there are differing sets of potential receptor locations for each of the sites.

The context of the landscape in which the solar power arrays are proposed to be located is likely to be an important factor that could mimimise any perceptions of visual impact. The existing altered visual baseline of the landscapes into which the developments would be located, and their location directly adjacent to existing areas of visual change due especially to urban or infrastructural development is a strong mitigating factor.

i) Social

Construction activities and impacts that pose a danger to proximate residents (Mohlakwana, Matholeng, Stocking, Steelpoort Town) through increased road traffic, dust and potential noise must be managed by the implementation of mitigation measures as proposed in the EMPrs (***Appendix G - I***).

The influx of Contractors and staff will result in the proliferation of social ills and issues such as crime, prostitution, alcohol consumption, abuse, the spread of HIV/ AIDs, COVID19 etc. Communication with local communities is also an important tool that will assist in monitoring such a situation as well as the implementation of a formal grievance system to be maintained throughout project.

The potential job creation at the construction phase of the project will be a positive for the local and regional economy as unemployment in the country is increasing.

j) Climate Change

The climatic trends and projections indicate that water availability and temperature stress are likely to affect the region in future, and these effects must be taken into account.

The CO_2 reduction potential of the solar PV facility will be 171 512 ton of CO_2 in the first year of operation and a total of 3 255 814 ton of CO_2 over 25 years. The South Africa national carbon budget is targeted at 350 $MtCO_2eq$ for 2025 according to the nationally determined contribution (NDC) recommended by South Africa's Presidential Climate Commission in July 2021. Considering the 2025 NDC, the solar project will marginally decrease the targeted GHG by a factor of about 0.05%.

k) Other Impacts (Dust, Emissions, Waste)

Other impacts relate to dust, emissions and waste must be managed during construction, decommissioning/closure and rehabilitation. Mitigation measures proposed in the EMPrs (***Appendix G - I***) must be adhered to reduce the significance of these potential impacts.

Environmental and Cumulative Impact Statement

The project, in the EAPs opinion, does not pose a detrimental impact on the receiving environment and its inhabitants and although there are potentially high to moderate significant impacts, these impacts can be mitigated significantly. There are no fatal flaws prohibiting the project from going ahead.

Acronyms

AC	Alternating Current
AR6	Sixth Assessment Report
ASPT	Average Score Per Taxon
BAS	Best Attainable State
BESS	Battery Energy Storage System
BRP	Bioregional Plan
CBAs	Critical Biodiversity Areas
CO_2	Carbon Dioxide
C-Plan	Conservation Plan
CSIR	Council of Scientific and Industrial Research
CWAC	Co-ordinated Waterbird Counts
DC	Direct Current
DEM	Digital Elevation Model
DFFE	Department of Forestry, Fisheries and the Environment
DO	Dissolved Oxygen
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Electrical conductivity
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMPrs	Environmental Management Programmes
EPL	Ecosystem Protection Level
ESAs	Ecological Support Areas
ESR	Environmental Scoping Report
EST	Environmental Screening Tool
ETS	Ecosystem Threat Status
FGTM	Fetakgomo Tubatse Local Municipality
FRAI	Fish Response Assessment Index
GHG	Greenhouse Gas
GPC	Global Protocol for Community scale GHG Emission Inventories
GSM	Gravel/Sand/Mud
HIA	Heritage Impact Assessment

I&APs	Interested and Affected Parties
IHAS	Integrated Habitat Assessment System
IHI	Index of Habitat Integrity
IEAP	Emission Analysis Protocol
IPCC	Intergovernmental Panel on Climate Change
IPPs	Independent Power Producers
IRP	Integrated Resources Plan
LCCS	Limpopo Climate Change Strategy
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
LEMA	Limpopo Environmental Management Act
LTAS	Long-Term Adaptation Scenarios Flagship Research Programme
LULUCF	Land Use, Land Use Change and Forestry
MIRAI	Macro-Invertebrate Response Assessment Index
MWp	Megawatt peak
NBA	National Biodiversity Assessment
NDC	Nationally Determined Contribution
NDP	National Development Plan
NEMA	National Environmental Management Act (Act No. 107 of 1998) (as amended)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Area
NNHR	No Natural Habitat Remaining
NWA	National Water Act (Act No. 36 of 1998) (as amended)
ONA	Other Natural Area
PA	Protected Areas
PPA	Power Purchase Agreement
PPP	Public Participation Process
PV	Photovoltaic
RCP	Representative Concentration Pathway
REC	Recommended Ecological Class
RFP	Request for Proposal
RMO	Recommended Management Objective

RO	Reverse Osmosis
RWQO	Resource Water Quality Objective
SABAP	Southern African Bird Atlas Project
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SAHRA	South African Heritage Resource Agency
SASS	South African Scoring System
SCPE	Sekhukhune Centre of Plant Endemism
SDGs	Sustainable Development Goals
SDM	Sekhukhune District Municipality
SEZs	Special Economic Zones
SIPs	Strategic Infrastructure Projects
SP	Significance Points
SWMP	Stormwater Management Plan
TFC	Tubatse Ferrochrome
UNFCCC	United Nations Framework Convention on Climate Change
VEGRAI	Riparian Vegetation Response Assessment Index
WMO	World Meteorological Organization
WUL	Water Use Licence

Glossary

Glossary Term	Glossary Text
Activity (Development)	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms 'activity' and 'development' are freely interchanged.
Albedo	Ground reflectance.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Buffer	A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Decommissioning	Decommissioning means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned.
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.
Environment	In terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) (as amended), "Environment" means the surroundings within which humans exist and that are made up of: i. the land, water and atmosphere of the earth; ii. micro-organisms, plants and animal life; iii. any part or combination of (i) and (ii), and the interrelationships among and between them; and

	iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes, or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental Impact	Change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly, or partially, resulting from an organisation's activities, products or services.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater runoff are supplied.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined in the National Environmental Management: Waste Amendment Act (No 26 of 2014). Schedule 3: Category A – Hazardous Waste.
Hornfels	Hornfels is a metamorphic rock formed by the contact between mudstone/ shale, or other clay-rich rock, and a hot igneous body, and represents a heat-altered equivalent of the original rock.
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity

Integrated Environmental Management	A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing, and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).
Interested and Affected Party (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.
Method Statement	A method statement is a written submission by the Contractor to the Engineer in response to the specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting a Method Statement. It contains sufficient detail to enable the Engineer to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.
Mitigate	The implementation of practical measures designed to avoid, reduce, or remedy adverse impacts or enhance beneficial impacts of an action.
No-Go Option	In this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Physiognomy	Physiognomy refers to overall structure or physical appearance - what the community and its dominant species look like, their height and spacing (height and canopy cover), and shape.
Pollution	The National Environmental Management Act, No. 107 of 1998 (as amended) defines pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Re-use	To utilise articles from the waste stream again for a similar or a different purpose without changing the form of properties of the articles.
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.

Scour	The removal of sediment or materials from the bed or banks of a watercourse occur when the forces imposed by the flow on a sediment particle exceed the stabilising forces.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
Vadose Zone	The vadose zone is the Earth's terrestrial subsurface that extends from the surface to the regional groundwater table.
Watercourse	Defined as: i. a river or spring; ii. a natural channel or depression in which water flows regularly or intermittently; iii. a wetland, lake or dam into which, or from which, water flows; and iv. any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.
Water Pollution	The National Water Act, 36 of 1998 (as amended) defines water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (aa) to the welfare, health or safety of human beings; (bb) to any aquatic or non-aquatic organisms; (cc) to the resource quality; or (dd) to property”.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

1 INTRODUCTION

1.1 Background

Samancor Chrome Ltd's core business is the mining and smelting of chrome ore. With an annual production capacity of 2.4 million tons of ferrochrome, Samancor Chrome is one of the largest integrated ferrochrome producers in the world. The ferrochrome produced is used in areas of the stainless-steel smelting process. Samancor Chrome has been, and continues to be, a major player in ferrochromium production. The company's total chromite resources exceed 900 million tons and are expected to support current mining activity for well over 100 years at the current rate of extraction. Some ores and concentrates are exported, but main allotments are destined for conversion into ferrochrome at the alloy plants.

The Tubatse Ferrochrome (TFC) Smelter was initially built as a three-furnace operation in 1975 as a joint venture between Gencor Ltd and Union Carbide Inc. (USA). In the same year, the Union Carbide Inc. shareholding was taken over by Samancor Chrome, and in 1989, Samancor Chrome acquired the Gencor Ltd shareholding. During the years 1989 – 1990, the plant was expanded to five furnaces with the sixth furnace being built in 1996. The plant is situated in Steelpoort, Limpopo Province and is in close proximity to the Eastern Chrome Mines. The core business of the operation is the production of charge chrome using six Submerged-Arc Furnaces, one metal recovery plant, and a Pellet and Sintering Plant.

The rising electricity tariffs in South Africa, combined with the increasingly severe load shedding patterns experienced across the country, has a negative impact on the production and revenue of Samancor Chrome's business. Climate change is also a concern for Samancor Chrome referring to the emissions of greenhouse gases (GHG) in the use of fossil fuel electricity. This together with the recent announcement by the President of South Africa to allow for an increase to 100MW embedded generation threshold has motivated Samancor Chrome to consider renewable energy generation at their smelter plants. Implementing solar Photovoltaic (PV) generation will result in improved availability of supply and reduced utility bills as well as going 'green' in terms of environmental considerations.

Samancor Chrome is therefore proposing the development of a 100 Megawatt peak (MWp) PV plant over 5 potential sites adjacent to the TFC Smelter in Steelpoort, Fetakgomo Tubatse Local Municipality (FGTM) (Figure 1-1 and ***Appendix A***). Initially, a 60MWp PV plant was considered, however, upon completion of the concept design engineering process, Samancor Chrome is now considering a 100MWp PV Plant and the EIA study considers this revised output.

Samancor Chrome invited Independent Power Producers (IPPs) to respond to a Request for Proposal (RFP) in March 2021, to finance, develop, construct, own, operate and maintain the PV plant, in order to supply electricity to Samancor Chrome's TFC Smelter. It is Samancor Chrome's intent to sign a Power Purchase Agreement (PPA) with the successful IPP for a minimum of 20 years.

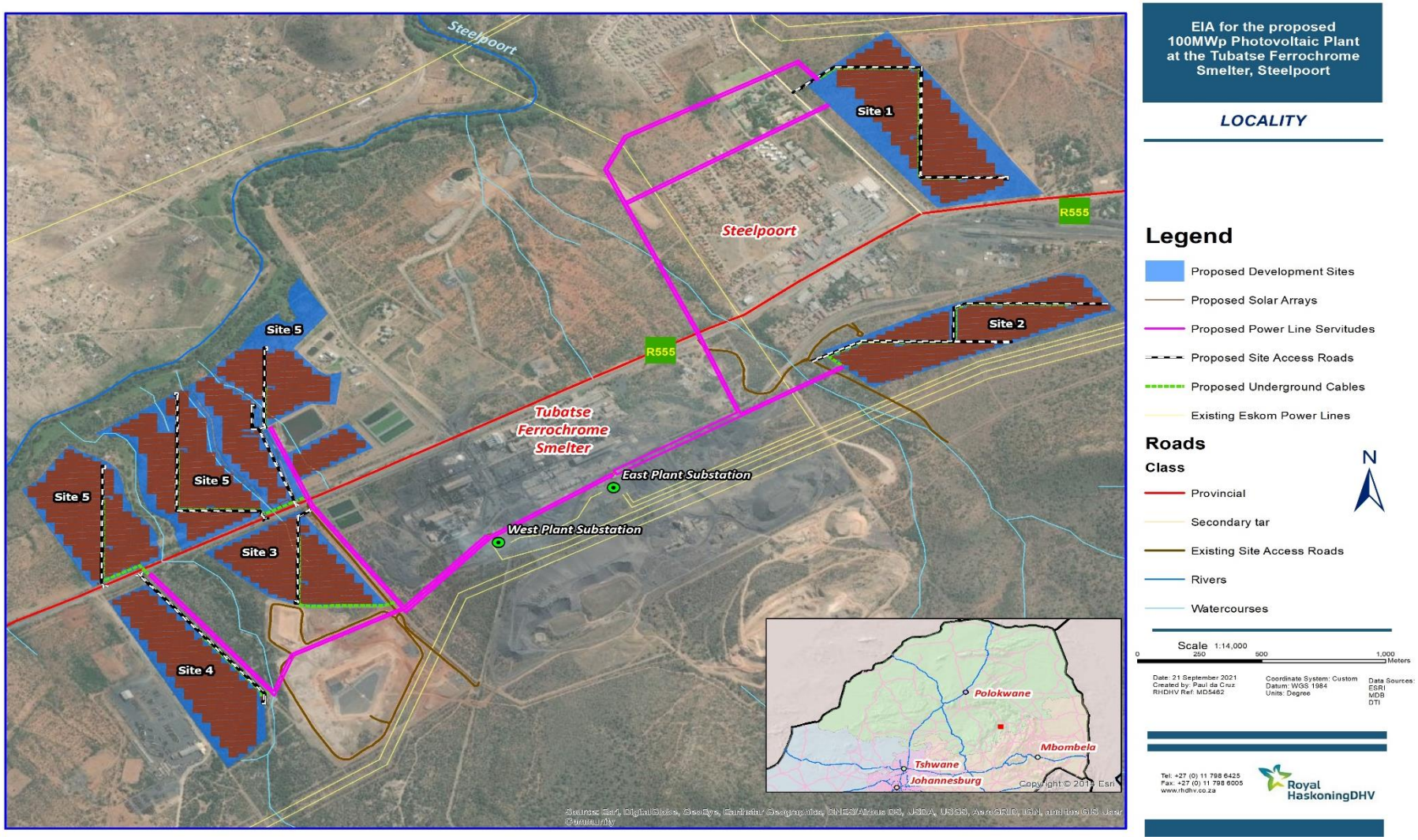


Figure 1-1: Locality map

1.2 Objectives of the Environmental Impact Assessment (EIA) Study

The objective of the EIA study is to, through a consultative process:

a. determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
b. describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Environmental Scoping Report (ESR);
c. identify the location of the development footprint within the approved site as contemplated in the accepted ESR based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
d. determine the –
    i. nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    ii. degree to which these impacts can be reversed; may cause irreplaceable loss of resources, and can be avoided, managed or mitigated;
e. identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted ESR based on the lowest level of environmental sensitivity identified during the assessment;
f. identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted ESR through the life of the activity;
g. identify suitable measures to avoid, manage or mitigate identified impacts; and
h. identify residual risks that need to be managed and monitored.

1.3 Specialist Input into the EIA Study

To ensure the scientific rigour of the EIA study as well as a robust assessment of impacts, Royal HaskoningDHV was assisted by various specialists in order to comprehensively identify both potentially positive and negative environmental impacts (social and biophysical) associated with the project and where possible mitigate the potentially negative impacts and enhance the positive impacts (Table 1-1).

Table 1-1: Specialist input into the EIA study

Specialist Assessments	Organisation
Hydrology	GCS Water and Environmental Consultants
Freshwater	Scientific Aquatic Services
Agriculture	Johann Lanz (private)
Biodiversity	Bathusi Environmental Consultants
Avifauna	Royal HaskoningDHV
Heritage and Palaeontology	PGS Heritage
Climate Change	Royal HaskoningDHV

1.4 Independent Peer Reviews

In addition to the above, the EIA Regulations 2014 (as amended) requires the Environmental Assessment Practitioner (EAP) to be independent, objective and have expertise in conducting EIAs. Such expertise should include knowledge of all relevant legislation and of any guidelines that have relevance to the

proposed activity. To ensure a lack of bias and to ensure transparency an external peer review of the draft consultation Environmental Impact Report (EIR) and Environmental Management Programmes (EMPrs) has been undertaken by W&L Consultants (***Appendix B***). In addition, external peer reviews have also been undertaken for the Avifauna (***Appendix E5)*** and Climate Change (***Appendix E7)*** studies by Ecological Logistics (Pty) Ltd and Themis Environmental (Pty) Ltd respectively.

1.5 Details of the Project Applicant

The Applicant for the project is Samancor Chrome and the details of the responsible person are listed in Table 1-2.

Table 1-2: Applicant details

Applicant	Samancor Chrome Pty Ltd/Tubatse Chrome (PTY) Ltd	
Representative	Willem den Heijer	
Physical Address	Block A, Cullinan Place Cullinan Close Morningside, Sandton, 2196	
Telephone	011 245 1000	
E-mail	Willem.denheijer@samancorcr.com	

1.6 Details of the Environmental Assessment Practitioner

The environmental team of Royal HaskoningDHV have been appointed as the EAPs by Samancor Chrome to undertake the appropriate environmental studies for this proposed project (Table 1-3).

The professional team of Royal HaskoningDHV has considerable experience in the environmental management field. Royal HaskoningDHV been involved in and/ or managed several of the largest EIAs undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects, including the establishment of linear developments (national and provincial roads, and powerlines), mixed-use developments, bulk infrastructure and supply (e.g. wastewater treatment works, pipelines, landfills), electricity generation (renewable as well as non-renewable) and transmission, urban, rural and township developments, environmental aspects of Local Integrated Development Plans, as well as general environmental planning, development and management.

EAP CVs are attached as ***Appendix C***.

Table 1-3: EAP details

Consultant	Royal HaskoningDHV	
Contact Persons	Prashika Reddy	Seshni Govender
Postal Address	PO Box 867, Gallo Manor, 2191	PO Box 867, Gallo Manor, 2191
Telephone	087 352 1577	087 352 1592
E-mail	prashika.reddy@rhdhv.com	Seshni.govender@rhdhv.com
Qualification	BSc (Hons) Geography BSc (Hons) Botany	BSc (Hons) Environmental Science

Consultant	Royal HaskoningDHV	
Expertise	Prashika Reddy is a Senior Environmental Scientist with 19 years' experience in various environmental fields including: EIAs, EMPrs, PPP and environmental monitoring and audits. She is/ has been part of numerous multi-faceted large-scale projects, including the establishment of linear developments (roads and powerlines), industrial plants, electricity generation plants, mixed-use developments and mining projects. She is a Professional Natural Scientist (400133/10) with the South African Council for Natural Scientific Professions (SACNASP) as well as a Registered EAP with EAPASA (2019/917).	Seshni Govender is an Environmental Consultant with 8 years' Environmental Consultant with eight (8) years working on compliance and strategic planning projects across South Africa. I have been involved in numerous Screening Studies, Basic Assessment, Water Use License projects, including complex integrated licensing that requires understanding cumulative environmental impacts. She is a Professional Natural Scientist (132741) with the SACNASP.

1.7 Structure of the EIR

This draft consultation EIR has been compiled in accordance with the stipulated requirements in GNR 326, Appendix 3 of the EIA Regulations 2014 (as amended) - Table 1-4.

Table 1-4: Compliance with Appendix 3 of GNR 236

EIR Requirements	Section/Comment
An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-	
a. details of— (i) the EAP who prepared the report; and (ii) (ii) the expertise of the EAP, including a curriculum vitae;	Section 1.6
b. the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 2.1 Figure 1-1
c. a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Figure 2-3 - Figure 2-7
d. a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Table 2-4 Chapter 4

EIR Requirements	Section/Comment
e. a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Chapter 4
f. a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 3
g. a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 5
h. a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 5, 6, 7 and 9
i. a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapter 9

EIR Requirements	Section/Comment
j. an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring;(v) the degree to which the impact and risk can be reversed; (v) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vi) the degree to which the impact and risk can be mitigated;	Chapter 9
k. where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Chapter 8
l. an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Chapter 10
m. based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Chapter 8
n. the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Chapter 5
o. any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 10.7
p. a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 10.5
q. a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 10
r. where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	NA
s. an undertaking under oath or affirmation by the EAP in relation to (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 10.9
t. where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	NA

EIR Requirements	Section/Comment
u. an indication of any deviation from the approved scoping report, including the plan of study, including— (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	NA
v. any specific information that may be required by the competent authority; and	NA
w. any other matters required in terms of section 24(4)(a) and (b) of the Act.	NA

2 PROJECT SCOPE

2.1 Property Details

The project area is located on opposite sides of the R555 and to the south of the Steelpoort River, Limpopo Province. The project area falls within the Sekhukhune District Municipality (SDM) and the FGTM within Ward 31. Small settlements of Pelaneng (located to the north), Stocking, Matholeng and Mohlakwana (located to the east) exist within the project area. The town of Steelpoort is located to the east of the TFC Smelter.

The details regarding the proposed sites and associated infrastructure are provided in Table 2-1 and Table 2-2 below.

Table 2-1: Property details for the PV plant sites

Site	Size (ha)	Property Details	Landowner	21 Digit Surveyor-General Code
1	31.69	Olifantspoortje 319 KT Portion 5	Steelpoort Prop cc	T0KT00000000031900005
		Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
2	24.19	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
3	15.82	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
4	20.04	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
5	70.41	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd TCTA	T0KT00000000033700000
		Goudmyn 337 KT Portion 6	Samancor Chrome Ltd TCTA	T0KT00000000033700006

Table 2-2: Property details for the associated infrastructure

Component	Property Details	Landowner	21 Digit Surveyor-General Code
Culverted Watercourse #1	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Culverted watercourse #2	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Site 1 Access Roads	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
	Olifantspoortje 319 KT Portion 5	Steelpoort Prop cc	T0KT00000000031900005
Site 2 Access Roads	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
Site 3 Access Roads	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Site 4 Access Roads	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000

Component	Property Details	Landowner	21 Digit Surveyor-General Code
Site 5 Access Roads	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Storage Yard/Site Office	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Site 1 Underground Cables	Olifantspoortje 319 KT Portion 5	Steelpoort Prop cc	T0KT00000000031900006
	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
Site 2 Underground Cables	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
Site 2 Underground Cables	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
Site 3 Underground Cables	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Site 4 Underground Cables	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
Site 5 Underground Cables	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000
33kV Substation (Tubatse East)	Goudmyn 337 KT Portion 6	Samancor Chrome Ltd	T0KT00000000033700006
33kV Substation (Tubatse West)	Goudmyn 337 KT Portion 6	Samancor Chrome Ltd	T0KT00000000033700006
Powerlines	Goudmyn 337 KT Portion 10	Goldbroz Inv Pty Ltd	T0KT00000000033700010
	Goudmyn 337 KT Portion 7	Provincial Government of The Limpopo Province Department of Education	T0KT00000000033700007
	Goudmyn 337 KT Portion 4	Provincial Government of The Limpopo Province Department of Education	T0KT00000000033700004
	Goudmyn 337 KT Portion 11	Provincial Government of The Limpopo Province Department of Education	T0KT00000000033700011
	Goudmyn 337 KT Portion 40	Glencore Prop Management Co Pty Ltd	T0KT00000000033700040
	Goudmyn 337 KT Portion 14	Apostoliese Geloof Sending Van Suid-Afrika-Steelpoort	T0KT00000000033700014
	Goudmyn 337 KT Portion 6	Samancor Chrome Ltd	T0KT00000000033700006
	Goudmyn 337 KT Portion 0	Samancor Chrome Ltd	T0KT00000000033700000

2.2 Project Coordinates

The corner points of each site are provided below in Table 2-3. The coordinates of the proposed powerline corridor, underground cables, access roads, and ancillary structure are provided in ***Appendix A***.

Table 2-3: Project coordinates

Component	Coordinates
Site 1	A: 24°43'31.05"S; 30°12'17.84"E; B: 24°43'23.35"S; 30°12'28.72"E C: 24°43'47.83"S; 30°12'49.16"E; D: 24°43'50.05"S; 30°12'35.48"E
Site 2	A: 24°44'11.91"S; 30°12'20.15"E; B: 24°44'17.28"S; 30°12'26.92"E C: 24°43'59.76"S; 30°12'51.39"E; D: 24°44'0.40"S; 30°12'54.72"E E: 24°44'5.58"S; 30°12'58.70"E
Site 3	A: 24°44'35.99"S; 30°11'12.17"E; B: 24°44'50.39"S; 30°11'23.56"E C: 24°44'50.64"S; 30°11'13.08"E; D: 24°44'49.25"S; 30°11'8.31"E E: 24°44'42.34"S; 30°10'59.74"E
Site 4	A: 24°45'4.17"S; 30°11'7.55"E; B: 24°45'10.75"S; 30°11'7.77"E C: 24°45'15.09"S; 30°11'2.75"E; D: 24°44'49.91"S; 30°10'47.24"E E: 24°44'46.96"S; 30°10'52.61"E
Site 5	A: 24°44'32.78"S; 30°10'35.88"E; B: 24°44'31.46"S; 30°10'37.95"E C: 24°44'26.55"S; 30°10'41.51"E; D: 24°44'26.10"S; 30°10'42.34"E E: 24°44'24.47"S; 30°10'45.21"E; F: 24°44'19.56"S; 30°10'53.38"E G: 24°44'17.18"S; 30°10'57.29"E; H: 24°44'15.37"S; 30°11'0.17"E I: 24°44'14.94"S; 30°11'0.51"E; J: 24°44'11.19"S; 30°11'4.38"E K: 24°44'9.63"S; 30°11'5.30"E; L: 24°44'8.99"S; 30°11'5.94"E M: 24°44'8.06"S; 30°11'6.34"E; N: 24°44'7.38"S; 30°11'7.32"E O: 24°44'5.72"S; 30°11'9.58"E; P: 24°44'6.44"S; 30°11'9.38"E Q: 24°44'7.18"S; 30°11'9.92"E R: 24°44'7.36"S; 30°11'10.43"E S: 24°44'7.34"S; 30°11'11.02"E T: 24°44'7.15"S; 30°11'11.33"E U: 24°44'6.44"S; 30°11'11.68"E; V: 24°44'6.23"S; 30°11'11.40"E W: 24°44'5.72"S; 30°11'11.31"E; X: 24°44'5.25"S: 30°11'10.88"E Y: 24°44'3.80"S; 30°11'10.57"E; Z: 24°44'2.32"S: 30°11'10.74"E AA: 24°44'1.18"S; 30°11'11.76"E; AB: 24°44'0.47"S; 30°11'12.00"E AC: 24°44'6.00"S: 30°11'15.75"E; AD: 24°44'11.29"S; 30°11'11.26"E AE: 24°44'15.35"S; 30°11'15.67"E; AF: 24°44'14.91"S; 30°11'17.61"E AG: 24°44'19.89"S; 30°11'16.86"E; AH: 24°44'19.75"S: 30°11'13.53"E AI: 24°44'23.30"S; 30°11'7.90"E; AJ: 24°44'27.66"S: 30°11'9.82"E AK: 24°44'22.64"S; 30°11'18.41"E; AL: 24°44'26.44"S; 30°11'21.73"E AM: 24°44'31.68"S; 30°11'11.63"E;AN: 24°44'34.13"S; 30°11'12.76"E AO: 24°44'42.03"S; 30°10'56.70"E; AP: 24°44'43.26"S; 30°10'54.29"E AQ: 24°44'47.65"S; 30°10'45.10"E; BA: 24°44'1.18"S; 30°11'11.76"E; BB: 24°44'0.47"S; 30°11'12.00"E BC: 24°44'6.00"S: 30°11'15.75"E; BD: 24°44'11.29"S; 30°11'11.26"E BE: 24°44'15.35"S; 30°11'15.67"E; BF: 24°44'14.91"S; 30°11'17.61"E BG: 24°44'19.89"S; 30°11'16.86"E; BH: 24°44'19.75"S: 30°11'13.53"E BI: 24°44'23.30"S; 30°11'7.90"E; BJ: 24°44'27.66"S: 30°11'9.82"E BK: 24°44'22.64"S; 30°11'18.41"E; BL: 24°44'26.44"S; 30°11'21.73"E BM: 24°44'31.68"S; 30°11'11.63"E; BN: 24°44'34.13"S; 30°11'12.76"E BO: 24°44'42.03"S; 30°10'56.70"E; BP: 24°44'43.26"S; 30°10'54.29"E BQ: 24°44'47.65"S; 30°10'45.10"E

2.3 Technical Description

The main components of the PV plant will include the following and is illustrated in Figure 2-1:

- Solar fields comprising of solar PV panels/ modules that convert solar radiation directly into electricity through the PV effect.
- Inverter and transformer combination - each power block will have a centralised inverter which converts the direct current (DC) power generated by the PV panels, to alternating current (AC) power and a transformer which transforms the power to a higher voltage of 33kV to facilitate transmitting the power over longer distances to connect to the Tubatse East- and West Plant Substations.
- Grid connection infrastructure - the solar fields connect to the Tubatse East- and West Substations by mean of power corridors to evacuate the AC power. The power corridor will comprise of overhead lines or underground cables, or a combination thereof, at a voltage level of 33kV.
- The proposed connections onto the Tubatse East- and West Plant Substations will comprise of 33kV indoor switchgear blocks located next to these substations. The purpose of these blocks would be to collect the feeders from the solar fields and combine them into one or two feeders to be connected onto the existing 33kV substation infrastructure.

Associated infrastructure includes:

- Mounting structures for the solar panels in a fixed tilt configuration.
- Internal access road (4 - 6m wide).
- Battery Energy Storage System (BESS) - lithium-ion is the preferred technology.
- Instrumentation and control consisting of hardware and software for remote plant monitoring and operation of the facility.
- Fencing (approximately 1.8m in height), gates and access control.
- Construction camp and laydown area.
- Guard houses at each site with ablution (such as chemical toilets) facilities, a water storage tank at each guard house.
- Channelisation of two drainage lines on Site 5.

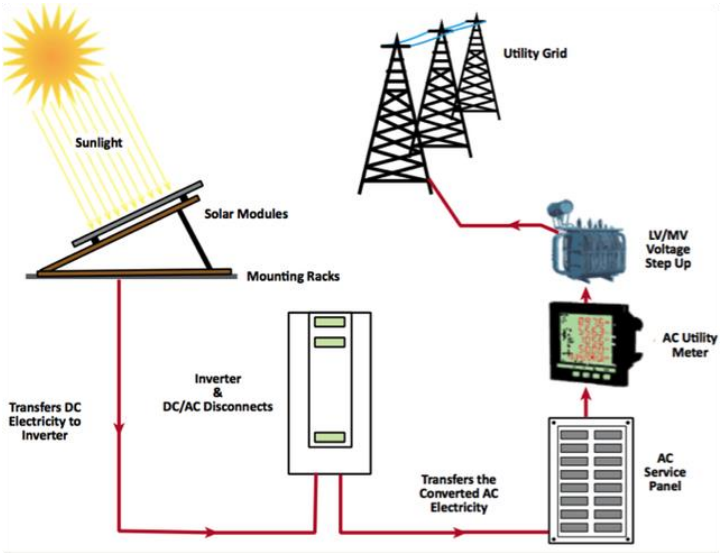


Figure 2-1: Overview of a solar PV plant[1]

[1] *Source: International Finance Corporation. 2015. Utility-scale Solar Photovoltaic Power Plants. A Project Developer's Guide.*

2.4 Power Corridors

The infrastructure required to connect the various solar PV sites to the Samancor 33kV power grid is accommodated in the power corridors. These corridors are indicated on the layout drawings: Figure 2-3 to Figure 2-7.

Overhead line or underground cable technology can be used for the power evacuation in these corridors. The proposed width of the power corridors is 11m for a single corridor and 22m in cases where the corridor needs to double up to accommodate the proposed 100MWp power flow.

2.4.1 Underground Cables

The design proposal for the underground cables is single-core cables to accommodate the combined power flow of more than one solar field. The cables will be buried 1m below ground level and the phases and circuits will be spaced for cooling purposes.

2.4.2 Overhead Powerlines

Powerlines comprising of a wood pole tower construction is proposed for the overhead 33kV powerlines. In cases where there is a double power corridor, either two wood pole lines will be used or a single steel monopole with a double circuit configuration. The height of the single circuit wood pole construction is 11m -13m and the steel monopoles are typically 20m tall.

2.5 Construction Camp and Laydown Area

Construction camps/ laydown areas will be required during the construction phase of the project. Only one construction camp and laydown area are proposed for the project. The location of these areas are shown on the layout drawing for Site 5 (Figure 2-7).

The construction camp is also intended to be used as administration office and workshops during the operational phase of the project. As this facility will be occupied during the construction and operational phase, ablution facilities are provided.

2.6 Water Provision

Water will be required during the construction activities as well as during the operational phase for panel cleaning. During construction, it is estimated that 2 x 15000ℓ water tankers will be used for dust suppression and other construction activities.

During operations, it is estimated that the proposed PV plant will require approximately 1200m^3 per cleaning cycle (based on best practice). The cleaning cycle depends on the type of technology, the pollution at the location as well as the seasonality. Lastly, it also depends on the maintenance regime of the chosen IPP. One can assume to allow for 2 cleaning cycles per month as this is a typical global approach, but as the costs of these influence the tariff, the chosen IPP will need to take this into account.

Water will be obtained from the TFC Reverse Osmosis (RO) Plant and no raw water sources will be required.

2.7 Access

These roads are relatively short in distance, typically 5m to 20m long, from the main road (R555) to each of the sites. The width of these roads is typically 5m.

2.8 Channelisation of Two Drainage Lines on Site 5

It is proposed that the third drainage line on Site 5 be augmented and formalised with a trapezoidal concrete-lined channel and the fourth drainage line on Site 5 be formalised into for example, a trapezoidal Terrafix® or a similar lined channel (Figure 2-2) for the typical general arrangement of the channels (subject to DWS consultation and approval) are provided in Figure 2-2 .

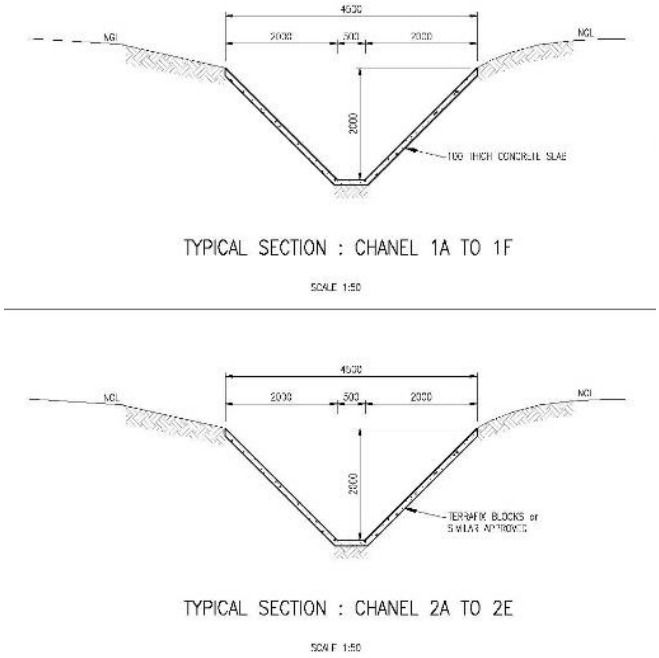


Figure 2-2: Typical sections of the proposed channels

2.9 Summary of the Technical Specifications

A summary of the technical specification for the proposed project are provided in Table 2-4. In terms of advanced technologies and upgrading this will be determined by a more detailed design. The technology proposed is for a life cycle of 20 years, as one normally builds a solar PV plant for this duration, due to the large capital investment, it is uneconomical to change the technology to follow latest trends and developments.

Table 2-4: Technical specifications for the PV plants and associated infrastructure

Facility Component	Description
Height of PV panels	▪ Approximately 0.8m
Total site extent	▪ 162ha
Type of PV panel	▪ Either mono- or bi-facial panels each with a rating of 540W each
Number of Inverters Required	▪ 16
Area occupied by inverter/ transformers (inverters are combined with the transformers on each site)	▪ 60m^2
Capacity of on-site substations	▪ Existing capacity - Tubatse East = 62.5MW, Tubatse West = 37.5MW ▪ 33kV indoor switchgear blocks will be added to the Tubatse East- and West Substations with a footprint of approximately 300m^2 respectively

Facility Component	Description
Area occupied by both permanent and construction laydown areas	▪ Only one construction camp and laydown area is proposed for the project ▪ The proposed size of laydown areas is defined as follows: 6000m^2 for west region (Site 3, 4 & 5) and 5000m^2 for the east region (Site 1 & 2) ▪ The construction camp is approximately 2000m^2
Occupation of construction camp	▪ The proposed number of staff during construction is approximately 600 people. The management staff (less than 20) will rent houses in Steelpoort.
Area occupied by buildings, switch houses, guard houses, offices, stores and workshops	▪ The construction camp is also intended to be used as an administration office and workshops during the operational phase of the project – 2000m^2 ▪ Five (5) guard houses are proposed at the entrance to each site ▪ A guard house is approximately 12m^2
Length of internal roads	These roads are relatively short in distance, the approximate lengths are provided below: ▪ Site 1 = 1346m ▪ Site 2 = 1465m ▪ Site 3 = 458m ▪ Site 4 = 775m ▪ Site 5 (left) = 572m ▪ Site 5 (middle) = 900m ▪ Site 5 (right) = 914m
Width of internal roads	▪ Typically 5m
Height of and type of fencing	▪ The fence height is 1.8m and the type of fence is a clear-view with overhang
Power corridor servitude	▪ 11m for a single corridor ▪ Overhead line or underground cable technology can be used for the power evacuation in these corridors
Powerline/ underground cable length	▪ Varies in length according to site location and connection point
Overhead powerline tower height	▪ Varies in length according to site location and connection point ▪ Wood pole tower construction is proposed for the overhead 33kV powerlines ▪ In cases where there is a double Power Corridor, either two wood pole lines will be used or a single steel monopole with a double circuit configuration ▪ The height of the single circuit wood pole construction is 11m-13m and the steel monopoles are typically 20m tall
Battery Energy Storage System (BESS)	▪ It is proposed to locate the BESS next to the BESS next to the 33kV connector substations. ▪ Lithium-ion technology will be used for the BESS. The BESS will have an on-board inverter system and will connect directly to the 33kV switchboard of the connector substation ▪ The proposed size of the BESS combined for East and West plant locations is a minimum value of 200 MWh ▪ This will typically require a combined footprint of approximately 2-3 ha
Stormwater drainage channels on Site 5	▪ Structure 1: 2m deep, 4.5m wide, 0.5m bottom width, slope 1:1, concrete-lined

Facility Component	Description
	▪ Structure 2: 2m deep, 4.5m wide, 0.5m bottom width, slope 1:1, for example Terrafix® or similar
Storage tanks	▪ Water tanks for non-potable on-site purposes are proposed for each site next to the guard house. The proposed storage tanks will have a capacity of 500ℓ each and will be filled by a water tanker

Refer to layout drawings Figure 2-3 to Figure 2-7 (***Appendix D***) indicating the proposed solar field per site as well as ancillary infrastructure associated with the proposed project.

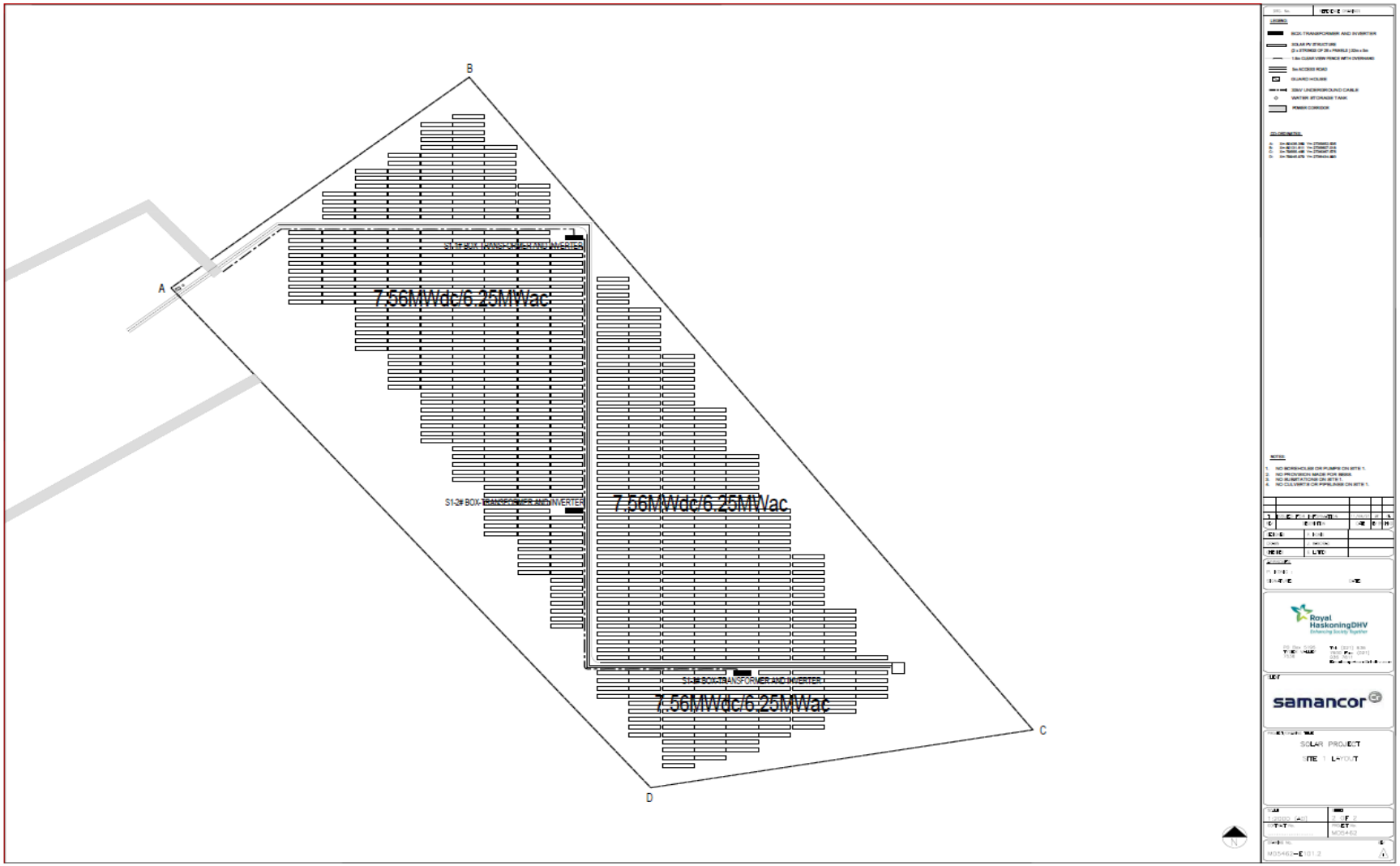


Figure 2-3: Site 1 layout

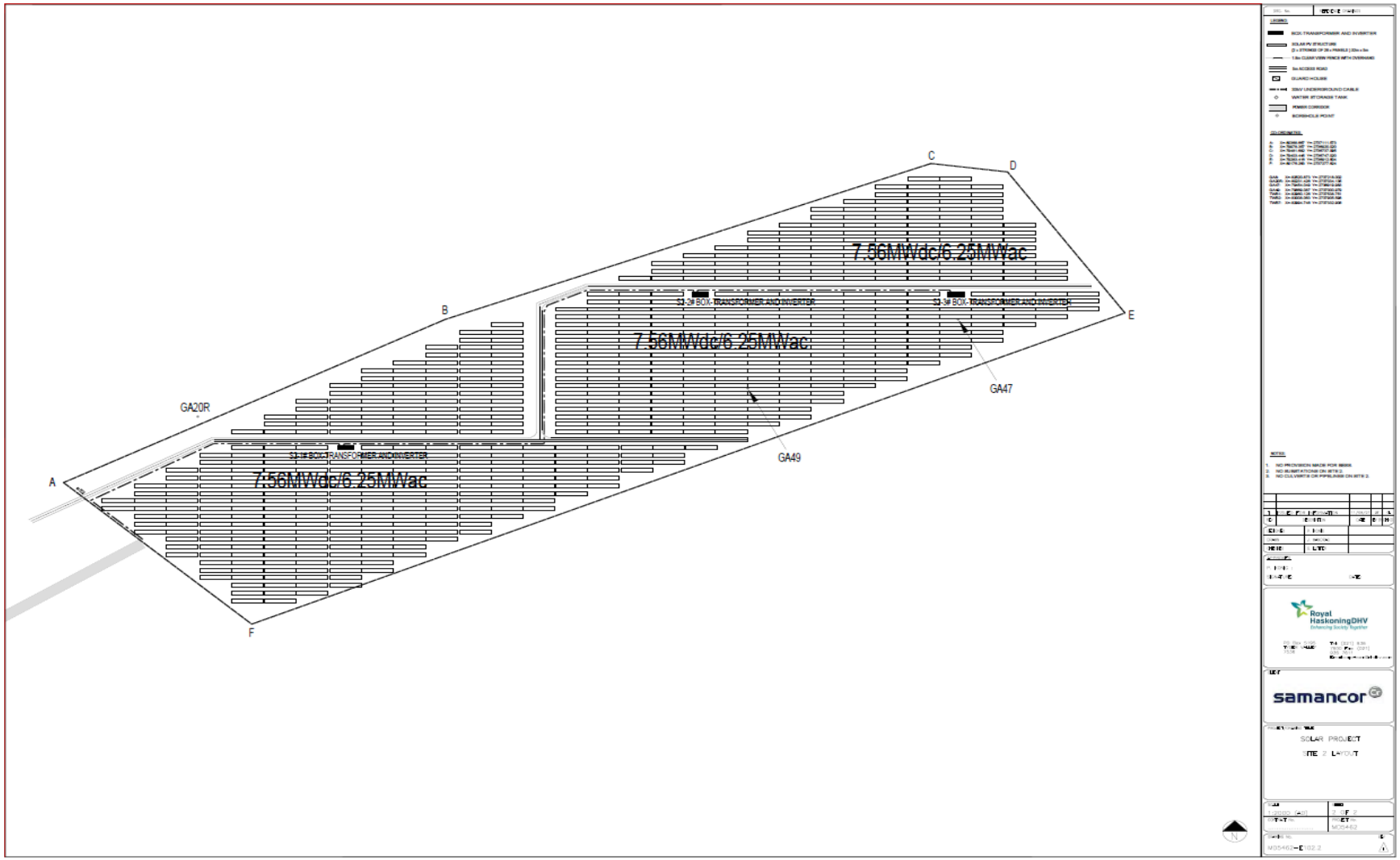


Figure 2-4: Site 2 layout

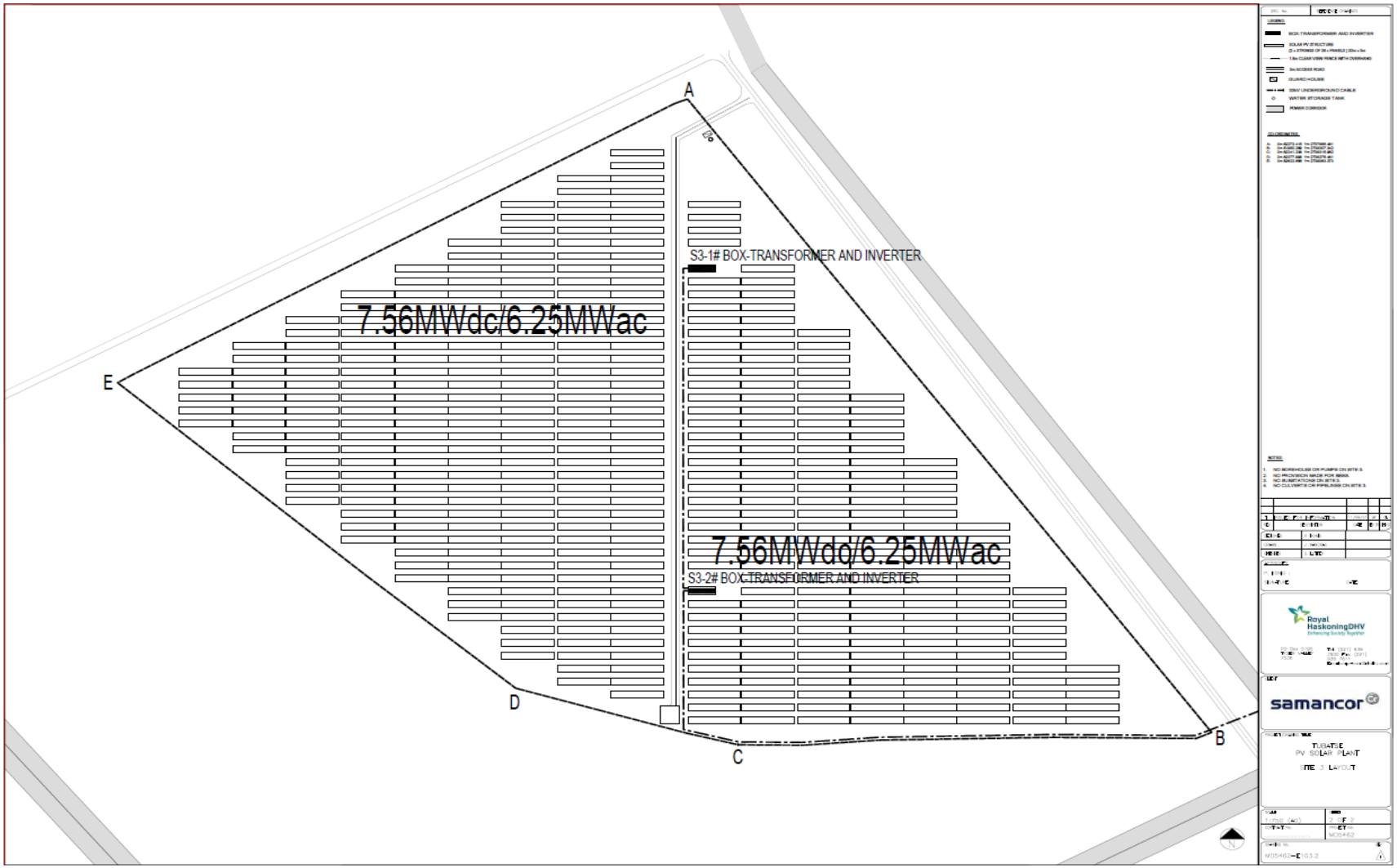


Figure 2-5: Site 3 layout

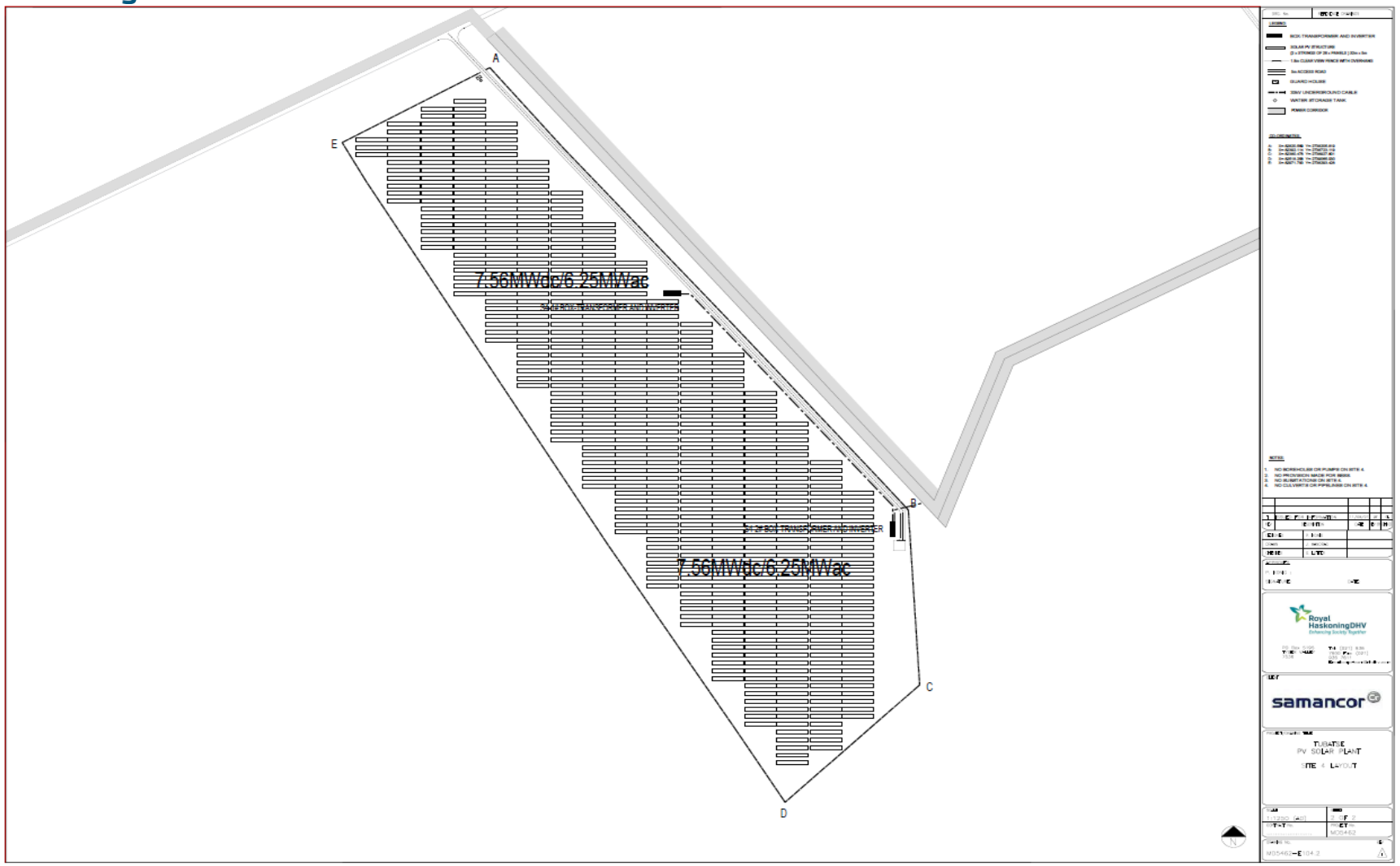


Figure 2-6: Site 4 layout

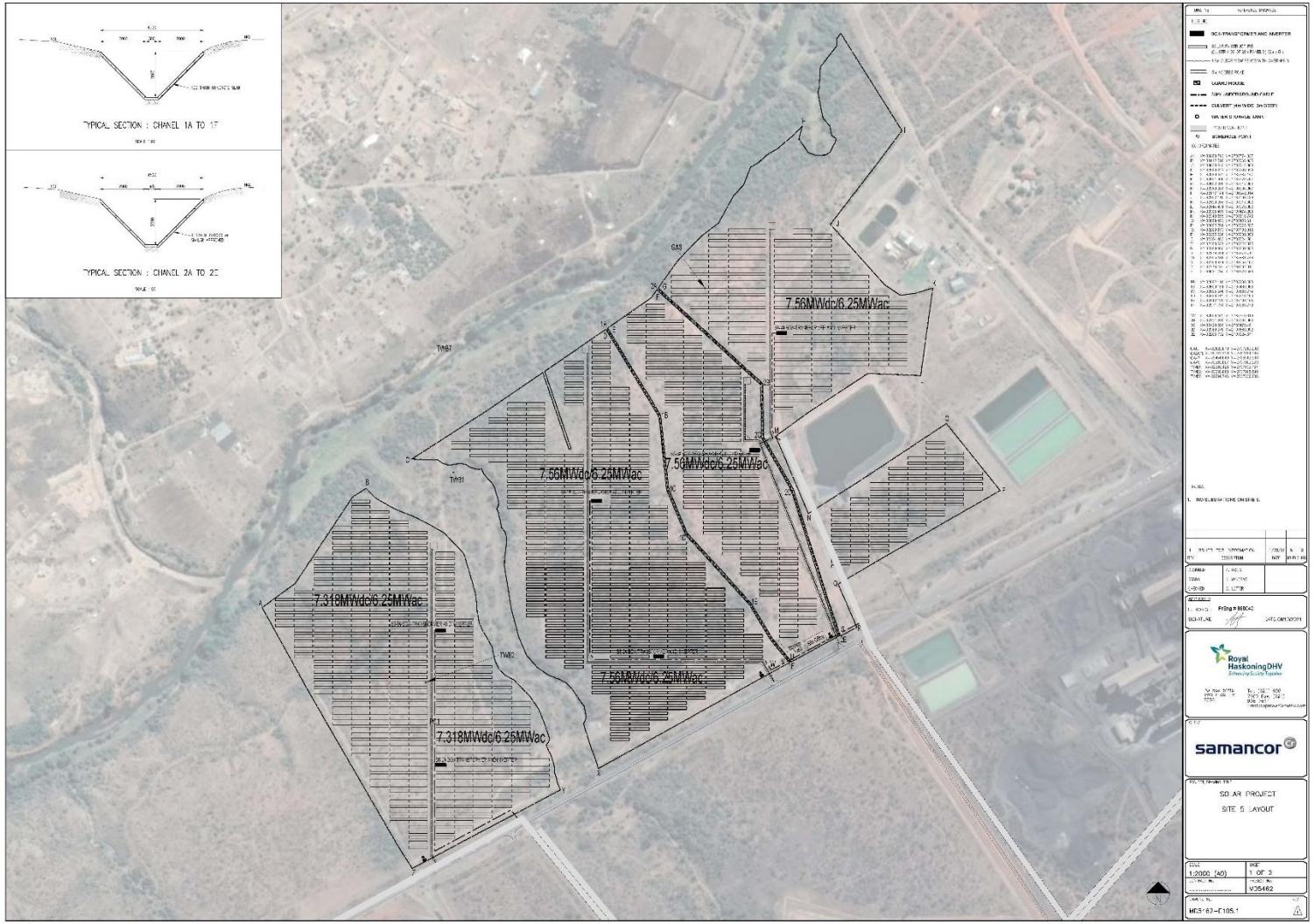


Figure 2-7: Site 5 layout

3 PROJECT MOTIVATION INCLUDING NEED AND DESIRABILITY

South Africa experiences some of the highest levels of solar radiation in the world. The average daily solar radiation in South Africa varies between 4.5 and 6.5kWh/m^2 (16 and 23 MJ/m^2), compared to about 3.6kWh/m^2 for parts of the United States and about 2.5kWh/m^2 for Europe and the United Kingdom.

Figure 3-1 below shows the annual solar radiation (direct and diffuse) for South Africa, which reveals considerable solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation.

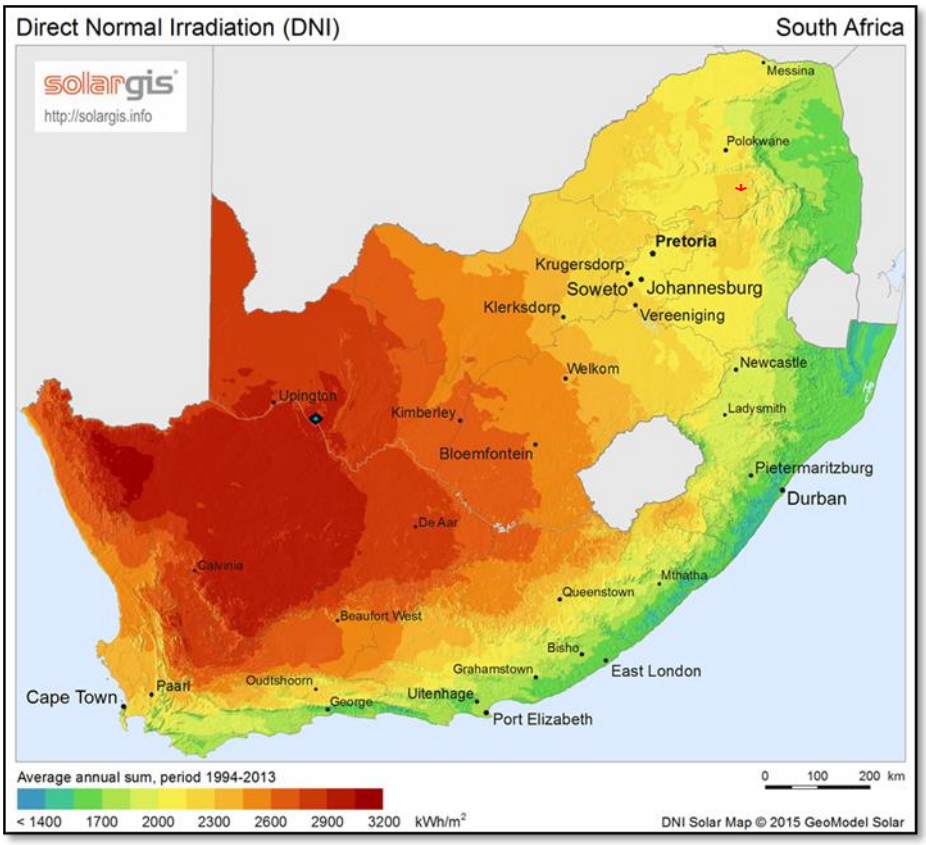


Figure 3-1: Annual incoming short-wave radiation for South Africa[2] (indicative study area indicated by the red asterisk)

3.1 Integrated Resource Plan (2019)

The Integrated Resources Plan (IRP 2019) is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, considering security of supply and the environment (minimize negative emissions and water usage). The promulgated IRP 2010 – 2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Besides capacity additions, several assumptions have changed since the promulgation of IRP 2010 – 2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant

[2] *www.soalrgis.info*

performance, as well as new technology costs. These changes necessitated the review and update of the IRP which resulted in the draft IRP 2018 and the promulgation of the IRP 2019.

The IRP 2019 recognises that whilst South Africa relies heavily on coal to meet its energy needs, the country is well endowed with renewable energy resources that offer sustainable alternatives to fossil fuels and therefore the country continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. The extent of decommissioning of the existing coal fleet due to end of design life, could provide space for a completely different energy mix relative to the current mix. Solar PV, wind and Concentrated Solar Power (CSP) with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.

The recent power cuts or increasingly severe load shedding events by Eskom have emphasised the need for additional power generation capacity in South Africa. There is a focus on moving towards increased generation from renewable energy sources. Due to South Africa's electricity generation and supply system being overloaded, the demand for an increased and stable electricity supply is a priority. Solar energy plants are important for reducing the country's overall environmental footprint from power generation and for directing a pathway towards sustainability.

3.2 The National Development Plan (2030)

The National Development Plan[3] (NDP) for 2030 seeks to promote economic growth and development through the provision of quality energy services that are competitively priced, reliable, and efficient. The NDP also seeks to promote social equity through the expansion of access to energy services. *Chapter 5: Environmental Sustainability and Resilience*, focuses on ensuring environmental sustainability and an equitable transition to a lower carbon economy and includes a number of objectives and actions which are specifically linked to climate change.

There are also strong climate change links with other chapters in the NDP, including *Chapter 3: Economy and Employment*, which includes a focus on the green economy, transition to a low carbon economy and society, and fostering motivation in green product and service development; *Chapter 4: Economy Infrastructure*, which includes the efficient and effective implementation of the environmental impact management governance system for new developments and the implementation of Strategic Infrastructure Projects (SIPs) proactive authorisation process. *Chapter 6* focuses on the promotion of an integrated and inclusive rural economy and *Chapter 8: Transforming Human Settlements* focuses on green cities and sustainable development.

The NDP states that energy generation makes up to 48% of South Africa's emissions, coupled with extensive natural coal resources, the Energy sector is both the most important and most challenging to transform. It is further suggested in the NDP that industrial energy consumption makes up to 9% of South Africa's emissions, with a further 14% from industrial processes and product use. The chemical industry, especially coal to liquids, and the minerals industry are primary contributors. The development of the PV plants to support the operations at the TFC Smelter can be seen as a means to reduce the reliance on traditional coal generated electricity thereby ensuring that there is a reduction in emissions and the successful implementation though Samancor Chrome's activities can set the precedent for other industries to incorporate more sustainable methods of generating electricity.

[3] *South Africa. 2012. The National Development Plan 2030: Our Future-Make it Work. National Planning Commission Department of The Presidency Republic of South Africa.*

3.3 Fetakgomo Tubatse Local Municipality Integrated Development Plan

According to the FGTM Integrated Development Plan IDP)[4], the local economy is driven by mining and agricultural activities, and the PV development will be used to supplement electricity requirements for the TFC Smelter. The FGTM hosts the biggest portion of the eastern limb of the Platinum Group Metals and the chrome ore. The Municipality, in conjunction with other government sectors, are busy with projects to expand the roads, ensuring that there is water to run the mines and the community, sourcing electrical energy to supply the mine and community etc. The project area is located between a Provincial Growth Point located in Burgersfort which consists of higher order land uses including residential, retail, warehouses, government functions and transport facilities. The construction of the PV development also provides a significant opportunity for members of the immediate community to benefit from the creation of jobs during the construction phase of the project and an opportunity to become skilled. The proposed number and type of employment opportunities is estimated to be 600 jobs during the construction phase.

3.4 Samancor Chrome Operations

The TFC Smelter consumes on average (between 2018 – 2020) 1425GWh/year of electricity supplied by Eskom and whilst the proposed project will only provide approximately 35% of the smelter's electricity requirements, the tariff is the main driver for the project as it has a negative impact on the production and revenue of Samancor Chrome's business. The PV plant will assist to generate energy during the peak tariff times at a lower tariff than the current Megaflex peak tariff, thereby resulting in an overall production cost saving.

The long-term profitability of the smelter operations at the TFC Smelter depend on minimising the cost of production. Electricity comprises a significant portion of this production cost. The proposed project will assist in alleviating the cost pressure of continuously increasing electricity costs and help to improve the GHG footprint of the operations and reduce the exposure to carbon tax. This will also help to reduce the risk of job losses associated with businesses under cost pressures.

This has motivated Samancor Chrome to consider renewable energy generation at their smelter plants as well as going 'green' with their operations. The ability for Samancor Chrome to generate electricity can also be seen as a means to alleviate pressure on the National Grid that is already severely constrained and can indirectly positively impact the surrounding community as there will be more capacity available in the grid to supply other users.

[4] *Fetakgomo Tubatse Local Municipality. 2020. 2020/21 Integrated Development Plan (IDP) & Budget*

4 DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT

In order to protect the environment and ensure that the development is undertaken in an environmentally responsible manner, there are a number of environmental impacts and their related legislation (Table 4-1 and Table 4-2) that need to be considered during this study.

This section outlines the legislation that is applicable to the proposed project and has been considered in the preparation of this report.

Table 4-1: Key legislation considered

<table>
<tr><th>Acts</th><th>Objectives, important aspects, associated notices and regulations</th></tr>
<tr><td>National Environmental Management Act, 1998 (Act No. 107 of 1998)(as amended)</td><td>
Objectives:
To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state.

Relevant Notices and Regulations:
▪ Environmental Impact Assessment Regulations 2014 (GNR 326 in Government Gazette - GG 40772 (as amended)
▪ Listing Notice 1 (GNR 327) as amended
▪ Listing Notice 2 (GNR 325) as amended
▪ Listing Notice 3 (GNR 324) as amended
▪ National Web-based Environmental Screening Tool – EST (2017).
▪ Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act - NEMA, 1998, when applying for EA in GG 43110, 20 March 2020).
▪ Environmental Impact Assessment (EIA) Regulations 2014 (Government Notice Regulations - GNR 326 in Government Gazette (GG) 40772 as amended on 04 April 2017 and GN 517 in GG 44701 as amended on 11 June 2021.

Relevance to the proposed project:
▪ Development must be socially, environmentally and economically sustainable.
▪ Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated; the social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration.
▪ ‘Polluter Pays’ principle.
▪ Any activity that is proposed and which is listed in the NEMA EIA Regulations, requires environmental authorisation.

Applicable listed activities:
<table>
<tr><th>Listed Activity</th><th>Applicability</th></tr>
<tr><td colspan="2">Listing Notice 1 (GNR 327)</td></tr>
<tr><td>Activity 11 - The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a</td><td>Applicable to the new 33kV overhead powerlines between the various sites and the Tubatse East and West</td></tr>
</table>
</td></tr>
</table>

Acts	Objectives, important aspects, associated notices and regulations	
	capacity of more than 33 but less than 275kV.	*substation. Underground cables do not trigger this activity.*
	Activity 12 - The development of – (ii) infrastructure or structures with a physical footprint of 100m^2 or more; where such development occurs – (a) within a watercourse; or (c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse.	*Applicable to the development of internal access roads (Site 3, 4, 5), power corridors (Site 1, 2, 4, 5) and PV panels and inverters (Site 3, 4, 5), underground cables (Site 3, 4, 5), construction camp (Site 5).*
	Activity 19 - The infilling or depositing of any material of more than 10m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m^3 from a watercourse.	*Applicable to the development of infrastructure (trapezoidal channels) within the two drainage lines on Site 5.*
	Activity 28 - Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture on or after 01 April 1998 and where such development will occur outside an urban area, where the total land to be developed is bigger than 1ha.	*Applicable to the development of the solar facility which will involve the transformation of approximately 162ha of agricultural zoned land. The project site is located outside an urban area.*
	Listing Notice 2 (GNR 325)	
	Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more.	*The electricity generation capacity of the PV plant will be 100MWp.*
	Activity 15 - The clearance of an area of 20ha or more of indigenous vegetation.	*Applicable to the construction of the proposed PV plant which will require the clearance of approximately 162ha of indigenous vegetation.*
	Listing Notice 3 (GNR 324)	
	No activities applicable.	
National Water Act (Act No. 36 of 1998) (as amended)	***Objectives:*** The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations. ***Relevance to the proposed project:*** ▪ Sustainable protection, use, development and conservation of water resources – including aquatic ecosystems. ▪ Defines 11 water uses and provides licensing procedures.	

Acts	Objectives, important aspects, associated notices and regulations
	Notices and Regulations: ▪ General Authorisation in terms of Section 39 of the National Water Act (Act No. 36 of 1998, Water Uses Section 21 (a) and (b) (GN in GG 40243 of 02 September 2016). ▪ General Authorisation in terms of Section 39 of the National Water Act (Act No. 36 of 1998, Water Uses Section 21 (c) and (i) (GN in GG 40229 of 26 August 2016). Water for construction and operational activities will be provided by Samancor Chrome from the Tubatse RO Plant. ***Applicable water uses:*** ▪ ***Section 21 (c) - impeding or diverting the flow of water in a watercourse*** *Applicable to any infrastructure (e.g. power corridor, access road, PV panels) within the 1:100 year floodline of a watercourse or 100m GN 509 Zone of Regulation (ZOR) (in the absence of the 1:100 year flood line) or within 500m to wetlands.* ▪ ***Section 21 (i) - Altering the bed, banks, course or characteristics of a watercourse*** *Applicable to any infrastructure (e.g. power corridor, access road, PV panels) within the 1:100 year floodline of a watercourse or 100m GN 509 Zone of Regulation (ZOR) (in the absence of the 1:100 year flood line) or within 500m to wetlands.*
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 - No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority. Section 35 - No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site. Section 36 - No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. “Grave” is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place. Section 38 (a) - the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length; (b) the construction of a bridge or similar structure exceeding 50m in length; (c) any development or other activity which will change the character of a site (i) exceeding 5000m^2 in extent. ***Potential permits:*** ▪ A permit issued under Section 35 of the Act that will include, surface collections, test excavations and analysis of recovered archaeological material. A further permit may be required for the destruction of the archaeological resources. ▪ Permit to relocate graves in terms of Section 36 of the Act.
National Environmental Management Biodiversity Act (Act No. 10 of 2004)	***Objectives:*** Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

Acts	Objectives, important aspects, associated notices and regulations
	Notices and Regulations: ▪ National Biodiversity Strategy and Action Plan (2005). ▪ National List of Ecosystems that are Threatened and in Need of Protection in terms of Section 52(1)(a) of the National Environmental Management Biodiversity Act (Act No. 10 of 2004), GN 1002 in GG 34809, 09 December 2011. ▪ Threatened or Protected Species (GN 388 in GG 36375, 16 April 2013). ▪ Alien and Invasive Species Regulations (GNR 506 in GG 36683, 19 July 2013). ▪ Publication of Exempted Alien Species (GNR 509 in GG 36683, 19 July 2013). ▪ Publication of National List of Invasive Species (GNR 507 in GG 36683, 19 July 2013). ▪ Publication of Prohibited Alien Species (GNR 508 in GG 33683, 19 July 2013). ▪ Limpopo Conservation Plan (2013). ▪ National Biodiversity Assessment – The Status of South Africa's Ecosystems and Biodiversity (2018). ▪ Draft National Offset Policy (2018). ▪ Sekhukhune Bioregional Plan (2020) – the Bioregional Plan has been gazetted in Notice 29 of 2020 (GG 3074, 27 March 2020) in terms of Section 40(1) of the National Environmental Management: Biodiversity Act, 2004.
Limpopo Environmental Management Act (Act No. 07 of 2003)	***Objectives:*** a) to manage and protect the environment in the Province b) to secure ecologically sustainable development and responsible use of natural resources in the Province c) generally to contribute to the progressive realisation of the fundamental rights contained in section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996); and d) to give effect to international agreements effecting environmental management which are binding on the Province. ***Relevance to the proposed project:*** ▪ Part 2 – Sites of Ecological Importance, Section 18 – 20. ▪ Part 3 – Protected Environmental and Private Nature Reserves, Section 21. ▪ Section 64(c)(iv) – Protection of indigenous plants – no person may without a permit pick any indigenous plant in a Provincial Nature Reserve, a Site of Ecological Importance, a Protected Environment or a Private Nature Reserve. ▪ Chapter 13 – Environmental Pollution. ***Potential permits:*** ▪ Permits issued in terms of Schedules 2 (Specially protected wild animals), 3 (Protected wild animals), 7 (Undesirable animals), 9 (Prohibited aquatics growths), 10 (Invertebrates), 11 (Specially protected plants) and 12 (Protected plants) of the Act to remove, relocate or destroy species listed in the above Schedules.
National Forests Act (Act No. 84 of 1998)	Provides for the protection of certain tree species, groups of trees, woodland or forests as declared by the Minister and prohibits the destruction of protected trees without an approval in place. Protected tree species have been confirmed within the study area. ***Regulations:*** List of Protected Tree Species under the National Forests Act, 1998 (GNR 690, 08 September 2017). ***Potential licence:*** ▪ Licence to cut, disturb, damage or destroy any protected tree.

4.1 Other Relevant Acts, Guidelines, Department Policies and Environmental Management Instruments

Table 4-2: Other relevant acts, guidelines, policies and environmental management instruments

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
The Constitution (No. 108 of 1996)	Chapter 2 – Bill of Right Section 24 – Environmental Rights
National Environmental Management: Waste Act (Act No. 59 of 2008) as amended	Section 17 - Every attempt must be made to reduce, recycle or re-use all waste before it is disposed. Section 25 - All waste (general and hazardous) generated during construction may only be disposed of at appropriately licensed waste disposal sites. All waste management activities (e.g. recycling, treatment) meeting the relevant thresholds should be authorised under the National Environmental Management: Waste Act (Act No. 59 of 2008) [NEM:WA] (as amended) and Government Notice (GN) 921 of 29 November 2013 (as amended in 2015 and 2017). No person may commence, undertake or conduct a waste management activity listed GN 921 (as amended) unless a licence is issued in respect of that activity.
National Environmental Management: Air Quality Act (Act No 39 of 2004) as amended	Section 32 - Control of dust. Section 34 - Control of noise. Section 35 - Control of offensive odours. National Dust Control Regulations published in GNR 827 in GG 36974, 01 November 2013.
Electricity Regulation Act No. 4 of 2006 as amended by the Electricity Regulation Amendment Act No. 28 of 2007	These regulations regulate the use and generation of electricity.
Occupational Health and Safety Act (Act No. 85 of 1993)	Section 8 - General duties of employers to their employees. Section 9 - General duties of employers and self-employed persons to persons other than their employees.
Construction Regulations (2014)	Contractors must comply with the Construction Regulations which lay out the framework for construction related activities.
Other: ▪ BirdLife South Africa: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa (2017) ▪ Conservation of Agricultural Resources Act (Act No. 43 of 1983) ▪ Civil Aviation Act (Act No. 13 of 2009) and Civil Aviation Regulations of 1997 ▪ Disaster Management Act (Act No. 57 of 2002, as amended) ▪ Electricity Act (Act No. 41 of 1987) ▪ Environmental Impact Assessment Guidelines for Renewable Energy Projects, GNR 989 of 2015 ▪ Greater Tubatse Municipality Final Integrated Development Plan (IDP) 2016/ 17 – 2020/ 21 ▪ Hazardous Substance Act (Act No. 15 of 1973) and Regulations ▪ Limpopo Climate Change Response Strategy 2016 - 2020 ▪ Limpopo Green Economy Plan (2013) ▪ National Climate Change Bill (2018)	

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
▪ National Climate Change Response White Paper (2011) ▪ Mineral and Petroleum Resources Development Act (Act No. 28 of 2002 – Section 53(1) ▪ National Road Traffic Act (Act No. 93 of 1996) ▪ South African National Standard (SANS) 10103: 2008 – The measurement and rating of environmental noise with respect to annoyance and to speech communication ▪ Relevant By-laws ▪ Sekhukhune District Municipality Final IDP 2016/ 17 – 2020/ 21 ▪ Sekhukhune District Municipality Draft Spatial Development Framework 2018. ▪ Spatial Planning and Land Use Management Act (Act No. 16 of 2013) ▪ White Paper on Renewable Energy (2003)	

4.2 International Conventions and Agreements

Other relevant environmental and social international conventions and agreements to which South Africa is a party that is applicable to this project are presented in Table 4-3.

Table 4-3: Relevant international conventions to which South Africa is a party

Convention	Summary of Objectives or Relevant Conditions	South African Status
Convention concerning the Protection of the World Cultural and Natural Heritage 1972 (Paris)	Ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage	Ratification
Montreal Protocol on Substances That Deplete the Ozone Layer (1 January 1989)	Calculated levels of consumption and production of chlorofluorocarbons must not exceed the stipulated thresholds.	Party to
Convention on Biological Diversity (29 December 1993)	The Convention has a bearing on the management of biodiversity at the study area. Countries such as South Africa that ascribe to the Convention must rehabilitate or restore degraded ecosystems through the formulation of appropriate strategies and plans.	Party to
United Nations Framework Convention on Climate Change (21 March 1994)	Protection of the climate system: Operations must protect the climate system by controlling greenhouse gases not controlled by the Montreal Protocol, which cause climate change through anthropogenic interference with the climate system.	Party to
United Nations Convention to Combat Desertification (26 December 1996)	To combat desertification and mitigate the effects of drought through national action programs.	Party to
United Nations Framework Convention on Climate Change - Kyoto Protocol (23 February 2005)	To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries and through the clean development mechanism (where developed countries can invest in developing country clean technology to offset emissions).	Party to

Convention	Summary of Objectives or Relevant Conditions	South African Status
Paris Agreement adopted on 12 December 2015 at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC CoP21)	The Agreement is a comprehensive framework which will guide international efforts to limit greenhouse gas emissions and to meet all the associated challenges posed by climate change. The main objective of the Agreement is to limit the global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees.	Ratified
Sendai Framework for Disaster Risk Reduction (2015)	The Sendai Framework for Disaster Risk Reduction 2015 - 2030 was adopted at the Third United Nations World Conference in Sendai, Japan, on March 18, 2015. The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters. One of the lessons learned from the HFA is that more dedicated action needs to be focused on tackling underlying disaster risk drivers, such as the consequences of climate change and variability. As such, the Sendai Framework considers the incorporation of disaster risk reduction measures into programmes within and across all sectors, as appropriate, related to, among other things, the adaptation to climate change.	Party to
Sustainable Development Goals (2015)	The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all UN Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs recognise that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. SDG 7 requires Affordable and Clean Energy for all. Investing in solar, wind and thermal power, improving energy productivity, and ensuring energy for all is vital if we are to achieve SDG 7 by 2030. Expanding infrastructure and upgrading technology to provide clean and more efficient energy in all countries will encourage growth and help the environment.	Party to

5 PROJECT ALTERNATIVES

In terms of the NEMA EIA Regulations 2014 (as amended), feasible alternatives are required to be considered as part of the environmental studies. An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

5.1 Site Alternatives

Royal HaskoningDHV undertook an Environmental Screening Investigation (ESI) during November 2020 for twelve sites identified by Samancor Chrome for the development of a PV plant (Figure 5-1). These sites were adjacent to the TFC Smelter along the eastern, western, northern, south-eastern and south-western boundary and varied in extent from 5.83ha to 660ha.

During the ESI, these sites were assessed albeit at a high-level using national, provincial and municipal GIS datasets, the Department of Forestry, Fisheries and the Environment (DFFE) national Web-based EST and various literature sources i.e. previous environmental studies, specialist assessments and planning documents. In addition, a rapid field assessment was conducted with key personnel from the TFC Smelter to determine further sensitivities based on their experience in the study area(s).

The ESI concluded that whilst the sites did not present any environmental fatal flaws to the proposed development there were some aspects which may be considered sensitive e.g. topography, untransformed and indigenous vegetation, watercourses, riparian vegetation and heritage resources. The ESI further recommended Sites 8, 10 and 12 (northern-most portion) for the development of the PV plant subject to a detailed EIA study.

Subsequent to a workshop held with Project Technical Team, Site 10 was no longer preferred due to the uncertainty of mining operations by the Aureus Industrial and Mining Operations Pty Ltd and this site was subsequently discarded. Further to this, Site 5 (close to the H:H Waste Facility), Site 6 (Quartz Mine) and Site 7 were discarded due various technical limitations. The area of Site 12 was reduced to exclude the southern extent of the site (that extends into the hilly incised terrain to the south-east of the Steelpoort town) as well as the north-eastern portion, so that it does not infringe on the residential development to the north-west of the site.

Prior to the commencement of the ESS, some sites were revised either in size or consolidated and the sites were renamed as follows:

- Site 12 was renamed as the ‘new’ Site 1;
- Site 8 was renamed as the ‘new’ Site 2;
- Site 1 was renamed as the ‘new’ Site 3;
- Site 4 – no change; and
- Sites 2, 3 and 11 were consolidated to form the ‘new’ Site 5.

In order to meet the generation of 100MWp, two new portions near the Tubatse RO Plant were added for assessment in this study. Refer to Figure 5-2 for the revised sites that are being assessed in this EIR.

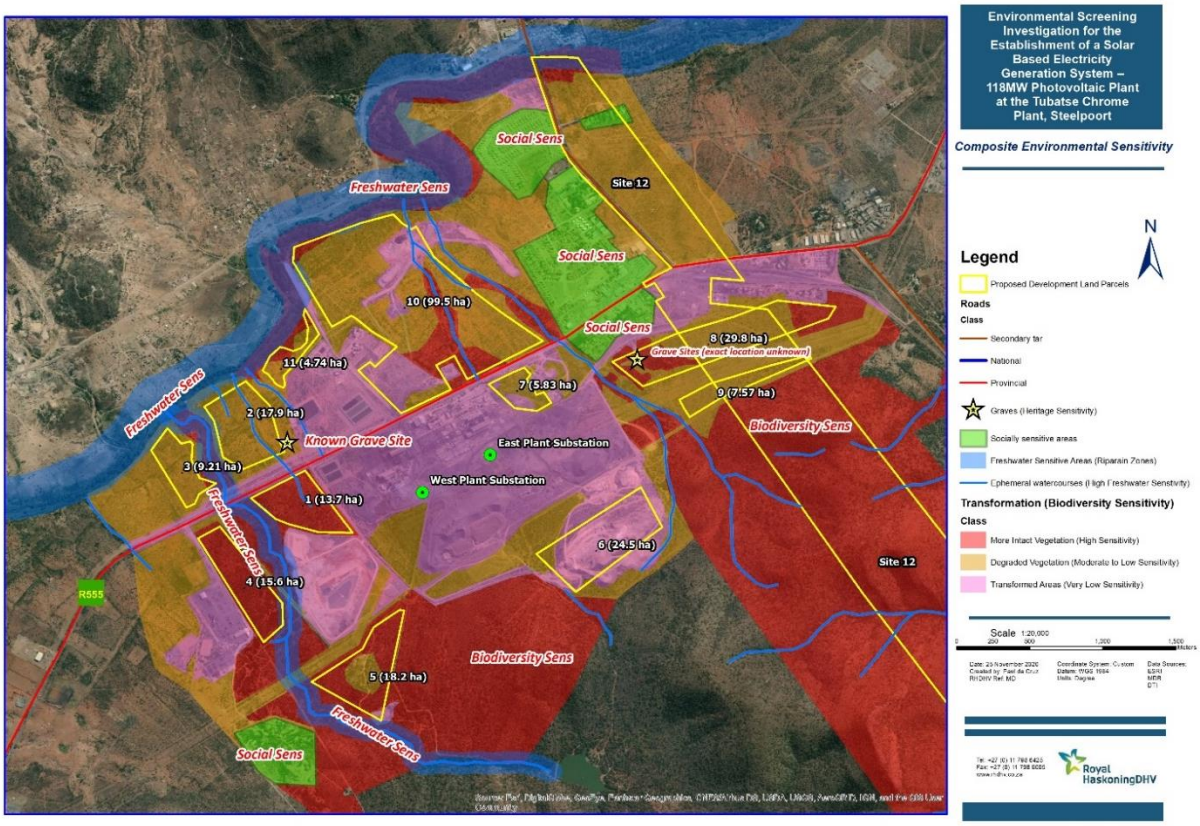


Figure 5-1: Sites assessed as part of the ESI (November 2020)

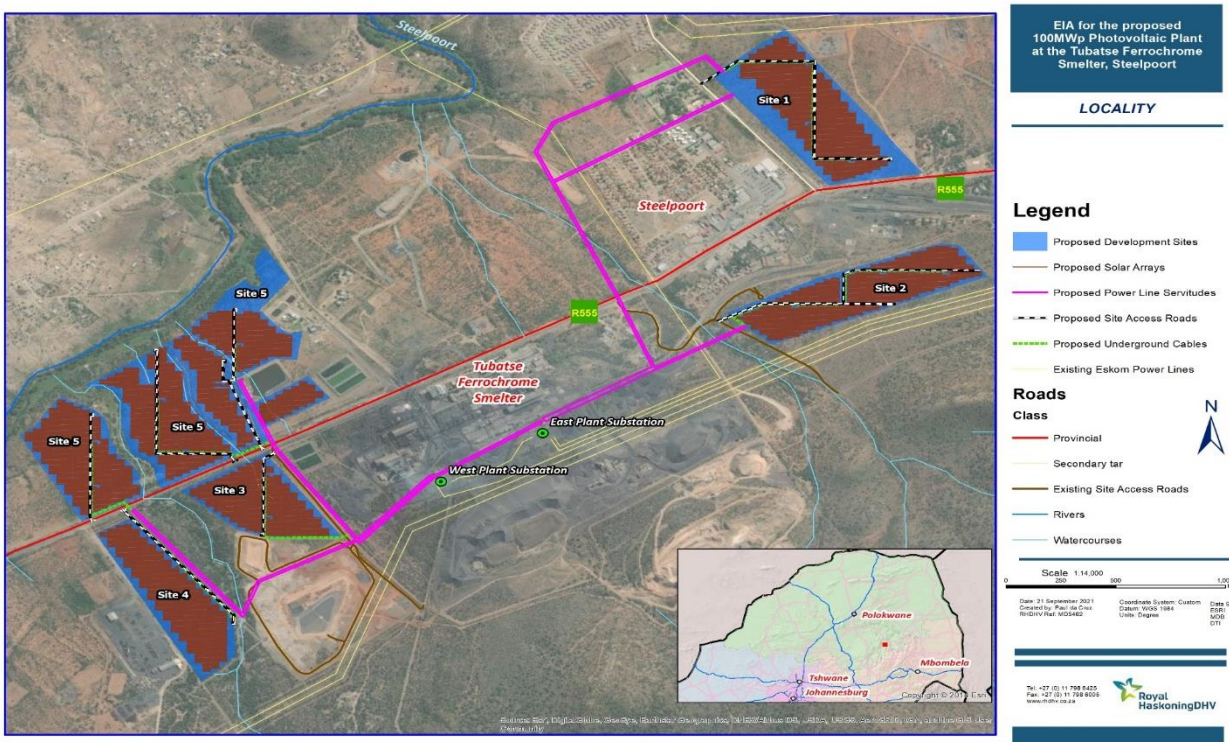


Figure 5-2: Revised sites assessed in this EIR (2021)

Selecting a suitable site is crucial for the development of a viable PV plant. The site selection process relied on various criteria as presented in Table 5-1.

Table 5-1: Site selection criteria

Criteria	Description
Available area	The proposed PV plant will require approximately 1.5ha of land per 1MWp generated. The total extent of all 5 potential sites is approximately 162ha, which will be sufficient for the development of the 100MWp plant over these sites.
Topography	The slope of the project site is considered to be acceptable for the development of a PV plant. This reduces the need for any extensive earthworks or levelling activities.
Land ownership and zoning	All of the sites for the development of the PV plant belong to Samancor Chrome, except for the western portion of Site 1 which belongs GoldBroz Inv Pty Ltd and the eastern portion that belongs to the Steelpoort Prop cc as well as the western portion of Site 2 that belongs to GoldBroz Inv Pty Ltd. Samancor Chrome have entered into discussions with the private landowner for possible lease/ acquisition. The servitudes for the powerlines and access roads may have to be acquired if they are not on Samancor Chrome land. Landowner details are provided in Table 2-2.
Accessibility	The sites are easily accessible from the R555.
Grid connection	The solar fields will connect to the Tubatse East- and West Substations by mean of power corridors to evacuate the AC power. A power corridor will comprise of overhead lines or underground cables, or a combination thereof, at a voltage level of 33kV.
Water availability for the operational phase (cleaning of panels)	The proposed PV plant will require approximately 1200m^3 per cleaning cycle (based on best-practice and to be confirmed with the concept (envelope) design). The cleaning cycle depends on the type of technology, the pollution at the location as well as the seasonality. Lastly, it also depends on the maintenance regime of the chosen IPP. One can assume to allow for 2 cleaning cycles per month as this is a typical global approach, but as the costs of these influence the tariff, the chosen IPP will need to take this into account. Water will be provided by the TFC Smelter based on the amount of industrial water available and the quality of water required as well as the conditions of the current WUL. The industrial water may need to be demineralized before it can be used on the panels.

Whilst various environmental sensitivities have been highlighted for Site 5, the site forms part of this assessment for the following reasons:

- Site 5 is needed to achieve the required power generation values i.e. 100MWp;
- Site 5 is under the ownership of Samancor and not earmarked for future expansion of the TFC Smelter operations;
- The site is in close proximity to the Tubatse West Substation grid connection point;
- From a security point of view, the site is close to Site 3 and 4; and
- The site is adjacent to the Tubatse RO Plant that will provide water for the cleaning of panels.

It is proposed that the PV plant be developed over these 5 potential sites, therefore, these sites are not considered alternatives.

5.2 Design Alternatives

5.2.1 Fixed and Tracking Systems

PV panels/ modules must be mounted on a structure to keep them orientated in the correct direction and to provide them with structural support and protection. Mounting structures may either be fixed-angle or tracking (Figure 5-3).

Fixed mounting systems keep the rows of modules at a fixed tilt angle while facing a fixed angle of orientation. Fixed frames are simpler to install, cheaper and require less maintenance.[5]

In locations with a high proportion of direct irradiation, single- or dual-axis tracking systems can be used to increase the average total annual irradiation. Tracking systems follow the sun as it moves across the sky. Single-axis trackers alter either the orientation or tilt angle only, while dual-axis tracking systems alter both orientation and tilt angle. Dual-axis tracking systems are able to face the sun more precisely than single-axis systems.[6] The foundation requirements also differ between these two technology types.

Based on the concept engineering design, the preferred alternative is fixed-angle mounting structures with a tilt angle of 23°.

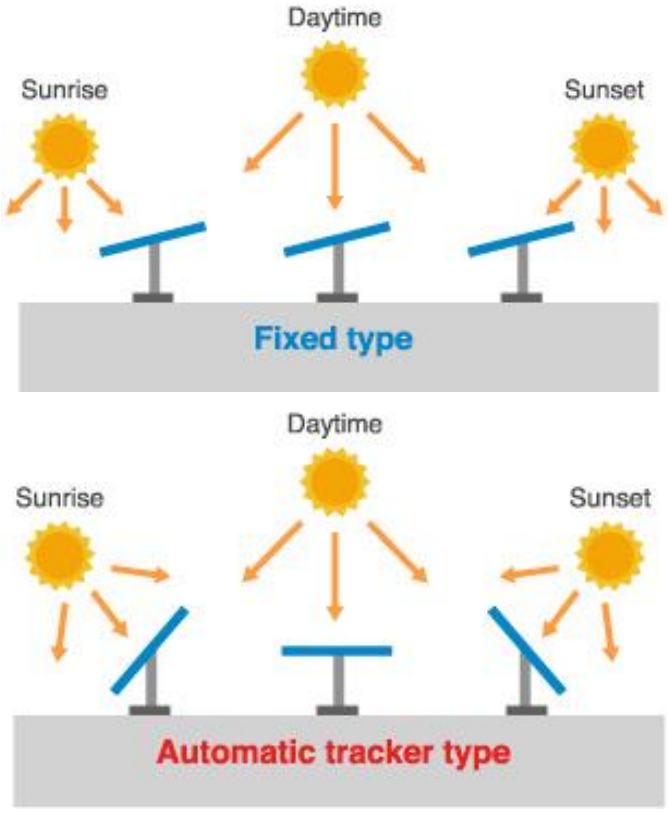


Figure 5-3: Fixed and tracking systems operation[7]

[5] *International Finance Corporation. 2015. Utility-scale Solar Photovoltaic Power Plants. A Project Developer's Guide.*
[6] *Ibid.*
[7] *Source: https://sunbenefit.jp/products/suntracking.html*

5.2.2 Monofacial and Bifacial Solar Panels

Bifacial panels produce solar power from both sides of the panel, whereas monofacial panels only use one side for solar energy production. The top solar cells of a bifacial solar panel system face the sun, so they capture incident sun rays directly, absorbing only certain wavelengths. The top solar cells function like those of a conventional solar panel array.[8] The bottom solar cells absorb light that is reflected off the ground (Figure 5-4). The ground reflectance or albedo is highly site-dependent. A higher albedo translates into greater reflection. Fresh grass has an albedo factor of 26%, reducing down to a minimum of approximately 15% when dry.[9] White gravel has an albedo of 27%.[10]

The aim of bifacial technology is not to increase the efficiency of the solar module or panel but to capture more solar energy per module. Gains of up to 30% are projected, depending on factors such as the reflectivity of the ground surface, height above ground, tilt angle and several others.[11]

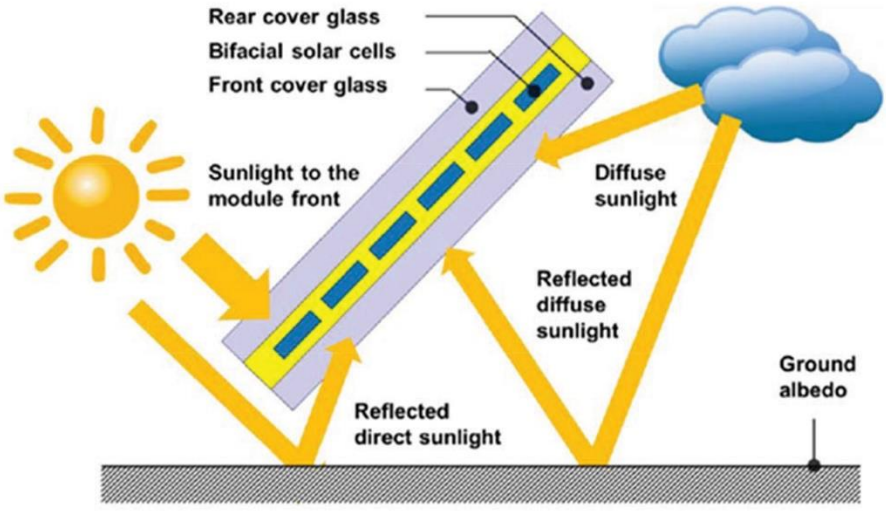


Figure 5-4: Image showing the operation of a bifacial solar panel[12]

Either mono- or bifacial panels will be used, this will be determined during the detail design.

5.2.3 Grid Infrastructure (Powerline) Alternatives

Either overhead line or underground cable technology can be used for the power evacuation in the power corridors. This will be determined during the detail design, however, this report make recommendations where applicable.

Underground cables will be single-core cables to accommodate the combined power flow of more than one solar field and will be buried 1m below ground level.

Powerlines comprising of a wood pole tower construction is proposed for the overhead 33kV powerlines. In cases where there is a double power corridor, either two wood pole lines will be used or a single steel monopole with a double circuit configuration. The height of the single circuit wood pole construction is 11m - 13m and the steel monopoles are typically 20m tall.

[8] *https://solarmagazine.com/solar-panels/bifacial-solar-panels/*
[9] *International Finance Corporation. 2015. Utility-scale Solar Photovoltaic Power Plants. A Project Developer's Guide.*
[10] *https://www.ee.co.za/article/bifacial-solar-pv-modules-give-increased-power-output-potential.html*
[11] *Ibid.*
[12] *Source: https://www.ee.co.za/article/bifacial-solar-pv-modules-give-increased-power-output-potential.html*

5.3 No-Go Options

South Africa currently relies almost completely on fossil fuels as a primary energy source with coal providing 75% of the fossil fuel-based energy supply.[13] Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is the main GHG that has been linked to climate change. An emphasis has therefore been placed on securing South Africa's future power supply through the diversification of power generation sources. Furthermore, South Africa would have to invest in a power generation mix, and not solely rely on coal-fired power generation, to honour its commitment made under the Copenhagen Accord and Paris Agreement to mitigate climate change challenges. Under the Accord, the country committed to reduce its carbon dioxide emissions by 34% below the "business as usual" level by 2020. Under the Paris Agreement, the country is committed to limiting the global temperature increase to well below 2°C.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel-based energy systems, the development of large-scale renewable energy supply schemes such as PV is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports in the country.

In the case of Samancor Chrome, the rising electricity tariffs in South Africa, combined with the increasingly severe load shedding patterns experienced across the country, has a negative impact on the production and revenue of Samancor Chrome's business. As well as Samancor Chrome's efforts to reducing greenhouse gas emissions, has motivated Samancor Chrome to consider renewable energy generation at their smelter plants. Implementing solar PV generation will result in improved availability of supply and reduced utility bills. It will also r reduce the operational Scope 2 GHG footprint.

Without the implementation of this project, the use of renewable options for power supply will not be realised. Therefore, the No-Go option is not considered as a feasible option on this proposed project.

[13] *Department of Minerals and Energy. 1999. Digest of South African Energy Statistics, compiled by CJ Cooper.*

6 DESCRIPTION OF THE RECEIVING ENVIRONMENT

6.1 Biophysical Environment

6.1.1 Meteorological Conditions

The TFC Smelter has an on-site meteorological monitoring station that measures various meteorological parameters such as wind speed, wind direction, surface temperature, humidity and rainfall data.

6.1.1.1 Wind

Based on the available meteorological data from the period January 2012 to December 2014, easterly winds predominate, accompanied by strong winds occurring within the north and north-easterly sectors. The TFC Smelter is located within a valley and as such, wind speeds are generally low over the monitoring period. Calm conditions, which are defined as wind speeds less than 1m/s, occur frequently (22.25% of the time) - Figure 6-1. In comparison, the modelled Steelpoort Area (MM5) meteorological data shows dominant south-easterly winds. Wind speeds are moderate to fast, with calm conditions occurring 2.63% of the time[14] - Figure 6-1.

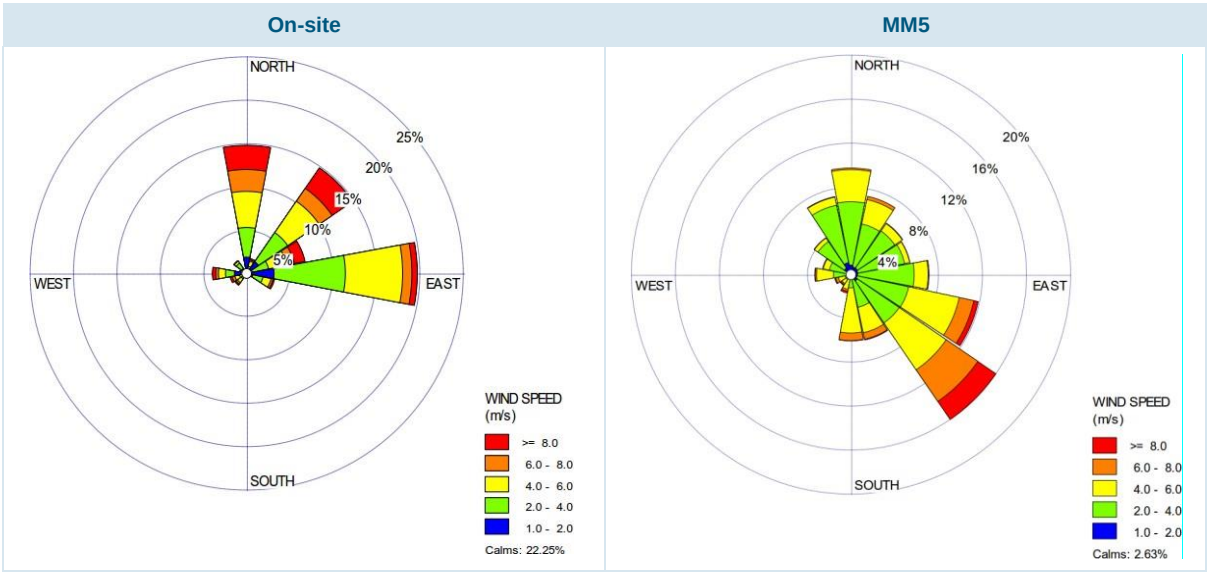


Figure 6-1: Period wind rose for Tubatse Chrome and Steelpoort (MM5) for the period January 2012 to December 2014[15]

6.1.1.2 Temperature

The Steelpoort climate is warm and temperate. The Köppen-Geiger chart describes the prevailing climate in Steelpoort as a local steppe climate (BSh, hot semi-arid climate). Throughout the year, the average daily maximum temperatures in the region range between 18°C (June, July) and 25°C (October - February), while daily minimum temperatures range from 14°C (December – February) and a low of round 4°C in July (Figure 6-2).

[14] *Sunderland, A. and Enslin, N. 2018. Air Quality Impact Assessment Update for Tubatse Chrome Pty Ltd prepared by WSP Environmental Pty Ltd.*

[15] *Ibid.*

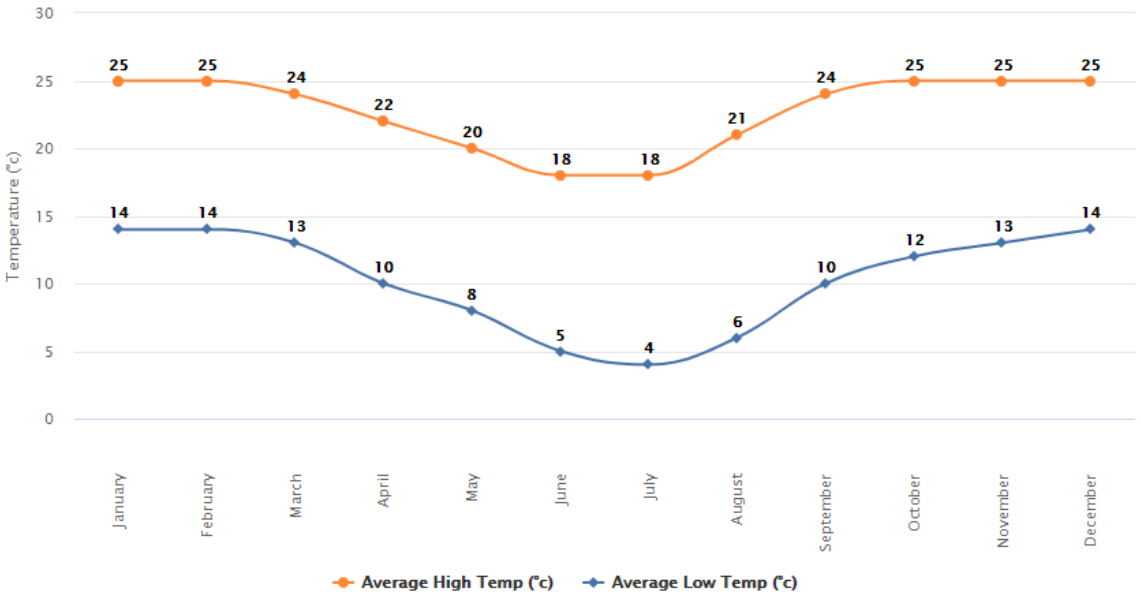


Figure 6-2: Average daily maximum and minimum temperatures[16]

6.1.1.3 Regional Rainfall

The site falls in quaternary catchment B41J, in the B4D rainfall zone and has a Mean Annual Precipitation (MAP) of 598mm/yr characteristic of the arid north of the country (40% of South Africa's MAP of approximately 460mm/yr.[17]) Average monthly rainfall data for the catchment was extracted from WR2012 and is presented in Figure 6-3.

Three South African Weather Service (SAWS) stations were identified in the vicinity: Ga-Sekhukhuneland, Maandagshoek and Rustplaats. These were compared to the quaternary catchment average monthly rainfall and MAP (Table 6-1).

Table 6-1: SAWS station parameters

Station Name	Number	Years	MAP (mm/yr)	Altitude (mamsl)
Ga-Sekhukhuneland	0593015W	77	517	1282
Maandagshoek	0593126W	69	574	1033
Rustplaats	0594141W	75	545	1250

Relative humidity is generally low to moderate, with an average of 41% during winter and 58% during summer.[18]

[16] *http://www.worldweatheronline.com/*
[17] *World Bank Group. 2021. Climate Change Knowledge Portal. Retrieved from https://climateknowledgeportal.worldbank. org/country/south-africa/climate-data-historical*
[18] *Sunderland, A. and Enslin, N. 2018. Air Quality Impact Assessment Update for Tubatse Chrome Pty Ltd prepared by WSP Environmental Pty Ltd.*

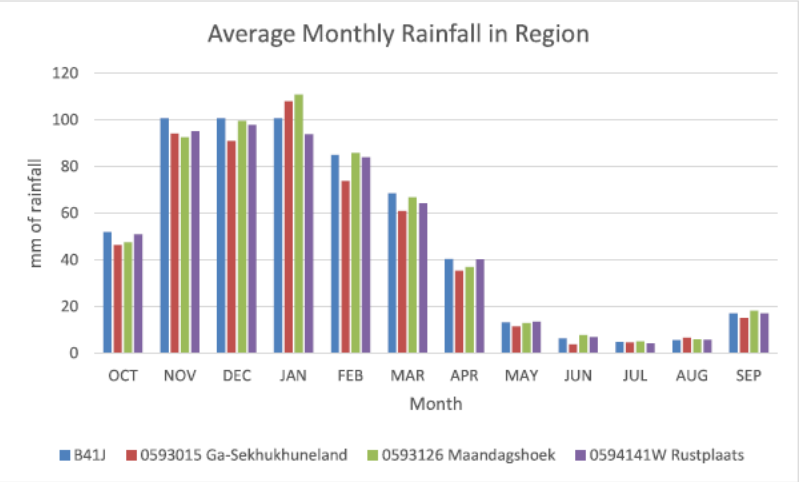


Figure 6-3: Average monthly rainfall

6.1.2 Topography

The Steelpoort region is highly mountainous, hence development occurs mostly in valleys, while ridges and mountains form linear dividers between settlements. This is particularly evident from developments and anthropogenic activities along the Steelpoort River. Ridges further divide the municipal areas creating pockets of homogenous compositions, which determine growth and development potential.

The proposed sites are geographically situated on the slightly undulating plains around Steelpoort. Local and minor drainage patterns and topographical features include shallow and incised drainage lines that are often characterised by steep banks. The land generally slopes in a north-western direction towards the Steelpoort River and the topographical elevation varies between approximately 810m (Site 2) and 747m (Site 5) - Figure 6-4. The Steelpoort River drains in an eastern direction.

No site-specific and accurate contours were available for the sites during the compilation of this report.

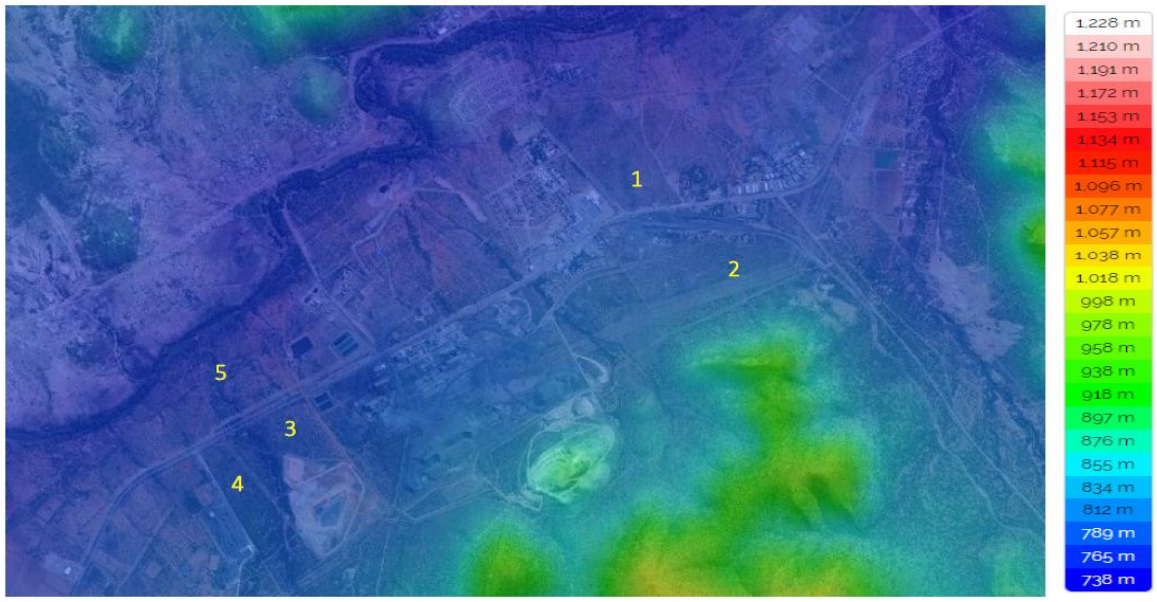


Figure 6-4: Topographical elevation variations on a local scale

6.1.3 Soils and Geology

The site is located in the Eastern limb of the Bushveld Igneous Complex and is underlain by the rocks of the Rustenburg Layered Suite, largely comprising the Dwars River Norites and Vermont Hornfels (Figure 6-5). Norite is a mafic intrusive igneous rock (magna forced into older rocks at depths) composed largely of the calcium-rich plagioclase labradorite, orthopyroxene and olivine, and is predominantly composed of orthopyroxenes, largely high magnesian enstatite or an iron bearing intermediate hypersthene. The Vermont Formation is composed mainly of hornfels), with subordinate quartzite, dolomitic limestone and chert.

Weathering of these geological formations produces soils that are included in the Ae27 and Ea88 land types (Figure 6-6). Map units A refer to yellow and red soils without water tables and belonging in one or more of the following soil forms: Inanda, Kranskop, Magwa, Hutton, Griffin and Clovelly. The map units refer to land which does not qualify as a plinthic catena and in which one or more of the above soil forms occupy at least 40 % of the area. In Ae (red-yellow apedal, freely drained soils, red high base status, >300mm deep, no dunes) yellow soils occupy less than 10% of the area while dystrophic and/ or mesotrophic soils occupy a larger area than high base status red-yellow apedal soils.

The Ea88 land type indicates land with high base status, dark coloured and/ or red soils, usually clayey, associated with basic parent materials, often described as dark, swelling clays. A land type more than half of which is covered by soil forms with vertic, melanic and red structured diagnostic horizons qualifies for inclusion in unit Ea provided it does not qualify for inclusion in units A, B, or C. Land types in which these soils cover less than half of the area may also qualify for inclusion (i) where duplex soils occur in the non-rock land but where unit Ea soils cover a larger area than the duplex soils, or (ii) where exposed rock covers more than half the land type. The Arcadia soil form predominates in this unit.

High variability of soils across the proposed development footprints were noted, ranging between rocky and gravelly soils in upland areas, red, sandy and loamy soils in midland positions and soils of a dark, clayey and structured disposition in bottomland positions.

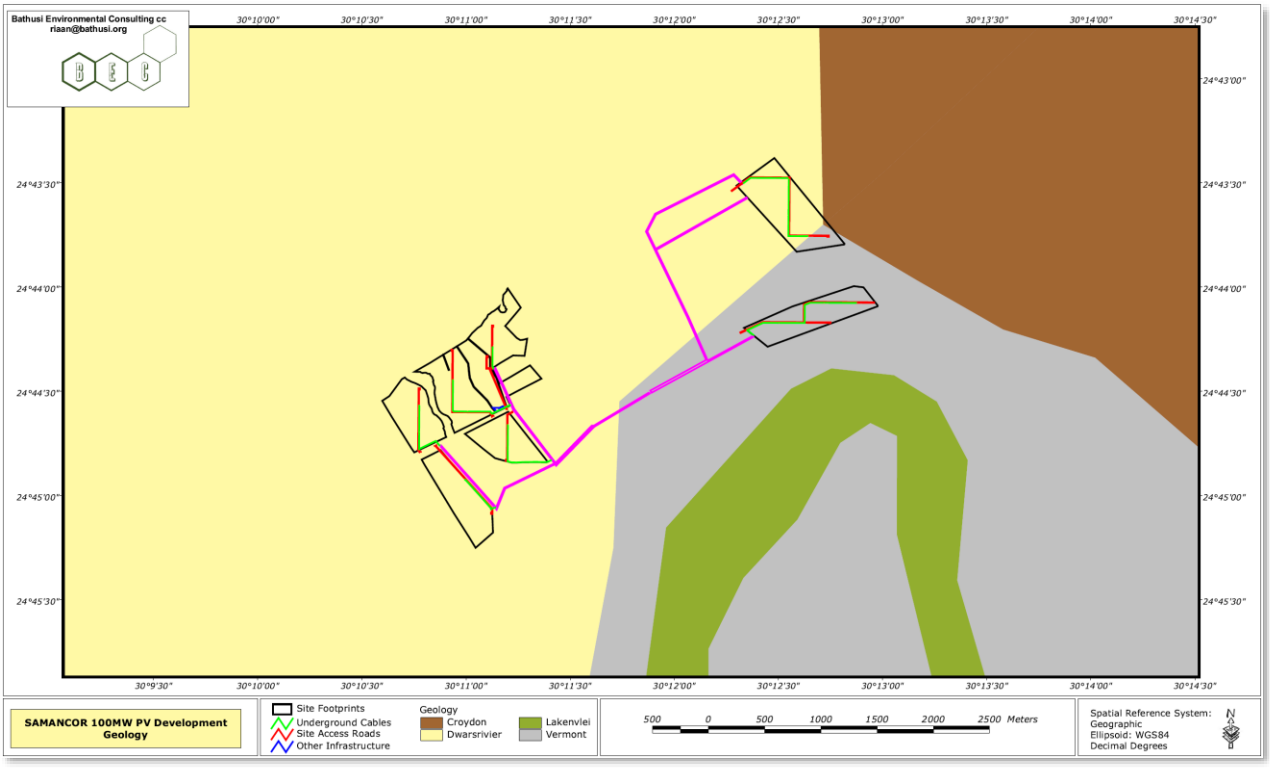


Figure 6-5: Geological patterns of the immediate surrounds

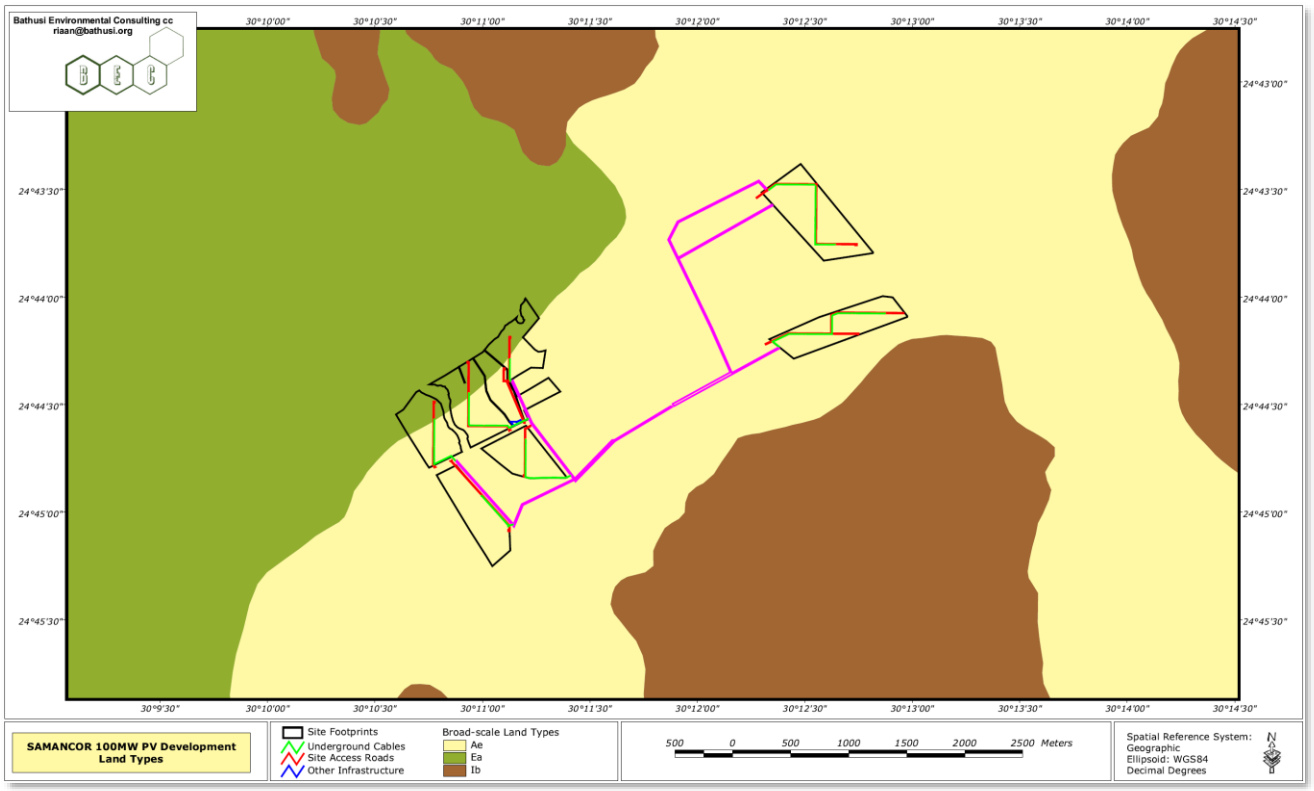


Figure 6-6: Land types of the study area

6.1.4 Agriculture

Agricultural sensitivity, in terms of environmental impact, is a direct function of the capability of the land for agricultural production. This is because a negative impact, or exclusion of agriculture, on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. The general assessment of agricultural sensitivity that is employed in the national Web-based EST, identifies all arable land that can support viable production of cultivated crops, as at least high sensitivity. This is because there is a scarcity of arable production land in South Africa.

The national Web-based EST classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is cultivated or not. All cultivated land is classified as at least high sensitivity, based on the logic that if it is under cultivation, it is indeed suitable for cultivation, irrespective of its land capability rating.

Uncultivated land is classified by the national Web-based EST in terms of its land capability rating, as per the 2017 Department of Agriculture, Forestry and Fisheries updated and refined land capability mapping for South Africa. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability values (≥8 to 15) are likely to be suitable as arable land for the production of cultivated crops, while lower values are only likely to be suitable as non-arable, grazing land, or at the lowest extreme, not even suitable for grazing.

6.1.5 Hydrology

The sites fall in quaternary catchment B41J (Figure 6-7), in the B4D rainfall zone. The catchment has a gross area of 691km^2 and drains to the Steelpoort River. The Steelpoort River Valley is steep with slopes of

2.5% in the plain and steep hills with slopes of 23% rising 1000m to altitudes of 1700 meters above mean sea level (mamsl) on the sides from approximately 700 mamsl along the river. The hills are rocky and the plains are densely vegetated with grasses, shrubs and trees. The Steelpoort River has major tributaries of the Tubatsane River which joins it from the north, downslope of the site. There are many small non-perennial drainage lines throughout the valley.

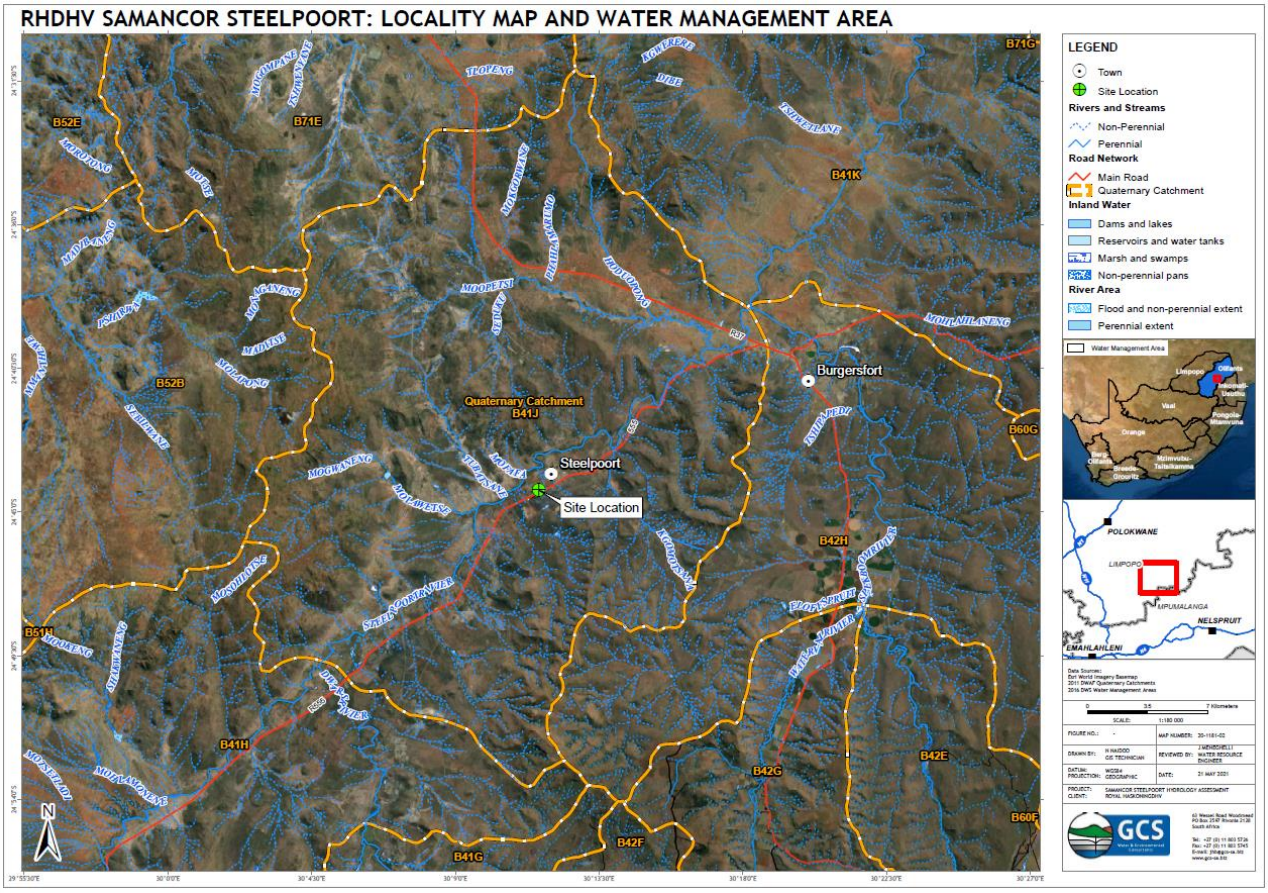


Figure 6-7: Water management areas associated with the proposed project

6.1.6 Freshwater

6.1.6.1 National Freshwater Ecosystem Priority Area (NFEPA)

The majority of the study area (95%) falls within a sub quaternary catchment considered an important fish support area, while a small western portion of the study area falls within a sub quaternary catchment not considered important in terms of watercourse conservation. Fish Support Areas include sub-quaternary catchments that are important for the migration of the fish species *Opsaridium peringueyi* (Least Concern).

According to the NFEPA database, there are five artificial unchanneled valley bottom wetland features located within the investigation area. These wetlands are indicated by NFEPA to be heavily to critically modified. During the field assessment these artificial wetland features were observed to be impoundments associated with the Tubatse Ferrochrome operations as well as impoundments associated with other operations within the study area (Figure 6-8).

According to the NFEPA Database the Steelpoort River is located approximately 150m north of the study area and the Tubatsane River confluences with the Steelpoort River approximately 150m west of the study area. The Steelpoort River is considered moderately modified (Class C) and considered a fish support area,

while the Present Ecological State (PES) 1999 classification indicates that the Tubatsane River is moderated modified (Class C), however the NFEPA Database indicates the Tubatsane River as not intact (Class Z) (Figure 6-8).

The study area falls within the Central Bushveld Group 7 WetVeg group, considered Least Threatened.

Figure 6-8: The artificial wetlands, Steelpoort and Tubatsane Rivers associated with the study and investigation areas, according to NFEPA

6.1.6.2 National Biodiversity Assessment (NBA) (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE)

According to the NBA 2018: SAIIAE there are no natural wetland features associated with the study area or investigation area, however the artificial unchanneled valley bottom wetland features as identified by the NFEPA Database (2011) are classified as dams, open reservoirs and large reservoirs according to the NBA Dataset (2018) (Figure 6-9). According to the NBA Dataset the Steelpoort River is largely modified (Class D), while the Tubatsane River is seriously modified (Class E). Both rivers are currently poorly protected (Ecosystem Protection Level - EPL and therefore considered endangered (Ecosystem Threat Status - ETS).

Figure 6-9: The artificial features and Steelpoort and Tubatsane Rivers associated with the study and investigation areas

6.1.6.3 Ecological Status of the Most Proximal Sub-Quaternary Reach

The study area is associated with the Steelpoort and Tubatsane Rivers and their applicable sub-quaternary (SQR) points are as follows (Figure 6-10):

- B41J – 00563 (Steelpoort River) 150m north of the study area;
- B41J – 00562 (Tubatsane River) 150m north-west of the study area; and
- B41J – 00576 (Steelpoort River) 250m west of the study area.

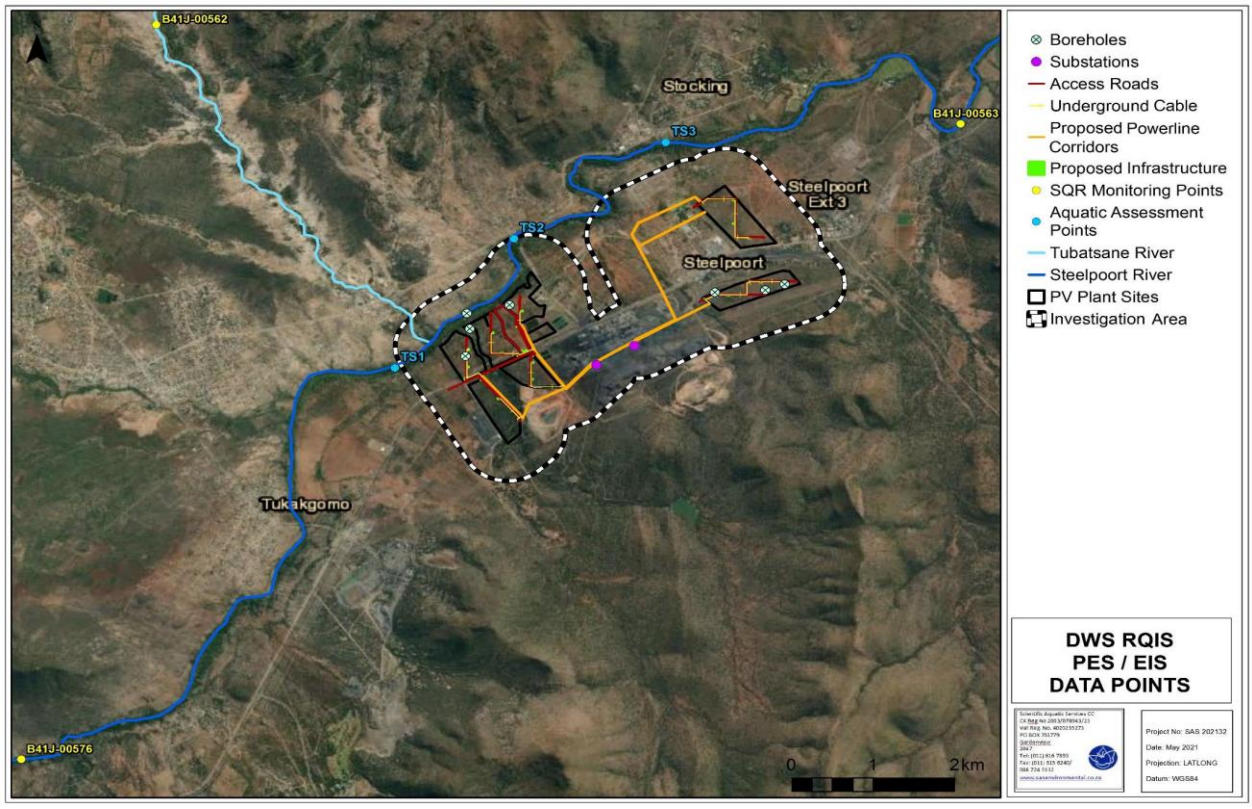


Figure 6-10: Relevant SQRs of the Steelpoort and Tubatsane Rivers associated with the study area

6.1.7 Biodiversity

6.1.7.1 Regional Biodiversity

The project area is located in the Savanna biome which covers approximately 48% of the SDM with grasslands covering 39% and the remainder being made up of forest (9%) biomes. Azonal vegetation is found in patches along the Steelpoort and Olifants Rivers.

The proposed study area is spatially situated within the Sekhukhune Centre of Plant Endemism – SCPE (Figure 6-11). The SCPE contains more than 2200 indigenous species of vascular plants making it an area of exceptionally high biodiversity that is globally recognised.[19] The SCPE comprises a mountainous region with flat to undulating valleys. Sekhukhuneland is known for its parallel belts or rocky ridges and mountains, including the Leolo and Dwars River ranges. The core of the SCPE is formed by the surface outcrops of the Rustenburg Layered Suite of the eastern Bushveld Complex.

[19] *Limpopo Department of Economic Development, Environment and Tourism (LDEDET), 2018. Sekhukhune District Bioregional Plan*

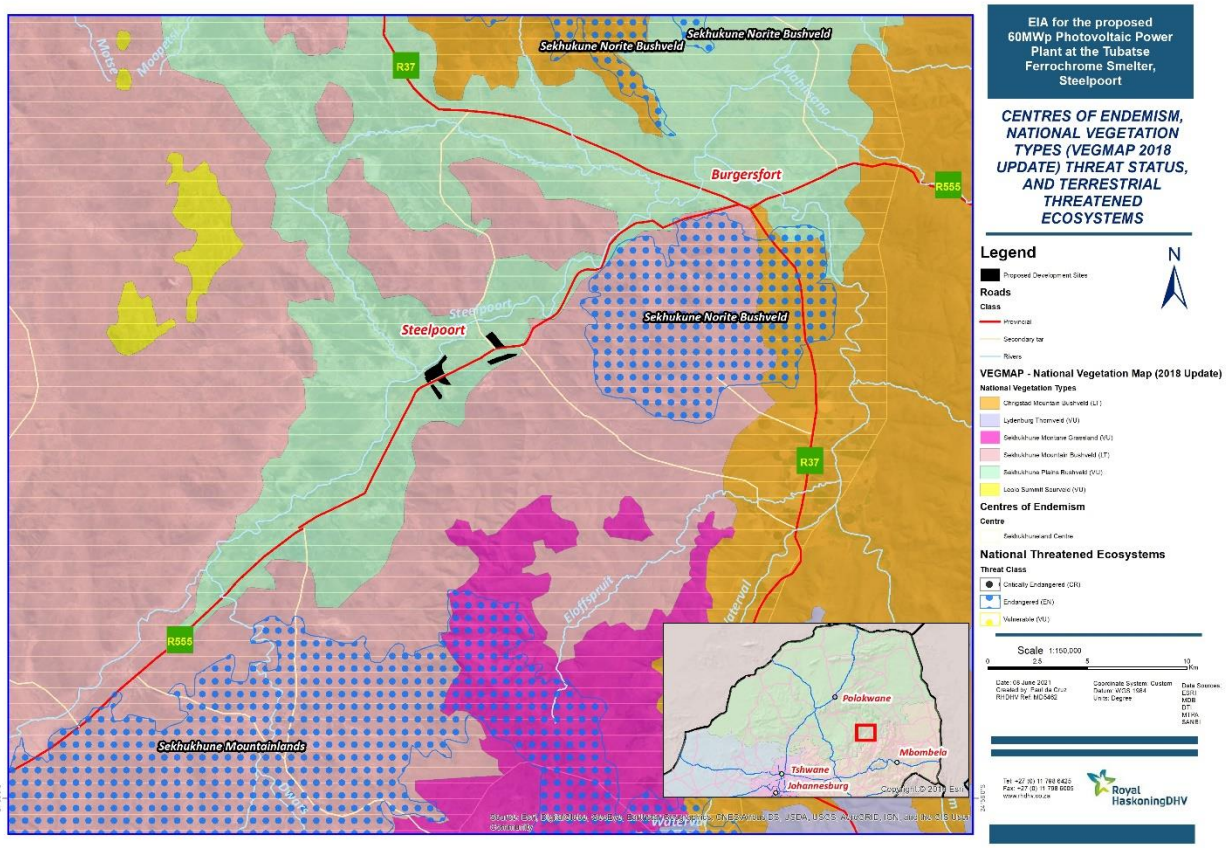


Figure 6-11: SCPE, vegetation types and threatened ecosystems

6.1.7.2 Vegetation Type

The Sekhukhune Plains Bushveld vegetation type is present within the study area (Figure 6-11). The current conservation level of this unit is set at Vulnerable; with a target of 19 %, only 2% is statutorily conserved in Potlake, Bewaarkloof and Wolkberg Caves Nature Reserves. Approximately 25% of this area has already been transformed and is mainly under dry-land subsistence cultivation. A small area is under pressure from chrome and platinum mining activities and associated urbanisation, notably around the Steelpoort area.

There is a high level of degradation of much of the remaining vegetation as a result of unsustainable harvesting, utilisation and exploitation. Erosion is widespread at usually high to very high levels with donga formation, but also expansive sheet and rill erosion. Alien Agave species, *Caesalpinia decapetala, Lantana camara, Melia azedarach, Nicotiana glauca, Opuntia* species, *Verbesina encelioides* and *Xanthium strumarium* are widespread but scattered, often with strong correlation with drainage lines and rivers.

6.1.7.3 Protected Areas

The study area is not situated within or in proximity to a declared protected area. The following protected areas (Figure 6-12) are in close proximity to the project area:

- De Hoop Dam Protected Environment (approximately 27km south-west from the project area);
- Steelpoort Private Nature Reserve (approximately 27km south-west from the project area);
- Apiesboom Private Nature Reserve (approximately 11km north-east from the project area);
- Luiperdhoek Private Nature Reserve (approximately 12km north-east from the project area); and
- Glen Ora Private Nature Reserve (approximately 16km east from the project area).

The sites are not within any National Protected Areas Expansion Focus Areas.

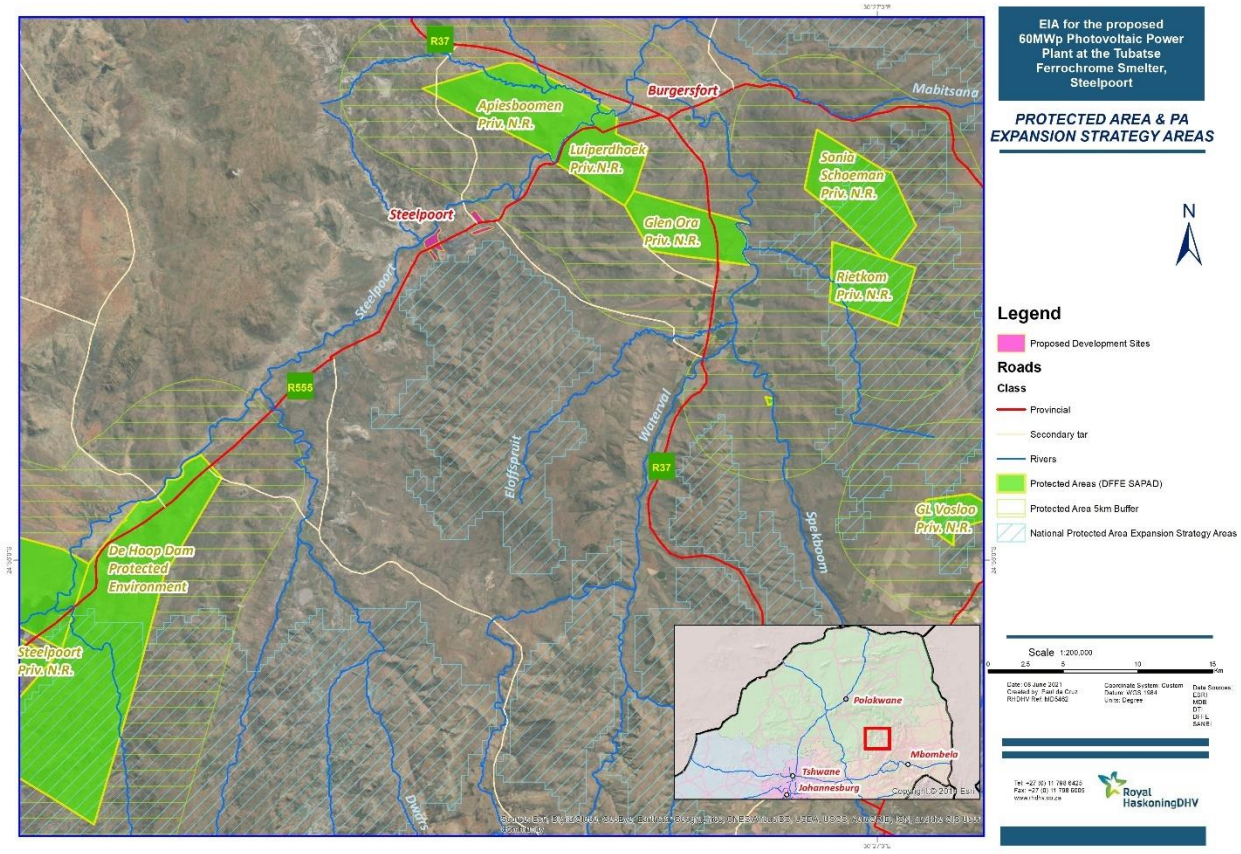


Figure 6-12: Protected areas in relation to the study area

6.1.7.4 Limpopo Province Conservation Plan (2013)

The purpose of the Limpopo Conservation Plan (C-Plan) v2 (2013) is to develop the spatial component of a bioregional plan – BRP (i.e. map of Critical Biodiversity Areas and associated land use guidelines). The purpose of a BRP is to inform land use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity.[20]

The Limpopo C-Plan categories are presented in *Table 6-2*.

Table 6-2: Limpopo C-Plan categories

C-Plan Category	Description
Protected Areas (PA)	Declared and formally protected areas under the Protected Areas Act, such as National Parks, Nature Reserves, World Heritage Sites and Protected Environments that are secured by appropriate legal mechanisms. Recommendations for this category include maintaining of the current status or obtaining formal conservation protection.
Critical Biodiversity Areas (CBAs)	The CBAs are sites that are required to meet biodiversity targets for ecosystems and species and need to be maintained in good ecological condition. CBAs in the SDM can be divided into two subcategories, namely *Irreplaceable (CBA 1)* in that there are little choice in terms of areas available to meet targets or *Optimal (CBA 2)* whereby the

[20] *Desmet, P. G., Holness, S., Skowno, A. & Egan, V.T. 2013. Limpopo Conservation Plan v.2: Technical Report. Contract Number EDET/2216/2012. Report for Limpopo Department of Economic Development, Environment & Tourism (LEDET) by ECOSOL GIS.*

C-Plan Category	Description
	selected sites are the ones that are best to achieve targets of the systematic biodiversity plan.
Ecological Support Areas (ESAs)	ESAs are required to support and sustain the ecological functioning of CBAs and Protected Areas and for meeting biodiversity targets. *ESA 1* are natural, near natural and degraded areas supporting CBA by maintaining ecological processes. *ESA 2* are areas with no natural habitat that important for supporting ecological processes.
Other Natural Areas (ONA)	Natural and intact but not required to meet targets or identified as CBA or ESA.
No Natural Habitat Remaining (NNHR)	Areas with no significant direct biodiversity value. Not Natural or degraded natural areas that are not required as ESA, including intensive agriculture, urban, industry; and human infrastructure.

Figure 6-13 illustrates the categorisation of the sites as inclusive of CBA 1 (Portion of Site 5), CBA 2 (Site 1 and 4 and portions of Site 2, 3 and 5), ESA 1 (Portion of Site 2, 3 and 5) and ESA 2 (Portion of Site 3) categories. The Ecological Specialist is not entirely in agreement with the information source on a wider scale as it is evident that the C-Plan does not accurately reflect the level of habitat loss and deterioration from the urban and industrial sones around Steelpoort that is prevalent. It should be noted that the erroneous assignment of conservation categories is most likely the result of data with a coarse scale and outdated information on a local scale. Since the inception of this information source in 2013, there have been considerable changes in land use and the associated deterioration of ecological status and connectivity of habitat occurred, notably in the immediate surrounds of settlements and residential areas.

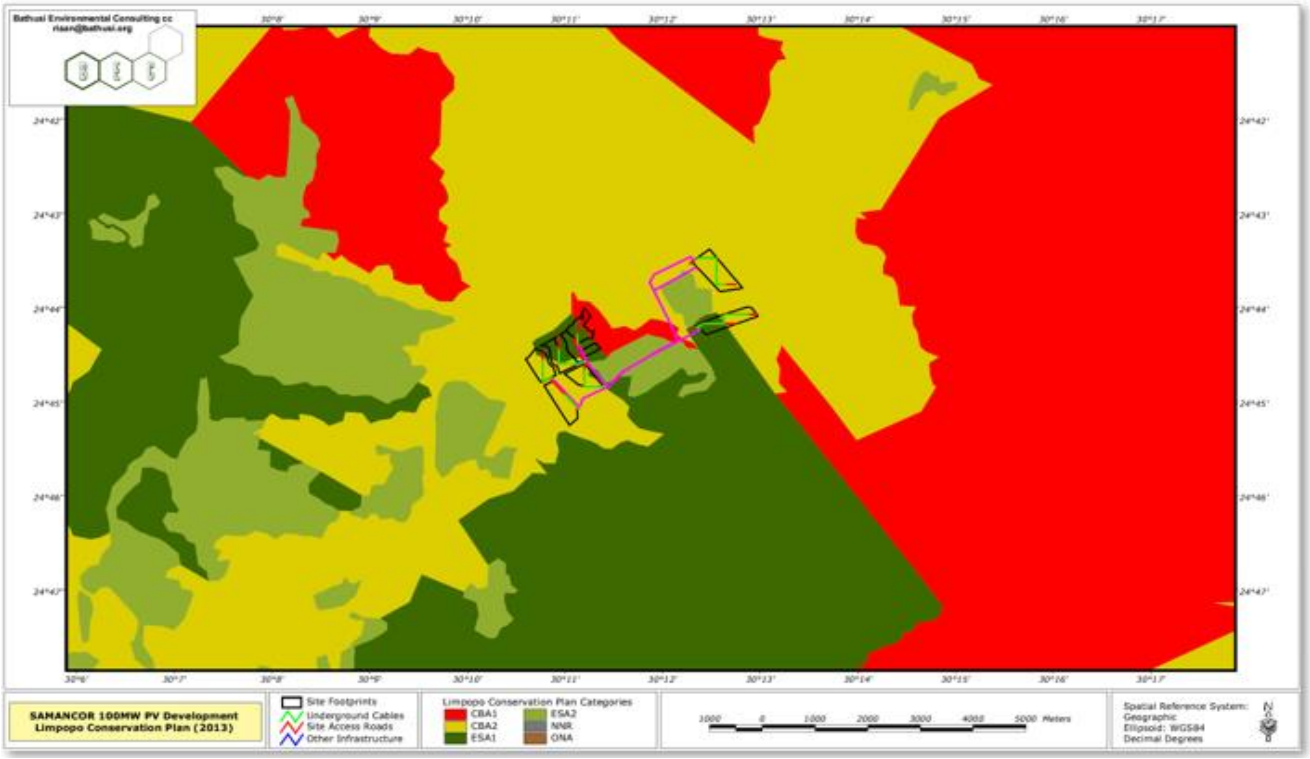


Figure 6-13: Limpopo C-Plan (2013) illustrating conservation categories and importance

6.1.7.5 Sekhukhune Bioregional Plan (2020)

The Sekhukhune Bioregional Plan (BRP) was gazetted in 2020 and is based primarily on datasets and information available at the time, notably from the CBAs and ESAs that were identified and delineated for the Limpopo C-Plan (2013).

The categories of the BRP are the same as those for the Limpopo C-Plan as indicated in *Table 6-2*. An appraisal of the BRP categories, specifically in comparison with the Limpopo C-Plan, provides for a more accurate and appropriate categorisation of remaining areas of natural habitat within the development footprints. Where the Limpopo C-Plan indicates elevated conservation contribution and status, the BRP more accurately describes land transformation and habitat deterioration that is associated with the fragmented and isolated portions of woodland habitat in the immediate surrounds of Steelpoort. The discrepancy between the 2 datasets is likely a result of refined and more recent interpretation of background layers. According to the BRP (*Figure 6-14*), all sites are within the ESA 1 category.

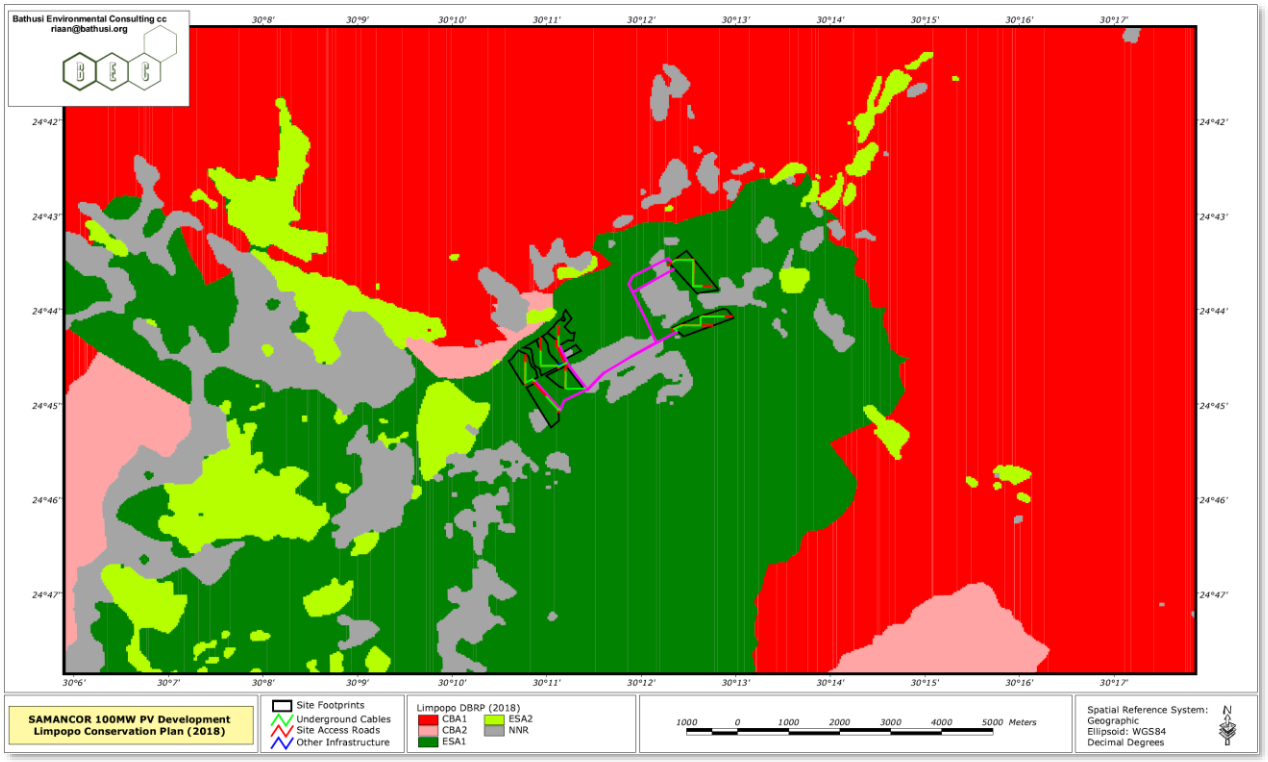


Figure 6-14: Sites in relation to the Sekhukhune BRP (2020)[21]

6.1.7.6 Plants Species of Conservation Concern

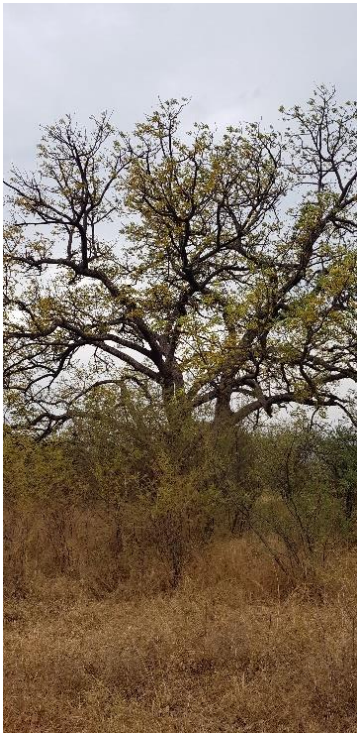
Plant species of conservation concern recorded in the respective development footprints include:

- *Adenia fruticosa* (Limpopo Environmental Management Act - LEMA Schedule 12)
- *Aloe burgersfortensis* (LEMA Schedule 12) - Figure 6-17
- *Balanites maughamii* (National Protected Tree) - Figure 6-16
- *Boscia albitrunca* (National Protected Tree) - Figure 6-17
- *Elephantorrhiza praetermissa* (LEMA Schedule 12)
- *Eulophia petersii* (LEMA Schedule 12) - Figure 6-15
- *Sclerocarya birrea* (National Protected Tree) - Figure 6-17
- *Stapelia gettliffei* (LEMA Schedule 12) - Figure 6-15
- *Stapelia gigantea* (LEMA Schedule 12) - Figure 6-16

[21] *Information in draft form and not to be disseminated indiscriminately.*

Figure 6-15: Eulophia petersii (left) and Stapelia cf. gettliffei (right) recorded in May 2021

Figure 6-16: Stapelia cf. gigantea (left) and Balanites maughamii (right) recorded in May 2021



Sclerocarya birrea

Adenia fruticosa

Boscia albitrunca

Figure 6-17: Plant taxa of conservation concern that were recorded from the site in May 2021

A review of the national Web-based EST, indicated the following aspects of importance pertaining to plant species sensitivities:

- Medium Sensitivity: Sensitive species[22] 1252 (Vulnerable)[23];
- Medium Sensitivity: Sensitive species 1033 (Endangered)[24];
- Medium Sensitivity: Sensitive species 587 (Rare)[25];
- Medium Sensitivity: *Asparagus fourei* (Vulnerable);
- Medium Sensitivity: *Polygala sekhukhuniensis* (Vulnerable);
- Medium Sensitivity: *Searsia batophylla* (Vulnerable);
- Medium Sensitivity: *Searsia sekhukhuniensis* (Rare); and
- Medium Sensitivity: *Combretum petrophilum* (Rare).

6.1.7.7 Declared Invasive Species and Common Weeds

Common weeds species as well as declared alien and invasive species that were recorded on the study site during the site investigation are included in Table 10 of the Biodiversity Assessment (***Appendix E4***).

6.1.7.8 Plants with Traditional Medicinal Uses

Table 11 of the Biodiversity Assessment (***Appendix E4***) lists plants with popular traditional and medicinal uses that were recorded on the sites.

6.1.7.9 Faunal Attributes

A review of the national Web-based EST, produced a medium sensitivity for the animal theme on the study site, including the following aspects:

- Medium Sensitivity: Invertebrate - *Aroegas fuscus;*
- Medium Sensitivity: Mammalia - *Dasymys robertsii*;
- Medium Sensitivity: Sensitive species 2[26];
- Medium Sensitivity: Sensitive species 7[27];
- Medium Sensitivity: Mammalia - *Crocidura maquassiensis*;
- Medium Sensitivity: Aves – *Sagittarius serpentarius*; and
- Medium Sensitivity: Mammalia – *Lycaon pictus*.

The faunal attributes of the study area are presented in Table 6-3.

[22] *Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly, and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. As per the best practise guideline that accompanies the protocol and Screening Tool, names of the sensitive species may not appear in the final EIA report or any specialist reports released into the public domain. It should be referred to as sensitive plant.*

[23] *A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.*

[24] *A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.*

[25] *A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.*

[26] *Please note that the National Environmental Screening report includes lists of animal and plant species of conservation concern that are known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. As per the best practise guideline that accompanies the protocol and Screening Tool, names of the sensitive species may therefore not appear in the final EIA report, or any specialist reports released into the public domain. It should be referred to as 'sensitive species'.*

[27] *Ibid.*

Table 6-3: Faunal attributes of the study area

Component	Attributes
Mammals	The expected mammal richness on the study sites and immediate surroundings is approximately 63 species, of which only 10 species have so far been documented for QDS 2430CA which is sympatric to the majority of the study sites. It implies that the mammal richness on the study sites is poorly documented given the higher number of species that is anticipated. Approximately 49 species (78 % of the expected richness) have a high probability to be present on the study sites, of which 15 of these species (31 % of species with a high probability of occurrence) were confirmed during the survey. One of the confirmed species (c. Southern Mountain Reedbuck *Redunca f. fulvorufula*) is endangered. A total of thirty (30) species are reasonably expected to be present with the sites and immediate areas. Furthermore, a total of five (5) species were confirmed during the surveys that have not been previously observed within the study area (sensu MammalMap). Furthermore, 11 of the expected species indicates a moderate probability of occurrence (17.5 %), of which two species are considered to be regular in the area (c. Serval - *Leptailurus serval* and Brown Hyaena - *Parahyaena brunnea*), while three (3) of the expected species have a low probability of occurrence (5 %). During the baseline survey it became evident that large bodied species were rare on the study sites, which is largely attributed to the intensity of human and industrial activities, nearby settlements and a high degree of fragmentation (dispersal barriers) in the area. It is evident that the mammal richness on the study area is relatively poor, which is best explained by the high degree of industrial and human-induced activities in the area. Domestic cats (*Felis catus*) are prevalent on the study area and may pose an eminent threat to the extant small vertebrate fauna within the wider area. The occurrence of domestic cats may also result in genetic contamination of the indigenous feline population, in particular the African Wild Cat (F. *sylvestris*), due to inbreeding. The relative ruggedness and high spatial heterogeneity along with the presence of surface outcrops north of the Steelpoort River (north of the study area) and immediately east of Site 2 provide micro-habitat for small mammal taxa with rupicolous affinities as well as large mammal taxa with large home range sizes. These features provide occasional foraging habitat for large charismatic carnivores and scavenging (c. Leopard *P. pardus* and Brown Hyaena *P. brunnea*), which also provides suitable habitat for threatened taxa and an overlooked sub-population of Southern Mountain Reedbuck (*Redunca f. fulvorufula*). Three regionally threatened and four near threatened mammal species are known to be present in the wider study region (sensu MammalMap; Child *et al*., 2016[28]). Four of these species exhibit a high or moderate-high probability of occurrence, of which one species were confirmed during the survey. The following threatened and near threatened species have been confirmed on the study site or have a high or moderate-high probability of occurrence: ▪ Serval (*Leptailurus serval*) ▪ Cape Clawless Otter (*Aonyx capensis*) ▪ Brown Hyaena (*Parahyaena brunnea*) ▪ Southern Mountain Reedbuck (*Redunca f. fulvorufula*) ▪ Leopard (*Panthera pardus*) ▪ Cohen's Horseshoe Bat (*Rhinolophus cohenae*) ▪ Highveld Vlei Rat (*Otomys auratus*)

[28] *Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D. & Davies-Mostert, H.T. (eds) 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.*

Component	Attributes
Amphibians	The amphibian richness on the study area is considered low, with 14 frog species expected to occur. Only eight of these have high probability of occurrence) on the study sites. The Steelpoort River (e.g. along Site 5) provides breeding habitat for obligate or "true" aquatic frog species such as Common Platanna (*Xenopus laevis)* and Delalande's River Frog (*Amietia delalandii*), while the floodplains immediately adjacent to the Steelpoort River offer ephemeral foraging and breeding habitat for most of the remaining widespread species (species with a high probability of occurrence). No frog species of conservation concern is expected to be present on the study area.
Reptiles	The reptile composition on the study site is poorly known with only 23 species currently known from the wider study area (c. QDS 2430AC, sensu ReptileMap, including personal observations). The expected reptile richness is underestimated for the study sites (and surrounds) and predicted that the richness may be as high as 54 species. However, reptiles remained to be rather uncommon on the respective study sites with Leopard Tortoise (*Stigmochelys pardalis*), Southern Tree Agama (*Acanthocercus atricollis*), Distant's Ground Agama (*Agama aculeata distanti*), Striped Skink (*Trachylepis striata*), Water Monitor (*Varanus niloticus*) and Variable Skink (*Trachylepis varia*) being prominent. The absence of prominent rock outcrops and sheetrock excludes the occurrence of obligatory taxa pertaining to the genera *Platysaurus, Smaug* and *Cordylus*. Sensitive Species 2, although categorised as Least Concern (IUCN, 2021), is considered a species of concern in the National Environmental Screening Report. This species would be confined to the Steelpoort River and immediate terrestrial surrounds, and because it is a highly opportunistic species, is possible, although unlikely, to persist within the Steelpoort River. Sensitive Species 7 (Vulnerable) could potentially persist on the variable open woodland on rocky slopes confined to the eastern parts of Site 2 and along certain sites where surface outcrops are prominent (mainly variable open woodland along some of the larger drainage lines). This species is categorised as Vulnerable since most of its global distribution corresponds to the Limpopo Province of which already 15 % of previously suitable habitat is currently developed or degraded.
Invertebrates	There are no butterfly species of conservation concern known to be present on the study area. However, the results of a screening report as per the outcome of the national Web-based EST (26/09/2021) produced a medium sensitivity for the animal theme on the study area with the potential occurrence of one shieldback katydid (Family Tettigoniidae): Brown False Shieldback (*Aroegas fuscus*). This species is globally endangered due to its small area of occupancy of approximately 10 km^2, where it is only known from two localities confined to the highland areas of Mpumalanga and Limpopo Provinces. These particular localities are threatened by livestock and wildlife grazing, afforestation, cultivation and floristic changes (especially the distribution of its host plant) due to climate change. When considering the habitat preferences of this species, it is of the opinion that *Aroegas fuscus* has a low probability of occurrence due to an absence of suitable habitat.

6.1.8 Avifauna

6.1.8.1 Bird Species Occurrence

A bird species list for the study area was compiled in the Scoping-phase of the project and has been updated based on the outcomes of the EIR-phase field assessments (refer to the Appendix B of the Avifaunal Assessment – ***Appendix E5*** of this report). The bird species list was primarily compiled on data from the SABAP2 project.[29]

The species composition of the study area is representative of the habitats present in the study area. The majority of bird species are typical of savannah (woodland or bushveld), the predominant habitat type within the study area. A relatively small number of species are associated with aquatic habitats, representing the presence of a perennial river and a number of artificial waterbodies (dams) within the wider study area. A small number of species more typically associated with grassland habitats do occur in the study area and have taken advantage of the modification of woodland habitat through clearing of woody vegetation.

The study area species list contains a number of larger bird species, including certain raptor and stork species. These species are significant as species from these groups of birds are often threatened and are typically prone to being impacted by powerlines, an important component of the proposed development.

6.1.8.2 Important Bird Areas

There are no Important Bird Areas (IBAs) within or in the immediate vicinity of the study area. Three IBAs are located roughly equidistant from the study area – the Wolkberg Forest Belt to the north and north-west, the Blyde River Canyon to the east and north-east and the Steenkamp Berg IBA to the south (Figure 6-18). The closest IBA to the proposed study area is approximately 37km to the north-east – the Blyde River Canyon IBA.

6.1.8.3 Occurrence of Red Data Species

A number of Red Data species have either been recorded or could potentially occur within the study area. The latest list of Red Data List bird species is contained within the 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*, 2015[30]). Table 6-4 lists the bird species in the study area species list that have been designated as Red Data species. Red Data species are very important in the context of the proposed development, as any impacts on these threatened species will be potentially significant at the population level. In addition, certain of these species are large birds that are vulnerable to collisions with infrastructure, especially powerlines.

[29] *The SABAP2 project is a citizen science project that utilises the inputs of several hundred volunteers to map the distribution of birds across several southern African countries. SABAP2 is the follow-up project to the Southern African Bird Atlas Project (SABAP1), which took place from 1987-1991. The second bird atlas project started on 1 July 2007 and thus represents nearly fourteen years of data. The project aims to map the distribution and relative abundance of birds in southern Africa. To gather data, volunteers select a geographical 'pentad' on a map and record all the bird species seen within a set time frame, in order of species seen. This information is uploaded to the SABAP2 database and is used for research and analysis by several different agencies, including the SANBI, BLSA, as well as academics and students at various universities http://sabap2.birdmap.africa/*

[30] *Taylor. M.R., Peacock. F., Wanless. R.M., (eds). 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa. Johannesburg, South Africa*

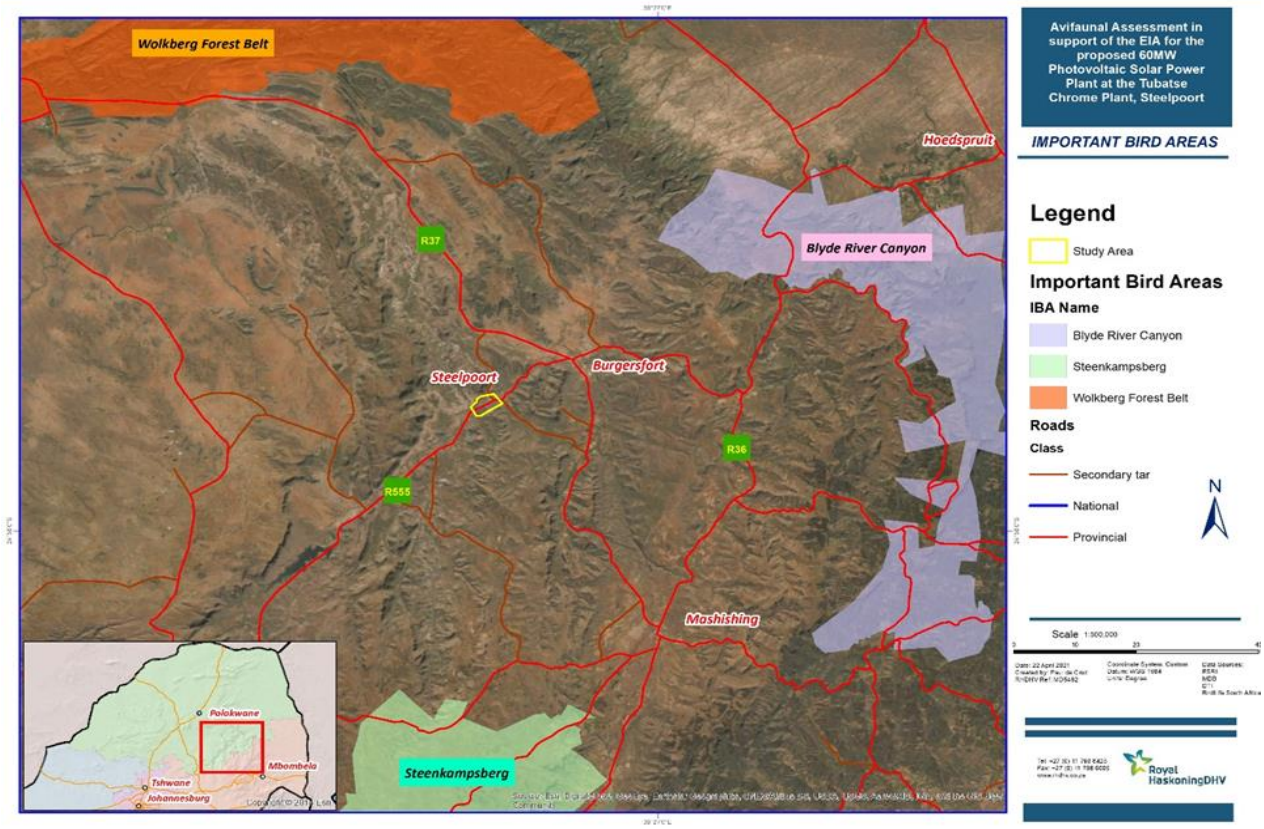


Figure 6-18: Location of IBAs in relation to the study area

Table 6-4: Red Data list birds recorded or potentially occurring within the study area

Scientific Name	Common Name	Regional Threat Category
Ciconia abdimii	Abdim's Stork	Near Threatened
Ciconia nigra	Black Stork	Vulnerable
Geronticus calvus	Southern Bald Ibis	Vulnerable
Sagittarius serpentarius	Secretarybird	Vulnerable
Gyps coprotheres	Cape Vulture	Endangered
Gyps africanus	White-backed Vulture	Endangered
Falco biarmicus	Lanner Falcon	Vulnerable
Polemaetus bellicosus	Martial Eagle	Endangered
Alcedo semitorquata	Half-collared Kingfisher	Near threatened
Coracias garrulus	European Roller	Near threatened

6.1.8.4 Occurrence of Endemic Species

Refer to Table 3 of the Avifaunal Assessment (***Appendix E5***) for the endemic species have been recorded within the study area. Endemic species are of importance due to their limited distribution and impacts on their populations (especially at cumulative level) could be significant It should be noted that species endemic to the southern African sub-region have been listed. A distinction has been drawn between birds completely endemic to the sub-region, as well as those species whose distributions mostly fall within the sub-region (near endemic).

6.1.8.5 Identification and Occurrence of Priority Bird Species

Based on the species list compiled for the study area and the sensitivity analysis, a number of 'priority species' with respect to the proposed development have been identified. The identification of priority species has also considered the conservation or endemism status of the species, as well as whether the species would be vulnerable to collisions with overhead powerlines or be impacted by PV-based solar power development. Species recorded in the wider area have been included as these could easily move into the study area. The priority species are:

- Abdim's Stork (*Ciconia abdimii*)
- Black Stork (*Ciconia nigra*)
- Southern Bald Ibis (*Geronticus calvus*)
- Secretarybird (Sagittarius serpentarius)
- Cape Vulture (*Gyps coprotheres*)
- White-backed Vulture (*Gyps africanus*)
- Peregrine Falcon (*Falco peregrinus*)
- Lanner Falcon (*Falco biarmicus*)
- Verreaux's Eagle (*Aquilla verreauxii*)
- Tawny Eagle (*Aquila rapax*)
- Martial Eagle (*Polemaetus bellicosus*)

Although the likelihood of the occurrence of certain of these species is likely to be very low, their threat status, twinned with their ability to range extensively over large territories or areas of occurrence entails that they could occur in the study area and should be considered.

6.2 Socio-Economic Baseline

6.2.1 Socio-Economic Baseline

The FGTM is a Local Municipality (Category B4) within the SDM, in the Limpopo Province. It was established after the August 2016 local elections by the merging of Fetakgomo and Greater Tubatse Local Municipalities. The Municipality borders Makuduthamaga Local Municipality in the south, Elias Motsoaledi Local Municipality in the east, Fetakgomo Local Municipality, Lepelle-Nkumpi Local Municipality in Capricorn District, Maruleng Local Municipality in Mopani District and Mpumalanga's Thaba Chweu Local Municipality. It is situated about 150km from Polokwane, and 250km from Mbombela. Geographically the Municipality is the biggest of the five (5) local municipalities in SDM, constituting 34.3% of the area with 4 550km^2 of the District's 13 264km^2.

6.2.1.1 Population

The population size is 335 676. The population in the Municipality is constituted by 97.8% Black, 1,6% White, with other population groups making up the remaining 0.7% (Figure 6-19). The sex ratio in the Municipality is 88, meaning that for every 100 women there are 88 men. Languages spoken in the Municipality include Sepedi (78.6%), Tsonga (6.9%), *isi*Ndebele (3.8%), *isi*Zulu (2.1%) and other languages make up 8.6%. Of those aged 20 years and older, 22.6% have completed matric and 6.6% have some form of higher education.[31]

[31] *Statistics South Africa. 2011 Census.*

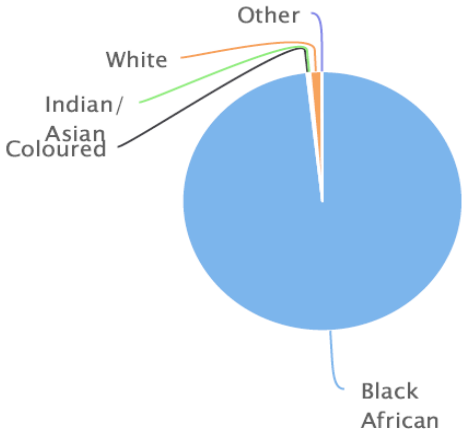


Figure 6-19: Population groups[32]

6.2.1.2 Settlement Type

Over 90% of the settlements are tribal/ traditional with urban and farm settlements constituting 7.9% and 2% respectively (Figure 6-20).

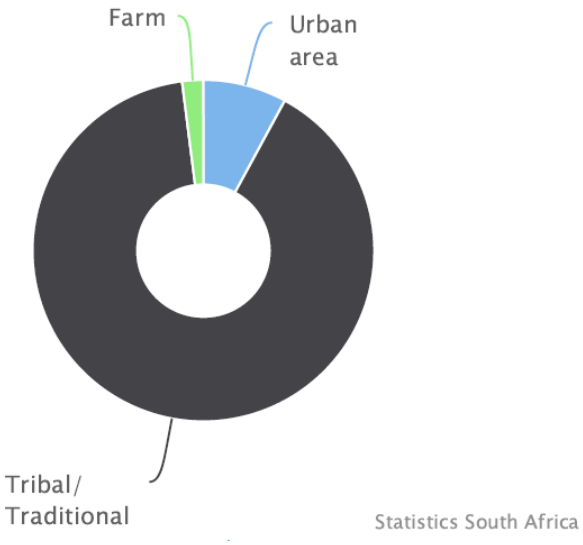


Figure 6-20: Settlement type[33]

6.2.1.3 Water Scenario

The water sources found in the SDM include groundwater, wells, rivers, pools, and dams (20 small dams and 2 major dams i.e. Flag Boshielo and De Hoop Dams). The SDM relies on two major rivers where the two large dams are located within its jurisdiction. The Flag Boshielo Dam located on the Olifants River has, at full storage capacity, 185.2 million cubic metres (110%) as at January 2020. The De Hoop Dam located on the Steelpoort River has, at full storage capacity, 348.7 million cubic metres (81, 2%) as at January 2020.[34]

[32] *Ibid.*
[33] *Ibid.*
[34] *Source: DWS in Final DDP-IDP Budget 2020*

The SDM is currently providing full water services in the main towns of Burgersfort (12 815 people), Marble Hall (4 025 people), Groblersdal (6 312 people), Steelpoort (3 374 people) and Ohrigstad (1 520 people). These areas have access to other high-level services such as refuse removal and roads infrastructure.

6.2.1.4 Electricity[35]

The FGTM is not the electricity authority or provider for the Municipality, this is the sole responsibility of Eskom. Basic electricity infrastructure has been provided by Eskom, but many of the rural communities have inadequate access to electricity. This further supports the need for Samancor Chrome to develop alternative sources of electricity as this would enable the Municipality and Eskom to use more resources in ensuring that these communities can have improved access to electricity.

6.2.1.5 Sanitation[36]

Sanitation services are a function of the SDM, the Municipality currently has a large backlog in terms of sanitation provision. Industrial consumers such as Samancor Chrome that operate in more urban areas discharge their effluent in existing wastewater treatment works via the municipal system. The FGTM IDP (2020) has stated that the Steelpoort sewerage plant has undergone a refurbishment to cater for the development in the area but the system is still overloaded due to the chemical toilets and septic tank discharges at the plant. It is important to note that there is proposed sewage works planned downstream for Steelpoort and Winterveld, the exact location and details has not been provided in the IDP but this does highlight the importance of the Steelpoort area and ensuring that the communities in this area have access to some form of services.

6.2.1.6 Economy

The Municipality has a weak economic base and high poverty levels with 15.7% with no income (Figure 6-21). The Burgersfort town in the Municipality has been identified as a growth point in the province because of its mining activities. A potential to grow the economic base in the Municipality, through tourism, has been brought by the availability of natural resources. Poverty alleviation projects implemented by the Municipality have improved the socio-economic conditions.

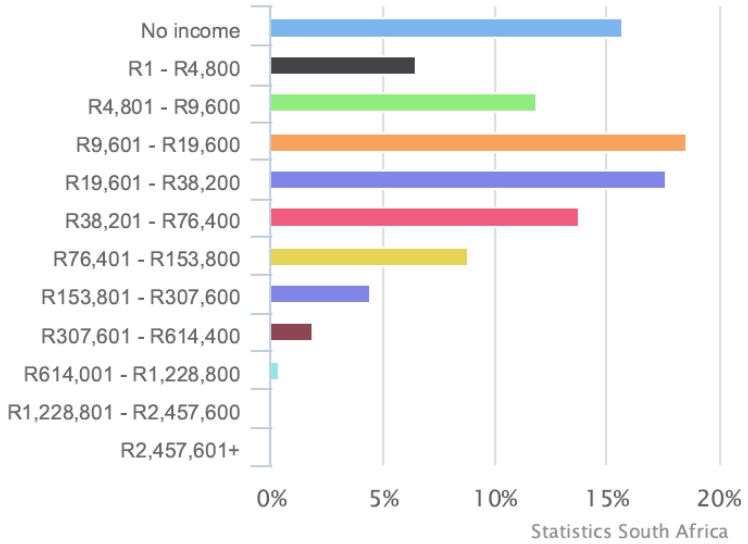


Figure 6-21: Average household income[37]

[35] *Fetakgomo Tubatse Local Municipality. 2020. 2020/21 Integrated Development Plan (IDP) & Budget.*
[36] *Ibid*
[37] *Statistics South Africa. 2011 Census.*

6.2.1.7 Sekhukhune District Development Plan 2020-2021

The SDM accounts for a total population of 1.2 million, or 20.4% of the total population in the Limpopo Province, with Vhembe being the most populous region in the Limpopo Province in 2018.

The increase in the population annual growth rate is attributed to the increasing number of the mining developments (particularly in the FGTM) which serve as an attraction of people for job opportunities, especially the male population.

6.2.1.8 Special Economic Zones (SEZs)

The Fetakgomo Tubatse SEZ is proposed in the province (Figure 6-22). The Fetakgomo Tubatse SEZ is in a mining zone area which has been designated for mineral beneficiation. Currently the Limpopo Economic Development Agency has secured 1 200ha of land where the SEZ will be located and the processes such as EIA and licensing are being undertaken. The challenges affecting the smooth inception of the SEZ include amongst others, the licensing, Eskom capacity for electricity provision and water provision.[38]

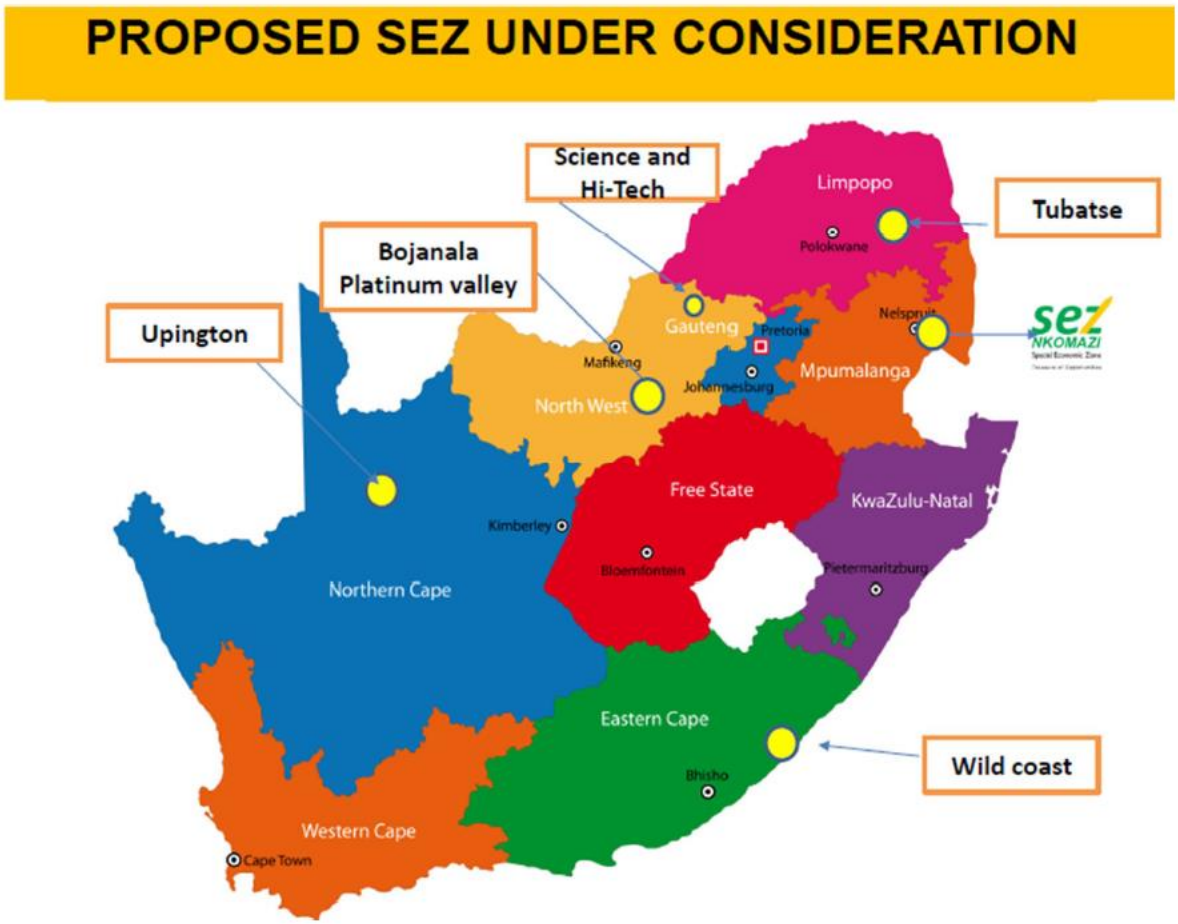


Figure 6-22: Map showing the proposed SEZs in South Africa[39]

[38] *SDM. District Development Plan 2020-2021.*
[39] *Department of Trade and Industry. 2018. Annual Performance Plan 2018/19.*

6.2.1.9 Identification of Sensitive Receptors

There are few formal serviced[40] communities and a few un-serviced communities in the general vicinity of the five proposed development sites. Table 6-5 and Figure 6-23 below provides the location of communities and the direction and approximate distance from each site.

Table 6-5: Local sensitive receptors to sites

Name of Community	Type of Community	Nearest Proposed Site	Direction and Distance from Site
Mohlakwana	Primarily formal residential housing on small holdings	Site 1	North, 1.3km, across the Steelpoort River
Matholeng	Formal residential housing, some on small holdings	Site 1	North, 1km, across the Steelpoort River
Stocking	Formal residential housing	Site 1	North, 1.2km, across the Steelpoort River
Pelaneng	Semi formal, formal housing	Site 5	North west, 170m across the Steelpoort River
Ga-Mapodila	Semi formal, formal housing	Site 4 and Site 5	West, 1km across the Steelpoort River, extending to almost 4km downstream. Has the only direct access road that crosses the Steelpoort River, linking to the R555.
Steelpoort Town (northern)	Formal residential	Site 1	North, 400m from Site 1.
Steelpoort Town (central)	Formal and business	Site 1 and Site 2	West, 200m from Site 1 and 430m north-west from Site 2, across the R555 (north).
Steelpoort Town (southern)	Formal residential, and business	Site 2	North-west 200m from Site 2, across the R555 (south).
Business District	Light industrial	Site 1 and Site 2	West 200m from Site 1, and north-west 200m from Site 2, along the R555.

[40] *'Serviced' refers to the provision of municipal and basic services such as refuse removal, water, electricity, health and educational facilities and telecommunication options.*

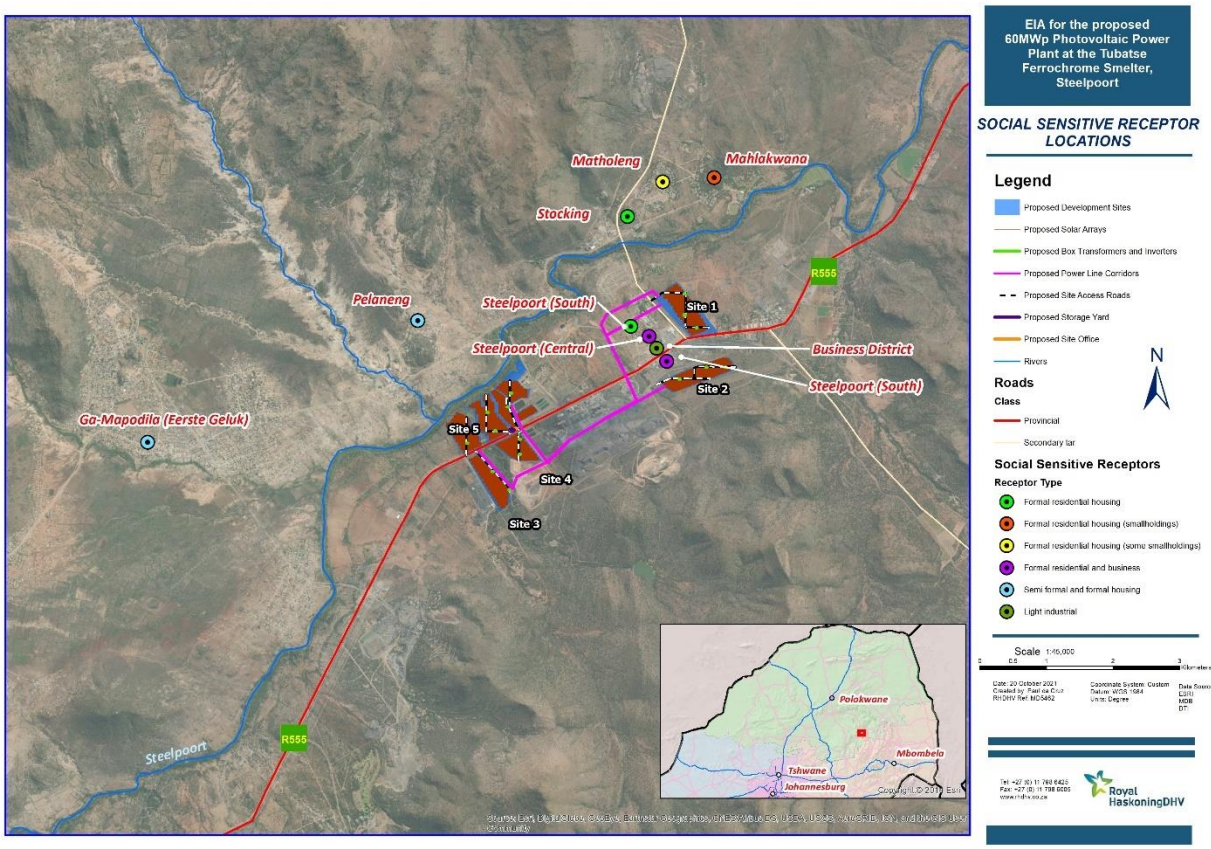


Figure 6-23: Sensitive receptors location in relation to the potential sites

6.2.2 Land Use

Land use within the larger region is rural, characterised by commercial agriculture and extensive livestock farming. Numerous small villages are sprawled across the landscape, notably along the Steelpoort River and major roads, characterised by deteriorated and transformed areas in the immediate surrounds. Mining and associated beneficiation industries account for major industrial type of land uses of the immediate region, which is particularly prevalent in the Steelpoort area. The Steelpoort town comprises mainly mining (inclusive of mineral processing and beneficiation plants) and other industrial land use types as well as medium density housing (peri-urban) and a small retail/ commercial component.

Aerial imagery of the immediate region (<2 km, Figure 6-24) reflects the severity of habitat transformation and deterioration that are typically associated with intensive industrial and mining land use activities around Steelpoort (south and south-west), as well as loss of habitat and associated impacts that are evident from rural villages and intensive utilisation of natural resources for subsistence purposes (north-west and west). Impacts associated with subsistence agriculture and persistent and high grazing pressure to the north of the site is evident from the absence of a woody component of the area and a poorly developed and degenerated herbaceous layer is often present.

The proposed sites comprise mostly natural (woodland) habitat, but because of proximity to the Steelpoort town area, exhibit a moderate level of habitat deterioration that stems from typical and surrounding land use activities, including severe and persistent grazing pressure as well as the effects from surrounding industrial land uses, such mining and industrial activities, mining infrastructure (ponds, artificial impoundments, spoils heaps, etc.), roads and railway lines, informal and illegal sand mining activities and residential areas and rural townships.

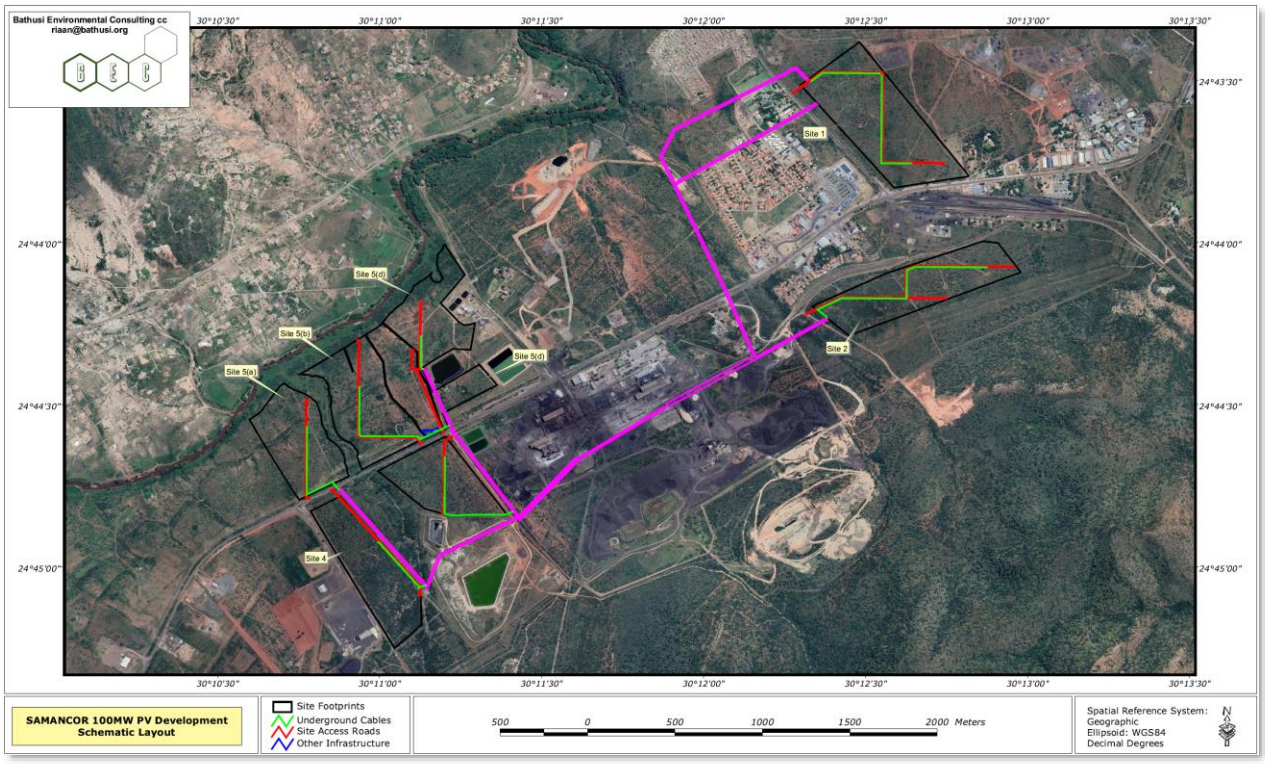


Figure 6-24: Aerial imagery of the site and immediate surrounds

6.2.3 Visual Landscape

The visual character of the study area is defined by a mix of both natural landscape features and human (anthropogenic) alterations to the landscape, mainly in the built form. The TFC Smelter (around which the solar development sites are located) and the small town of Steelpoort which is in close proximity to the Smelter are located within the valley of the Steelpoort River. The valley is aligned in a north-east/ south-west orientation and is flanked on its eastern and western sides by tall hills. Apart from some mining activities in the valley slopes, these hilly areas flanking the valley are largely undeveloped and provide the Steelpoort valley with a strong natural visual component.

Within the valley floor, flatter topography has allowed development and transformation of the natural woodland vegetation to occur. The wider valley in the surrounds of the Smelter and the town is characterised by a mix of land uses and landcover, including peri-urban, mining, industrial, commercial, and other land uses. These land uses have all been transformative in the context of removal of natural vegetation, with the establishment of large structures in many areas. The socio-cultural context of the area has also influenced the visual context and character of the area; the Steelpoort River formed the eastern boundary of the homeland of Lebowa under the Apartheid regime, and this legacy of separate development is still present in the area today in that the parts of the Steelpoort Valley located to the west of the river are largely characterised by rural or peri-urban settlements that consist of formal houses on small plots of land, located in a wider context of open land consisting of veld that has been highly degraded through communal land tenure and livestock grazing. Conversely the eastern side of the valley consists of mining and industrial developments and residual undeveloped land, with some areas of human settlement, most notable of which is the small town of Steelpoort.

The above mix of natural areas, in particularly the visually prominent and largely undeveloped hilly areas flanking either side of the Steelpoort Valley, along with the large industrial and mining components imbue

the study area with a mixed visual character that can be characterised as partly rural with strong natural and industrial elements. The economy of the Steelpoort Valley in the wider vicinity of the TFC Smelter is very much focused on mining and industrial development, and it can be stated with a reasonably high level of confidence that the Steelpoort area is perceived as a prominently mining and industrial-related area by those who inhabit or visit the area.

6.2.3.1 Location of Visual Receptors in the Study Area

As the proposed development consists of five (5) separate parcels of land on which solar power arrays are proposed to be constructed that are distributed around the existing TFC Smelter, along with various sets of powerlines that would be associated with the five sites, there are differing sets of potential receptor locations for each of the sites. Accordingly, each site, or set of sites in the case of those located in close proximity and their associated powerline alternatives could potentially affect a different set of visual receptors. The location of visual receptors described below is indicated in Figure 6-25.

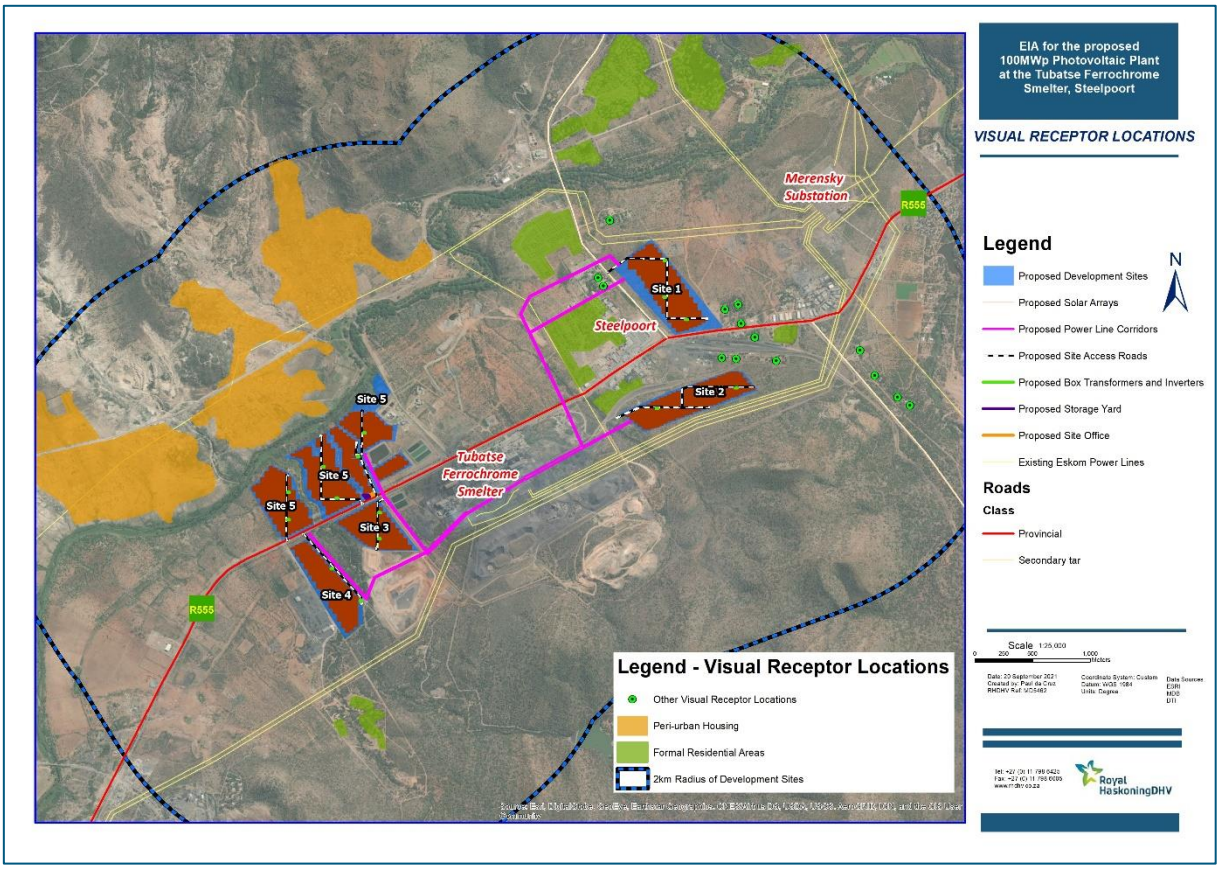


Figure 6-25: Visual receptor locations in the study area

a) Site 1

Site 1 is an elongated site located close to the two components of the town of Steelpoort, as well as two major arterial roads – the R555 regional route that links Steelpoort with Roosenekal and Burgersfort, and the link road between the R555 and the R37 regional route that connects Burgersfort with Polokwane. Site 1 is located in relatively close proximity to the primary residential area of Steelpoort that has been developed northwards from the town's commercial shopping node along the R37 link road. The closest receptor locations are the Laerskool Steelpoort School and the AGS Steelpoort Church, with the residential complexes set slightly further back to the west and north-west of the site. A nursery school and an accommodation facility are located on the northern and south-eastern side of the site respectively. Further residential areas are located to the south-west of the site and to the south-east (both located to the south of

the R555 road). Accordingly, Site 1 has arguably the highest number of sensitive visual receptors in its immediate surrounds due to its location in close proximity to the residential areas of Steelpoort.

The power corridor associated with Site 1 that cross the R37 link road would run immediately adjacent to a number of residential properties and thus in close proximity to visual sensitive receptors (Figure 6-26). Both power corridor alternatives would link to the northern part of Site 1, crossing the R37 link road. The more southerly power corridor alternative would run along Anthracite Street, running close to the AGS Steelpoort Church and the Excelsius Combined School. The more northerly power corridor alternative would run close to the Laerskool Steelpoort School, traversing a field on the school property. The power corridor alternatives then join and run slightly to the west (approximately 150m) of the residential areas. The households along Anthracite Street and the properties on the western edge of the Steelpoort Residential Area, along with the church and two schools would thus have a high degree of visual exposure to overhead powerlines.

Figure 6-26: Residential properties on the western edge of the Steelpoort Residential Area and the powerline running parallel

A number of formal residential areas are located to the north and north-east of Site 1 (on the northern side of the Steelpoort River). The closest parts of these residential areas are located 850 – 1 100m to the north.

b) Site 2

Site 2 is located close to Steelpoort but is slightly set back from the town's commercial and residential areas. The closest residential area and potential sensitive receptor location is houses located between the R555 and the railway shunting yards that are located immediately to the north of Site 2 (Figure 6-27). The properties have been developed around a small koppie and thus certain have an elevated position in relation to the site. A small number of households on Transnet Rail Property are located on the north-eastern side of the site. The remainder of the area surrounding the site is comprised of either vacant land, powerline servitudes, or mining/ industrial areas and thus no receptor locations are located on the southern, eastern, and western areas surrounding Site 2.

The power corridor associated with Site 2 would not traverse an area in which any visual receptor locations are situated, traversing an area associated with the TFC Smelter activities.

Figure 6-27: Receptor locations situated in close proximity to Site 2 as viewed from the northern boundary of the proposed solar array layout on Site 2

c) Site 3 and 4

There are very limited visual receptors located in close proximity to these two sites. The R555 road runs parallel to the northern boundaries of both sites. The only static receptor location is located to the south-west of Site 3 and south of Site 4 – a set of homesteads located to the south of the truck depot. The remainder of the areas surrounding the sites is comprised of open vacant land (including Site 5 to the north) and smelter ancillary infrastructure in the form of two waste dams, various powerline servitudes, the TFC Smelter and associated slag dump to the east of Site 3.

The power corridor associated with Sites 3 and 4 would not traverse an area in which any visual receptor locations are situated, traversing the waste dams and the TFC Smelter property and running in parallel to an existing powerline on the eastern boundary of Site 4.

d) Site 5

Site 5 is located on open vacant land which is bounded by the R555 on its southern boundary. This stretch of the R555 road thus forms a transient receptor location. Sites 3 and 4, as well as the TFC Smelter are located to the south and south-east of the site, and in addition to the Tubatse RO Plant and Water Treatment Plant associated with the TFC Smelter located to the east of Site 5, there are no receptor locations in the areas to the south, south-east, and east of Site 5. The area immediately to the south-west of Site 5 is similarly uninhabited and no receptor locations are present in this area. The only area in which receptor locations are thus located is in the area on the opposite (northern) bank of the Steelpoort River, an area characterised by peri-urban settlements (households on small plots of land).

Figure 6-28: Typical peri-urban area on the northern bank of the Steelpoort River to the north of Site 5

The power corridor associated with Site 5 would not affect an area in which any static receptor locations are situated. The power corridor would cross the R555, thus being visible to motorists travelling along the road.

6.2.4 Cultural Heritage and Palaeontology

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant. The Heritage Impact Assessment (HIA) has shown that the study area and surrounding area has some heritage resources situated within the proposed development boundaries.

Site significance classification standards used is based on the heritage classification of Section 3 in the National Heritage Resources Act and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2016) is implemented in this assessment (Table 6-6).

Table 6-6: Rating system for archaeological and built environment resources

Grading	Description of Resource	Heritage Significance
Archaeological Resources		
I	Heritage resources with qualities so exceptional that they are of special national significance. Current example: Mapungubwe Cultural Landscape	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current example: Schoemansdal, Louis Trichardt, Soutpansberg District	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.	
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Koni ruins, Lydenburg	High Significance

Grading	Description of Resource	Heritage Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Medium Significance
IIIC	Such a resource is of contributing significance.	Low Significance
Not Conservation Worthy (NCW)	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No research potential or other cultural significance
Built Environment Resources		
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: Moorddrift Monument, Potgietersrus	Exceptionally High Significance
III	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.	
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement, or community.	Medium Significance
IIIC	Such a resource is of contributing significance to the environs. These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No research potential or other cultural significance

During the field work several heritage features and resources were identified and logged. A total of fifty-seven (57) points of interest were logged that resulted in the delineation and identification of twenty-four (24) separate heritage sites.

7 PUBLIC PARTICIPATION AND STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinion and/ or concerns which enables the EAP to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects.

The primary aims of the PPP are:

- to inform I&APs and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- to promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- to provide responses to I&AP queries.

The PPP must adhere to the requirements of Regulations 41 and 42 (GNR 326) as amended. Further, a Public Participation guideline in terms of NEMA was issued by the DFFE in 2017, of which provisions will also be implemented.

The PPP for proposed project will be undertaken according to the steps outlined in Figure 7-1 below.

Figure 7-1: Steps in the public participation process

In order to achieve a higher level of engagement, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the non-governmental organisation (NGO) sector, to the communities of wards of residential dwellings as well as Traditional Authorities which surround the study area;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The fielding of queries from I&APs and others, and providing appropriate information;

- The convening of specific stakeholder groupings/ forums as the need arises; and
- The preparation of reports based on information gathered throughout the EIA study via the PPP and feeding that into the relevant decision-makers;

The proposed project PPP has entailed the following activities.

7.1 Authority Consultation

The Competent Authority, the DFFE, is required to provide an Environmental Authorisation (whether positive or negative) for the project. The DFFE was consulted from the outset of this study and has been engaged throughout the project process. The Limpopo Department of Economic Development, Environment and Tourism (LDEDET) will be the commenting authority.

Authority consultation included the following activities:

- Pre-application meeting held on 11 June 2021 and approval of PP plan; and
- Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations 2014 (as amended).

7.2 Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders will be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders from the outset and to provide background information about the project during the Scoping and EIA studies.

All relevant stakeholders will be allowed an opportunity to comment on the draft consultation EIR.

7.3 Site Notification

The EIA Regulations 2014 (as amended) require that a site notice be fixed at a place conspicuous to the public at the boundary or on the fence of the site where the activity to which the application relates and at points of access or high through traffic. The purpose of this is to draw people's attention to the project and make them aware that they are able to play a role in the project.

Royal HaskoningDHV erected a number of notices at various noticeable locations (i.e. Tubatse Chrome Golf Club, Steelpoort Primary School, Post Office and the proposed Site 3) in the study area on 05 May 2021. (***Appendix F***).

7.4 Identification of Interested and Affected Parties

I&APs were identified utilising an existing database developed as a result of previous environmental studies undertaken in the study area and this database is being updated on an on-going basis. E-mails were sent to key stakeholders and other known I&APs on 02 June 2021, informing them of the studies for the project and indicating how they could become involved in the project.

The contact details of all identified I&APs are updated on the project database, which is included in ***Appendix F***.

7.5 Background Notification Document

A Background Information Document (BID) for the proposed project was compiled in English (***Appendix F***) and distributed to key stakeholders and prospective I&APs.

The aim of this document was to provide a brief outline of the application and the nature of the development. It is also aimed at providing preliminary details regarding the environmental study and explains how I&APs could become involved in the project.

The BID was distributed to all identified I&APs and stakeholders, together with a registration/ comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project.

7.6 Advertising

In compliance with the EIA Regulations 2014 (as amended), notification of the commencement of the scoping phase and review of the draft consultation ESR for the project was advertised in a local newspaper as follows:

- *Steelburger* on 24 June 2021 (***Appendix F***).

An advert for the commencement of the public review of the draft consultation EIR will also be advertised in the *Steelburger.*

The primary aim of this advertisement is to ensure that the widest group of I&APs possible was informed and invited to provide input and questions and comments on the project.

7.7 Meetings

A public meeting and Focus Group Meeting will be conducted between the 23 - 24 November 2021 at the Tubatse Chrome Club, Steelpoort. Minutes of these meetings will be provided in ***Appendix F*** and in the Issues Trail.

7.8 Issues Trail

An issues trail (***Appendix F***) has been compiled during the scoping phase of the project; the key issues raised thus far include:

7.8.1 Key Issues Raised

- The proposed development site falls within the Critical Biodiversity Area (CBA) 2 in terms of the Conservation Plan of 2013. Therefore, it must be noted that industrial infrastructure activity is an incompatible activity within CBA 2.
- There must be an intensive environmental impact study including ground and river water.
- There must be a very careful heritage impact study done before anything else.
- The project is acknowledged since it will create some work opportunities around the municipality.
- The Developer must ensure that they comply with environmental legislation especially during operational phase. The Municipality has one licensed landfill site situated at Apel, the site is general waste facility, no hazardous waste allowed, therefore all the waste generated during construction and operational phase must be disposed at Malogeng Landfill site in Apel.
- Based on the information provided in the report, all sites are within the Ecological Support Area (ESA 1) Category and development within those areas is acceptable as it supports and sustains ecological functioning of the Critical Biodiversity Areas (CBA). Therefore, approximately 25% of this area has already been transformed due to mining activities, cultivation and associated urbanisation, notably around the Steelpoort area.

All issues raised during the EIA study will also be included in the Issues Trail as part of the Public Participation Summary Report (***Appendix F***).

7.9 Review of the Draft Consultation EIR

The draft consultation EIR will be made available for authority and public review for a total of 30 days from 05 November – 06 December 2021.

The report will be made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Burgersfort Public Library and Municipal Offices;
- The TFC Smelter offices; and
- Electronically on the Royal HaskoningDHV Website: https://www.royalhaskoningdhv.com/en/south-africa/projects/environmental-reports.

7.10 Final EIR

The final stage in the EIA study entails the capturing of responses and comments from I&APs in order to refine the EIR and ensure that all issues of significance are addressed. An electronic copy of the final EIR will be sent to all registered I&APs.

8 SPECIALIST FINDINGS

The specialist assessment indicated in Table 8-1 have been undertaken as part of this EIA study.

Table 8-1: Specialist input into the EIR

Specialist Assessment	Reference
Agriculture	***Appendix E1***
Hydrology	***Appendix E2***
Freshwater	***Appendix E3***
Biodiversity	***Appendix E4***
Avifauna	***Appendix E5***
Heritage and Palaeontology	***Appendix E6***
Climate Change	***Appendix E7***

8.1 Agriculture

A map of the proposed development area overlaid on the national Web-based EST sensitivity is provided in Figure 8-1. Because there is no cultivation, agricultural sensitivity is purely a function of land capability. The land capability of the investigated site varies from 6 to 10. A map of the land capability of the site is provided in Figure 8-2. Land capability values of 6 to 8 give medium agricultural sensitivity and values of 9 to 10 give high agricultural sensitivity. The small-scale differences in land capability (pixels) across the project area are not very significant and are more a function of how the land capability data is generated by modelling, than actual meaningful differences in agricultural potential on the ground.

The land capability rating for the site is highly likely to be accurate. The terrain and climate are suitable for cultivation and the indications of soil potential from the land type data are that dominant soil types are deep, well-drained Hutton soils that are suitable for cultivation, although shallower soils do also occur.

However, there are other factors, apart from the natural agricultural resources, that limit the agricultural potential of the land on this site. Agriculture is not possible on the sites while Samancor Chrome and related industries are operating there. One of the restrictions to agricultural activities is that Samancor Chrome utilises boreholes on the sites for their water supplies and therefore have strict controls over land use. The current owners of the land (Samancor Chrome) have little interest in using the land for agriculture and the land around the sites is broken up by mining and smelting-related industry which makes it impractical to use as farmland.

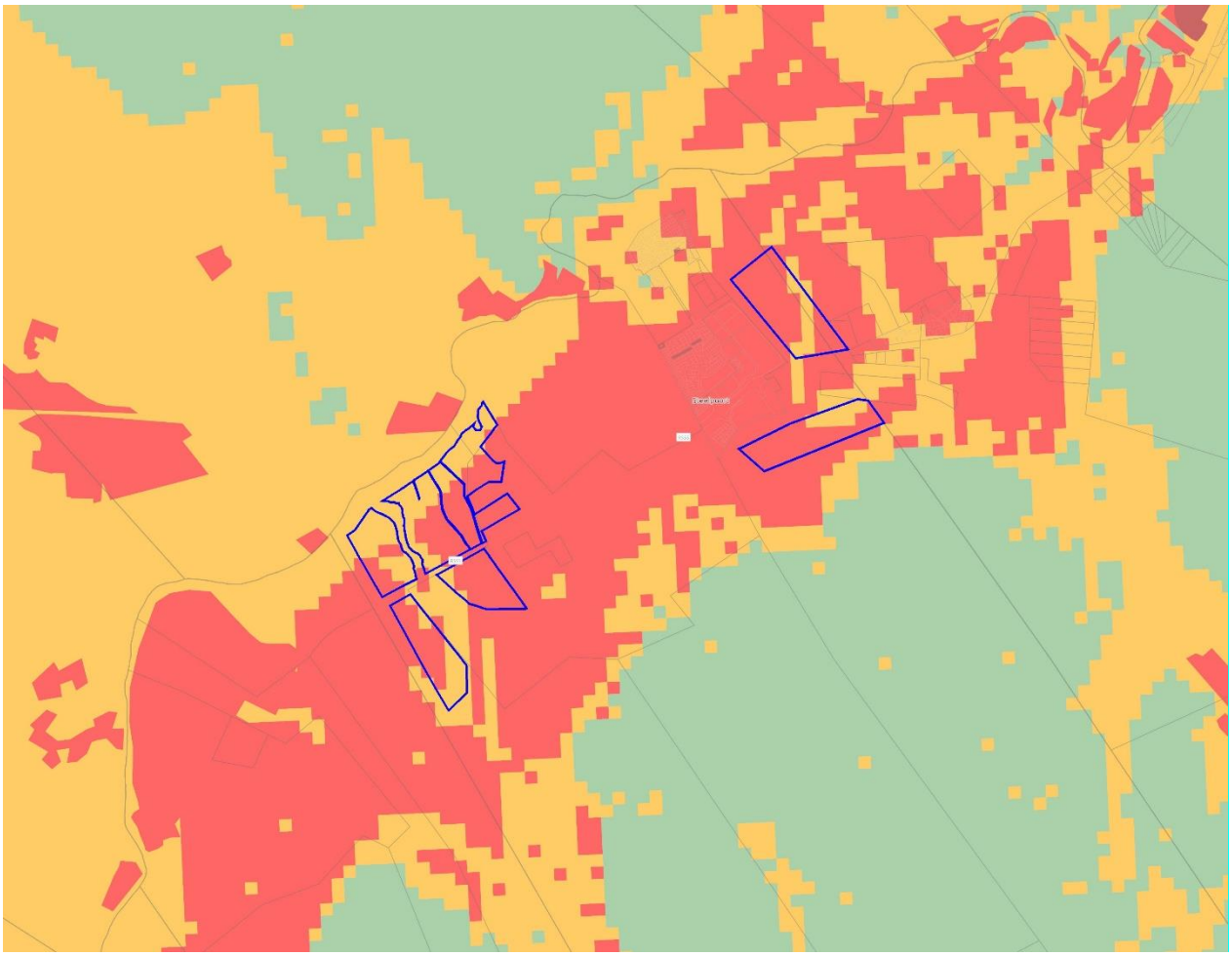


Figure 8-1: The proposed development site (blue outlines) overlaid on agricultural sensitivity, as given by the EST (green = low; yellow = medium; red = high; dark red = very high)

The purpose of the NEMA Agricultural Protocol and the sensitivity rating of agricultural land by the national Web-based EST is to conserve functional agricultural land, particularly arable land for agricultural use, within the context of a shortage of arable land that is suitable for crop production in South Africa. However, if land cannot be used for agriculture and particularly the production of cultivated crops, then it does not make sense to conserve it for agricultural use, by preventing other land uses.

It is important to note that the need to conserve arable land is not only relevant to the present, but also to the future. The natural agricultural resources of this land must be conserved for a potential future time when the mining and smelting related industries no longer occupy the site and agricultural use may again become possible. The proposed development is associated with those industries and so if they cease to occupy the site, the proposed development will also cease to occupy the site. Its impact does not therefore prevent future agricultural use.

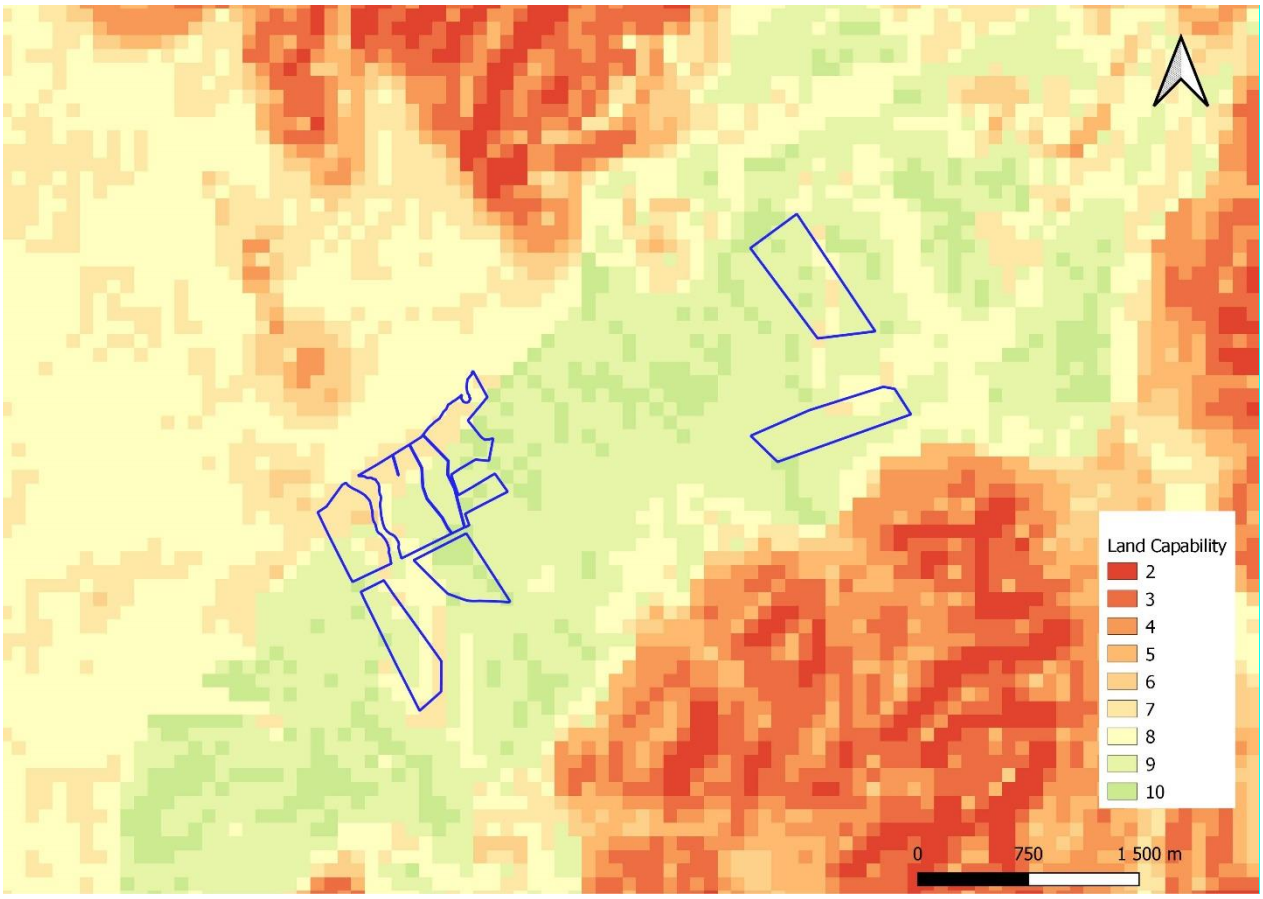


Figure 8-2: The land capability of the proposed development site (blue outlines)

8.2 Hydrology

8.2.1 Catchment Delineation

The site is in the valley, adjacent to the escarpment and therefore receives runoff from the hills. There are many drainage lines running through the valley. Two drainage catchments influencing the sites that drain to the Steelpoort River were identified.

Table 8-2: Catchment characteristics

Sites	Characteristics
Site 1	There are no drainage lines through Site 1. The site is just 800m from the Steelpoort River and is bordered by the R555 to the south and an unnamed arterial road to the west. It is approximately 900m long and 375m wide and 32ha in area. From site observations of scouring, it appears that runoff from the road flows alongside the road (no formal channel) to the river and therefore do not affect the site. There is a low point on the site at its south-west corner, where the two roads intersect, that has manholes and there is evidence of some flow here (gauged from flattened vegetation). However, no defined flow path could be identified from visual inspection or topographical modelling and it was therefore assumed that the flow volumes are not large and are dissipated into the area as overland flow. The area is densely vegetated with grasses and shrubs, on sandy soil. The is no existing infrastructure on the site.

Sites	Characteristics
	As there are not any drainage lines through Site 1, there will not be any floodlines to be considered in the planning and layout of the proposed PV plant. For the purposes of floodline determination, no sub-catchments were delineated for this site, although for the conceptual stormwater management plan an assessment of surface runoff over the area will be required.
Site 2	There are no drainage lines through Site 2. The site is located behind the smelter and railway line, at the foot of the hills. It is a long rectangular site, approximately 1 300m long (east to west) by 250m wide, with an area of 24ha. The vegetation is dense and diverse, with grasses, shrubs and large trees. The soil is sandy and loose and will have a high drainage potential. There are two boreholes located on the site, and access roads leading to them. The site is otherwise undeveloped. The topography was observed to be gently sloping with no localized surface depressions or outcrops. To the west of the site there is a significant watercourse that is channeled beneath the railway line through a square concrete culvert approximately 3m wide by 2.5m high, and 16m long. The invert level of the culvert is approximately 5m below the railway line, and the channel has steep slopes and falls steeply from the hills. This shape and slope would result in high velocity flows. No water was observed in the channel, indicating that it is a non-perennial river. It was deemed necessary to investigate the floodline associated with this channel to determine if it will influence the site. The hills do not have a plateau, so the runoff is from their slopes only. The total sub-catchment area is approximately 227ha with a slope of 20% on the hills and 5% on the plains and a flow length of 2 015m.
Sites 3, 4 & 5	These three sites are located to the west of the factory and are all irregular in shape with areas of 15.8ha (Site 3), 20ha (Site 4) and Site 5 being the largest site at 70.41 ha. There are no drainage lines through Site 3 and Site 4, but they lie adjacent to a significant drainage line that continues through Site 5. The R555 road lies between Site 3, 4 and Site 5. The vegetation is extremely dense and varied on these sites. They are undeveloped and have no existing infrastructure on them. These sites have hilly topography and slope towards the drainage line. The drainage line is approximately 5m deep with steep sides. It did not have water flowing in it at the time of the site visit, indicating that it is non-perennial. There is a rock feature protruding in it, which will have turbulent flow over its steep faces during rainfall events. The drainage lies passes below the R555 road through a bridge consisting of two concrete openings estimated to be 5m by 5 in width and height. This drainage line receives runoff from a contributing sub-catchment that originates in the large hill formation lying to the south. The total area of the sub-catchment is 2 260ha and is steep. This will result in high peak flows through the drainage channel. The floodline was determined from these observed catchment characteristics.
Site 5	In addition to the major line passing through the site, there are three minor drainage lines that discharge into the site from under the road and drain to the Steelpoort River. These sub-catchments have areas of 0.15, 0.29 and 2.17ha. It was not possible to delineate floodlines of these drainage lines as the Digital Elevation Model (DEM) did not reflect their cross-sections. However, peak flows have been estimated and based on site measurements of the channel's size their water surface levels on the site will be calculated.

All catchment characteristics are summarised in Table 8-3.

Table 8-3: Catchment attribute summary

Catchment Name	Area (ha)	Flow Length (km)	Slope (%)
S1_2	0.16	0.57	3.46
S1_2	2.17	2.94	6.08
S1_3	0.29	1.03	3.29
S2	482.97	4.35	11.30
S3	323.58	2.83	9.87
S4	517.27	5.26	6.13
S5	441.58	4.43	8.00
S6	135.64	1.93	2.09
S7	253.14	2.53	8.47
S8	106.11	1.73	20.30
S11	104.04	2.02	5.45
S12	122.91	2.02	12.10

8.2.2 Peak Flow Calculation

Peak flows were calculated for each sub-catchment for the 1:10, 1:20, 1:50 and 1:100 year design storm events. All peak flows calculated per delineated sub-catchment for each event are summarised in Table 8-4.

Table 8-4: Peak flows calculated for sub-catchments

Catchment Name	Peak Flows (m^3/s) Return Period (years)			
	10	20	50	100
S1_1	0.36	0.44	0.56	0.67
S1_2	0.07	0.09	0.12	0.14
S1_3	0.08	0.10	0.13	0.16
S2	31.99	45.77	66.21	83.30
S3	25.89	37.04	53.58	67.41
S4	26.72	38.23	55. 30	69.58
S5	26.80	38.34	55.46	69.78
S6	9.39	13.43	19.43	24.44
S7	20.84	29.82	43.14	54.27
S8	12.70	18.17	26.28	33.06
S11	8.94	12.79	18.50	23.27
S12	12.46	17.82	25.78	32.44

8.2.3 Floodline Delineation

The first drainage line that passes Site 2 does not encroach on the site for any event and therefore does not exclude any area available for development. Key characteristics for each flood event are in Table 8-5) and mapped in Figure 8-3. The maximum water surface elevation is 801.22 mamsl which is 2m below the edge Site 2. The maximum surface width is 58.61m from the drainage centreline which does not influence the site as the centreline is 130m west of the site.

Table 8-5: Floodline attributes for a typical transect on the drainage line past Site 2

Return Interval (years)	Water Surface Elevation (mamsl)	Depth (m)	Velocity (m/s)	Surface Width (m)	Total Volume (1 000 m^3)
10	800.97	0.47	1.63	48.52	1.17
20	801.05	0.54	1.82	51.46	1.52
50	801.15	0.64	2.00	55.36	1.95
100	801.22	0.71	2.12	58.61	2.29

Invert Elevation: 800.51mamsl

Figure 8-3: Tributary 2 floodline

The second major drainage line that passes between Sites 3 and 4 and through Site 5 experiences large volumes of flow (45 4300m^3 for the 1:100 year event). The floodlines encroach slightly on the south-east corner of Site 4 and do not affect Site 3. However, there is a significant impact on Site 5 as the flood will spread up to 88m minimum width, rendering a large area of the site unsuitable for development (Figure 8-4).

Table 8-6: Floodline attributes for a typical transect on the drainage line past Site 3 & 4 and through Site 5

Return Interval (years)	Water Surface Elevation (mamsl)	Depth (m)	Velocity (m/s)	Surface Width (m)	Total Volume (1 000 m^3)
10	761.50	0.74	1.88	69.93	23.96
20	761.62	0.86	2.03	77.79	30.51
50	761.79	1.03	2.16	85.87	39.26
100	761.89	1.13	2.30	88.73	45.43

Invert Elevation: 760.76mamsl

A limitation for this assessment is that there was not elevation data available for the smaller drainage lines through Site 5. The channel was simulated to be triangular with a width of 50 m and side slopes of 1:5 m/m. The design rainfall determined was applied to the channel. For the 1:100 year event, the surface width of flow was estimated to spread to 17m (Figure 8-4). This indicates that a drainage channel with suitable hydraulic infrastructure is required as part of the stormwater management plan to canalise this flow, such that the maximum possible area of the site can still be used. It is recommended that topographical survey of the three minor drainage lines on the site be carried out in order to accurately model the floodlines and flows associated with these channels.

8.2.3.1 Steelpoort River Analysis

The Steelpoort River falls within the Olifants Water Management Area. The Steelpoort River originates as the Grootspruit near Belfast in Mpumalanga from whence it flows in a northerly direction for approximately 180km to confluence with the Olifants River near Ohrigstad in Limpopo province. The top of the catchment is at an elevation of 2 327mamsl, falling to 581mamsl at the confluence with the Olifants River[41]. The total area of the catchment is 7 136km^2.[42] The MAP for the catchment varies from 600 to 1 000mm/yr. Land use is predominantly agricultural and pastoral with mining operators and small towns centres such as Steelpoort.

The proposed PV plant lies along the Steelpoort River, between its two major tributaries being the Dwars Rivier 15km upstream and the Spekboom 17km downstream. The total sub-catchment area of the Steelpoort River upstream on the site is approximately 4 407km^2, 61% of the total catchment area and is made up of nine (9) quaternary catchments. The De Hoop Dam lies approximately 39km south-west of the proposed site. This dam was recently constructed by the DWS and was opened for operation in 2014 which is a concrete arch dam. The dam has a surface area of 1 690ha, a height of 81m, a length of 1 000m, and the full supply capacity is 347Mm^3.

The methods of catchment runoff modelling employed for the other tributaries passing through the PV plant site are not suitable for determination of the peak flows in the Steelpoort River because it is such a long river with varying land uses, topography and climate. In addition, a rainfall event will have a spatial and temporal limitation and will occur within the catchment, not over the entire catchment. Conventional catchment runoff modelling assumes homogeneity across the catchment, a simplifying assumption that cannot be applied to this large and complex system. Therefore, floodline and corresponding peak flows for various recurrence intervals could not be determined by this method. Publicly available data was then investigated for the river. No data was available regarding floodlines of the river.

The elements affecting flow volumes in the river were then investigated. The volume of water flowing in the Steelpoort River adjacent to the site will be controlled by a combination of the De Hoop Dam releases and

[41] *Limpopo River Awareness Kit. (2010). Retrieved from River Awareness Kit: http://www.1impopo.riverawarenesskit.org/ Limpoporak_com/ en/ river/ sub_basin_summaries/steelpoort.htm*
[42] *DWS. (2018). Integrated Water Quality Management Plan for the Olifants River System: Steelpoort Sub-catchment Plan.*

inflow from the Dwars River. Based on this premise, it was postulated that the maximum flows that could occur adjacent to the site would be comprised of the maximum release possible from the De Hoop Dam spillway summed with the peak inflow from the Dwars River. In order to determine these values, stream flow data and dam spill data was obtained from the DWS and evaluated.

It was found that in February 2015, the De Hoop Dam was 101.4% full and released a total volume of 23.8mm^3 in the month (measuring station B4R007), corresponding to a flow of 29.4Mm^3 for the month downstream of the dam (measuring station B4H023). In the same month, the Dwars River experienced a monthly flow of 3.29Mm^3 (measuring station B4H009).

The following assumptions were made:

- The 29.4Mm^3 from the dam spilled over seven days at 4.2Mm^3 per day.
- The Dwars River experienced a flow of 3.29 Mm^3 at the peak of a 24-hour storm event.
- These two flows were superimposed to result in a total peak flow of 7.49Mm^3 in 24 hours.

This flow was then input as the steady state flow to the GeoHECRAS model for backwater analysis and this resulted in the floodlines show in Figure 8-4.

In order to estimate the recurrence interval associated with this flow, the rainfall event of February 2015 was investigated. The following information was retrieved from a newspaper article[43]:

- Lydenburg recorded 93.0mm of rainfall in 24 hours.
- Tzaneen recorded 124.0mm of rainfall in 24 hours.

Comparing this to the design rainfalls of Lydenburg and Tzaneen, this corresponds to a 20-year 24-hour recurrence interval event. It is further assumed that the maximum spill from the De Hoop Dam is limited by the spillway capacity and therefore is unlikely to exceed the volumes released during this event.

It follows that the De Hoop Dam provides effective flood mitigation and protects downstream from flood hydrographs by tempering the releases. It is therefore unlikely that the maximum flow in the river would exceed the predicted flow of 7.49Mm^3 as this flow is controlled by the dam spillway. It should also be noted that the dam was at full supply level when these releases were made (101.4% capacity).[44] Therefore, downstream flooding will only occur if the spillway releases coincide with the dam being full. It can therefore be concluded that the modelling of the floodlines based on dam spill data from the 2015 20-year recurrence interval represents the maximum extent of flooding that will be observed in the Steelpoort River adjacent to the proposed PV plant site.

[43] *Floodlist (2015). Retrieved from https: / /floodlist.com/africa/south-africa-floods- johannesburg-limpopo-province-december-2015*
[44] *DWS. (2015). Retrieved from https: / /www.gov.za/levels-de-hoop-dam-do-not-constitute-disaster*

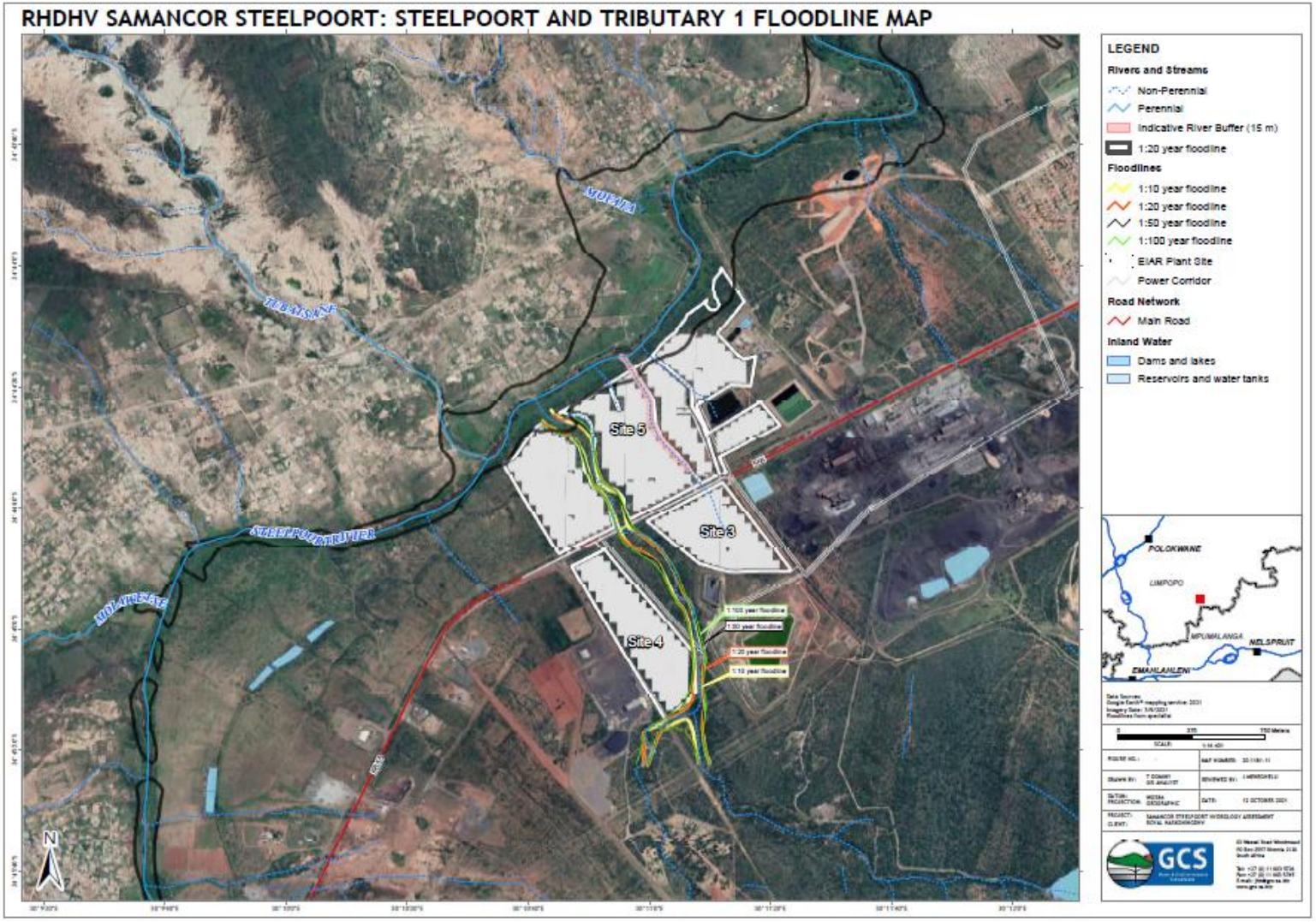


Figure 8-4: Tributary 1 and Steelpoort River floodline

8.2.4 Conceptual Stormwater Management Plan (SWMP)

In accordance with Best Practice Guideline - G1: Stormwater Management (2006) the SWMP for the site will seek to achieve certain objectives based on a philosophy of protecting the environment from impacts. This is of utmost importance as the proposed sites are undeveloped, and thus runoff hydrographs from them currently pose no threat to the receiving Steelpoort River. Therefore, impacts to the pristine environment should be minimised:

- Clean and dirty water should be separated, and it should be ensured that all stormwater structures are designed to keep dirty and clean water separate and can accommodate a defined precipitation event.
- The clean water catchment area should be maximised, and clean water should be routed to a natural watercourse with minimal damage to that watercourse in terms of quality, quantity and frequency of discharge.
- Dirty areas should be minimised, and runoff from these areas contained and treated for reuse. Natural watercourses and the environment should be protected from contamination by dirty areas by ensuring that the dirty water cannot enter the clean water system by spillage or seepage.

It should be noted that the PV plants are considered clean areas as they do not introduce any contaminants to the surface which may pollute surface runoff. Therefore, all areas are clean. In addition to these aims, this SWMP has the following criteria:

- Stormwater should be directed such that no water flows in an unruly fashion that may jeopardise the safety of personnel or infrastructure, or such that it is a nuisance.
- Protection of the soils by preventing erosion is also a key requirement of the SWMP.
- Minimise modification of the natural topography of the area and avoid any modification of the natural watercourse as far as possible.

In terms of SANRAL Drainage Manual (2013) the area is rural, with low traffic volumes providing access to individual farms and is therefore considered a Class 5 area so stormwater management infrastructure should be sized for the 1 in 10-year recurrence interval.

The floodline analysis identified two major drainage lines and three minor ones. The hydrology affecting each proposed site is summarized in Table 8-7.

Table 8-7: Stormwater management proposed for the 5 sites

Site	Stormwater Management
Site 1	▪ Site 1 will be free draining and does not require any stormwater infrastructure.
Site 2	▪ Site 2 will be free draining and will not require any stormwater infrastructure within its footprint. Site 2 will require a protection berm and drain system along its southern perimeter to divert flows from the upstream sub-catchments draining towards it. This drain will discharge to the environment via a release structure.
Site 3	▪ Site 3 will be free draining with a protection berm and drain system on its eastern perimeter to divert flows from the upstream sub-catchments around it.
Site 4	▪ Site 4 will be free draining and will not require any stormwater infrastructure.

Site	Stormwater Management
Site 5	▪ Main watercourse to be preserved in its natural condition. This means no removal of riparian vegetation. This is critical in preventing erosion from developing. ▪ The second minor drainage line will not require any infrastructure by panels should be placed away from it, as per design. ▪ The third drainage line shall be formalized into a trapezoidal channel 1m wide by 1m deep and lined with concrete (as a recommendation). It shall discharge via a release structure into the Steelpoort River. ▪ The fourth drainage line will be formalized into a grass-lined trapezoidal channel with a depth of 0.5m and a bottom width of 0.5m, with side slopes of 1:2 (as a recommendation). ▪ The existing culvert under the R555 linking the protection berm flows from Site 3 to the third channel on Site 5 is of sufficient capacity to handle the predicted flows and is not required to be upgraded.

8.3 Freshwater

8.3.1 Watercourse Classification and Assessment

Six (6) separate drainage systems were identified in the study area consisting of non-perennial rivers with riparian vegetation and ephemeral drainage lines without well-defined riparian vegetation. A classification of the watercourses is provided in Table 8-8 and a summary of the six (6) drainage systems identified in the study area relative to the proposed development infrastructure is provided in Table 8-9.

Table 8-8: Classification of the watercourses associated with the proposed development

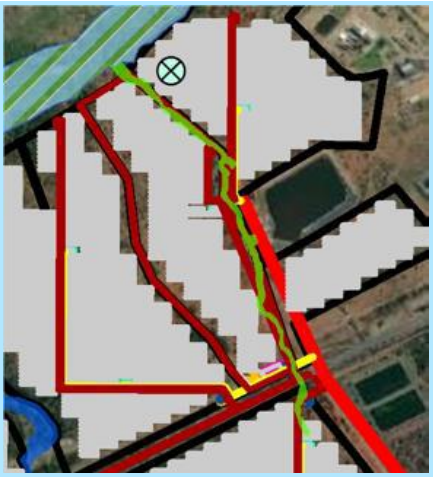
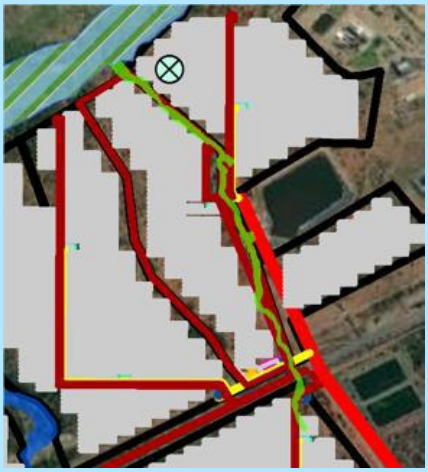
Watercourse	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Type
Steelpoort River	Valley Floor: the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	A linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Non-perennial rivers with riparian vegetation	Valley Floor: the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	
Ephemeral drainage lines without riparian vegetation	Slope: an inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	

System 1 is a non-perennial river located west of the preferred site 5 and confluences with the Steelpoort River. System 2 bisects Site 5 and originates from in between sites 3 and 4. This system also connects to the Steelpoort River. System 3 is a preferential flow path with no discernible riparian vegetation. System 4 is an ephemeral drainage line running from site 3 to site 5, west of the Water Treatment Plant. This system also confluences with the Steelpoort River. System 5 is a non-perennial river located east of the Tubatse Ferrochrome plant with majority of the surface infrastructure located outside of the 32m ZOR. Only the powerline corridors traverse this system.

System 6 is a small ephemeral drainage line draining to System 2 located south of preferred layout site 4. Although these episodic drainage lines cannot be classified as rivers resources in the traditional sense thereof due to the lack of saturated soils and riparian vegetation, they do still function as waterways, through episodic conveying of water. However, based on the definition of a watercourse, water flows regularly or intermittently within these drainage lines, conveying water from the upgradient catchment area into the downgradient Steelpoort River. As such, they can be defined as watercourses, and due to their importance for hydrological functioning as they do function as waterways and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

Table 8-9: Summary of the drainage systems identified in the study area, relative to the proposed infrastructure

Drainage System	Locality	Infrastructure Proximity and General Description
System 1	Located west of Site 5 	No proposed surface infrastructure components are located within close proximity to this drainage system. Non-perennial river with riparian vegetation. Confluences with the Steelpoort River.
System 2	Traverses Site 5, located in between Sites 3 and 4 	Majority of the surface infrastructure components are located outside of the 32m ZOR. New powerline corridors traverse the system. Non-perennial river with riparian vegetation. Confluences with the Steelpoort River.
System 3 (left)	Runs from Site 3 to Site 5, west of the Water Treatment Plant.	Majority of the surface infrastructure components are located outside of the 32m ZOR. New powerline corridors and underground cables traverse the system.

Drainage System	Locality	Infrastructure Proximity and General Description
		Preferential flow path with no discernible riparian vegetation. Drains to the Steelpoort River. This system is proposed to be canalised.
System 4 (right)	Runs from Site 3 to Site 5, west of the Water Treatment Plant. 	Majority of the surface infrastructure components are located outside of the 32m ZOR. New powerline corridors and underground cables traverse the system. Ephemeral drainage line without well-defined riparian vegetation. Drains to the Steelpoort River. This system is proposed to be canalised.
System 5	Located east of the TFC Smelter. 	No proposed surface infrastructure components are located within close proximity (outside of the 100m ZOR) to this drainage system. Only new powerline corridors traverse the system. Non-perennial river with riparian vegetation. Confluences with the Steelpoort River.
System 6	Located south of site 4, connects to system 2.	The majority of the surface infrastructure components are located outside of the 32m ZOR. Ephemeral drainage line without well-defined riparian vegetation. Drains to system 2.

Drainage System	Locality	Infrastructure Proximity and General Description
		

Due to the similar watercourse characteristics of the non-perennial rivers and that of the ephemeral drainage lines, and each of these watercourse types having been subjected to the same anthropogenic impacts, the ecoservice provision, hydrological regime, geomorphological characteristics, water quality and habitat of these watercourses, all of the non-perennial rivers and all of the ephemeral drainage lines were assessed in a combined fashion (Table 8-10 and Table 8-11).

8.3.2 Aquatic Ecological Assessment

Instream integrity of the Steelpoort River associated with the PV plant was assessed according to the appropriate instream aquatic indices.

Two points (Sites TS1 and TS2) were selected as representative points on the Steelpoort River during the April 2021 assessment (Table 8-12 and Table 8-13). A third point (Site TS3) was considered in terms of water quality and macro-invertebrate community integrity, but no fish assessment was conducted at site TS3 (Table 8-14). The results from site TS3 were used from a previous aquatic ecological assessment of the Steelpoort River conducted in December 2020 and yielded similar results to sites TS1 and TS2 as conducted in April 2021.

Table 8-10: Summary of results of the assessment of the non-perennial rivers associated with the study area

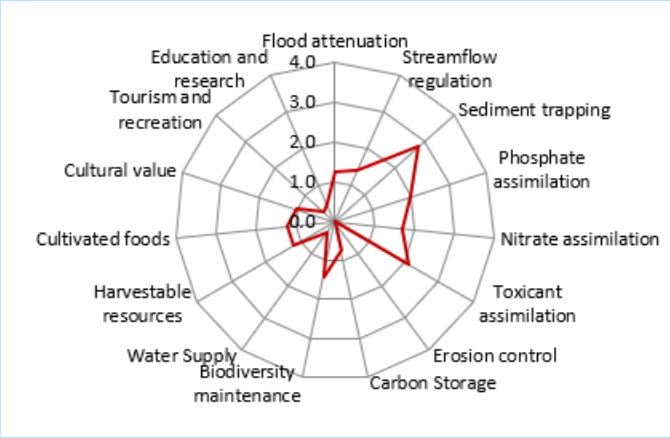


Figure 8-5: Ecological and socio-cultural service provision graph

Figure 8-6: Representative photographs of the non-perennial rivers with riparian vegetation

VEGRAI Discussion	Ecoservice provision
VEGRAI Category: System 1 and 2: Category B/C (Largely Natural to Moderately Modified) System 4: Category C: Moderately Modified Vegetation within/ alongside the natural channels were moderately modified. Although categorised as a riparian habitat type, the dominant vegetation does not exhibit the typical riparian characteristics but is rather a reflection of the surrounding variable shrubland types, notably the woody (trees and shrubs) component, which may be locally slightly denser compared to the surrounding terrestrial area.[45] Few riparian indicator species, namely *Gymnosporia buxifolia* and *Senegalia* species were found on site. Grass species that typically occupy these parts are most often pioneer and poor-quality species, including *Aristida* species.	Ecoservice Provisioning: 1.2 (Moderately Low) Due to the non-perennial nature of these systems, their capacity to provide certain ecological services is considered reduced, although this is counteracted by the relative ecological integrity which increases overall functionality. Due to their high degree of connectivity to other natural areas, these systems are ecologically important in terms of providing migratory corridors and habitat for a variety of biota. These systems are not considered important for harvestable resources or cultivated foods, mainly due to it being located in a natural water scarce region and not located within an area utilised for recreational purposes.

[45] *Bathusi Environmental Consulting (BEC). (2021). Terrestrial Biodiversity EIA Assessment for the proposed 100MW Photovoltaic plant at the Tubatse Ferrochrome Plant, situated near Steelpoort in the Limpopo Province. Draft Report. 28th of September.*

Ecological Importance and Sensitivity (EIS) discussion	Recommended Ecological Class (REC) Category and Recommended Management Objective (RMO)
EIS Category: Moderate The EIS of the watercourses falls within Category C, which are watercourses that are considered ecologically important and sensitive on a provincial or local scale. The watercourse is considered moderately sensitive due to the nature of the watercourse being moderately sensitive to changes in floods and low flows. The watercourse has experienced significant disturbances, although it is still representative of a riparian habitat.	REC: Category C BAS: Category C RMO: B/C (Maintain / Improve) Since these systems are considered of moderate Ecological Importance and Sensitivity, the RMO is to, at minimum, maintain these systems in its present state, as any potential impacts my also impact cumulatively on the downstream Steelpoort River. Whilst some modifications to the overall drainage systems have occurred as a result of road crossings, further degradation of these drainage lines should not be permitted. It is recommended that small scale rehabilitation of areas which may potentially be impacted by the proposed development (such as road or powerline crossings) be undertaken. Additionally, it must be ensured no edge effects (such as sediment laden stormwater runoff) from surface infrastructure proposed as part of the proposed development that may be located within close proximity to the non-perennial rivers, enters these systems.
Extent of modification anticipated	Minimal Some modification is anticipated to the extent of the systems. This is attributed to the construction of new roads, upgrading of the existing road crossings and the installation of underground cables along these road crossings and new powerline corridors, changes to flow pattern and timing will need to be monitored to ensure that the hydrological connectivity are not adversely affected. Should construction take place only within the dry period and the recommended mitigation measures be applied, the impact significance can be reduced to a low negative impact.

Table 8-11: Summary of results of the assessment of the ephemeral drainage lines associated with the study area

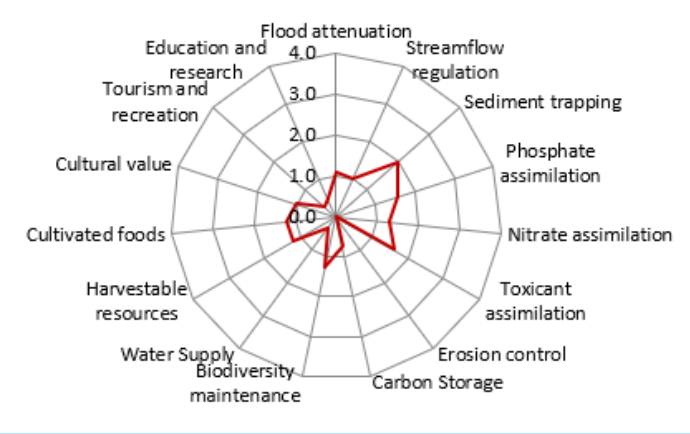


Figure 8-7: Ecological and socio-cultural service provision graph

Figure 8-8: Representative photographs of the ephemeral drainage lines without well-defined riparian vegetation

Riparian Vegetation Response Assessment Index (VEGRAI) Discussion	Ecoservice provision
VEGRAI Category: System 3 and 5: Category D (Largely Modified) Vegetation within/ alongside these channels were considered to be largely modified. All species found bordering the watercourse were terrestrial species. The relative lack of riparian indicator species is most likely due to the episodic nature of the watercourse and thus the generally dry state of the channel.	Ecoservice Provisioning: 1.0 (Moderately Low) Due to the ephemeral nature of these systems, their capacity to provide certain ecological services is considered reduced. Due to their high degree of connectivity to other natural areas, these systems are ecologically important in terms of providing migratory corridors and habitat for a variety of biota. These systems are not considered important for harvestable resources or cultivated foods, mainly due to it being located in a natural water scarce region and within an area utilised for recreational purposes.
Ecological Importance and Sensitivity (EIS) discussion	**Recommended Ecological Class (REC) Category and Recommended Management Objective (RMO)**
EIS Category: Moderate The EIS of these drainage lines falls within Category C: Moderate. Systems that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	REC: Category D BAS: Category D RMO: C/D (Maintain / Improve) Since these ephemeral drainage lines (EDLs) are considered of moderate EIS, the RMO is to, at minimum, maintain these EDLs in its current ecological state, as any potential impacts my also impact cumulatively on the downstream Steelpoort River. Whilst some modifications to the overall drainage system have occurred as a result of road crossings, further degradation of these drainage lines should not be permitted. It is recommended that small scale rehabilitation of areas which may potentially be impacted by the proposed development (such as road crossings and powerlines) be undertaken. Additionally, it must be ensured no edge effects (such as sediment laden stormwater

	runoff) from surface infrastructure proposed as part of the proposed development that may be located within close proximity to the EDLs, enters these systems.
Extent of modification anticipated	Minimal Some modification is anticipated to the extent of the systems This is attributed to the construction of new roads and the installation of underground cables along these road crossings and new powerline corridors, changes to flow pattern and timing will need to be monitored to ensure that the hydrological connectivity are not adversely affected. Should construction take place only within the dry period and the recommended mitigation measures be applied, the impact significance can be reduced to a low negative impact.

Table 8-12: Results of the assessment at site TS1 (located on the Steelpoort River, upstream of the proposed PV plant)

Site TS1						
	***In situ* physico-chemical water quality**				**Aquatic macro-invertebrate community integrity**	
	pH	8.51	Resource Water Quality Objective (RWQO) EWR9 Steelpoort River[46]		Invertebrate community assessment (South African Scoring System (SASS5) and Integrated Habitat Assessment System (IHAS))	
	EC (mS/m)	35.5			SASS5 score	95
	DO (mg/L)	9.61	pH	5.0 – 10.0	Average Score Per Taxon (ASPT) score	7.3
	DO (% sat)	123.0	EC (mS/m)	≤ 85	IHAS score	65 (Adequate)
	Temp (°C)	23.8	DO (mg/L)	≥ 5.0	Macro-Invertebrate Response Assessment Index (MIRAI) score	81.0 (Category B/C)
	Water Quality Comments				**Macro-Invertebrate Community Integrity Comments**	

[46] *Department of Water and Sanitation (DWS). (2018). National Water Act (Act no. 36 of 1998). Reserve Determination of Water Resources for the Olifants and Letaba catchments. Government Gazette No. 41887. September 2018.*

<table>
<tr><th colspan="5">Site TS1</th></tr>
<tr><td colspan="2"> 
Figure 8-9: View of site TS1 at the time of the assessment</td><td colspan="2">▪ The pH value measured during the assessment was largely natural and complied with the RWQO[47];
▪ The EC complied with the guideline limits required by the RWQO[48];
▪ The DO saturation was considered adequate and complied with the recommended the 5.0mg/L requirement stated by the RWQO[49];
▪ Temperature was considered largely natural considering diurnal variation and the time of day of the assessment; and
▪ Overall, the water quality of this section of the Steelpoort River was considered good.</td><td>▪ The aquatic macro-invertebrate community integrity was classified as a Category C (Moderately Modified) condition according to the MIRAI EcoStatus tool.
▪ Highly sensitive taxa observed on site was Heptageniidae and moderately sensitive taxa was Leptophlebiidae, Tricorythidae and Ecnomidae. The taxa observed on site had a diverse preference for stones, vegetation and GSM with airbreathers limited to Belostomatidae.
▪ The habitat suitability was considered adequate at the time of the assessment, however, significant sand mining of this section of the Steelpoort River has resulted in bank incision, erosion, increased sedimentation and some loss of instream habitat.</td></tr>
<tr><td>Algal proliferation</td><td>Slight proliferation on rocks.</td><td colspan="2">Index of Habitat Integrity (IHI)</td><td colspan="2">Fish Community Assessment</td></tr>
<tr><td rowspan="2">Depth profiles</td><td rowspan="2">Limited depth variation at the site under the current flow conditions. The site is dominated by shallow riffles and deeper pools.</td><td>Instream IHI – 76.8 (Category C)</td><td>Riparian IHI – 75.0 (Category C)</td><td>Fish Response Assessment Index (FRAI) Score</td><td>63.9 (Category C. Moderately Modified)</td></tr>
<tr><td colspan="2">Erosion evident at several points along the embankment. Alien vegetation encroachment is evident in the whole study area. Significant</td><td colspan="2">Species: Chiloglanis pretoriae, Enteromius neefi, Enteromius trimaculatus, Labeobarbus marequensis</td></tr>
</table>

[47] *Ibid.*
[48] *Ibid.*
[49] *Ibid.*

Site TS1			
		sedimentation and some algal proliferation observed on instream rocks.	
Flow condition	Moderately slow flow	**Riparian Vegetation Response Assessment Index**	
Riparian zone characteristics	The riparian zone is considered relatively narrow due to the incised nature of the system. The site is dominated by trees, grasses and shrubs	VEGRAI score 72.9 (Category C)	Some alien vegetation encroachment present in the study area, along with significant areas of vegetation clearing due to rural community settlements. Alien vegetation species include *Datura sp*. (Caster-oil plant), *Solanum mauritianum* (Bugweed), *Phragmites australis* (Common reed), *Lantana camara* (Common lantana) and *Amaranthus sp.* (Pigweed).
Water clarity and odour	Water was clear. No odours present.	Key Drivers of System Change: ▪ Possible cumulative impacts on the water quality as a result of mining activities upstream of this point. ▪ Impacts on the hydraulic processes and geomorphological processes due to the effects of the De Hoop dam. ▪ Cumulative impacts from surrounding rural communities (subsistence farming, cattle watering, and washing of clothes). ▪ Significant areas of vegetation clearing and sand mining, leading to increased erosion and sedimentation. ▪ Due to upstream impoundments (De Hoop Dam) the natural flow of the Steelpoort River has been altered and results in significant variability in system flow rate (i.e. natural constraints). Bed-modification due to community sand mining has also resulted in significant instream habitat changes (deeper slow flowing pools, shallow runs) thus limiting the diversity and sensitivity of the aquatic community likely to occur. ▪ Bank erosion and instream sedimentation evident resulting from the sand mining activities as well as slight algal proliferation.	
Signs of pollution or impact	Significant sand mining occurring in this section of the Steelpoort River, resulting in erosion, sedimentation and loss of instream habitat.		
MIRAI	Category B/C (Largely Natural to Moderately Modified)		
Instream IHI	Category C (Moderately Modified)		
Riparian IHI	Category C (Moderately Modified)		
VEGRAI	Category C (Moderately Modified)		
FRAI	Category C (Moderately Modified)		
Integrated Ecological Category: 73.7% (Category C: Moderately Modified)			

Table 8-13: Results of the assessment at site TS2 (located on the Steelpoort river, downstream of sites 3, 4 and 5 of the proposed PV plant)

<table>
<tr><th colspan="7">Site TS2</th></tr>
<tr><td colspan="2"></td><td colspan="3">In situ physico-chemical water quality</td><td colspan="2">Aquatic macro-invertebrate community integrity</td></tr>
<tr><td colspan="2" rowspan="5"> 
Figure 8-10: View of site TS2 at the time of the assessment</td><td>pH</td><td>8.56</td><td rowspan="2">RWQO EWR9 Steelpoort River[50]</td><td colspan="2" rowspan="2">Invertebrate community assessment (SASS5 and IHAS)</td></tr>
<tr><td>EC (mS/m)</td><td>28.5</td></tr>
<tr><td>DO (mg/L)</td><td>6.1</td><td>pH</td><td>5.0 – 10.0</td><td>SASS5 score</td><td>90</td></tr>
<tr><td>DO (% sat)</td><td>71.2</td><td>EC (mS/m)</td><td>≤ 85</td><td>ASPT score</td><td>6.0</td></tr>
<tr><td>Temp (°C)</td><td>19.1</td><td>DO (mg/L)</td><td>≥ 5.0</td><td>IHAS score</td><td>79 (Excellent)</td></tr>
<tr><td colspan="3">Water Quality Comments</td><td colspan="3">Macro-Invertebrate Community Integrity Comments</td></tr>
<tr><td colspan="3">▪ The pH value measured during the assessment was largely natural and complied with the RWQO[51];
▪ The EC complied with the guideline limits required by the RWQO[52];
▪ The DO saturation was considered adequate and complied with the recommended the 5.0mg/L requirement stated by the RWQO[53];
▪ Temperature was considered largely natural considering diurnal variation and the time of day of the assessment; and
▪ Overall, the water quality of this section of the Steelpoort River was considered good.</td><td colspan="3">▪ The aquatic macro-invertebrate community integrity was classified as a Category C (Moderately Modified) condition according to the MIRAI EcoStatus tool.
▪ Highly sensitive taxa observed on site was Oligoneuridae and moderately sensitive taxa was Leptophlebiidae and Ecnomidae. The taxa observed on site had a diverse preference for stones, vegetation and GSM with airbreathers limited to Corixidae.
▪ The habitat suitability was considered excellent at the time of the assessment, with biotope diversity including stones in and out of current, marginal vegetation and Gravel/Sand/Mud (GSM).</td></tr>
<tr><td>Algal proliferation</td><td>Slight proliferation on rocks.</td><td colspan="2">Index of IHI</td><td colspan="2">Fish Community Assessment</td></tr>
<tr><td>Depth profiles</td><td>Some depth variation at the site under the current flow conditions. The site is</td><td>Instream IHI – 76.8 (Category B/C)</td><td>Riparian IHI – 75.0 (Category C)</td><td>FRAI Score</td><td>75.1 (Category C. Moderately Modified)</td></tr>
</table>

[50] *Department of Water and Sanitation (DWS). (2018). National Water Act (Act no. 36 of 1998). Reserve Determination of Water Resources for the Olifants and Letaba catchments. Government Gazette No. 41887. September 2018.*
[51] *Ibid.*
[52] *Ibid.*
[53] *Ibid.*

<table>
<tr><th colspan="4">Site TS2</th></tr>
<tr><td></td><td>dominated by shallow runs and riffles and deeper pools.</td><td>Alien vegetation encroachment is evident in the whole study area. Slight sedimentation and some algal proliferation observed on instream rocks.</td><td>Species: Chiloglanis pretoriae, Clarias gariepinus, Enteromius neefi, Enteromius trimaculatus, Enteromius paludinosus, Labeo cylindricus, Labeobarbus marequensis, Oreochromos mossambicus</td></tr>
<tr><td>Flow condition</td><td>Moderately slow flow</td><td colspan="2">Riparian Vegetation Response Assessment Index</td></tr>
<tr><td rowspan="2">Riparian zone characteristics</td><td rowspan="2">The riparian zone is moderately wide. The site is dominated by trees, shrubs and grasses.</td><td>VEGRAI score</td><td rowspan="2">Some alien vegetation encroachment present in the study area, along with significant areas of vegetation clearing due to rural community settlements. Alien vegetation species include Datura sp. (Caster-oil plant), Solanum mauritianum (Bugweed), Phragmites australis (Common reed), Lantana camara (Common lantana) and Amaranthus sp. (Pigweed).</td></tr>
<tr><td>72.9 (Category C)</td></tr>
<tr><td>Water clarity and odour</td><td>Water was clear. No odours present.</td><td colspan="2" rowspan="8">Key Drivers of System Change:
▪ Impacts on the hydraulic processes and geomorphological processes due to the effects of the De Hoop Dam.
▪ Possible cumulative impacts on the water quality as a result of mining activities upstream of this point.
▪ Cumulative impacts from surrounding rural communities (subsistence farming, cattle watering, and washing of clothes). Significant areas of vegetation clearing and sand mining, leading to increased erosion and sedimentation.</td></tr>
<tr><td>Signs of pollution or impact</td><td>None observed.</td></tr>
<tr><td>MIRAI</td><td>Category C (Moderately Modified)</td></tr>
<tr><td>Instream IHI</td><td>Category B/C (Largely Natural to Moderately Modified)</td></tr>
<tr><td>Riparian IHI</td><td>Category C (Moderately Modified)</td></tr>
<tr><td>VEGRAI</td><td>Category C (Moderately Modified)</td></tr>
<tr><td>FRAI</td><td>Category C (Moderately Modified)</td></tr>
<tr><td colspan="2">Integrated Ecological Category: 75.2% (Category C: Moderately Modified)</td></tr>
</table>

Table 8-14: Results of the assessment at site TS3 (located on the Steelpoort river, downstream of the proposed PV plant). assessed December 2020

<table>
<tr><th colspan="7">Site TS3</th></tr>
<tr><td colspan="3" rowspan="2"></td><td colspan="4">In situ physico-chemical water quality</td><td colspan="2">Aquatic macro-invertebrate community integrity</td></tr>
<tr><td rowspan="2">pH</td><td rowspan="2">7.55</td><td rowspan="3" colspan="2">RWQO EWR9 Steelpoort River[54]</td><td colspan="2" rowspan="2">Invertebrate community assessment (SASS5 and IHAS)</td></tr>
<tr><td rowspan="2">EC (mS/m)</td><td rowspan="2">37.2</td></tr>
<tr><td colspan="3" rowspan="4"> 
Figure 8-11: View of site TS3 at the time of the assessment</td><td>SASS5 score</td><td>120</td></tr>
<tr><td>DO (mg/L)</td><td>7.52</td><td>pH</td><td>5.0 – 10.0</td><td>ASPT score</td><td>6.0</td></tr>
<tr><td>DO (% sat)</td><td>100.4</td><td>EC (mS/m)</td><td>≤ 85</td><td>IHAS score</td><td>68 (Adequate)</td></tr>
<tr><td>Temp (°C)</td><td>25.8</td><td>DO (mg/L)</td><td>≥ 5.0</td><td>MIRAI score</td><td>80.2 (Category B/C)</td></tr>
<tr><td colspan="4">Water Quality Comments</td><td colspan="3">Macro-Invertebrate Community Integrity Comments</td></tr>
<tr><td colspan="4">▪ The pH value measured during the December 2020 assessment was largely natural and complied with the RWQO[55];
▪ The EC complied with the guideline limits required by the RWQO[56];
▪ The DO saturation was considered adequate and complied with the recommended 80 – 120% saturation range as stipulated by the guidelines[57],as well as the 5.0 mg/L requirement stated by the RWQO[58];
▪ Temperature was considered largely natural considering diurnal variation and the time of day of the assessment; and
▪ Overall, the water quality of this section of the Steelpoort River was considered good.</td><td colspan="3">▪ The aquatic macro-invertebrate community integrity was classified as a Category B/C (Largely Natural to Moderately Modified) condition according to the MIRAI EcoStatus tool.
▪ Highly sensitive taxa observed on site was Pyralidae and moderately sensitive taxa was Leptophlebiidae, Tricorythidae Chlorocyphidae and Elmidae. The taxa observed on site had a diverse preference for stones, vegetation and GSM with multiple airbreathers (five taxa) ranging from low to moderate sensitivity.
▪ The habitat suitability was considered as adequate at the time of the assessment, with biotope diversity including stones in and out of current, marginal vegetation and GSM.</td></tr>
<tr><td>Algal proliferation</td><td colspan="2">Slight proliferation on rocks.</td><td colspan="5">Key Drivers of System Change:</td></tr>
</table>

[54] *Department of Water and Sanitation (DWS). (2018). National Water Act (Act no. 36 of 1998). Reserve Determination of Water Resources for the Olifants and Letaba catchments. Government Gazette No. 41887. September 2018.*
[55] *Ibid.*
[56] *Ibid.*
[57] *Department of Water Affairs and Forestry (DWAF). (1996). South African water quality guidelines vol. 7, Aquatic ecosystems.*
[58] *Department of Water and Sanitation (DWS). (2018). National Water Act (Act no. 36 of 1998). Reserve Determination of Water Resources for the Olifants and Letaba catchments. Government Gazette No. 41887. September 2018.*

Site TS3		
Depth profiles	Some depth variation at the site under the current flow conditions. The site is dominated by shallow runs and riffles and deeper pools.	▪ Impacts on the hydraulic processes and geomorphological processes due to the effects of the De Hoop Dam. ▪ Possible cumulative impacts on the water quality as a result of mining activities upstream of this point. ▪ Cumulative impacts from surrounding rural communities (subsistence farming, cattle watering, and washing of clothes). Significant areas of vegetation clearing and sand mining, leading to increased erosion and sedimentation.
Flow condition	Moderately slow flow	
Riparian zone characteristics	The riparian zone is moderately wide. The site is dominated by trees, shrubs and grasses.	
Water clarity and odour	Water was clear. No odours present.	
Signs of pollution or impact	None observed.	
MIRAI	Category B/C (Largely Natural to Moderately Modified)	
Instream IHI	Not Assessed	
Riparian IHI	Not Assessed	
VEGRAI	Not Assessed	
FRAI	Not Assessed	
Not Assessed during the December 2020 assessment.		

8.3.3 Ecological Importance and Sensitivity Assessment

As with the derived aquatic ecological category, the EIS method[59] was applied to the section of the Steelpoort River to ascertain the sensitivity and importance of the system taking into account the instream component. The results of the assessment are presented in Table 8-12:

Table 8-15: Results of the EIS assessment for the Steelpoort River within the study area

Biotic Determinants	Score
Rare and endangered biota	4
Unique biota	1
Intolerant biota	4
Species/ taxon richness	3
Aquatic Habitat Determinants	
Diversity of aquatic habitat types or features	3
Refuge value of habitat type	3
Sensitivity of habitat to flow changes	2
Sensitivity of flow-related water quality changes	2
Migration route/ corridor for instream and riparian biota	3
Nature Reserves, Natural Heritage sites, Natural areas, PNEs	2
Ratings	2.7
EIS category	High

The Ecological Importance and Sensitivity Assessment analysis of the Steelpoort River provided a score of 2.7 which is considered of high importance and sensitivity. Quaternaries/ delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases may have substantial capacity for use. The Steelpoort River was considered of high sensitivity with regards to diversity of aquatic habitat types (rapids, riffles and riparian vegetation), biota intolerant to changes in flow (*Chiloglanis swierstrai, Enteromius lineomaculatus, Opsaridium peringueyi* and *Chiloglanis pretoriae*) and rare and endangered species (*Enteromius lineomaculatus* and *Opsaridium peringueyi).*

8.3.4 Watercourse Delineation and Sensitivity Mapping

The Steelpoort River has a well-developed riparian zone while the non-perennial tributaries have riparian zones which vary from moderately to weakly developed depending on the position in the landscape as well as the effects of geological characteristics and geomorphological processes at play. In terms of NEMA (Act No. 107 of 1998) any activities falling within 32m of the delineated boundary will trigger a listed activity. Any activities proposed within the watercourse and the associated 1:100 year flood line of the watercourse or 100m GN 509 ZOR (in the absence of the 1:100 year flood line), including rehabilitation, must be authorised by the Department of Water and Sanitation (DWS) in terms of Section 21 (c) & (i) of the NWA (Act No. 36 of 1998). Should this not be feasible, the proponent could undergo a WULA process to attempt to obtain approval from the DWS in terms of Section 21 (c) and (i) of the NWA.

The watercourse delineation for and associated ZOR are indicated in Figure 8-12 and Figure 8-13.

[59] *Department of Water Affairs and Forestry, (1999). Resource Directed Measures for Protection of Water Resources. Volume 3: River Ecosystems Version 1.0. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.*

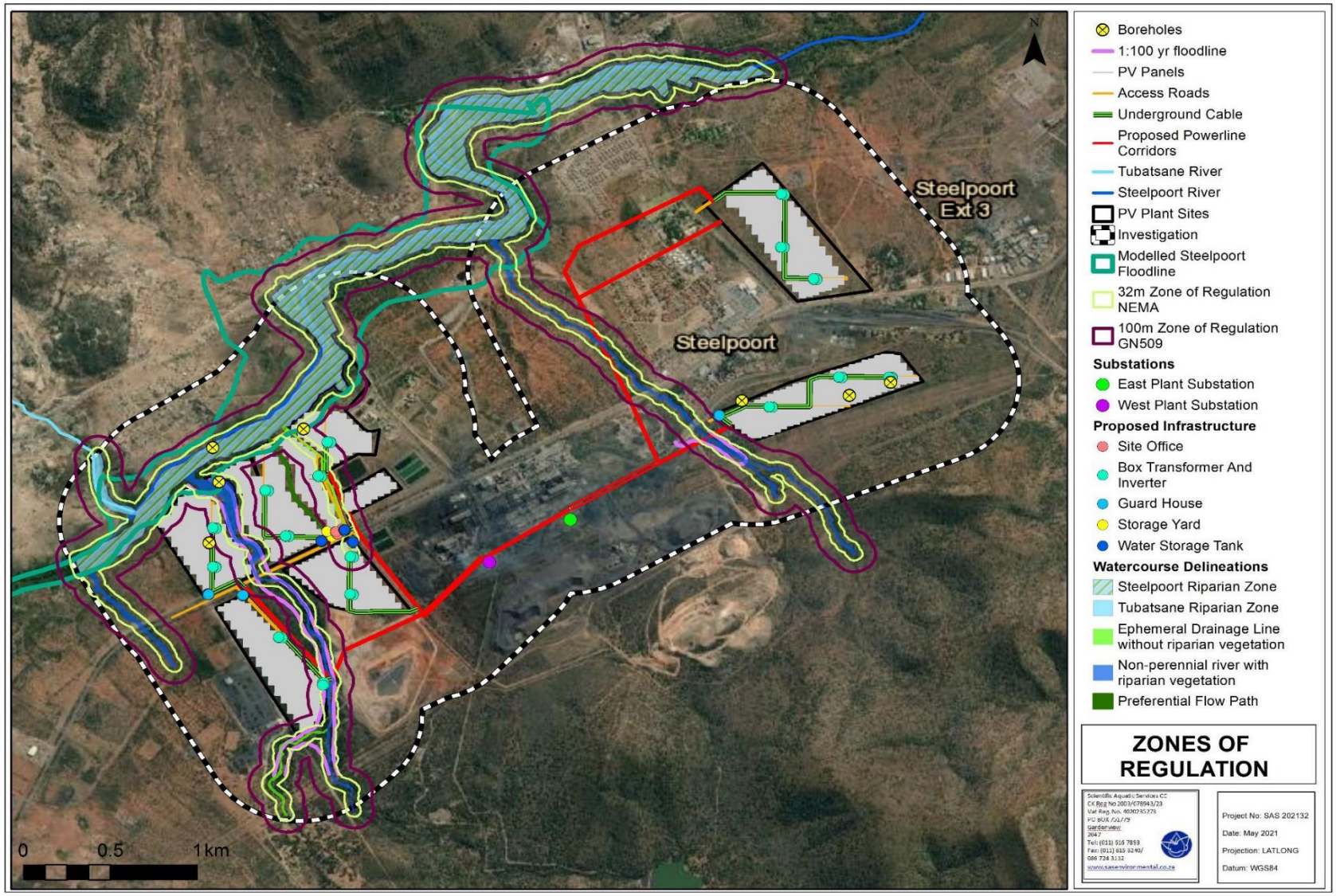


Figure 8-12: Watercourse delineation and associated ZOR[60]

[60] *Modelled Steelpoort floodline based on 2015 20 year 24-hr occurrence.*

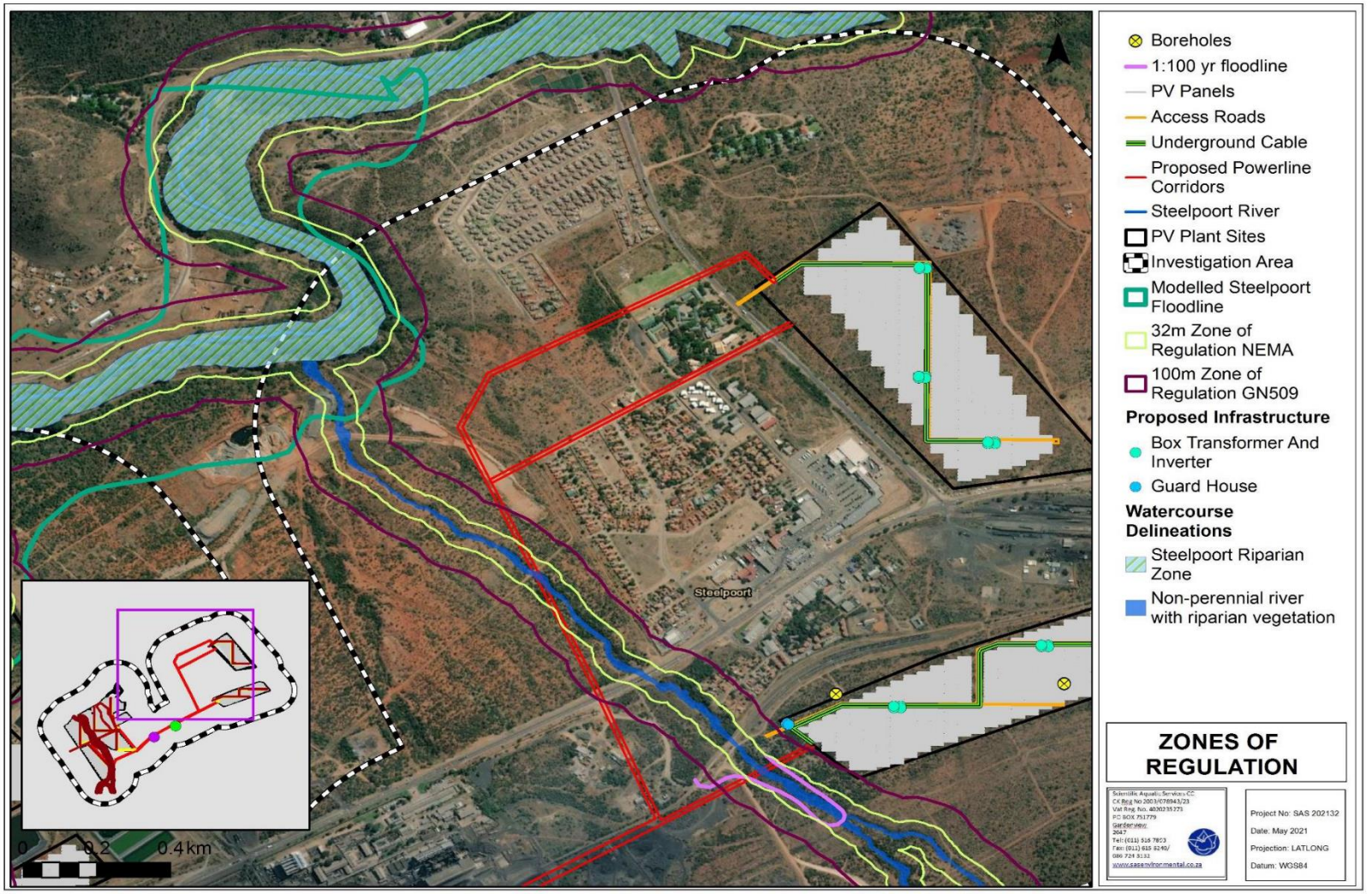


Figure 8-13: Watercourse delineation and associated ZOR zoomed in for detail[61]

[61] *Modelled Steelpoort floodline based on 2015 20 year 24-hr occurrence.*

8.4 Biodiversity

8.4.1 Broad Habitat Types of the Proposed Sites and Immediate Surrounding Area

The following broad-scale habitat types and categories were recognised from the study areas and the immediate surrounds (Figure 8-14) and are described in more detail below:

- Artificial Impoundments;
- Deteriorated Open Shrubland Types;
- Drainage Lines and Variable Shrubland Banks;
- Steelpoort River, Tall Closed Riparian Banks and Phragmites Levees;
- Tall Closed Riparian Bushland;
- Closed Mixed Thicket and Bushland;
- Transformed Areas, Infrastructure, Industries, etc.; and
- Variable Mixed Shrubland.

8.4.1.1 Artificial Impoundments

A number of artificial impoundments were constructed as part of the existing operations. As these areas comprise no natural vegetation, they were excluded from the surveys and were ascribed a low floristic sensitivity (Figure 8-15).

8.4.1.2 Deteriorated Open Shrubland Types

The range and nature of land-use activities of the wider area represent the major developmental force for this habitat type, causing immediate direct and medium-term, indirect impacts that affect the status of extensive portions of the regional shrubland types, adversely affecting both the floristic composition and structure. The dominant floristic attributes of these parts therefore no longer correlate to the regional ecological types i.e. the Sekhukhune Plains Bushveld. Activities such as bush clearance within powerline servitudes and recent and historic surface disturbances from industrial and residential land use activities resulted in an altered and dynamic/ transitional floristic status, ultimately rendering the floristic status of these parts compromised and poor.

The floristic sensitivity of these parts moderately low (Figure 8-15). It was also noted that the presence of conservation important species is considerably lower in these parts. While this habitat/ type is generally represented as isolated portions throughout the wider area, Site 1 is entirely comprised of this habitat type.

8.4.1.3 Drainage Lines and Variable Shrubland Banks

Apart from the dominant Steelpoort River that is situated immediately north of Site 5, the presence of several small and medium sized drainage lines are noted from the wider area. These features generally drains northwards into the Steelpoort River.

The drainage line situated between Sites 3 and 4 and across Site 5 is a significant feature; the width is in excess of 50m in places and the depth may exceed 5m. This drainage line is characterised by deeply incised banks and a wide, flat and clayey stream bottom from which the overlying sandy layers have been removed. While the banks of this feature, similarly, exhibit a reflection of the surrounding variable woodland types, the wide streambed is characterised by a secondary and transitional climax status that features a prominent and diverse herbaceous layer, but also a depleted collection of tree and shrub species that survives periodic flooding. It is thought that anthropogenic development of the wider area has resulted in severe alteration of the flow patterns within this area; ultimately ameliorating the severe nature of flood events and therefore facilitating the formation of a transitional climax vegetation layer. Evidence of erosion is noticeable from the banks of this feature.

Figure 8-14: Broad-scale habitat types of the study areas and immediate surrounds

Figure 8-15: Floristic sensitivity of the study areas and immediate surrounds

These drainage features strongly reflect the status of the surrounding variable shrubland, appearing locally deteriorated, notably the larger drainage line between Sites 3 and 4. Although likely to be ecologically more significant, particularly the larger drainage line, the floristic sensitivity is not considered to be high and was ascribed a moderately high sensitivity, at best (Figure 8-15). No specific floristic feature of importance or sensitivity is associated with these features and protected, and conservation important species only occur sporadically within these features at lower abundance values compared to the surrounding variable shrubland.

8.4.1.4 Steelpoort River, Tall Closed Riparian Banks and *Phragmites* Levees

The perennial Steelpoort River and associated tall and dense wooded banks as well as the seasonally inundated *Phragmites* levees comprise a distinctive topographical and ecological feature of the immediate area. While the macro elements of this unit, such as the large trees and (southern) riverbanks, are considered comparatively natural, the undergrowth, levee areas, and smaller topographical features exhibit significant evidence of deterioration from high utilisation and resource plundering (informal sand mining practices); numerous and prominent weeds and invasive species, poor water quality, high grazing pressure and poor fire management resulted in a moderately deteriorated status of this unit.

The Steelpoort River ecosystem represents a system that has a restricted presence on a wider scale and could therefore be considered ecologically sensitive. However, no floristic aspects of particular importance, and or species of conservation importance was recorded from this unit, a moderate-high floristic sensitivity is thus ascribed (Figure 8-15).

8.4.1.5 Tall Closed Riparian Bushland

Terrestrial habitat that is situated in proximity to the Steelpoort River is characterised by a prominent and dense layer of tall '*Acacia'* vegetation, prominent species include *Dichrostachys cinerea, Vachellia nilotica* and *V. tortilis*, but also comprising other woody species such as *Ehretia rigida, Euclea natalensis, Grewia bicolor, G. flava, G. vernicosa, Gymnosporia buxifolia,* as well as a well-developed herbaceous stratum that include a high occurrence of species that are strongly correlated to the xeric terrestrial habitat types (variable woodland), such as *Aloe* species and the grasses *Aristida diffusa, A. rhiniochloa, Digitaria eriantha, Eragrostis capensis, Perotis patens* and *Stipagrostis hirtigluma.*

The dense nature of the vegetation results in poor access for grazing animals, providing some protection against severe grazing pressure, although the ground layer appears depleted and open in parts of this unit, mostly attributed to periodic flooding and localised surface erosion. The sporadic presence of the protected tree *Balanites maughamii* is noted in this unit, and also because of the association with the nearby riparian habitat and a comparatively natural status, albeit not pristine, a moderate-high floristic sensitivity is ascribed to these parts of the site (Figure 8-15).

8.4.1.6 Closed Mixed Thicket and Bushland

Isolated parts of the sites comprise particularly dense (closed) thickets and bushland where the cover of shrubs and trees often exceed 60 %. The reason for the excessive densification of the woody layer is unclear and is possibly attributed to variation in management or exclusion of fire for a prolonged period. Despite some structural differences between this and the nearby Variable Mixed Shrubland, the species composition is comparatively similar, providing some evidence that these types were historically similar types, generally correlating to the regional Sekhukhune Plants Bushveld type.

A relative high abundance of protected and conservation important species were recorded in this unit, including the vulnerable *Adenia fruticosa,* and the protected trees *Balanites maughamii, Boscia albitrunca* and *Sclerocarya birrea*. As a result, and despite a moderate level of deterioration, a moderate-high floristic sensitivity is ascribed to these parts (Figure 8-15).

8.4.1.7 Transformed Areas, Infrastructure, and Industries

Parts of the region where natural habitat has been entirely replaced by infrastructure, mining and related industrial areas, residential areas, etc. No, or minimal natural, vegetation remain in these parts. No surveys have been conducted in these parts and a low floristic sensitivity is ascribed to these parts (Figure 8-15).

8.4.1.8 Variable Mixed Shrubland

This type represents the dominant habitat type within the wider area, manifesting as a variable shrubland with woody cover ranging between 20 % and 65 % and the average height of shrubs and trees between 3 m and 10 m. It conforms to an open to closed microphyllous and broad-leafed savanna type and is situated on the plains where shallow and sandy soils generally prevail where surface rock occur sporadically.

The floristic status of this habitat varies considerably. Portions within Site 5 is considered moderately deteriorated, while portions from Sites 3 and 4 exhibit more natural conditions. Site 2, due to certain edaphic factors and proximity to the mountainous areas to the south (and therefore different edaphic attributes), provide for a slightly different composition and structure, although it is included under this variable shrubland type, and despite the localised infestation by *Agave sisalana* and *Opuntia* species and isolated surface disturbances, include species such as the notable tree *Kirkia wilmsii*. The notable presence of protected trees *Sclerocarya birrea, Balanites maughamii, Boscia albitrunca,* as well other (provincially) protected species such as *Eulophia petersii, Stapelia* species and the vulnerable (IUCN) *Adenia fruticosa* ultimately renders the floristic sensitivity of these areas moderate-high, despite localised deterioration factors (Figure 8-15).

8.4.2 Annotations on Floristic Attributes of the Development Footprint Sites

Annotations on the floristic attributes of the development footprints are provided in Table 8-16.

Table 8-16: Annotations on the floristic attributes of the development footprints

Site	Description
Site 1	Apart from localised areas that are entirely transformed from recent surface disturbances, this site and immediate surrounds comprise entirely of deteriorated shrubland that bears evidence of long-term deterioration, removal/ harvesting of trees, and severe and intensive grazing, also bearing no correlation to the regional ecological type. Notably, the woody layer is dominated by microphyllous encroacher shrub species *Dichrostachys cinerea* and *Vachellia exuvialis* and is additionally locally infested by the succulent *Agave sisalana.* Sporadic occurrences of *Aloe* species are noted, and only occasional and isolated protected trees occur within the site. The floristic species richness of the site is comparatively low, with only 45 species recorded during the survey. Site 1 is also situated immediately east of the commercial and residential areas of Steelpoort and is affected by peripheral and indirect impacts. The floristic nature of the site is homogenous with no topographic or ecological distinguishing features. Apart from a low number of protected tree species, no floristic aspect of sensitivity or importance was recorded during the survey and the floristic sensitivity of the site is ultimately considered moderate-low.  *Figure 8-16: Collage of images of habitat conditions within Site 1*

Site	Description
Site 2	Site 2 comprise entirely of the Variable Mixed Shrubland habitat type, but do exhibit minor attributes that sets it slightly apart from other portions of this habitat type. Specifically, the presence of the tree *Kirkia wilmsii*, provides some evidence of the ecotonal location. This site is situated proximally to the Sekhukhune Mountain Bushveld and contain some elements of this topographically heterogenous ecological type, notably *Senegalia nigrescens, S. senegal var. leiorhachis, Kirkia wilmsii (d), Terminalia prunioides, Bolusanthus speciosus, Boscia albitrunca, Dichrostachys cinerea* and *Grewia vernicosa*, some of which is also abundantly represented in other portions of the Variable Mixed Shrubland. Surrounding land use activities have had a detrimental effect on the status of this site, and the presence of several invasive exotic species was recorded. This, in association with a poor grass component and the extensive presence of a weedy disposition of much of the herbaceous layer, ultimately detract from the floristic status, although some parts are considered comparatively natural and representative of the regional type. The presence of several protected and conservation important plants, such as the vulnerable *Adenia fruticosa* and the protected trees *Balanites maughamii, Boscia albitrunca* and *Sclerocarya birrea* and a high connectivity to pristine savanna types to the south of the site, renders the floristic sensitivity moderately high.  *Figure 8-17: Collage of images of habitat conditions within Site 2*
Site 3	Site 3 comprise of the Variable Mixed Shrubland and a small drainage line in the eastern perimeter of the site. The nature of the woodland is comparatively natural and representative of the regional ecological type with minor deterioration aspects noted, which is assumed to be a result of the protection against high utilisation pressure afforded by fencing as part of the Samancor properties. Comparatively high densities of protected and conservation important plants were recorded from this site, including the vulnerable *Adenia fruticosa,* the provincially protected *Eulophia petersii, Aloe burgersfortensis, Stapelia* species and the protected trees *Balanites maughamii, Boscia albitrunca* and *Sclerocarya birrea.* The small drainage line on the eastern perimeter conforms to the xeric surrounding shrubland, but with a shallow streambed where the overlying sandy soils were removed to expose the underlying rocky substrate. The vegetation does not correlate to a mesic environment and the herbaceous layer is somewhat depleted, while the woody stratum correlates to the surrounding shrubveld. A major drainage line is situated on the western perimeter of the site but is not spatially included in the site.  *Figure 8-18: Collage of images of habitat conditions within Site 3*

Site	Description
Site 4	Similar to Site 3, Site 4 correlates largely to the regional Sekhukhune Plains Bushveld, but historic management practices, specifically the exclusion of fire for a prolonged period, resulted in significant densification of the shrub layer, which allowed the development of the Closed Mixed Thicket and Bushland habitat in the southern extent of the site. The northern part of the site conforms to the Variable Mixed Shrubland, but with varying levels of deterioration. A major drainage line is situated on the eastern perimeter of the site, but is not spatially included in the site. Comparatively high densities of protected and conservation important plants were recorded from this site, including the vulnerable *Adenia fruticosa,* the provincially protected *Eulophia petersii, Aloe burgersfortensis, Stapelia* species and the protected trees *Balanites maughamii, Boscia albitrunca* and *Sclerocarya birrea.*  *Figure 8-19: Collage of images of habitat conditions within Site 4*
Site 5	Site 5 is characterised by numerous smaller variations that cannot necessarily be correlated to natural biophysical attributes, but rather to mosaical effect of varying management applications, subsistence grazing strategies and an altered fire regime. What is however evident is that habitat from this site is comparatively deteriorated and in a poorer condition compared to the Variable Mixed Shrubland at Sites 3 and 4. The presence of numerous protected trees, notably *Balanites maughamii, Boscia albitrunca* and *Sclerocarya birrea* and other protected plant species is noted across the site. Despite the somewhat deteriorated status of the vegetation, the abundant presence of these species warrant a moderate-high floristic sensitivity of much of the area. A wide drainage line also runs centrally in a northern direction across the site and is characterised by a compendium of shrubs and herbaceous species that correlate the surrounding terrestrial shrubland environment.  *Figure 8-20: Collage of images of habitat conditions within Site 5*

8.4.3 Faunal Ecological Sensitivity

The faunal importance of the study sites was based on the inherent biodiversity value and ecological function of the respective habitat units corresponding to each site. Major emphasis was placed on the following functional aspects during the sensitivity grading process (Figure 8-21):

- Presence of habitat of high vertical heterogeneity: Area with intact variable or riparian woodland tend have taller tree canopies. Habitat containing taller canopy structure will provide a higher niche space for bird and arboreal animal species through an ecological process of niche packing. Therefore, it allows species with similar guilds (e.g. insectivorous foliage gleaners in birds) to co-occur without too much inter-specific competition for recourses. The result is that more species could occur in habitat with high vertical heterogeneity.
- Presence of specialised habitat: The presence of wetland, riparian or aquatic habitat (including functional manmade impoundments) provide habitat for stenotropic[62] animals species with high affinities to either moist conditions or inundated habitat. Many of these habitat units are either spatially limited (azonal) and hence uncommon in the region. Typical species include facultative wetland taxa, such as shorebirds and waterbirds, which will collectively contribute towards the overall species diversity in the area.
- Ecological connectivity: Intact habitat that are located along drainage lines and rivers (Steelpoort River), will promote animal dispersal, thereby allow for more species to utilise the habitat units at a particular site.

The proposed solar facilities will coincide with areas ranging from high to moderate-low sensitivities. In general, the construction of the proposed solar PV plant will result in a loss of natural woodland, while also occupying sections comprising of natural drainage lines (e.g. Site 5). The subsequent loss of habitat will displace animal species from the footprint site, especially large bodied species that requires large home ranges. These species occur naturally at low densities, and many are also threatened or near-threatened.

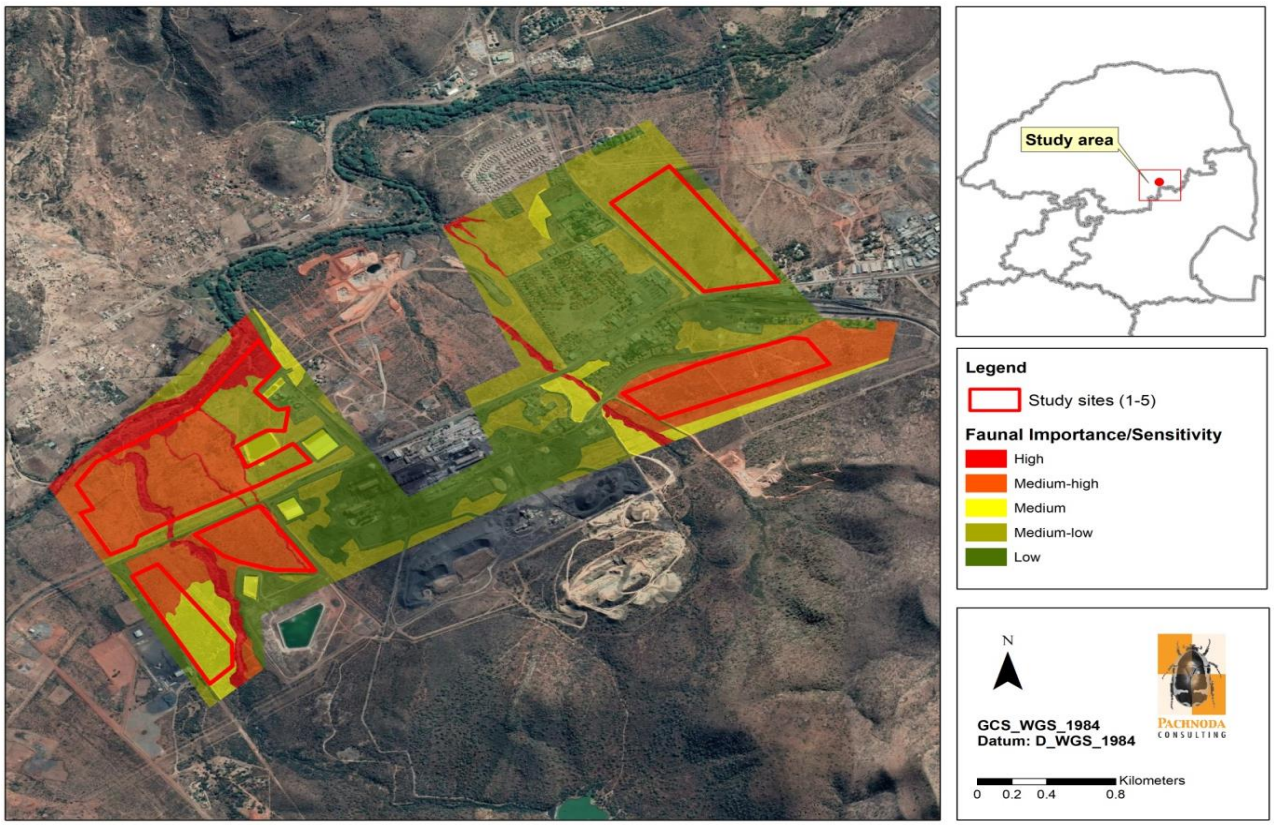


Figure 8-21: Faunal importance and function (ecological sensitivity)

[62] *Able to tolerate only a narrow range of environmental changes.*

8.5 Avifauna

8.5.1 Bird Species of Occurrence on the Development Sites

8.5.1.1 General Bird Species Occurrence and Abundance

A total of 103 species (detailed in the study area species list – ***Appendix E5***) was recorded during the avifaunal monitoring, representing a significant portion of the bird species list for the site.

An important component of the overall species composition, although occurring in generally low densities, is the presence of a handful of raptor species which are at the top of the food chain and act as apex avian predators in the environment of the study area. These raptor species are typically species most-commonly occurring with modified/ partly transformed rural habitats in north-eastern South Africa (as opposed to large protected areas).

The site observations indicated a handful of species to be the most abundantly occurring within the study area and on the development sites. An overall tally of number of records (***Appendix E5***) of each species during such data gathering revealed that the White-bellied Sunbird (*Cinnyris talatala*) and to a lesser degree the Blue Waxbill (*Uraeginthus angolensis*) are the most abundantly occurring species across the study area and these two species were recorded in all transects/ at fixed points with the exception of two/ three transects/ fixed points respectively.

The other most abundantly occurring species as revealed by the results of the transect/ fixed point data gathering were the Southern Boubou (*Laniarius ferrugineus*), Laughing Dove (*Spilopelia senegalensis*), Pied Crow (*Corvus albus*), White-browed Scrub-Robin (*Cercotrichas leucophrys*), White-browed Sparrow Weaver (*Plocepasser mahali*) and the Dark-capped Bulbul (*Pycnonotus tricolor*). A further suite of common 'Bushveld' bird species was recorded at slightly lower overall recording rates on all of the development sites irrespective of the type of woodland and level of degradation, typified by species such as Yellow-fronted Canary (*Crithagra mozambica*), Long-billed Crombec (*Sylvietta rufescens*), Acacia Pied Barbet (*Tricholaema leucomelas*), Black-chested Prinia (*Prinia flavicans*), Southern Masked Weaver (*Ploceus velatus*) and Red-faced Mousebird (*Urocolius indicus*).

Certain species were slightly more common on individual (development) sites, for example the dense closed low woodland habitat on Sites 3 and 4 supported a greater density of Southern Boubou, for example, and White-throated Robin Chat (*Cossypha humeralis*) – both species associated with dense thickets or woodland. Sites 3 and 4 also included transects along the ephemeral watercourse that drains between the two sites and thus the records for these sites also include a suite of birds commonly associated with the riparian corridor. The small finch Jameson's Firefinch (*Lagonosticta rhodopereia*) was revealed to be very common in the grassy substrate that lines the channel and its surrounds but was uncommon elsewhere on the site. This characteristic is likely to be mimicked for other finches and granivores, especially birds such as widows, queleas and bishops that will seasonally move onto the sites in mid to late summer to feed on the seeding grasses.

Certain of the sites located closer to the urban habitats of Steelpoort or the peri-urban areas located on the northern bank of the Steelpoort River were characterised by a greater abundance of certain species typically associated with urban habitats, such as Laughing Doves, White-browed Sparrow Weavers, Pied Crows and Common Mynas (*Acridotheres tristis*). The two sites located closest to Steelpoort (Sites 1 and 2) thus displayed the highest number of records of these species, as compared to other sites. There is a very high density of Pied Crows in the vicinity of Steelpoort town, and the numerous powerline servitudes that occur in its immediate surrounds. Sites 1 and 2 thus were characterised by a relatively high density of Pied Crow sightings, often with numerous birds present at one time. This may account for the slightly lower density of raptors recorded on these two sites, with the combined presence of human activity and disturbance factor and the abundance of large numbers of Pied Crows posing a significant nuisance factor.

Observations soon after dawn on Site 5 revealed very large numbers of Common Mynas flying north-westwards from the direction of the TFC Smelter – presumably where a communal roost is located – over the Steelpoort River to the peri-urban areas on the northern side of the river where these birds are very common. During a 15-minute period upwards of 150 birds were observed flying from the TFC Smelter in small flocks of around 5-10 birds.

A small number of nocturnal species was recorded during night-time observations. The most commonly recorded species that was also encountered during the day on Site 1 was the Spotted Thick-knee (*Burhinus capensis*), along with the Fiery-necked Nightjar (*Caprimulgus pectoralis*). One incidence of the call of a Rufous-cheeked Nightjar (*Caprimulgus rufigena*) was recorded in the footslopes located to the south of Site 2. No owl species were recorded, but it is highly likely that the Spotted Eagle-Owl (*Bubo africanus*) and the Barn Owl (*Tyto alba*) occur in the study area. Apart from the general loss of habitat that is discussed for all species below, the proposed development is unlikely to adversely affect night birds, especially if the facility remains unlit at night.

It is important to note that due to EIR-timing restrictions, no detailed avifaunal monitoring was able to be undertaken during the period of likely peak bird biomass occurrence in the study area. This is likely to occur in mid- to late summer when large numbers of seed-eating birds such as certain widow, bishop, whydah, indigobird species and likely most importantly Red-billed Queleas (*Quelea quelea*) are to be expected to move into the study area to breed and to forage, especially in summers of good rainfall. Although the sward on many of the sites is degraded due to overgrazing, riparian areas including that of the Steelpoort River and the ephemeral watercourse draining between Sites 3 and 4 and which bisects Site 5 are likely to be characterised by an abundance of grass species such as *Panicum maximum* which would attract significant numbers of such granivores. The timing of the EIR-site visits was also too early to record most migratory species (whether Intra-African or Palearctic) that would seasonally supplement the resident birds in the study area. A number of such species could occur commonly to abundantly in the study area, including species such as Barn Swallow (*Hirundo rustica*), a number of cuckoo species, Red-backed Shrikes (*Lanius collurio*) and certain warbler species.

8.5.2 Presence of Raptors

Of the larger birds present on the site, raptors were noted to comprise a significant portion. Raptors are significant in an avifaunal context for a number of reasons. Firstly, they provide vital ecosystems services in many areas as raptors are amongst the most common top predators and are likely to shape the species assemblages of birds and mammals[63], as well as their behaviours[64] [65]. Due to the territorial nature of many species, they often occur at relatively low densities and are thus vulnerable to disturbance. Raptors are threatened in many ways, with the major factor affecting raptors being the strong human population increase throughout sub-Saharan Africa, with the strongest and most widespread declines having been reported from rural areas, where former wildlands with few people have made way for transformed habitats. Other factors such as poisoning and collision and electrocution from electricity infrastructure are major threats.

Certain raptor species were listed as being priority species for the site, but with the exception of the Lanner Falcon, none of the priority raptor species were recorded on the development sites or in their immediate vicinity. Two sightings of Verreaux's Eagle were recorded while field lists were being compiled for two of the adjacent pentads to the study area. The proximity of the records to the development sites is significant as it is strongly suggestive that the study site would form part of the territory of a resident pair of these birds (on both occasions a pair of eagles was observed), and that the hilly terrain located immediately to the south of the development sites could form part of the areas in which these birds would hunt.

[63] *Ritchie E.G., Elmhagen B., Glen A.S., Letnic M., Ludwig G. and McDonald R. 2013 Ecosystem restoration with teeth: what role for predators? Trends Ecol Evol 27:265–271*
[64] *Shultz S. and Noë R. 2002. The consequences of crowned eagle central-place foraging on predation risk in monkeys. Proc R Soc B 269:1797–180*
[65] *Willems E.P. and Hill R.A. 2009. Predator-specifc landscapes of fear and resource distribution: effects on spatial range use. Ecology 90:546–55*

No Rock Hyraxes (*Procavia capensis*) were observed on the development sites or in the hilly terrain adjacent to the site, and in addition there is not a high density of small livestock (i.e. goats) which could also form part of the prey of these eagles on the development sites or their immediate vicinity and this suggests that the resident pair would range occasionally over the development sites rather than actively occurring on them. The risk of the solar power PV arrays and the associated powerlines affecting this species is thus assessed to be low.

A low raptor species diversity was encountered on the development sites and in the wider study area, with a total of six species encountered. The raptor species encountered on the development sites included (Figure 8-22):

- Black-chested Snake Eagle
- Wahlberg's Eagle
- African Fish Eagle
- Lanner Falcon
- Black-winged Kite
- Rock Kestrel
- Little Sparrowhawk

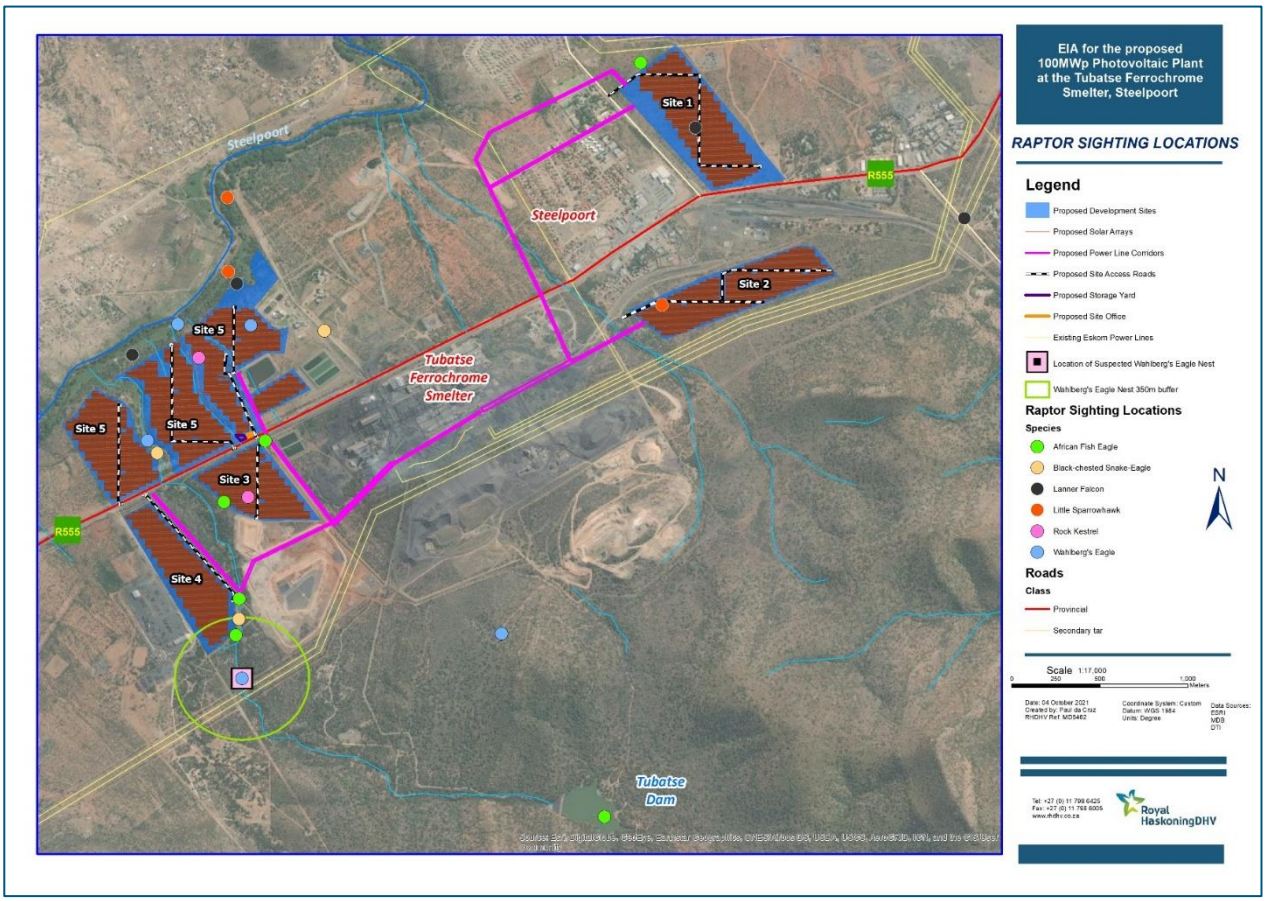


Figure 8-22: Raptor sighting locations in the study area

Of these species, only the Lanner Falcon was included in the list of priority species. Figure 8-22 indicates the location of all raptor sightings on the development sites and the surrounds. There were a number of Lanner Falcon sightings, mostly in the eastern part of the study area, close to the town of Steelpoort and its surrounds and in the vicinity of the Steelpoort River riparian zone. This suggests that at least one bird is resident in the area. The species appears to favour the Steelpoort riparian zone (where there is a high density of prey species) and the vacant areas surrounding Steelpoort, being associated with the various powerlines to hunt its avian prey. Sites 1 and 5 are proposed to be developed in the area in which the

species was most regularly observed, and along with other raptors, the transformation of habitat could lessen the available area in which the bird hunts. This impact would be mitigated by the non-development of the Steelpoort riparian corridor.

The Black-chested Snake-Eagle is one of the more commonly occurring larger raptor species over the northern parts of South Africa and Limpopo. The species was observed on several occasions during both the Scoping- and EIR-phase field assessments, typically a single bird in flight at a relatively low altitude over the site. The sightings were primarily in the vicinity of Sites 4 and 5. Accordingly the development sites are likely to form part of the territory of a resident bird, with the bird hunting over the woodland in these areas. The transformation of the woodland on the sites would thus have an effect on the area available to the resident bird(s) in which to hunt, but the relatively low overall area that would be transformed would limit the significant of the impact on these birds.

African Fish Eagles were recorded on a number of occasions during the EIR-phase field assessments, always at high altitudes when observed from the development sites. A pair was recorded at the Tubatse Dam located in the hilly terrain to the south of the development sites. This dam is stocked with fish and a pair observed at the dam is likely to utilise the dam for hunting and could possibly even nest in the mature woodland in the hilly terrain surrounding the dam. The artificial waterbodies surrounding the site could attract these piscivorous birds but would not be used for fishing as these waterbodies do not hold fish. The birds could also be likely to frequent the Steelpoort River and its riparian zone,

The last larger raptor which was recorded in the study area was the Wahlberg's Eagle. The species was commonly recorded in the study area during both of the EIR-phase site assessments, mostly in the air, generally soaring in a northerly or north-easterly direction into the wind the that prevailed during the site assessments. A single bird was sometimes observed, but a pair was also observed. Most importantly, during the undertaking of fixed-point observation located to the south of Site 4, a pair of these birds was observed mating in a tree within the riparian zone of the watercourse that drains between Sites 3 and 4. The area was thus carefully searched and what appeared to be a nest structure (Figure 8-24) was located in close proximity to the tree in which the birds were mating. The nest structure was located approximately 5-6m above the ground in a *Senegalia nigrescens* tree and consisted of twigs and small branches placed untidily in the fork of the tree below the canopy. The nest was estimated to be about 75m in diameter. Importantly, pairs can have more than one (up to five) nest sites per territory.

Figure 8-23: A Wahlberg's Eagle interacting with a mobbing Pied Crow on the site

The observation was made on the last day of the second EIR-phase site visit and accordingly it was not possible to revisit the site to ascertain whether this was indeed a Wahlberg's Eagle nest and whether the pair observed were adding material to this particular nest in preparation for egg-laying. The mating in close proximity to a structure that appears to be an eagle's nest structure, allied with the relatively high frequency of sightings of the species on the site is strongly suggestive that this is an active breeding site, and is suggestive that this nest is being utilised for breeding.

The nest is located 220m from the closest point of Site 4, and thus the development of the site (in particular construction with associated noisy activities associated with vegetation clearing and operation of heavy machinery) on the site could potentially cause the nest to be abandoned.

Figure 8-24:The suspected Wahlberg's Eagle nest

8.5.2.1 Implications of Raptor Occurrence on the Development Sites for the Development

As with the general species assemblage on the site, raptors will be impacted to a certain degree by the loss of habitat in which to forage (hunt). However, the limited related aerial extent of the combined development footprint in a study area and wider context will minimise the significance of the impact in the context of the range and territories of the raptors that inhabit the site. Sufficient natural/ modified natural habitat should remain in the wider area to prevent significant impacts on these raptors and is unlikely to have impacts on the development from being able to proceed to be developed.

The potential confirmation of breeding of a pair of Wahlberg's Eagles in close proximity to Site 4 does however have implications for the development, as the maintenance of a buffer that encompasses a certain portion of the solar array footprint on Site 4 (refer to Section 9.8).

8.5.3 Waterbird Occurrence and Birds associated with the Artificial Water Bodies on the Site

One of the key avifaunal sensitivity associated with the study area is the presence of the Steelpoort River as a significant local bird movement corridor, especially for larger waterbirds and the Scoping-phase avifaunal study identified this as a significant aspect of the avifaunal sensitivity in the study area. In addition to this the potential for waterbirds to move between the river corridor and the Tubatse Dam located in the hilly terrain to the south of the TFC Smelter and development sites was also raised as a potential movement of waterbirds within the study area.

Furthermore, there are a number of artificial waterbodies in the vicinity of the TFC Smelter and thus certain of the development sites, in particular Site 5. These artificial waterbodies are primarily lined ponds or dams, including the dams associated with the TFC Smelter's Water Treatment Plant, along with a stormwater dam, a number of brine dams and two dams associated with the H:H Waste Facility that is located to the south-west of the TFC Smelter and closest to Sites 3 and 4. Although lined and not offering suitable littoral habitat favoured by many waterbirds, these waterbodies were nonetheless noted in the Scoping-phase avifaunal field assessment to hold a few waterbird species. With the development of the concept design that indicated the presence of arrays and a proposed powerline located in close proximity to certain of these waterbodies identified the possibility of impacts on the waterbirds visiting these water bodies.

Accordingly, the assessment of the waterbird assemblage at these various waterbodies was included in the EIR-phase avifaunal field assessment. This was undertaken using the Co-ordinated Waterbird Counts (CWAC) methodology that is used by the Animal Demography Unit of the University of Cape Town to act as an effective long-term waterbird monitoring tool, benefiting conservation efforts worldwide CWAC was created as part of South Africa's commitment to international waterbird conservation.

Although none of the artificial waterbodies or the Tubatse Dam would constitute a potential CWAC site, the method is useful for counting the number of birds at the waterbodies on the site. Accordingly, the CWAC methodology was applied at the Tubatse Dam and at the waterbodies associated with the TFC Smelter's Water Treatment Plant.

8.5.3.1 Waterbird Occurrence along the Steelpoort River and Bird Movement along the River

The Steelpoort River in the vicinity of the development sites is currently being highly degraded in a co-ordinated and systematic function by the conducting of sand mining with large earth moving equipment. This mining is occurring along the northern bank of the river, and much of the marginal, lower and upper zones of the rivers riparian corridor have been severely transformed. This has resulted in the loss of riparian vegetation along certain reaches of the river. The disturbance, along with likely similar disturbances upstream have resulted in a high silt load and highly turbid water within the river. The degradation of the aquatic environment has been likely to limit the suitability of the river for waterbirds and a limited number of true waterbirds were observed along the river.

Observations did reveal a number of waterbirds flying along the river and its riparian corridor. The birds were observed flying along the river's course, often in a north-easterly (downstream direction). Such waterbirds were observed flying at relatively low altitude and included the Egyptian Goose and Reed Cormorants, recorded on a number of occasions, along with the presence of numerous small flocks of Western Cattle Egrets (*Bubulcus ibis*), Yellow-billed Ducks and a Hamerkop (*Scopus umbretta*). A dusk observation of the river's riparian corridor revealed that three Black-headed Herons (*Ardea melanocephala*) arrived at dusk and settled into a large riparian tree on the southern bank to roost. Other (non waterbirds) were observed to be flying along the river, including various weaver and widows along with one sighting of what is assumed to be the resident Wahlberg's Eagle pair at a low altitude flying downstream along the river.

The observations do support the conclusion that the river is an important movement corridor for waterbirds, however for a much lower number of species and overall number of birds that could potentially have moved along the river. The exclusion of the Steelpoort River's riparian corridor from the development footprint (including powerlines) is an important mitigation measure that is likely to greatly minimise any potential impact of the development on the waterbirds (along with other birds) that regularly move along the river. The low altitude at which most of the birds fly is likely to prevent any occurrence of the 'lake effect' of birds moving along the river mistaking the PV solar panel arrays for waterbodies.

Observations of the ephemeral watercourse revealed no waterbirds flying along it from the Steelpoort River in the direction of the Tubatse Dam.

8.5.3.2 Waterbird Occurrence at the Tubatse Dam

The CWAC count at the Tubatse Dam revealed a very low number of waterbirds and species diversity at the dam. The primary waterbirds recorded included a number of Reed and White-breasted (*Phalacrocorax lucidus*) Cormorants, Darter (*Anhinga rufa*) a pair of Egyptian Geese and a number of furtive reedbed-inhabiting waterbird species including three Striated (Green-backed) Herons (Figure 8-25), a Black-crowned Night-Heron (*Nycticorax nycticorax*) and a number of Black Crakes (*Zapornia flavirostra*). Earlier observations at the Tubatse Dam during the Scoping-phase site visit in April 2021 revealed a similar assemblage of birds. The CWAC count at the dam recorded a pair of African Fish Eagles display calling over the dam. It is highly likely that this dam that is stocked with fish is regularly utilised for hunting by the pair, and it appears likely that this is the focal area of the species' occurrence in the study area, as evidenced

also by records of the species from the development sites being birds soaring at very high altitude or where a call was heard, and the bird could not be located by sight.

The conclusion drawn from the assessment of Tubatse Dam is that the dam is primarily utilised by piscivorous waterbirds that favour open water habitats, with a low species richness and low density of birds. As described above, the altitude of the dam in relation to the development sites in the Steelpoort Valley twinned with the low density of waterbirds visiting the dam will negate any potential for collision of birds moving between the Steelpoort Valley and the Dam.

Figure 8-25: A Striated (Green-backed) Heron at the Tubatse Dam wall

8.5.3.3 Waterbird Occurrence at the Artificial Waterbodies located close to the TFC Smelter

A late afternoon CWAC survey was undertaken at the artificial waterbodies near the TFC Smelter, and which are located close to the proposed Site 5 proposed solar PV arrays. The survey included the two lined dams at the Water Treatment Plant, the lined stormwater dam, and the three brine dams. Due to the lined nature of these waterbodies and their steep sides, these waterbodies do not provide any suitable habitat for waders and any other species that favour littoral or wetland habitats. Like the Tubatse Dam, the vast majority of birds recorded at these artificial waterbodies were open water species. No birds other than a pair of Blacksmith Lapwings (*Vanellus armatus*) were observed at the two lined ponds at the Water Treatment Plant. The stormwater dam is the largest of these waterbodies and was observed to hold several White-breasted Cormorants, a Darter, and three Cape Teals (*Anas capensis*).

A greater number of waterbirds were observed at the brine dams, with a total of 5 Cape Teals and a total of 19 Little Grebes (Figure 8-26, in addition to several pairs of Blacksmith Lapwings, a pair of Egyptian Geese. The brine dams were also visited by a Three-banded Plover (*Charadrius tricollaris*) and a Common Sandpiper (*Actitis hypoleucos*). Closer to dusk the dam was visited by several swallows and martins including Greater Striped Swallows (*Cecropis cucullata*), Wire-tailed Swallows (*Hirundo smithi*) and Brown-throated Martins (*Riparia paludicola*). No birds apart from a further pair of Egyptian Geese were observed to fly into the dams just prior to dusk, but all birds present, were likely to have roosted at the waterbodies.

Other incidental observations of waterbirds from the surrounds revealed a similar assemblage of species, with the presence of a Grey Heron and a single Glossy Ibis (*Plegadis falcinellus*).

The record of the Cape Teals at the waterbodies is noteworthy in a species distribution context as the record presented as strongly out of range for this species with the closest records in the SABAP2 database being in the Polokwane and Belfast (eMakhazeni) areas. This species favours open saline or brackish wetlands and does inhabit sewage and effluent ponds and thus the brine dams present suitable habitat. The record of the single Glossy Ibis similarly registered as out of range on the SABAP2 database, with most records of this species being on the Highveld to the southwest and on the Polokwane Plateau, and no records for Sekhukhuneland.

Figure 8-26: Cape Teals and Little Grebes at one of the brine dams

In conclusion, the artificial waterbodies are inhabited/ utilised by a low number of species and relatively low overall number of birds. However, the waterbodies are utilised as roosting sites by a number of species that are resident in the area, and accordingly these birds will move to and from the waterbodies. Incidental observations are suggestive that the waterbodies may occasionally be utilised by species that would not regularly occur in the wider area to rest/ roost. In the context of the development of solar arrays close to the stormwater dam in particular and the development of the proposed Site 5 powerline adjacent to this dam, these new developments could impact the waterbirds utilising the waterbodies.

8.5.3.4 Implications of Waterbird Occurrence and Density on the Development Sites for the Development

As described above, neither a high species density of waterbirds, or high numbers of birds overall characterises the natural or artificial surface water features on the site. Although certain mitigation measures have been specified relating to certain of the development components, the impacts of the proposed development on waterbirds are not expected to be of any significance that would render the development unable to proceed.

8.5.4 Occurrence of Priority Species

As discussed above, none of the species identified as priority species in the Scoping-phase avifaunal assessment were recorded in the study area, with the exception of the Lanner Falcon which was recorded on numerous occasions on certain of the development site in both the Scoping- and EIR-phase field visits. The Verreaux's Eagle was recorded out of the study area, but in sufficiently close proximity (on two occasions) in the areas to the north-west (approximately 7km distant in Ga-Mapodila) and to the south-east (approximately 10km distant along the D737 road) to suggest that a resident pair(s) are likely to range into the study area. Birds ranging over the development site are highly unlikely to hunt over the development sites as their primary prey (Rock Hyraxes) are not present on the development sites. This species may hunt other prey such as goats, but no goats are present on any of the development sites. The likelihood of Verreaux's Eagles occurring in the immediate vicinity of the development sites and interacting with the proposed infrastructure is thus deemed to be very low.

The absence of the other priority species from the site assessment records conducted for the study does not entail that these would not be present. The two vulture species could arguably visit livestock carcasses on the development sites, but the very high human presence in the Steelpoort area would make this unlikely. Birds would rather be likely to range at high altitudes over the hilly ground on the margins of the Steelpoort Valley, away from the development sites. Tawny and Martial Eagles as well as Peregrine Falcons are likely to be occasional visitors to the study area, whilst the high degree of human presence and habitat transformation is likely to significantly reduce the potential for the occurrence of the Secretarybird on the development sites. The habitat on the development sites and their immediate surrounds is not suitable for the Southern Bald Ibis or the White and Abdim's Storks. The Black Stork may visit certain of the waterbodies on the site that hold fish and other aquatic prey such as amphibians, but the degradation of the Steelpoort River and the altitude and physical distance of the Tubatse Dam away from the development sites entail that this species would be very unlikely to interact with the development infrastructure.

8.5.4.1 Implications of Priority Species Occurrence on the Development Sites for the Development

Overall, the impact of the proposed development on the identified suite of priority species is likely to be very low, due to the lack of suitable habitat in the vicinity of the development sites, the high human disturbance/ transformation factor and the very occasional nature of occurrences of these species within the study area. In this way the potential presence of priority species is unlikely to have any impact on the ability of the proponent to develop the solar arrays on the five development sites.

8.5.5 Refined Sensitivity Assessment

A primarily desktop-based sensitivity assessment was undertaken in the Scoping-phase avifaunal study. The assessment identified areas of high sensitivity to be rivers (i.e. the Steelpoort River) and associated riparian zones, along with the largest of the ephemeral watercourse and its associated riparian zone that bisects Site 5, and which drains in between Sites 3 and 4. Waterbodies were also identified to be areas of high avifaunal sensitivity. Natural woodland in the study area was assigned a moderate level of sensitivity while degraded woodland was assigned a low level of sensitivity.

The results of the EIR-phase avifaunal assessment have confirmed that the Steelpoort River and its riparian corridor, along with the ephemeral watercourse and its riparian corridor should be assigned a high degree of avifaunal sensitivity. There are various reasons for this that include:

- The Steelpoort River, although being actively degraded through sand mining, is still an important local movement corridor and habitat for (an albeit low species density) waterbirds. The river's riparian corridor, especially on the southern side of the river is characterised by large riparian trees, *Phragmites mauritianus* reedbeds and dense thickets that provide a heterogenous matrix of micro-habitats that support a high density of species.
- The availability of moisture for much of the year in both the riparian corridors of the Steelpoort River and the ephemeral watercourse allows the growth of a dense grassy and thicket substrate that

supports high number of seedeaters and other birds into the late summer and ensuing autumn and early winter months.

- In the context of the continuing disturbance, transformation and fragmentation of the surrounding woodland habitats (to which the proposed development would contribute if approved), these riparian corridors perform critical ecological linkage functions, allowing birds to move along them and to provide excellent foraging opportunities.
- The presence of large trees provides nesting (breeding) opportunities for many larger bird species. This is particularly evident within the suspected presence of the Wahlberg's Eagle nest that is located along the ephemeral watercourse to the south of Site 4.

Figure 8-27: A Retz's Helmet-Shrike in the riparian zone of the Steelpoort River

The presence of the suspected Wahlberg's Eagle nest site has been assigned a 350m wide buffer as part of the mitigation of the impacts of the development and this buffer area has been included in the area of high sensitivity.

The results of the data collection conducted during the EIR-phase site assessments are suggestive that there is less of a distinction in terms of bird species richness and relative abundance between areas of woodland that were designated as being degraded and those designated as being more intact. Those development sites and their surrounds at which data collection was undertaken that are located in areas of degraded woodland (e.g. areas on Sites 1, 2 and 5) did not show a markedly lower bird species richness and relative abundance as compared to more intact woodland (Sites 3 and 4) This may be explained by the process of 'opening up' of woodland from which woody vegetation is removed, thereby creating more open, less dense thicket that is favoured by more bird species. Accordingly, all areas of residual woodland habitat have been designated as being moderately sensitive.

The designation of all artificial waterbodies as being highly sensitive may have been slightly overstated. The results of the observations and data collection for waterbird occurrence and abundance for both the Tubatse Dam and the assemblage of artificial waterbodies located to the north of the TFC Smelter have indicated

that these are mainly inhabited/ visited by a relatively low number of primarily piscivorous waterbird species, primarily those species that prefer open water habitats, with very limited habitat available for shoreline waders and birds which prefer shallower water, due to the lined nature of all of the artificial ponds, and due to the input of a constant pumped source of water into the Tubatse Dam that does not allow water levels to fluctuate (thereby exposing areas of mudflats and shallower water). As such the artificial waterbodies located on, and close to the development sites have been altered to a moderate level of avifaunal sensitivity.

In order to reduce the severity of the impact associated with the physical transformation/ loss of natural woodland habitat associated with the development of PV arrays and ancillary infrastructure of the five development sites, it is key to maintain residual woodland habitat that is located adjacent to, and in some cases in between sites located adjacent to one another. The maintaining of areas of residual woodland is key to ensuring that the ecological integrity of residual areas (including in particular from an avifaunal perspective) is maintained.

8.6 Heritage and Palaeontology

During the field work several heritage features and resources were identified and logged. A total of fifty-seven (57) points of interest were logged that resulted in the delineation and identification of twenty-four (24) separate heritage sites. These consist of five (5) burial grounds (Site 1-1, 1-7, 2-1, 2-2 and 2-3 which is indicated as a stone feature that could possibly be a grave) with a High heritage significance and a heritage grading of IIIA. Nine (9) historic recent structures (these are 1-2, 1-3, 1-4, 1-5, 1-6, 2-4, 2-5, 5-5 and 5-7), which vary in significance from medium to low and a grading of IIIB. The archaeological finds consist of nine (9) archaeological sites (Site 3-1, 3-2, Site 4-1, 4-2, and Sites 5-1, 5-2, 5-3, 5-4 and 5-6) and has in most cases a rating of Medium significance and a grading varying between IIIC and IIIA at the highest. Site 5-8 represents a possible memorial now in disuse and it was rated as having a Low heritage significance but with a possible local significance.[66]

The following sections (Table 8-17 - Table 8-21) provides a breakdown of the different heritage resources identified and provides a heritage significance grading for each site.

[66] *The site numbering convention is done by grouping the sites per alternative development areas. Site 1 in development area 1 is thus numbered: Site 1-1*

Table 8-17: Sites identified during the heritage survey for Site 1

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 1-1	24°43'30.81"S 30°12'22.39"E	Large cemetery situated within site 1 of the study area. The cemetery contains more than 120 graves of which the oldest is dated to the 1940. The graves are a combination of packed stone, granite, and brick packed graves.	 *Figure 8-28: Site 1-1 a large cemetery containing 120 graves*	High	IIA
Site 1-2	24°43'40.40"S 30°12'27.94"E 24°43'49.07"S 30°12'34.52"E 24°43'48.96"S 30°12'38.44"E	Packed stone feature. Site 1-2 forms part of a large series of low packed stone features that resemble stone walling. These features are however degraded, and half buried making any substantial interpretation difficult.	 *Figure 8-29: Packed stone feature*	Medium	IIIB

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 1-3	24°43'46.97"S 30°12'46.82"E	Cement water trough located on the eastern edge of the study area at Site 1. Probably part of a past farmstead.	 *Figure 8-30: Cement water trough at Site 1-3*	Low	NCW
Site1-4	24°43'42.35"S 30°12'37.73"E	Series of broken-down structures and foundations. These structures were built using brick. Cement and packed stone elements. Site 1-4 seems historical in age.	 *Figure 8-31: A series of broken-down structures and foundations*	Low	IIIC

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 1-5	24°43'36.91"S 30°12'38.41"E	Site 1-5 marks a packed stone feature of possible foundation.	 *Figure 8-32: Packed stone feature or foundation at Site 1-5*	Low	IIIC
Site 1-6	24°43'27.28"S 30°12'29.81"E	Broken down foundation hidden among tall grass cover.	 *Figure 8-33: Broken down foundation hidden among tall grass at Site 1-6*	Low	IIIC

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 1-7	24°43'37.01"S 30°11'52.61"E	Site 1-7 marks a small cemetery located directly underneath the proposed powerline alignment. The cemetery contains about 20 graves of various styles including granite and packed stone graves. Some graves are enclosed by metal bars. The oldest date located was 1966. The cemetery is divided into two separate sections on either side of a small stream.	 *Figure 8-34: Small cemetery at Site 1-7*	High	IIIA

Table 8-18: Sites identified during the heritage survey for Site 2

Site Number	Latitude	Description		Heritage Significance	Heritage Rating
Site 2-1	24°44'16.08"S 30°12'20.28"E	Cemetery situated along proposed route of the powerline west of Site 2. This cemetery contains about 18 graves of various styles including packed stone and granite graves. The oldest marked grave dates to 1952.	 *Figure 8-35: Cemetery at Site 2-1*	High	IIIA

Site Number	Latitude	Description		Heritage Significance	Heritage Rating
Site 2-2	24°44'18.22"S 30°12'26.44"E	Possible graves at Site 2-2. These packed stone features are hidden and overgrown.	 *Figure 8-36: Possible graves*	High	IIIA
Site 2-3	24°44'8.82"S 30°12'29.99"E	Site 2-3 marks a packed stone feature that could possibly be an historical grave location.	 *Figure 8-37: Packed Stone feature at Site 2-3*	Medium	IIIA

Site Number	Latitude	Description		Heritage Significance	Heritage Rating
Site 2-4	24°44'18.81"S 30°12'25.76"E	Site 2-4 marks an area with multiple packed stone features. These features are degraded making any identification difficult.	 *Figure 8-38: Packed stone feature*	Low	IIIC
Site 2-5	24°44'3.70"S 30°13'1.78"E	Site 2-5 marks two large cement features. The first is a rectangular brick and cement structure with multiple small reservoirs built into the centre. The second is a large cement water reservoir that is still half filled with water. These structures are not being used anymore but probably relates to the mining activity within the area.	 *Figure 8-39: Cement structure at Site 2-5*	Low	NCW

Table 8-19: Sites identified during the heritage survey of Site 3

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 3-1 and 3-2	24,7438924S 30,18716E 24,74595S 30,18650E	The area is characterised by several low stone wall foundations, grain bin platforms and a general background scatter of ceramics. The ceramics herringbone decoration is indicative of the material identified on Site 4 and 5. Although a small sample the motives can be associated with the Doornkop faeces of the Iron Age.	 *Figure 8-40: Herringbone decoration*	Medium	IIIB

Table 8-20: Sites identified during the heritage survey of Site 4

Site number	Latitude	Description		Heritage Significance	Heritage Rating
Site 4-1 and 4-2	24,75067S 30,18457E 24,75069S 30,18317E 24,74860S 30,18148E	The site covers an area of approximately 300-400m on the eastern section of Site 4. The archaeological remains are characterised by low stone walling, numerous grain bin platforms. A few huts out lines could be discerned in the thick undergrowth. A low-density ceramic scatter is present over the site with numerous decorate shards found. Most of these shards have a herringbone motive in single and double bands.	 *Figure 8-41: Well defined grain bin platforms*	Medium to High	IIIA

Table 8-21: Sites identified during the heritage survey of Site 5

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 5-1	24°44'34.11"S 30°10'40.10"E 24°44'32.51"S 30°10'39.99"E	This cluster is located on the north-west corner of the study area of Site 5. The area sits near a natural drainage line and can be described as a rocky area due to the consistent erosion taking place around this area. A widespread moderate density scatter of Middle Stone Age lithic material was identified within this area.	 *Figure 8-42: Lithic assemblage*	Low	IIIC
Site 5-2	24°44'42.14"S 30°10'49.10"E 24°44'42.85"S 30°10'50.11"E 24°44'42.11"S 30°10'42.88"E 24°44'43.22"S 30°10'44.71"E	The site is situated towards the south-west corner of the study area at Site 5. This area is dominated by multiple series of low packed stone features including what seems to be remnants of stone walling, circular features, and possible grain bin stands. The area is overgrown and makes identifying the full extent of these features difficult. Remnants of low packed stone features among the tall grass as well as an open area devoid of stone features indicative of a cattle byre.	 *Figure 8-43: Packed stone feature among aloes*	Medium	IIIB

Site Number	Coordinates	Description	Heritage Significance	Heritage Rating
		 *Figure 8-44: Site 5-2 - Low packed stone feature*  *Figure 8-45: Upper grindstone located at Site 5-2*		
Site 5-3	24°44'38.61"S 30°10'42.15"E	Situated near the southern edge of the study area close to the main road running towards Burgersfort. Site 5-3 is characterised as a similar pattern to the other clustered areas where a combination of low packed stone features together with a concentration in aloes indicate the presence of archaeological material. marks an area with multiple packed stone features. These features resemble grain bin stands.	Medium	IIIB
		 *Figure 8-46: Packed stone feature, possible grain bin stand*		

Site Number	Coordinates	Description	Heritage Significance	Heritage Rating
Site 5-4	24°44'21.79"S 30°10'57.93"E 24°44'21.04"S 30°11'0.09"E 24°44'20.22"S 30°10'58.99"E 24°44'18.62"S 30°10'59.63"E 24°44'16.99"S 30°11'3.37"E 24°44'22.47"S 30°10'57.00"E	This cluster of sites are all located within the large drainage line that runs downstream towards the Steelpoort River. This area is dominated by a moderate scatter of MSA Lithic artefacts. The highest density scatter was with 10-15 lithic artefacts per m².  *Figure 8-47: General site around drainage line*  *Figure 8-48: Sample Lithic assemblage for Site 5-4*	Medium	IIIB

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 5-5	24°44'21.77"S 30°11'7.16"E	Recent historic stone-built weir and drainage line is in an overgrown gully area.	 *Figure 8-49: Watergate at Site 5-5*	Low	NCW
Site 5-6	24°44'26.03"S 30°11'6.95"E	The position in Site 5-6 indicates a small number of ceramic sherds that were located next to the small gravel road. Some of the ceramics have indicative decoration associated with the Doornkop faeces of the Iron Age.	 *Figure 8-50: Ceramic sherds located at Site 5-6*	Medium	IIIB

Site Number	Coordinates	Description		Heritage Significance	Heritage Rating
Site 5-7	24°44'31.96"S 30°11'5.76"E	Site 5-7 marks a dumping area that seems to contain historical material. The material found was extremely fragmented therefore an estimated age could not be obtained.	 *Figure 8-51: Waste dump*	Low	IIIC
Site 5-8	24,74151S 30,18555E	The Site 5-8 seems to be a former local monument or grave that was exhumed. The memorial plinth and headstone are still present, but a large hole is left where the possible burial was done. Research on SAHRIS could not show any permits or registration of a memorial in the vicinity of this site.	 *Figure 8-52: View of remains of the grave dressing*	Low	IIIC

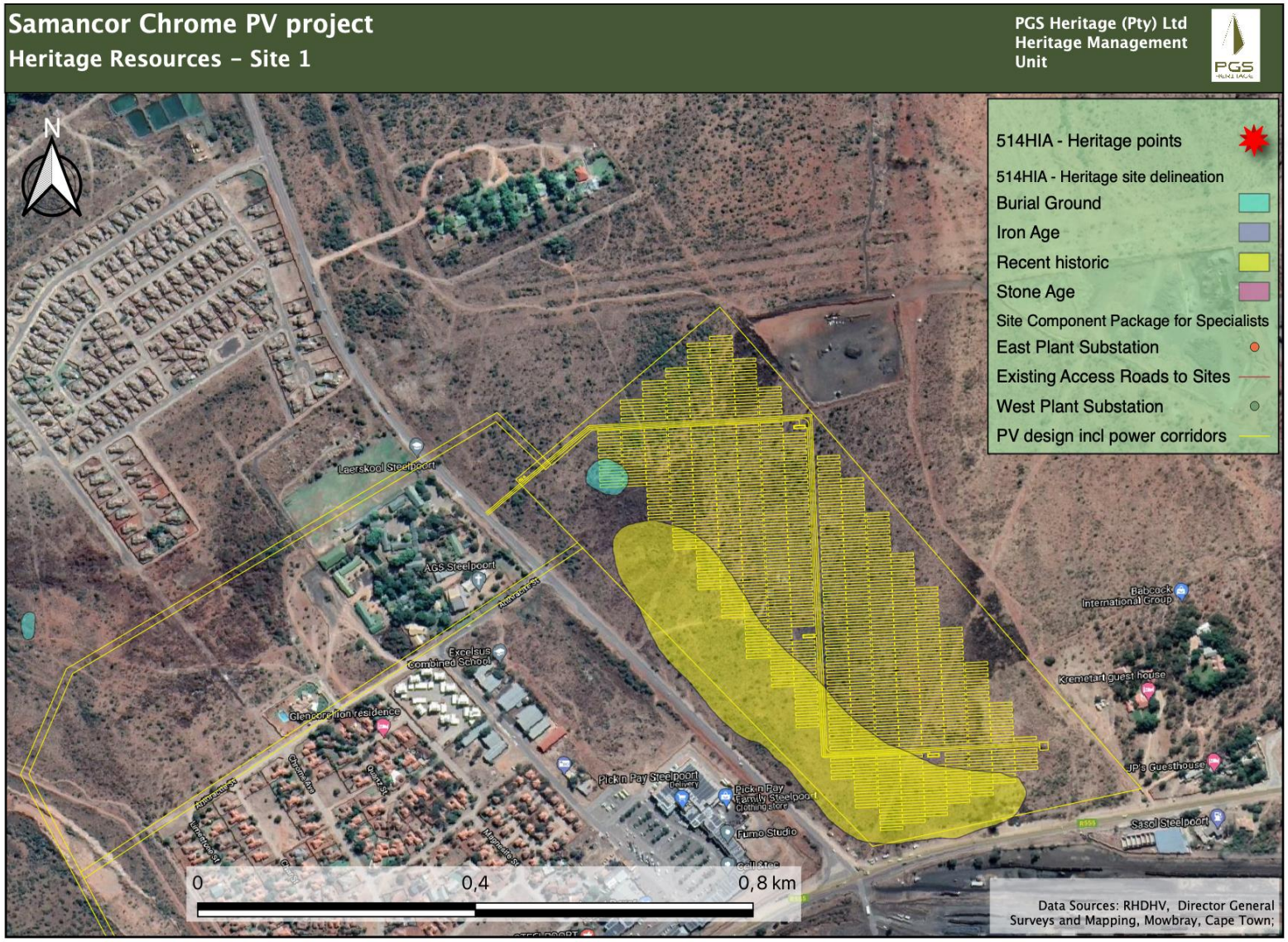


Figure 8-53: Locality of the heritage resource in relation to Site 1

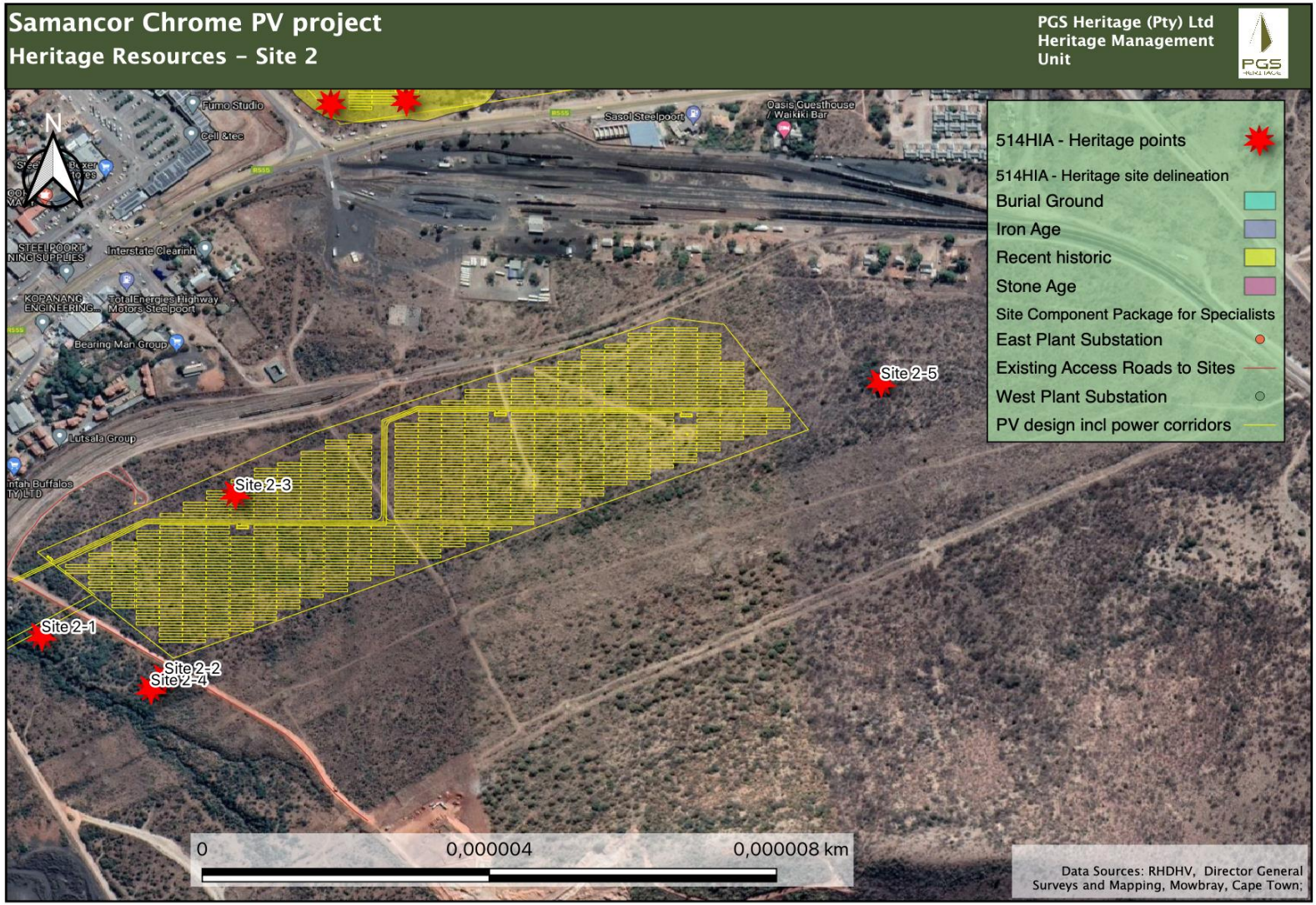


Figure 8-54: Locality of the heritage resource in relation to Site 2

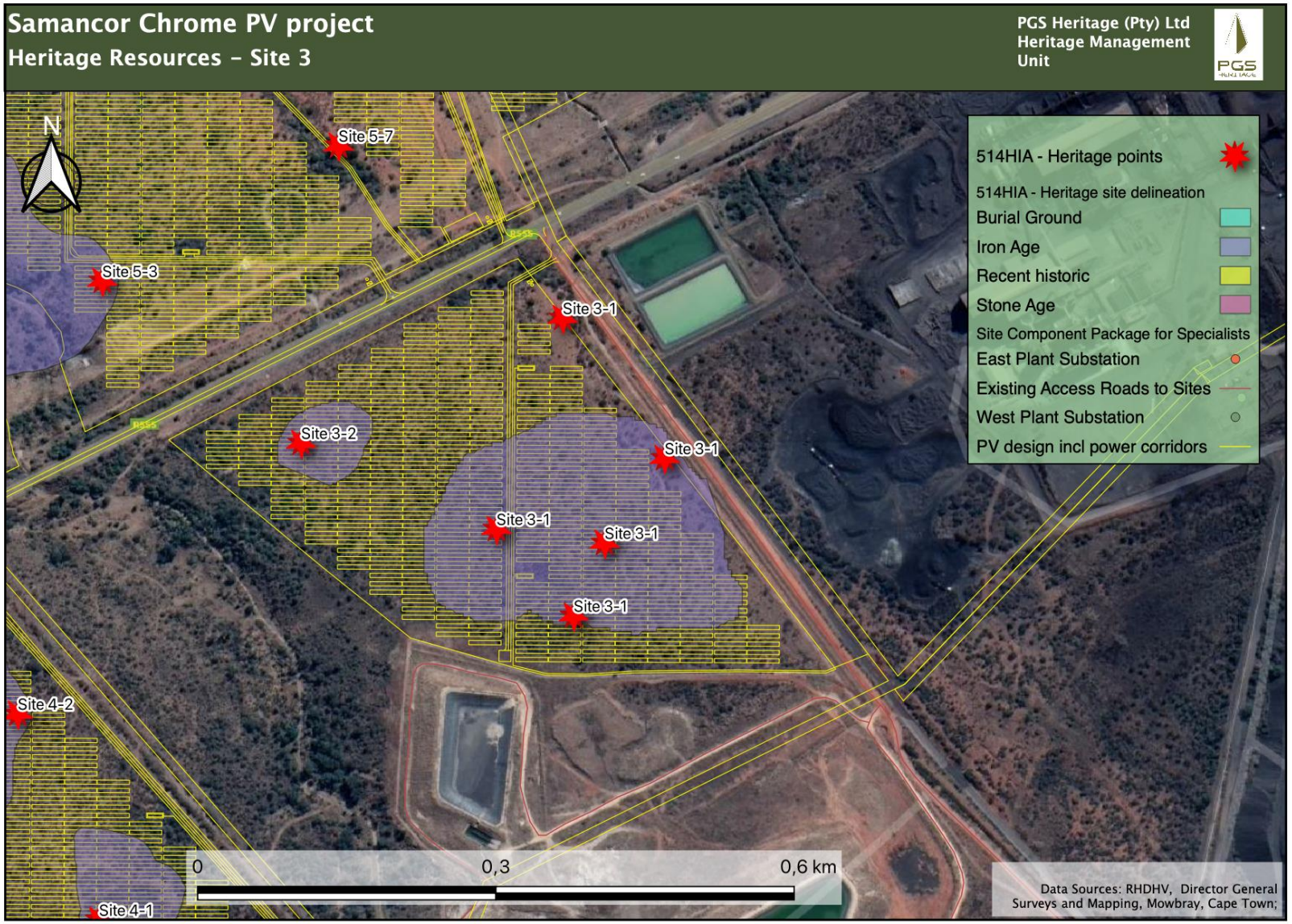


Figure 8-55: Locality of the heritage resource in relation to Site 3

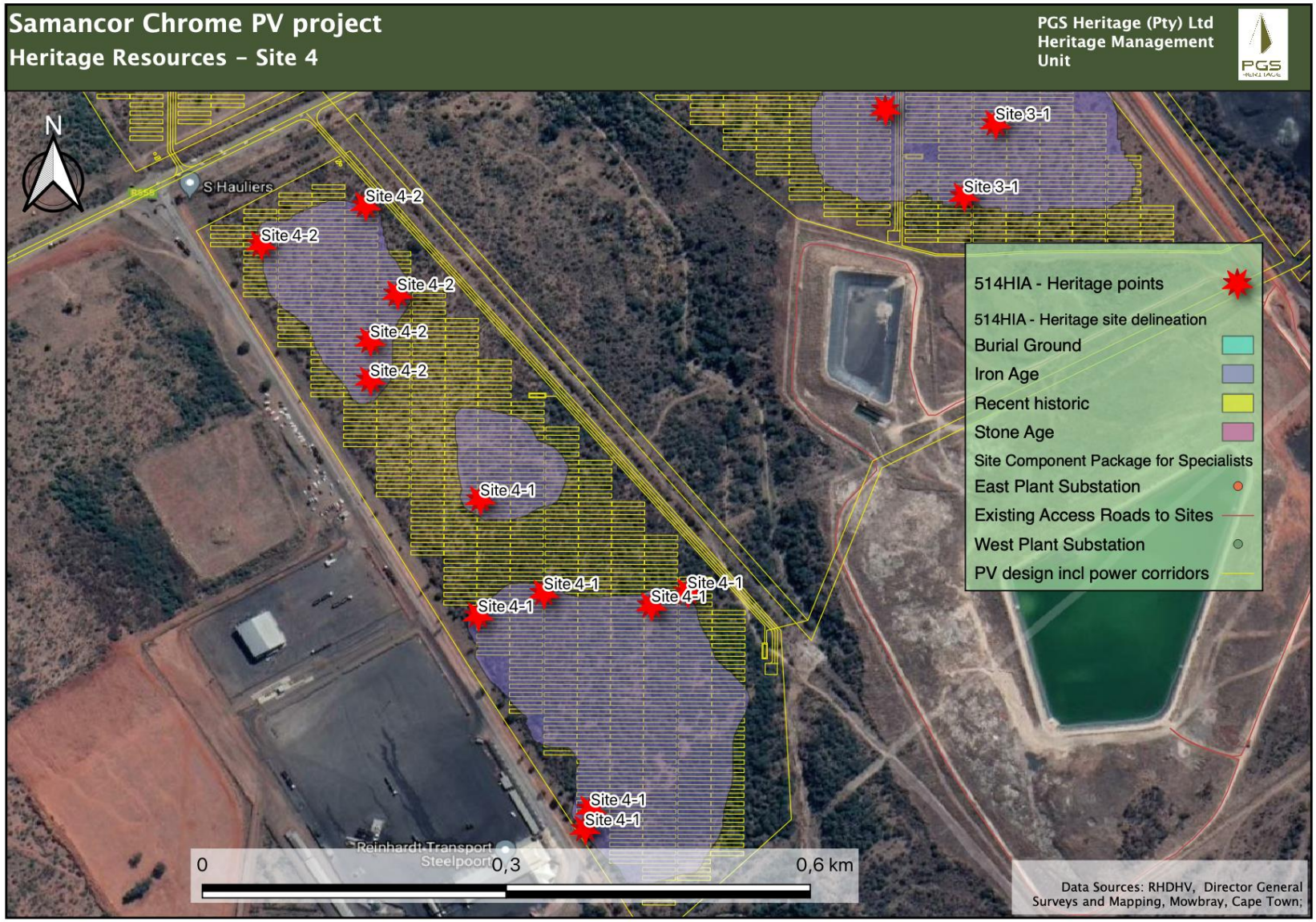


Figure 8-56: Locality of the heritage resource in relation to Site 4

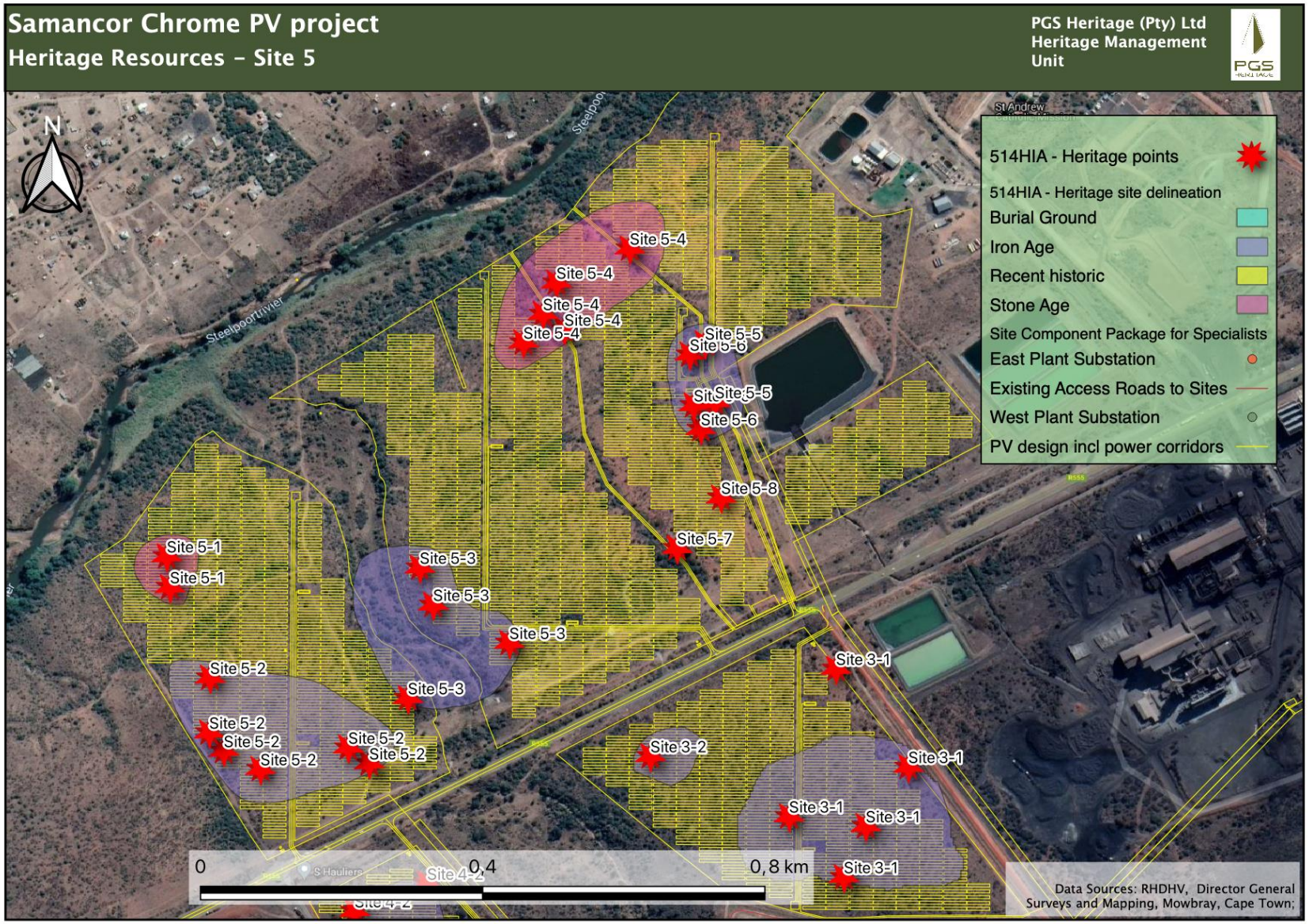


Figure 8-57: Locality of the heritage resource in relation to Site 5

According to the PalaeoMap of the South African Heritage Resource Information System (SAHRIS) - Figure 8-58, there is a low chance of finding fossils in the area within which the project footprint occurs.

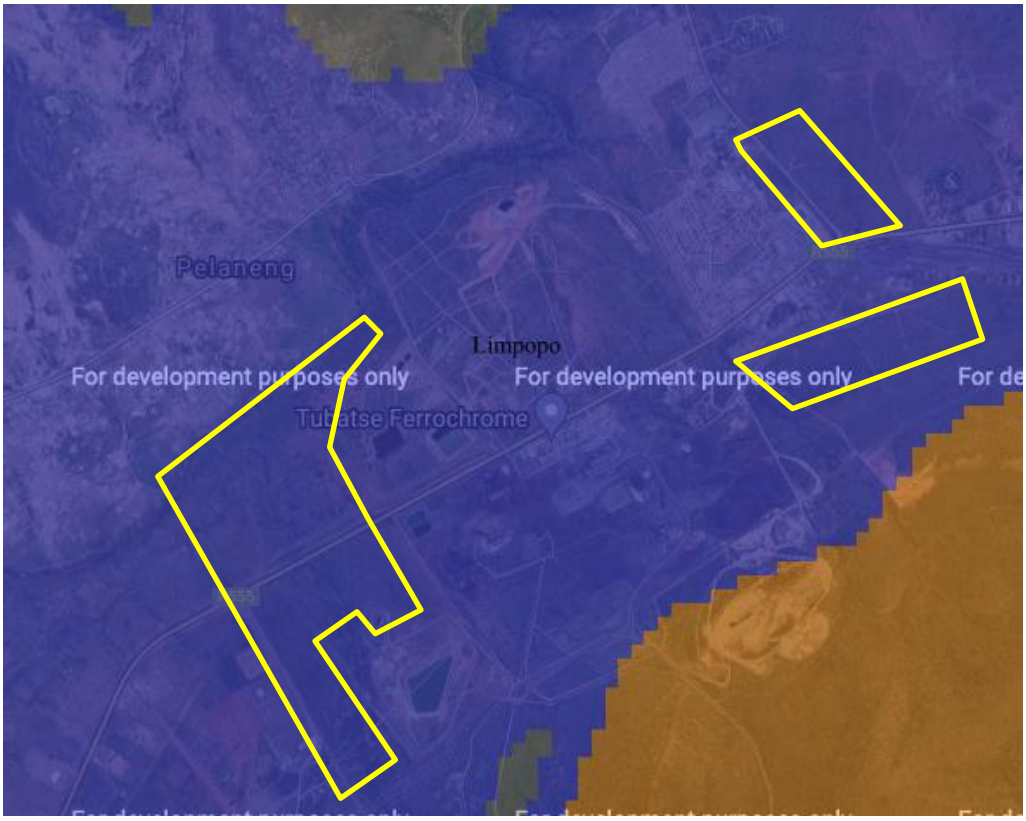


Figure 8-58: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) Approximate location of the proposed development is indicated in yellow

8.7 Climate Change

The climate change impact assessment for the proposed 100MWp PV plant considers three main aspects:

- Climate resilience of the project - “the extent in which the project itself is able to cope with or withstand impacts of climate change”
- Climate resilience through the project - “the extent in which the project contributes to addressing climate related risks outside of the project”
- Potential GHG mitigation impact of the project - “the extent in which the project will increase or reduce the GHG emissions”.

8.7.1 What is Climate Change?

In order to assess information relevant to the understanding of human induced climate change, potential impacts of climate change and options for mitigation and adaptation, the World Meteorological Organization and the United Nations Environment Programme established the Intergovernmental Panel on Climate Change (IPCC). Since its founding in 1988, the IPCC has completed a number of assessment reports, developed methodology guidelines for national greenhouse gas inventories, special reports and technical papers. There have been a number of IPCC reports through the years and the most recent work (IPCC Assessment Report 6 of 2021) currently presents the most up-to-date assessment of the current state of research on climate change.

Climate change refers to any change in the average long-term climatic trend and is a natural part of the earth system. Human activities since the Industrial Revolution have, however, succeeded in altering the composition of the atmosphere to such an extent that it will absorb and store increasing amounts of energy in the troposphere within the coming century. This will result in the atmosphere heating up, thereby altering weather and climate patterns. The main findings of the IPCC's Sixth Assessment Report (AR6) shows that global warming will reach 1.5°C by the early 2030s, with 2°C being exceeded this century if emissions continue at their current levels.[67] This will lead to a cascade of effects, including changes to precipitation, seasons, microclimates and habitat suitability. It is also reported that human activity is causing an accelerated rate of climate change around the world and that this phenomenon won't slow down unless we severely curb our greenhouse gas emissions at a global scale. [68]

The impact of climate change has the potential to adversely affect the economic, natural resources and social sectors of the Limpopo Province, as for the rest of South and Southern Africa. Changes to both weather patterns and longer-term climate will induce changes to how land can be used, and how exposed economic activities and people will be to climate and weather-related threats. Warmer temperatures, for example, will affect crop selection for agriculture, habitat suitability for wildlife, water availability for mining, energy usage by urban populations and the spread of diseases. Climate change furthermore leads to indirect impacts as social and economic sectors attempt to adapt to the changing climate. Global efforts at mitigation will, for example, force a shift towards forms of energy with lower global warming potentials; thereby altering the foundations of coal-based economies.

8.7.2 Climate Change Profile

The AR6, indicates that each of the last four decades have been successively warmer than any decade that preceded it since 1850. Global surface temperature in the first two decades of the 21st century (2001-2020) was 0.99°C higher than 1850-1900. Global surface temperature was 1.09°C higher in 2011–2020 than 1850–1900.[69]

The report further outlines Africa as the most vulnerable continent. Some of the observed impacts in recent years, show that Africa will experience extreme weather and climate events including droughts and floods which will have significant impacts on economic sectors, natural resources, ecosystems, livelihoods, and human health.

The report further revealed that southern Africa will suffer a decrease in water resources due to climate change. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors such as agriculture, water supply, energy production and health. Regionally, it is projected that climate change will result in large increases in irrigation water demand. The beneficial impacts of increased annual runoff in some areas are likely to be tempered by the negative effects of increased precipitation variability and seasonal runoff shifts on water supply, water quality and flood risk.

According to the Limpopo Climate Change Strategy (LCCS) 2016-2020[70], the industrial sector dominates the energy picture of Limpopo Province at 63.8% of total energy consumption and 82.4% of total electricity consumption for the Province. Electricity is the main source of fuel in the industrial sector combined at 51%. Coal contributes 46% and heavy furnace oil 1.5%. Transport-related energy consumption for this sector is

[67] *IPCC. 2021. Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.*

[68] *Ibid.*

[69] *Ibid.*

[70] *Thivhafuni, P. 2016. Provincial Climate Change Response Strategy 2016-2020. Limpopo Department of Economic Development Environment and Tourism (LEDET)*

examined as part of the transport sector. The transport sector accounts for 29% of all energy consumption in the Limpopo Province.

The LCCS further noted that GHG emissions associated with provincial sources and included in the provincial emission inventory are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). To date there is no official GHG inventory published for the Limpopo Province. The current GHG inventory included in the LCCS was conducted in accordance with approved principles and standards of both the International Local Government GHG Emission Analysis Protocol (IEAP) and the Global Protocol for Community scale GHG Emission Inventories (GPC) and should be viewed as a first level emission inventory. Sub-sectors in the land use, land use change and forestry (LULUCF) sector with emissions and removals for afforestation and deforestation are not included in the provincial total.

Table 8-22 provides an overview of the emissions considered in the first level GHG inventory. Scope 1 emissions are all direct emissions sources located within the geographical boundary of Limpopo Province, while Scope 2 emissions are indirect emissions that result from sources located within the geographical boundary of Limpopo Province.

Table 8-22: Scope 1 emission sources categories[71]

Scope 1	**Source Category**	
All direct emissions sources located within the geographical boundary of Limpopo Province	Consumption based emission source	Fossil Fuel - Residential
		Fossil Fuel -Industrial
		Fossil Fuel - Transport
		Fossil Fuel - Agriculture
		Fossil Fuel - General
	Generation based emission source	Matimba Power Station
Scope 2	**Source Category**	
Indirect emissions limited to electricity consumption within the Province, but the associated emissions	Electrical Residential	
	Fossil Industrial	
	Electrical Transport	
	Electrical Agriculture	
	Electricity General	

Table 8-22 above excludes the Medupi Power Station which was not fully operational at the time of the compilation of the LCCS. Construction activities commenced in May 2007 and commissioning was delayed. Unit 6 was synchronized in 2015, the first unit to generate power at the station, followed by Unit 5 in April 2017, Unit 4 in November 2017, Unit 3 in June 2019 and Unit 2 in November 2019. Commercial operation of Unit 1 has been postponed from 2020 to 2021. Once it is fully operational it is projected to emit 32 million tons of carbon dioxide equivalent (CO_2eq) a year.[72]

GHG emissions are attributed to four defined sectors: energy; industrial processes; waste and agriculture. Emissions for energy have further been broken down into four sub-sectors i.e. industrial, residential, transport, agriculture and other sources) as a significant percentage of total emissions are attributed to these sub-sectors.

[71] *Ibid.*
[72] *Global Energy Monitor (GEM). 2021. Medupi Power Station. https://www.gem.wiki/Medupi_Power_Station#cite_note-6 Date of Access: 7 October 2021*

Provincial emissions, across all sectors examined, were approximately 45 603 542 metric tonnes of CO_2eq ($MTCO_2$eq) in 2013. The energy sector is the largest single source of provincial GHG emissions at 67% (30 450 066 tCO_2eq). The industrial and waste sectors contribute 19% (8 581 225 tCO_2eq) and 9% (4 300 883 tCO_2eq) respectively to the provincial GHG emissions.[73]

The promotion of energy conservation and demand management initiatives can significantly reduce emissions. Increasing the use of alternative energy (i.e. wind, hydro, solar) in the supply mix will lower the demand for non-renewable sources and reduce GHG. Solar energy systems are dependent on sunlight and therefore highly suitable for Limpopo, as the Province has 80-95% sunlight presence during the daytime. It should also be noted that renewable energy developments such as the current proposed solar PV plant are more aligned with the more ambitious nationally determined contribution (NDC) targets recently submitted to the UNFCCC.

8.7.3 Observed Hazards and Extreme Events

The Limpopo Province is characterised by four climatic regions, the subtropical plateau which is a flat elevated interior area that is hot and dry with winter rain, the moderate eastern plateau with warm to hot and rainy summers and cold dry winters, the escarpment region with colder weather because of the altitude and rain all year around; and the subtropical Lowveld region, of hot-rainy summers and warm-dry winters, also known as the South African Bushveld.[74]

8.7.3.1 Hazards and Extreme Events

Mpandeli *et al.* describes the Sekhukhune District as being characterized by low rainfall and periodic flooding as well as recurrent droughts especially in 1981/1984, 1988/1989, 1991/1992 and in 2004.[75] Droughts could have an indirect effect on the project as it significantly affects people's vulnerability, and the project would need to avoid exacerbating the situation by depriving people of livelihoods or access to water resources.

A number of climate-related disasters and major occurrences have occurred over the years within the Limpopo Province and within the Sekhukhune District. The list below was compiled from open-source media:

- Every year between June and September, veldfires is a major problem in the area. Every year between June and September the area between Mostelus and Maserumpark experiences veldfires resulting in loss of cropland, also in the area between Tswaing and Thbampshe the annual veldfires result in the loss of livestock and destruction of grazing land.
- 1996, 2002, 2005 and 2008 Floods – floods were recorded to have occurred in Greater Marble Hall.
- 2007/2008 floods - The areas noted to be affected by flooding in Fetakgomo are Pelangwe (2007), Atok and Strydkraal in 2007/2008 and in Apel in 2008.
- 2008, Cholera - the Musina area in the Limpopo Province experienced a cholera outbreak during November 2008.
- 2010, Floods - some parts of the Province received heavy rains in particularly the Vhembe and Sekhukhune Districts.
- Veld and forest fires, 2010 - Waterberg District experienced two significant veld and forest fires on 13 July 2010. The second fire took place on 09 October 2010 in Alma, Verdrag, Velgevonden and Rankiespaas-Alma farms in the Thabazimbi Local Municipality. Eighty thousand hectares of land was destroyed.
- 2011, Floods – a National State of Disaster was declared by the President in a number of provinces, including Limpopo, on 21 January 2011 as a result of heavy rains and floods.

[73] *Thivhafuni, P. 2016. Provincial Climate Change Response Strategy 2016-2020. Limpopo Department of Economic Development Environment and Tourism (LEDET)*
[74] *Ibid.*
[75] *Mpandeli, S., Nesamvuni, E., and Maponya, P. 2015. Adapting to the Impacts of Drought by Smallholder Farmers in Sekhukhune District in Limpopo Province, South Africa. Journal of Agricultural Science. 7. 10.5539/jas.v7n2pxx.*

- 2012, Floods – Limpopo suffered extensive destruction in January 2012 due to severe storms with heavy rain, wind, hail and flooding.
- 2013, Floods - in January 2013 heavy rainfall and severe flooding affected areas in the Vhembe and Mopani District Municipalities. Eskom, also reported flooding affecting their infrastructure and operations in these areas.
- 2013, Floods – a Local State of Disaster was declared in the Mopani District Municipality due to flooding in October 2013.
- 2014, Floods – a Local State of Disaster was declared in the Waterberg District Municipality due to flooding in March 2014.
- 2015, Drought – a Provincial State of Disaster was declared for the Limpopo Province in November 2015.
- 2016, Floods – a Local State of Disaster was declared in the Vhembe District Municipality due to flooding in May 2016.
- 2016, Thunderstorm – a Local State of Disaster was declared in the Mopani District Municipality due to thunderstorms in June 2016.
- 2018, Drought – a National State of Disaster was declared in March 2018.
- 2020, Drought – a National State of Disaster was declared in March 2020.
- 2020, COVID-19 - a National State of Disaster was declared in March 2020.

Various disaster risks have been identified and assessed during 2018/2019 as set out in the risk profile of FGTM. The list below provides an overview of the types of climate related hazards that may affect the project site.

- Severe storms
- Riverine floods
- Water pollution
- Drought
- Lightning
- Air pollution
- Pest infestations – alien vegetation
- Land degradation

The Think Hazard tool, developed by the Global Facility for Disaster Reduction and Recovery, also notes the following hazards (Figure 8-59) for the Sekhukhune District Municipality.

Figure 8-59: Hazards identified for the Sekhukhune District Municipality[76]

[76] *Global Facility for Disaster Reduction and Recovery. 2020. Think Hazard. https://thinkhazard.org/en/report/77355-south-africa-limpopo-sekhukhune-district-municipality Date Accessed: 21 September 2021*

Based on the above, in summary, the main climate-related disaster risks related to the project site are veldfires, drought and severe storms.

8.8 Climate Change Projections

Figure 8-60 provides a comparison of current and future climates for the project area and is based on the Koppen-Geiger climate classification.[77] Based on the classification below, the project area is expected to transition from a more Subtropical Monsoon climate to a Hot Semi-Arid climate, which would entail a shift from high summer rainfall and low winter rainfall to lower rainfall all year round. Similarly, there will be a shift in temperature from very hot to cool with very hot dry summers to very hot summers and mild winters.

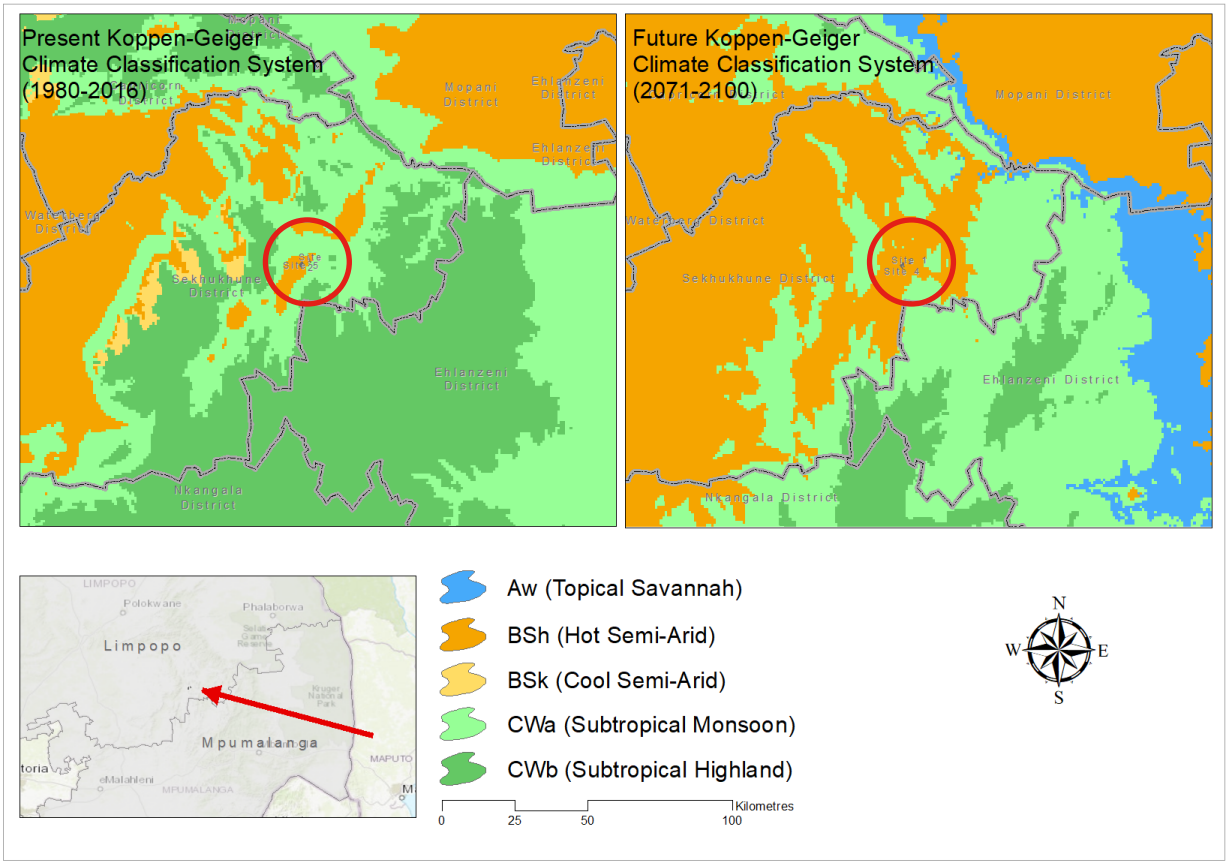


Figure 8-60: Comparison of current and future Koppen-Geiger climate classification for the project area[78]

South Africa has been experiencing acute climate change impacts since at least 2011 and is becoming increasingly aware of future impacts that it must prepare for.[79] The country is located in one of the three regions of the African continent that is most likely to suffer significant adverse impacts from climate change.[80] The country will experience progressively warmer and drier summers, wetter and milder winters and more frequent extreme weather, particularly heavy rainfall and heat waves.

[77] *Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution. Nature Scientific Data: 5(1). DOI: 10.1038/sdata.2018.214.*

[78] *Ibid.*

[79] *Department of Environmental Affairs. 2011. South Africa's Second National Communication Under the United Nations Framework Convention on Climate Change*

[80] *Kirby, A. 2014. 3 African Regions at High Risk from Climate Change. Published on Climate Central on the 11th of May 2014. https://www.climatecentral.org/news/climate-hotspots-imperil-parts-of-africa-17417. Date Accessed: 29 April 2021.*

The Climate Risk and Vulnerability Handbook published by the Council of Scientific and Industrial Research (CSIR) state that changes in rainfall will vary across the region and over time. The Handbook specifies that no models indicate mean wetter futures throughout the simulated period and for maximum temperatures all scenarios suggest an increase in the future. Further projections suggest that the annual frequency of very hot days (number of days when the maximum temperature exceeds 35°C) will increase into the future. An increase in the frequency of extreme rainfall events (20mm of rain falling within 24 hours) is also expected to occur over the north-east corner of South Africa, this is driven by modelled changes in the landfall of tropical cyclones originating in the Indian Ocean.

Downscaled climate change projections for the period 2025-2045 were also obtained from the University of Cape Town's Climate Systems Analysis Group to identify climate change trends for the area. The Representative Concentration Pathway (RCP) 4.5 scenario was selected (Figure 8-61. According to the IPCC, emissions in RCP 4.5 are expected to peak around 2040 and requires that CO_2 emissions start declining by approximately 2045, which aligns with the lifespan of the PV plant, which is 20-25 years. The scenarios support the projections above, anticipating higher temperatures and drought extremes as well as an increase in the frequency of extreme rainfall events.

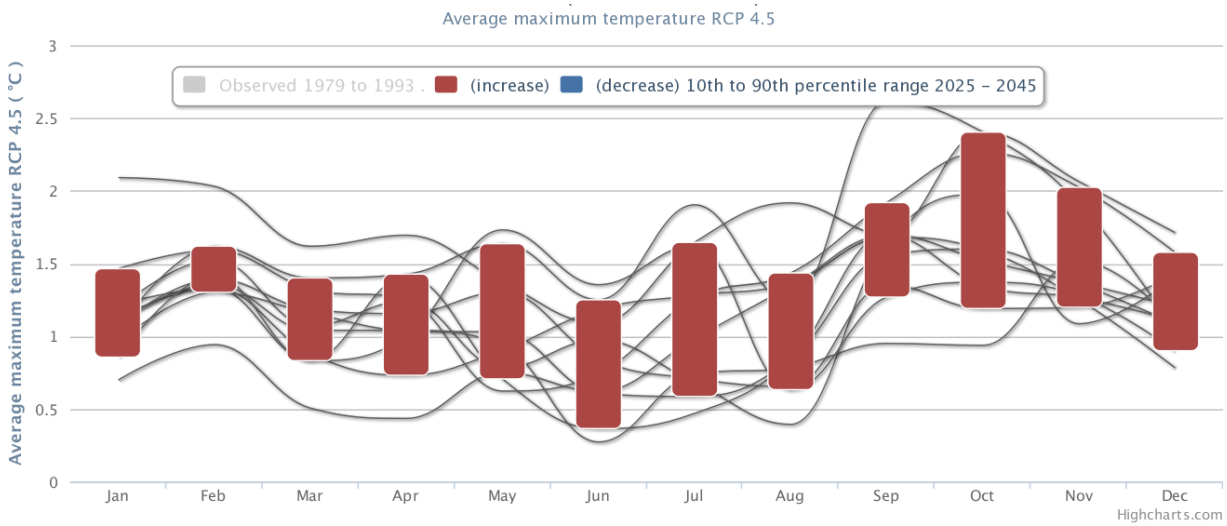


Figure 8-61: Average maximum temperatures projected for the project area for RCP 4.5

Furthermore, the Annual State of the Climate and World Meteorological Organization (WMO) Extreme Climate Indices provide a comprehensive overview of the climate of South Africa during 2019, compared to previous years.

Some of the main conclusions from the results of the analyses contained in the reports[81] [82]are the following:

- For surface temperature there is a general warming trend over South Africa over the period 1931 – present. Annual maximum temperatures are showing an increase in especially the western half of the country, while annual highest daily minimum temperatures are showing significant increases, especially along the coast and parts of the northern interior. The lowest minimum temperature per year shows significant increases almost countrywide. Generally, cool days are decreasing and hot days increasing. Similarly, cold nights are decreasing and warm nights increasing, but not significantly in the central interior. However, the annual maximum warm spells have increased

[81] *South African Weather Service. 2020. Annual State of the Climate of South Africa 2019. Pretoria. South Africa.*
[82] *Zide, T. 2020. South Africa Weather Service Annual Report 2019/2020. South African Weather Service. Pretoria. South Africa.*

significantly over the western and central interior. In contrast, the maximum annual cold spell lengths have decreased countrywide.

- Compared with surface temperature, where all the extreme indices can be linked to a general warming trend, mixed trends are presented by the trends in extreme rainfall indices analysed over the period 1921 to 2019. Most indices can be associated with a decreasing trend in annual rainfall in isolated regions in the eastern and far northern interior, with weaker drying signals in the south-west, while increases in rainfall are shown in the southern interior. The annual maximum daily and five-daily rainfalls show significant increases in the central and southern interior. Trends in the intensity of rainfall on rainy days show mixed signals, but there are clear decreases in the far north-eastern interior and increases in the central and south-eastern parts. Trends in days with daily rainfall above the specific thresholds of 10mm and 20mm mostly indicate increases in the western and southern interior and decreases in the east and north-east. However, in the case of the 25mm threshold, increases are apparent over the central and southern interior and spreading eastwards, while decreases are only apparent in the far north.

    - The annual maximum dry spells are increasing over most of the summer rainfall areas but decreasing in the south-western interior, which can indicate that winter rainfalls in the regions with predominantly summer rainfall are diminishing. The annual maximum spells of wet days are decreasing in the north-eastern half of South Africa but there are signals of significant increases in the south-eastern interior. There are also indications that in general, over most of South Africa, daily rainfalls that are considered to be relatively high are increasing.

The DFFE has undertaken the Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) which aimed at responding to the South African National Climate Change Response White Paper by developing national and subnational adaptation scenarios for the country under plausible future climate conditions.[83] As part of LTAS, climate trends and projections were done at both a national and local scale, in relation to six hydrological zones of South Africa (Figure 8-62).

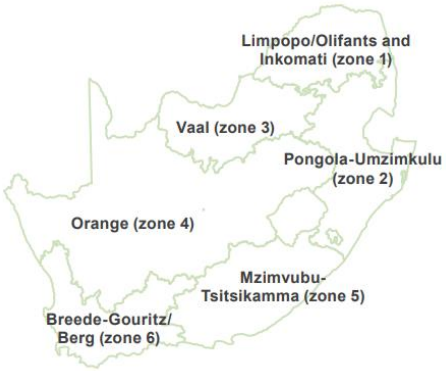


Figure 8-62: The six hydrological zones[84]

The proposed development is located within the Limpopo Water Management Area which fall within Zone 1. Zone 1 includes activities such as irrigated agriculture and livestock farming as well as power generation and increasing mining operations due to the vast untapped mining potential in the area.[85] These activities

[83] *Department of Environmental Affairs. 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa: Summary for Policy-Makers. Pretoria: Department of Environmental Affairs.*
[84] *Ibid.*
[85] *Department of Water and Sanitation. Reconciliation Strategy for the Limpopo Water Management Area North. https://www.dws.gov.za/iwrp/Limpopo/ Date Accessed: 28 Apr 2021*

have high water requirements and with the growing population and economic growth, this zone will have an increasing impact on water demand due to likely reduction in rainfall and significant increased temperatures which are expected due to climate change.[86]

A summary of the LTAS findings is provided below.

8.8.1 Observed Climate Trends for South Africa (1960-2010)

- Mean annual temperatures have increased by at least 1.5 times the observed global average of 0.65°C reported by the Fourth Assessment Report (AR4) of the IPCC for the past five decades.
- Maximum and minimum daily temperatures have been increasing annually, and in almost all seasons. A notable exception is the central interior (Zone 3, Vaal), where minimum temperatures have been increasing less strongly, and some decreases have been observed.
- High and low temperatures (i.e. hot and cold extremes) have respectively increased and decreased in frequency in most seasons across the country, particularly in the western and northern interior.
- The rate of temperature change has fluctuated, with the highest rates of increase occurring from the middle 1970s to the early 1980s, and again in the late 1990s to middle 2000s.
- Rainfall has shown high inter-annual variability, with smoothed rainfall showing amplitude of about 300mm, about the same as the national average.
- Annual rainfall trends are weak overall and nonsignificant, but there is a tendency towards a significant decrease in the number of rain days in almost all hydrological zones. This implies a tendency towards an increase in the intensity of rainfall events and increased dry spell duration.
- There has also been a marginal reduction in rainfall for the autumn months in almost all hydrological zones.
- Extreme rainfall events show a tendency towards increasing in frequency annually, and especially in spring and summer, with a reduction in extremes in autumn.
- Overall, rainfall trends are similar in all the hydrological zones, with rainfall being above average in the 1970s, the late 1980s, and mid to late 1990s, and below average in the 1960s and in the early 2000s, reverting to the long-term mean towards 2010.

8.8.2 Projected Rainfall and Temperature Changes for South Africa (to 2050 and beyond)

- All modelling approaches project warming trends until the end of this century, but most approaches project the possibility of both drying and wetting trends in almost all parts of South Africa.
- Very significant warming, as high as 5–8°C, over the South African interior by the end of this century. Warming would be somewhat reduced over coastal zones.
- A general pattern of a risk of drier conditions to the west and south of the country and a risk of wetter conditions over the east of the country.
- Many of the projected changes are within the range of historical natural variability, and uncertainty in the projections is high.
- Effective global mitigation action is projected to reduce the risk of extreme warming trends, and to reduce the likelihood of extreme wetting and drying outcomes by at least mid-century.
- High resolution regional modelling suggests even larger benefits of effective global mitigation by the end of this century, when regional warming of 5–8°C could be more than halved to 2.5–3°C.
- Overall, there is far greater certainty in temperature than in rainfall projections.

[86] *Department of Environmental Affairs. 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa: Summary for Policy-Makers. Pretoria: Department of Environmental Affairs.*

8.8.3 Projected Climate Futures for South Africa (2015–2035, 2040–2060 and 2070–2090)

South Africa's climate future up to 2050 and beyond can be described using four fundamental climate scenarios at national scale, with different degrees of change and likelihood that capture the impacts of global mitigation and the passing of time.

- **Warmer (3°C above 1961–2000) and Wetter** with substantially greater frequency of extreme rainfall events.
- **Warmer (<3°C above 1961–2000) and Drier**, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.
- **Hotter (>3°C above 1961–2000) and Wetter**, with substantially greater frequency of extreme rainfall events
- **Hotter (>3°C above 1961–2000) and Drier**, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.

In both wetter and drier futures, a higher frequency of flooding and drought extremes could be expected, with the range of extremes significantly increased under unconstrained emissions scenarios. Figure 8-63 gives rainfall projections for these scenarios for Zone 1.

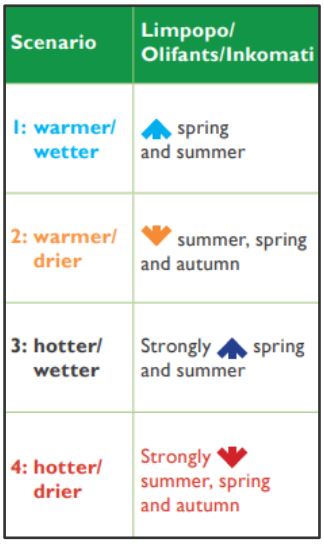


Figure 8-63: Rainfall projections for Zone 1[87]

In summary, available information suggests that most of the Limpopo River Basin will become hotter and significantly drier as average temperatures are projected to increase by 2-3°C by 2050 and by 3-6°C by 2080–2100.[88] In terms of rainfall, both wetter and drier futures are expected, with a higher frequency of flooding and drought extremes.

Figure 8-64 provides a comparison of current and future climates for the project area and is based on the Koppen-Geiger climate classification. [89] Based on the classification below, the project area presently has a predominantly Subtropical highland climate. This oceanic climate, also known as a maritime climate or

[87] *Ibid.*
[88] *Petrie, B., Chapman, A., Midgley, A. and Parker, R. 2014. Risk, Vulnerability and Resilience in the Limpopo River Basin System: Climate change, water and biodiversity – a synthesis. For the USAID Southern Africa "Resilience in the Limpopo River Basin" (RESILIM) Program. OneWorld Sustainable Investments, Cape Town, South Africa.*
[89] *Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution. Nature Scientific Data: 5(1). DOI: 10.1038/sdata.2018.214.*

marine climate, is the Köppen classification of climate typical of west coasts in higher middle latitudes of continents, generally featuring mild summers (relative to their latitude) and cool but not cold winters, with a relatively narrow annual temperature range and few extremes of temperature. This is expected to transition to a Hot Semi-Arid climate in the future. These climates tend to have hot, sometimes extremely hot, summers and warm to cool winters, with some to minimal precipitation.

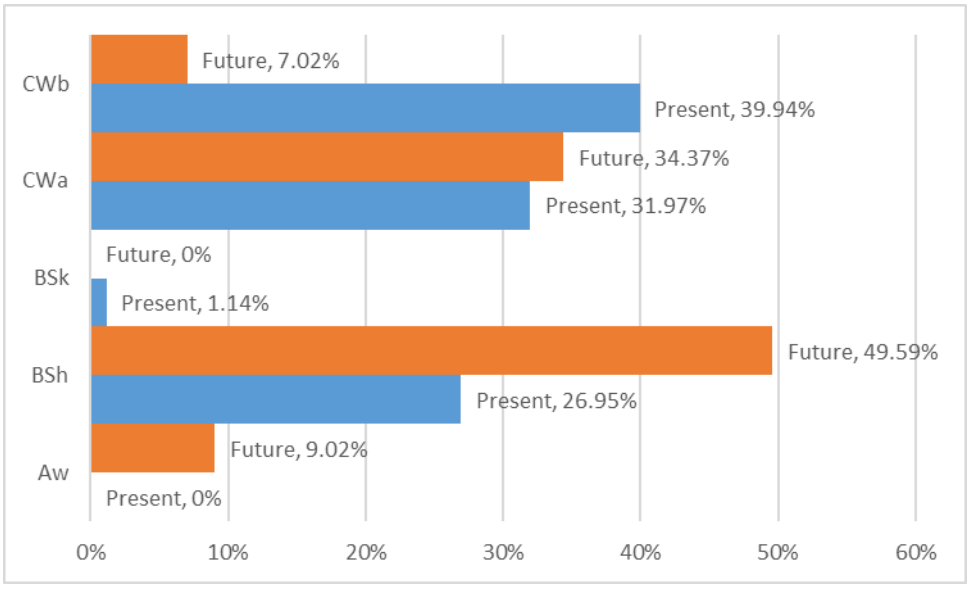


Figure 8-64: Present and future (2100) ratio of Koppen-Geiger climate classification categories[90]

Based on the above, the Limpopo Province would therefore experience regular droughts and heat intensity, water shortages and flooding, as well as spread of diseases with adverse effects on the economy, natural resources, infrastructure, human health and community livelihoods. Water shortages are already a key feature in the drier Limpopo Province and the situation is going to become even more severe as a result of climate change. Important water use sectors such as agriculture and electricity generation (i.e. the energy sector) will face severe effects from climate change.

8.9 General Implications for the Project

The observed trends confirm the general regional pattern of universally increasing temperature indices, and a possibility of decreased overall availability of moisture due to increasingly erratic rainfall and increased evaporation.

The climatic changes will alter the functioning of the natural ecological systems, due to the higher temperatures and lower water availability. The effects will include increased desiccation, species migration, higher wind speeds, increased erosive effects from wind and runoff, etc. The facility's performance may be affected by increased temperatures and increased dust mobilisation that reduce the efficiency of the panels, and intense rainfall, hail or wind that threatens its physical integrity. Furthermore, drier conditions will also mean higher levels of dust settling on the panels, making more regular cleaning necessary, which in turn would increase the water usage.

[90] *Ibid.*

8.10 Avoided GHG Emissions

A study conducted by the United Nations Renewable Energy Lab.[91] Comparing life cycle stages and proportions of GHG emissions from each stage for PV and coal shows that, for coal-fired power plants, fuel combustion during operation emits the vast majority of GHGs. The project lifespan was considered to be 25 years for this study. For PV power plants, the majority of GHG emissions are upstream of operation in materials and module manufacturing and construction activities.

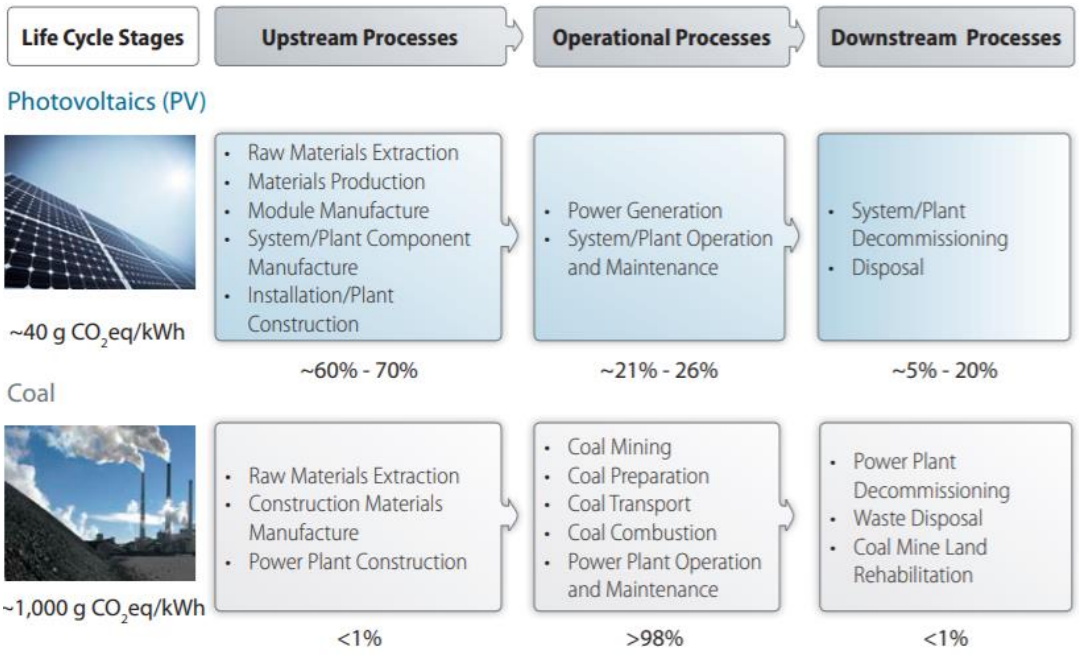


Figure 8-65: Comparison of life cycle stages and proportions of GHG emissions from each stage for PV and coal fired power plants[92]

This is supported by another more recent study that explores and compares the emissions of GHG from various PV systems with fossil fuel energy resources.[93] The results revealed that the negative environmental impacts of PV systems could be substantially mitigated. The carbon footprint emission from PV systems was found to be in the range of 14–73 g CO_2-eq/kWh, which is 10 to 53 orders of magnitude lower than emission reported from the burning of oil (742g CO_2-eq/kWh from oil). It was concluded that the carbon footprint of the PV system could be decreased further using novel manufacturing materials. The study further notes that the recycling of solar cell materials can also contribute up to a 42% reduction in GHG emissions.

Given the latest national GHG emissions total of 513 140 Gg CO_2eq (2017), the project under scrutiny, being a solar PV installation, is expected to have a negligible Scope 1 and 2 emissions profile – i.e. within the project boundaries - and excluding Scope 3 emissions embodied in materials and transport to the site. Emissions during operation will be limited to maintenance activities that require energy other than what is available on site, such as liquid fuels for vehicles. When considering Scope 3 emissions, it has been shown

[91] *National Renewable Energy Laboratory. (2012). Renewable Electricity Futures Study. Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory. http://www.nrel.gov/analysis/re_futures/.*

[92] *Ibid.*

[93] *Tawalbeh, M., Al-Othman, A., Kafiah, F., Abdelsalam, E., Almomani, F. and Alkasrawi M. 2021. Environmental impacts of solar photovoltaic systems: A critical review of recent progress and future outlook. https://doi.org/10.1016/j.scitotenv.2020.143528.*

that the embodied emissions of a solar PV installation are relatively low, as compared to conventional coal, gas, bioenergy or hydropower facilities.[94]

The CO_2 reduction potential was calculated using the UNFCCC Clean Development Mechanism ACM0002 methodology[95]. The baseline scenario of the proposed project is the electricity delivered by the project activity that would have otherwise imported from the Eskom grid had the 100MW AC solar PV generation facility not been connected. The calculations refer to Scope 1 and 2 emissions from the operational phase. Scope 1 and 2 construction emissions will still be factored in a Phase 2 Climate Change Assessment once the information becomes available.

The following assumptions were used in performing the calculations:

- Calculations performed for the PV plant operating life of 25 years;
- Solar PV facility commissioned in 2022 (2022 is referred to as year 1 in calculations);
- Grid emission factor reduction of 2% per year;
- Solar PV facility emits zero emissions as there will be no on-site combustion of fossil fuels during operation of the facility, and
- Solar PV facility annual output of 180GWh with a 1.5% degradation rate in the first year of operation and 0.4% in the remaining operational years.

An Eskom combined grid CO_2 emission factor of 0.9871 tCO_2/MWh obtained from the Institute for Global Environmental Strategies Project Database[96] was used to calculate the baseline emissions. The database provides 'official grid emission factors published by host country governments or published as CDM standardized baseline approved by the CDM Executive Board'.[97] The emission factor can also be calculated using Eskom historic generation data per plant obtained from the Eskom website[98] as well as all the installed renewable generation in the grid[99].

It was estimated that the grid emission factor would reduce by 2% per year over the 25 -year solar PV facility operational period due to addition of more renewable generation into the grid. Table 8-23 shows the calculated CO_2 reduction for the first operational year and the total reduction over the 25 years.

Table 8-23: CO2 reduction potential for the 100MW PV plant

	Unit	Baseline (Eskom Grid)	Solar PV Facility
Net power delivered to the grid[100] (year =1)	MWh/yr	177 300	177 300
Eskom grid CO_2 emission factor (year =1)	t CO_2/MWh	0.97	0
CO_2 emission (year = 1)	t CO_2/yr	171 512	0
Total CO_2 emission (year = 25)	t CO_2	3 255 814	0
CO_2 reduction (year = 1)	t CO_2/yr	**171 512**	
Total CO_2 reduction (year = 25)	t CO_2	**3 255 814**	

[94] *Pehl, M., Arvesen, A., Humpenöder, F., Popp, A., Hertwich, E. G., & Luderer, G. 2017. Understanding future emissions from low-carbon power systems by integration of lifecycle assessment and integrated energy modelling. Nature Energy, 2, pages939–945. doi:doi: 10.1038/s41560-017-0032-9*

[95] *https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG*

[96] *https://pub.iges.or.jp/pub/iges-list-grid-emission-factors*

[97] *Institute for Global Environmental Strategies (2021). List of Grid Emission Factors version 10.10. Available at: https://pub.iges.or.jp/pub/iges-list-grid-emission-factors*

[98] *CDM calculations (eskom.co.za)*

[99] *https://www.eskom.co.za/IR2021/pages/default.aspx*

[100] *Assumed all power generated can be delivered to the grid*

The CO_2 reduction potential of the solar PV facility will be 171 512 ton of CO_2 in the first year of operation and a total of 3 255 814 ton of CO_2 over 25 years. The South African national carbon budget is targeted at 350Mt CO_2eq for 2025 according to the nationally determined contribution (NDC) recommended by South Africa's Presidential climate commission in July 2021.[101] Considering the 2025 NDC, the solar project will marginally decrease the targeted GHG by a factor of about 0.05%.

[101] *https://climateactiontracker.org/blog/south-africas-presidential-climate-commission-recommends-stronger-mitigation-target-range-for-updated-ndc-close-to-15c-compatible/*

9 IMPACT IDENTIFICATION AND ASSESSMENT

Impact assessments must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). Each issue/ impact is also assessed according to the project stages construction (including pre-construction) and operation to the closure/ rehabilitation phase (where applicable). The construction period of the project is estimated to be between 12 - 18 months and the operational period of individual plant will be 25 years. Decommissioning is not foreseen in the next 25 years.

The comparative assessment of power corridor infrastructure (overhead lines and underground cables) are noted where the specialist assessments have made specific recommendations.

9.1 Impact Assessment Methodology

9.1.1 Potential Impacts and Significance

The potential environmental impacts associated with the project will be evaluated according to its nature, extent, duration, intensity, probability and significance of the impacts (Table 9-1).

Table 9-1: Environmental criteria to be rated

Environmental Criteria	Description
Nature	A brief written statement of the environmental aspect being impacted upon by a particular action or activity
Extent/ Scale	The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale
Duration	Indicates what the lifetime of the impact will be
Magnitude	Describes whether an impact is destructive or benign
Probability	Describes the likelihood of an impact actually occurring

The probability and the occurrence as well as severity (incorporating the extent/ scale and magnitude) of impact will be assessed.

Table 9-2: Criteria for the ranking of impacts

Ranking Criteria	
Probability	***Duration***
5 – Definite	5 - Permanent
4 - Highly probable	4 - Long-term
3 - Medium probability	3 - Medium-term (5 - 15 years)
2 - Low probability	2 - Short-term (0 - 5 years)
1 - Improbable	1 – Immediate
0 – None	0 – None

Ranking Criteria	
Extent/ Scale	***Magnitude***
5 - International	10 - Very High
4 - National	8 – High
3 - Regional	6 – Moderate
2 - Local	4 – Low
1 - Site	2 – Minor
0 – None	0 – Negligible

Once these criteria have been ranked for each impact, the significance will be determined using the following formula:

SP (significance points) = (magnitude + duration + scale) x probability

The maximum value is 100 significance points (SP). The impact significance (Table 9-3) is then rated as follows:

Table 9-3: Impact significance

SP >75	Indicates high environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 - 75	Indicates moderate Environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates low environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that constitutes an improvement over pre-project conditions

Cumulative impacts (where applicable) will also be determined. A cumulative impact in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary will have been included in the EMPrs (***Appendix G - I***).

Refer to ***Appendix J*** for the detailed assessment of potential impacts.

9.2 Agricultural Potential

The loss of agricultural potential by occupation of land is normally the most important agricultural impact of any development on agricultural land. However, in this case, because agricultural use of the land is not possible (refer to Section 8.1), this impact is not relevant. Therefore, only one agricultural impact has been identified, which is a direct impact i.e. loss of agricultural potential by soil degradation.

9.2.1 Construction

Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface runoff characteristics, which can be caused by construction-related land surface disturbance, vegetation removal, and the establishment of hard surface areas like panels and roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.

The impact is **low (SP = -10)** with mitigation and the significance can be reduced even **lower (SP = -5)** with the implementation of the following mitigation measures:

- Implement an effective system of stormwater runoff control, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any runoff water from all hardened surfaces and it must prevent any potential down slope erosion.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the sites, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil profile below surface, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation, which may be after construction or only at decommissioning.
- Spillages must be cleaned up immediately and contaminated soil must either be remediated *in situ* or disposed of at an appropriately licenced landfill site.

9.2.2 Operations

During operations, the mitigation measures include maintaining the stormwater runoff control system and monitoring erosion and remedying the stormwater control system in the event of any erosion occurring. The impact on soils resources during operations would be **low (SP = -12)** without mitigation and **low (SP = -6)** with mitigation.

9.2.3 Decommissioning/ Closure and Rehabilitation

During closure and decommissioning, soil degradation can result from erosion, topsoil loss and contamination. Erosion can occur as a result of the alteration of the land surface runoff characteristics, which can be caused by decommissioning-related land surface disturbance. Loss of topsoil can result from poor topsoil management during decommissioning related excavations. Hydrocarbon spillages from decommissioning activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.

The impact is **low (SP = -10)** with mitigation and the significance can be reduced even **lower (SP = -5)** with the implementation of the mitigation measures provided in Section 9.2.1 as well the EMPrs (***Appendix G - I)***.

9.2.4 Cumulative

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of agricultural land, with a consequent decrease in agricultural production. The proposed development has zero impact on future agricultural production, as long as it does not degrade the agricultural resource base so that future agricultural production is compromised. If the project contributes zero impact to the cumulative impact, then its cumulative impact must be assessed as insignificant. The proposed development is therefore acceptable in terms of cumulative impact.

9.2.5 Comparative Assessment of Alternatives

Due to the nature of the impacts and the effectively uniform agricultural potential conditions across the site, there will be no material difference between the agricultural impacts of any alternative layouts within the site boundaries and any technology alternatives. All alternatives are considered acceptable.

9.3 Hydrology

9.3.1 Construction

The proposed impacts during the construction phase include:

- Disturbance of the vadose zone during excavations/ construction activities.
- Surface water contamination and sedimentation from erosion and alteration of natural drainage lines which may lead to ponding or increased runoff patterns (i.e. may cause stagnant levels or increase in erosion).
- Spillage of fuels, lubricants and other chemicals.
- Increased runoff altering flow regimes of receiving watercourses due to vegetation removal and compacting of soil.

The above impacts are rated as being of **moderate (SP = -20)** significance pre-mitigation and **low (SP = -10)** post-mitigation.

The following mitigation is proposed:

- Only excavate and clear areas applicable to the project area.
- Phase the construction works.
- Survey the site, remove large vegetation and then construct the SWMP infrastructure prior to continuing with the clearing and construction of the remainder of the site.
- Construct silt traps at the entrances to the SWMP infrastructure and at the outlet points. These silt traps will be in position for the duration of construction and will serve to trap the sediment. Sediment deposits should regularly be cleared and recompacted into the site or onto the stockpiles of material.
- Use silt-fences (strips of permeable geotextile) around the perimeter of the works.
- Divert stormwater away from construction activities by the use of temporary berms. The topography of the site is favourable in that it is situated on a slope so runoff will naturally drain away from the site, but diversion/ protection berms can be constructed around stockpiles to prevent rainwater from running through them and becoming contaminated.
- Exposed soils to be protected using a suitable covering.
- Existing roads should be used as far as practical to gain access to the site and crossing the streams in areas where no existing crossing is apparent should be unnecessary, but if it is essential crossings should be made at right angles.
- Clean up spillages immediately.
- Keep chemicals in bunded areas.
- Keep vehicles and equipment clean.

9.3.2 Operations

During operations, erosion due to change in topography, land use and vegetation removal may have an impact significance of **moderate (SP = -32)** without mitigation. Mitigation measures include designing the SWMP to ensure that the velocities of stormwater runoff flow are kept to a minimum; release structures must be installed to dissipate stream power and erosion protection measures such as rip rap should be designed into the release structures. With the implementation of mitigation measures, the significance of the impact will be **low (SP = -14)**.

Increased runoff due to compacted surfaces from the proposed site onto surrounding soils may cause higher velocities and frequency of occurrence and sediment transport to the nearby streams. As a form of mitigation, release structures for stormwater runoff from the site must be installed to dissipate energy and disperse flow to ensure minimal impact to the receiving environment. The significance of this impact is **moderate (SP = -32)** without mitigation and **low (SP = -16)** with mitigation.

Potential sedimentation may still be observed several months after the site has been constructed. Stormwater release structures for runoff from the sites should incorporate silt traps to allow for settlement of sediments. These silt traps must be regularly cleaned. The significance of this impact is **moderate (SP = -35)** without mitigation and **low (SP = -12)** with mitigation.

Impacts to water quality during operation and maintenance activities have a **moderate (SP = -28)** significance prior to mitigation and a **low (SP = -14)** significance with mitigation. Mitigation measures include:

- Implementation of a SWMP to keep clean water away from dirty areas.
- Demarcated dirty area to be limited to roads, parking areas and chemical storage areas.
- Spills must be cleaned up immediately.
- Vehicles and equipment to be regularly maintained and cleaned.

9.4 Freshwater

9.4.1 Construction

During the construction phase, the removal of vegetation and associated disturbances to soils (outside of the outside of the Steelpoort River and non-perennial rivers and associated floodlines, but within the 32m and 100m ZOR may result in the following impacts:

- Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream watercourse areas,
- Exposure of soils, leading to increased runoff, and erosion, and thus increased sedimentation of the watercourses.
- Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses.
- Proliferation of alien and/ or invasive vegetation as a result of disturbances.

The following mitigation is proposed that would reduce the significance from **moderate (SP = -36)** to **low (SP = -14)** post-mitigation:

- During construction activities associated with surface infrastructure within close proximity to a watercourse, regular spraying of non-potable water or the use of chemical dust suppressants must be implemented to reduce dust and to ensure no smothering of vegetation within the watercourses occurs from excessive dust settling.
- The watercourses must be considered as No-Go areas. No construction vehicles, or construction personnel or vehicles may traverse through these watercourses.
- All vehicle re-fuelling must take place outside of the 32m ZoR.

- No vegetation may be removed from the 32m ZoR surrounding the watercourse where no infrastructure is planned within 32m thereof, as this provides a natural buffer zone around the watercourses which disperse surface runoff into the watercourses, and thus prevents sedimentation and erosion thereof.
- Installation of appropriately sized silt traps and attenuation facilities in the correct locations to minimize sediment-laden runoff from entering the Steelpoort River – refer to Section 9.3.1.

The construction of new roads and installation of underground cables traversing through watercourses may lead to further sedimentation, erosion and alien and/ or invasive vegetation proliferation. With the implementation of mitigation measures such as:

- Undertaking construction works during the dry, winter months when the flow is very low in the watercourses, and no diversion of flow would be necessary.
- The reaches of the watercourses where no activities are planned to occur must be considered No-Go areas. These No-Go areas can be marked at a maximum distance of 5m upstream and downstream of the proposed road crossing. This 5m buffer area would allow for construction personnel, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be constructed.
- The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2m. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/ invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.

This impact is rated as **low (SP = -27)** pre-mitigation to **low (SP = -14)** post-mitigation.

Earthworks relating to foundations and trenches, backfilling of excavated and disturbed areas and miscellaneous activities by construction personnel (outside of the Steelpoort River and non-perennial rivers and associated floodlines, but within the 32m and 100m ZOR) may result in altered runoff patterns within the local catchment of the watercourses, potentially leading to increased erosion and sedimentation of the watercourses, potential impacts on the water quality of surface runoff (when present) which may potentially enter the watercourses and potential of backfill material entering the watercourses, increasing the sediment load of the watercourses.

The following mitigation is proposed that would reduce the significance from **moderate (SP = -36)** to **low (SP = -14)** post-mitigation:

- During excavation activities, the topsoil and vegetation should be stockpiled separately from other material outside of the 32m NEMA ZoR.
- All exposed soils must be protected for the duration of the construction phase to prevent potential erosion and sedimentation of the watercourses.
- Construction of the proposed surface infrastructure may result in disturbance to the natural buffer zone surrounding the watercourses which may result in the reduction of surface roughness. This can be mitigated by ensuring that no concentrated runoff from the surface infrastructure construction area enters the watercourses. This can be achieved by installing silt traps or placing haybales down gradient of the construction footprint to ensure no sediment-laden or concentrated runoff generates from the construction footprint.
- It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction.
- Installation of appropriately sized silt traps and attenuation facilities in the correct locations to minimize sediment laden runoff from entering the Steelpoort River - refer to Section 9.3.1.

Construction of new road crossings and trenching through the watercourses (impact on the Steelpoort River) is rated as a **moderate (SP = -30)** pre-mitigation to **low (SP = -12)** post-mitigation whilst the construction of

new road crossings and trenching through the watercourses (direct impact on the drainage lines) is rated as **moderate (SP = -48)** pre-mitigation to **moderate (SP = -30)** post-mitigation:

The following mitigation is proposed:

- During the construction of internal roads and associate cable installation that may potentially traverse watercourses, a buffer of no more than 5m on either side of the proposed road reserve through the watercourses may be impacted. This area must be cordoned off, and no vehicles or personnel are permitted outside of the authorised construction area.
- Material to be used (gravel) as part of the road construction must be stockpiled outside the 32m NEMA ZoR of the watercourses to prevent sedimentation thereof and to avoid any other vegetation to be impacted by the construction activities. These stockpiles may not exceed a height of 2m and should be protected from wind using covers.
- All alien and invasive vegetation should be removed. All material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.

The canalisation of two ephemeral drainage lines located in Site 5 (impact on the Steelpoort River) is rated as a **moderate (SP = -48)** pre-mitigation to **low (SP = -20)** post-mitigation whilst the canalisation of two ephemeral drainage lines located in Site 5 (direct impact on the drainage lines) is rated as **moderate (SP = -52)** pre-mitigation to **moderate (SP = -33)** post-mitigation:

The following mitigation is proposed:

- Construction works should be undertaken during the dry winter months.
- No mixed concrete may be deposited outside of the designated construction footprint.
- Installation of appropriately sized silt traps and attenuation facilities in the correct locations to minimize sediment-laden runoff from entering the Steelpoort River - refer to Section 9.3.1.
- The stormwater outlet should be constructed from energy dissipating structures to slow down the velocity of water inflow to the Steelpoort River.
- Use soft engineering techniques (swales and other attenuation devises such as cobble beds) must be used to appropriately manage water in the landscape.
- Release of the stormwater into the riparian area of the Steelpoort River must not result in further erosion, sedimentation and bank incision.

9.4.2 Operations

Operation and maintenance of the surface infrastructure outside the Steelpoort River and non-perennial rivers and associated floodlines (but within the 32m and 100m zones of regulation) may result in the disturbance to soils and ongoing erosion as a result of periodic maintenance activities and altered water quality (if surface water is present) as a result of increased availability of pollutants. The following mitigation is proposed that would reduce the significance from **moderate (SP = -36)** to **low (SP = -21)** post-mitigation:

- No indiscriminate driving through the watercourses may be permitted during standard operational activities or maintenance activities. Use must be made of the existing watercourse crossings only.
- Ensure that routine inspections and monitoring of any instream infrastructure are undertaken to monitor the establishment of indigenous vegetation and the presence of any alien or invasive plant species.
- The surface infrastructure areas must be inspected to ensure that no concentrated runoff from these areas forms erosion gullies and eventually flow into the watercourses. Should this be noted, these gullies/ preferential flow paths must be infilled with *in situ* material and appropriately revegetated.
- Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically at the road crossings and surface infrastructures.

The operation and maintenance of roads traversing watercourses may result in concentrated runoff from the road crossing leading to erosion and subsequent sedimentation of the watercourses (increase in the sediment load) and turbulent flows when surface water is present as well higher flood peaks into the

watercourses due to reduced surface roughness in the watercourses. The following mitigation is proposed that would reduce the significance from **low (SP = -27)** to **low (SP = -14)** post-mitigation:

- Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings.
- Stormwater runoff from the road crossings should be monitored, so it does not result in erosion of the watercourses.
- Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted.
- During periodic maintenance activities of the roads, monitoring for erosion should be undertaken. Should erosion be noted that was caused by the road crossings the area must be rehabilitated by infilling the erosion gully and re-vegetation thereof with suitable indigenous vegetation.

9.4.3 Decommissioning/ Closure and Rehabilitation

The removal of all surface infrastructure from the study area may result in the disturbance of soil and established vegetation in the operational area. The following mitigation is proposed that would reduce the significance from **moderate (SP = -36)** to **low (SP = -14)** post-mitigation:

- All surface infrastructure within the watercourses and that within its 100m ZoR must be decommissioned.
- High flood peaks from the decommissioning footprint areas can be mitigated by ensuring that no concentrated runoff from the surface infrastructure area and subsequent cleared area enters the watercourses. The velocity of surface water flow from these areas must be reduced by entering that the vegetation in the buffer area surrounding the watercourses are intact or by the strategic placement of silt traps of haybales as a means to obstruct flow but still allow flow to percolate at a reduced velocity and encourages a diffuse flow pattern.
- Areas where surface infrastructure have been decommissioned and removed must be suitably compacted and revegetated to ensure that no erosion occurs which may contribute to the sediment load of the watercourses.
- Should erosion gullies be noted, these areas must be rehabilitated by infilling them with suitable soil and ensuring the area is vegetated.
- Should road crossings be decommissioned, road footprint areas in the watercourse must be levelled to the same level and shape as that of the upstream and downstream reaches. This will ensure a continuous bed level and prevent any concentration of surface flow from occurring.
- All bare areas in the study area, specifically where vegetation was initially cleared for surface infrastructure components) must be ripped and be revegetated within suitable indigenous vegetation species.

9.4.4 Cumulative

Cumulative and latent impacts include:

- The soils of this area are particularly prone to erosion. With site clearing for the PV arrays there is a risk of reduced surface roughness, which will increase the risk of erosion and sedimentation of the non-perennial watercourses and the Steelpoort River.
- Alterations to stormwater runoff within the area, altering the hydrological processes of the systems and increased sedimentation.
- Sediment-laden stormwater runoff entering the Steelpoort River, leading to smothering of biota and potentially altering surface water quality is a potential impact that might occur during the operational phase of the PV plant.
- Proliferation of alien and weed species in disturbed areas will lead to altered vegetation communities within the riparian zone and adjacent areas.

9.5 Flora/ Vegetation

9.5.1 Construction

a) Site 1

Much of Site 1 constitute deteriorated woodland and results of the site inspection indicated that the presence of conservation important and protected plant species on this site is low, or unlikely. Anticipated impacts from a botanical perspective are therefore likely to be moderate, mostly as a result of the minor losses of remaining natural woodland from the site (also in context with the location of the proposed site adjacent to existing transformed areas). However, the abundant presence of invasive exotic species on the site and the likely (if left uncontrolled) spread of these species to surrounding areas of natural woodland habitat types is considered an important consideration. The introduction of a generic mitigation approach, but with specific reference to the management and control of invasive plant species from the site, is likely to reduce the anticipated impacts significance to acceptably low levels – refer to the EMPrs (***Appendix G - I***).

The impacts for Site 1 as well as the significance rating before and after mitigation are presented:

- Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance – **moderate (SP = -40)** pre-mitigation and **low (SP = -20)** post-mitigation.
- Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types - **moderate (SP = -30)** pre-mitigation and **low (SP = -10)** post-mitigation.
- Depletion of local floristic diversity and loss of rare species or flora communities – **moderate (SP = -30)** pre-mitigation and **low (SP = -20)** post-mitigation.
- Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale – **low (SP = -22)** pre-mitigation and **low (SP = -9)** post-mitigation.
- Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat - **low (SP = -20)** pre-mitigation and **low (SP = -9)** post-mitigation.
- Introduction of exotic and invasive species to the area or exacerbating the spread of existing infestations – **moderate (SP = -52)** pre-mitigation and **low (SP = -20)** post-mitigation.

b) Site 2

While parts of this proposed site are considered deteriorated and heavily infested with exotic and invasive plants, other portions comprise comparatively natural savanna habitat that is also representative of the regional ecological types (which is considered vulnerable on a regional scale), and losses of remaining natural habitat is an important consideration. Ultimately, the abundant presence of several protected plants, notably the vulnerable *Adenia fruticosa*, ultimately renders the remaining natural vegetation comparatively sensitive, and losses of these conservation important plants is an important consideration on a local scale. As this site is spatially situated on the perimeter of areas of existing transformation, including industrial and linear activities, the buffering role that this portion of land plays between these areas and pristine and natural habitat further to the south of the site is also considered important. While the anticipated impact significance is considered to be moderately high, the introduction of generic and site-specific mitigation measures, notably a dedicated invasive species management programme will result in amelioration of high significance impacts to a more acceptable level – refer to the EMPrs (***Appendix G - I***).

The impacts for Site 2 as well as the significance rating before and after mitigation are presented:

- Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance – **high (SP = -75)** pre-mitigation and **high (SP = -70)** post-mitigation.

- Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types - **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Depletion of local floristic diversity and loss of rare species or flora communities – **moderate (SP = -30)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale – **moderate (SP = -52)** pre-mitigation and **low (SP = -18)** post-mitigation.
- Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat - **low (SP = -26)** pre-mitigation and **low (SP = -20)** post-mitigation.
- Introduction of exotic and invasive species to the area or exacerbating the spread of existing infestations – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.

c) Site 3

This site comprises natural shrubveld habitat that is representative of the regional ecological types. Considering that the regional type is categorised as Vulnerable, and also with the known presence of conservation important plants within this site, the floristic sensitivity is considered moderately high. Losses of conservation important plants and natural savanna habitat is therefore considered significant on a local scale and the implementation of a generic mitigation approach, notably the relocation of conservation important plants from the site, will only render the post-mitigation significance of anticipated impacts moderate, albeit mostly localised - refer to the EMPrs (***Appendix G - I***).

The impacts for Site 3 as well as the significance rating before and after mitigation are presented:

- Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance – **high (SP = -75)** pre-mitigation and **high (SP = -70)** post-mitigation.
- Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types - **high (SP = -75)** pre-mitigation and **moderate (SP = -55)** post-mitigation.
- Depletion of local floristic diversity and loss of rare species or flora communities – **moderate (SP = -60)** pre-mitigation and **moderate (SP = -44)** post-mitigation.
- Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat - **low (SP = -26)** pre-mitigation and **low (SP = -18)** post-mitigation.
- Introduction of exotic and invasive species to the area or exacerbating the spread of existing infestations – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.

d) Site 4

This site comprises natural shrubveld habitat that is representative of the regional ecological types. Considering that the regional type is categorised as Vulnerable, and also with the known presence of conservation important plants within this site, the floristic sensitivity is considered moderately high. Losses of conservation important plants and natural savanna habitat is therefore considered significant on a local scale and the implementation of a generic mitigation approach, notably the relocation of conservation important plants from the site, will only render the post-mitigation significance of anticipated impacts moderate, albeit mostly localised - refer to the EMPrs (***Appendix G - I***).

The impacts for Site 4 as well as the significance rating before and after mitigation are presented:

- Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance – **high (SP = -75)** pre-mitigation and **high (SP = -70)** post-mitigation.
- Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types - **high (SP = -75)** pre-mitigation and **moderate (SP = -55)** post-mitigation.
- Depletion of local floristic diversity and loss of rare species or flora communities – **moderate (SP = -60)** pre-mitigation and **moderate (SP = -44)** post-mitigation.
- Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat - **low (SP = -26)** pre-mitigation and **low (SP = -18)** post-mitigation.
- Introduction of exotic and invasive species to the area or exacerbating the spread of existing infestations – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.

e) Site 5

Aspects that render this site moderately high in sensitivity, despite the moderately deteriorated nature of most of the habitat, include the abundant presence of conservation important plants and protected tree species, the presence of the ecologically significant and sensitive Steelpoort River system to the immediate north of the site and several smaller drainage lines across the larger site. The proximity of these surface drainage systems are important considerations, albeit mostly in ecological terms (and not necessarily as significant botanical features), ultimately renders the anticipated significance of impacts on the floristic receiving environment of a high nature, despite the moderately deteriorated status of much of the shrubveld of this site - refer to the EMPrs (***Appendix G - I***) for mitigation measures.

The impacts for Site 5 as well as the significance rating before and after mitigation are presented:

- Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance – **high (SP = -85)** pre-mitigation and **high (SP = -70)** post-mitigation.
- Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types - **high (SP = -75)** pre-mitigation and **moderate (SP = -55)** post-mitigation.
- Depletion of local floristic diversity and loss of rare species or flora communities – **moderate (SP = -60)** pre-mitigation and **moderate (SP = -44)** post-mitigation.
- Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat - **low (SP = -26)** pre-mitigation and **low (SP = -18)** post-mitigation.
- Introduction of exotic and invasive species to the area or exacerbating the spread of existing infestations – **moderate (SP = -60)** pre-mitigation and **low (SP = -22)** post-mitigation.

9.6 Fauna (all 5 sites)

9.6.1 Construction

- Direct and permanent loss of natural fauna habitat (especially habitat with a high or moderate-high faunal importance) located within the development footprint during the construction, operational and

also the decommissioning phases. The decommissioning or closure phase will entail rehabilitation of affected/ lost habitat - **high (SP = -75)** pre-mitigation and **moderate (SP = -44)** post-mitigation.
- Indirect losses of animal taxa, especially threatened and near threatened bird and mammal species due to the displacement from the area during the construction and operational phases - **moderate (SP = -65)** pre-mitigation and **low (SP = -22)** post-mitigation.
- Indirect ecological impacts during all phases pertaining to the loss of the ecological connectivity and faunal dispersal corridors - **moderate (SP = -60)** pre-mitigation and **moderate (SP = -33)** post-mitigation.
- Indirect impacts related to anthropogenic encroachment (job-seeking people, increased plundering of natural resources and poaching of wildlife due to increased human encroachment) - **low (SP = -28)** pre-mitigation and **low (SP = -88)** post-mitigation.

Refer to the EMPrs (***Appendix G - I***) for mitigation measures.

9.6.2 Operations

During operations, secondary impacts related to infrastructure attracting animals (nesting and roosting on structures, foraging underneath panels, bird pollution) is rated a **moderate (SP = -56)** significance pre-mitigation and **low (SP = -24)** post-mitigation.

The following mitigation is proposed:
- Apply appropriate deterrent devices to prevent birds from nesting on important structures.
- Monitor any nest-building activities and remove/ trim nests that are a risk (fire risk or affecting the operations of the solar facilities) with the consent of the local Conservation Department. Trimming should only be conducted during the non-breeding season.
- Conduct regular screens to determine the occurrence/ density of invader taxa (e.g. invader/ alien rats and mice, domestic cats). If detected, a specialist in the field of pest control should be appointed to rectify the problem with the consent of the local Conservation Department.
- No pets should be allowed on the premises, with specific reference to feral cats.

9.7 Cumulative (Flora and Fauna)

Anticipated cumulative impacts of the proposed project include:
- Inappropriate harvesting of natural resources and exacerbation of pressure on natural resources due to increased human encroachment, accessibility to the site, also considering changes in land use of surrounding areas that are not compatible to conservation efforts;
- Exacerbation of existing levels of habitat fragmentation and isolation, considering past, present and reasonably foreseeable future anthropogenic disruptive activities in the immediate region, with specific reference to mining activities; and
- Cumulative impacts on local/ regional and national conservation efforts, targets, and obligations (loss of natural habitat).

9.8 Avifauna

9.8.1 Construction

a) Loss of habitat

One of the primary impacts associated with the development of a PV solar power generation facility is its physical transformation of large areas of natural vegetation – in many cases PV facilities involve the complete removal of vegetation from the inclusive footprint of the installed infrastructure. It is understood that such an approach would be adopted for the proposed development especially in areas where rocky outcropping or uneven terrain occur. On Site 5, two of the watercourses that drain the site are proposed to

be transformed into 4.5m-wide culverts, thus resulting in further habitat loss. The habitat transformation associated with the clearing of all vegetation could result in a number of impacts on birds, including:

- direct habitat loss which would be particularly significant for species with restricted ranges or very specific habitat requirements,
- habitat fragmentation and/or modification; and
- disturbance / displacement of species (e.g. through construction / maintenance activities).

The development of the arrays will have a significant impact on the bird assemblage (abundance and species density) on the sites, and most birds that currently occur on the woodland on the sites will no longer be able to inhabit the sites once construction (vegetation clearing) has commenced. The fragmented layout of the development in being split into five distinct sites will entail that habitat destruction will be limited to the solar array and ancillary infrastructure footprint, and thus natural habitat will be retained in areas located immediately adjacent to, or between sites. This is an important factor in limiting the impact of the proposed development on avifauna in the study area.

Although the numbers of birds will be reduced in the study area through loss of habitat, the retention of intervening areas of natural habitat will reduce the impact of habitat transformation, allowing the bird species composition in the study area to remain similar to pre-development levels provided that vegetation clearing outside of the infrastructure footprint is prevented. The retention of adjacent habitat will also assist in the maintaining of bird movement corridors between residual areas of natural habitat, particularly in the context of the linkage of the large unimpacted areas of natural habitat to the south and south-west of the sites with the Steelpoort River and associated riparian zone.

Accordingly, various parcels of land adjacent to the sites and arrays have been identified as being critical to ensuring ecological connectivity between areas of residual habitat. Such areas are indicated in Figure 9-1 and include:

- The riparian zone of the Steelpoort River located to the north of Site 5.
- The riparian zone of the watercourse and flanking woodland located between Site 4 and the H:H Waste Facility dam and Site 3.
- The downstream reach of the same (above) watercourse and riparian zone that bisects Site 5.
- Remnant woodland between the R37 link road and the solar panel arrays on Site 1.
- Remnant woodland located between the northern boundary of Site 2 and the rail shunting yards
- The watercourse located immediately west of Site 2.

It is strongly recommended that these areas, along with the riparian corridor of the Steelpoort River be maintained as areas of natural woodland.

b) Construction-related disturbance and displacement impacts

The construction of the solar panel arrays over a large area will be a massive undertaking that will involve bulk earthworks, the removal of vegetation, and in some cases the removal of outcropping or underlying bedrock. Construction will thus be very noisy, will at times generate large volumes of dust, and will involve the use and co-ordination of large numbers of plant and other vehicles. Sources of loud noise are likely to have varied, but definite impacts on birds.

In the context of the study area, it is important to note however that the TFC Smelter provides a significant source of noise to the ambient noise levels in the area. The baseline is thus altered from a natural setting, especially for parts of certain of the development sites that are located closest to the TFC Smelter (parts of Sites 3 and 5). Nonetheless, construction activities, in particular the above-mentioned high noise generating activities would be likely to lead to the displacement and disturbance of birds, even in areas not being developed that are located adjacent to the development site. This is a temporary impact that will last for the duration of the construction in that particular development site/ s but may lead to the temporary displacement

of birds and the abandonment of breeding efforts. This would be particularly significant for larger species of birds which occur in lower densities due to the occurrence of large territories. The presence of a suspected Wahlberg's Eagle nest has been discussed in Section 8.5.2 and the undertaking of construction when such species are not breeding is important. The majority of bird species breed in the summer months, and accordingly it is thus recommended that construction activities, in particular earth moving, rock removal and vegetation clearing occur in the winter months when most bird species are not breeding and there is a lower number and species diversity on the site due to the absence of migratory species.

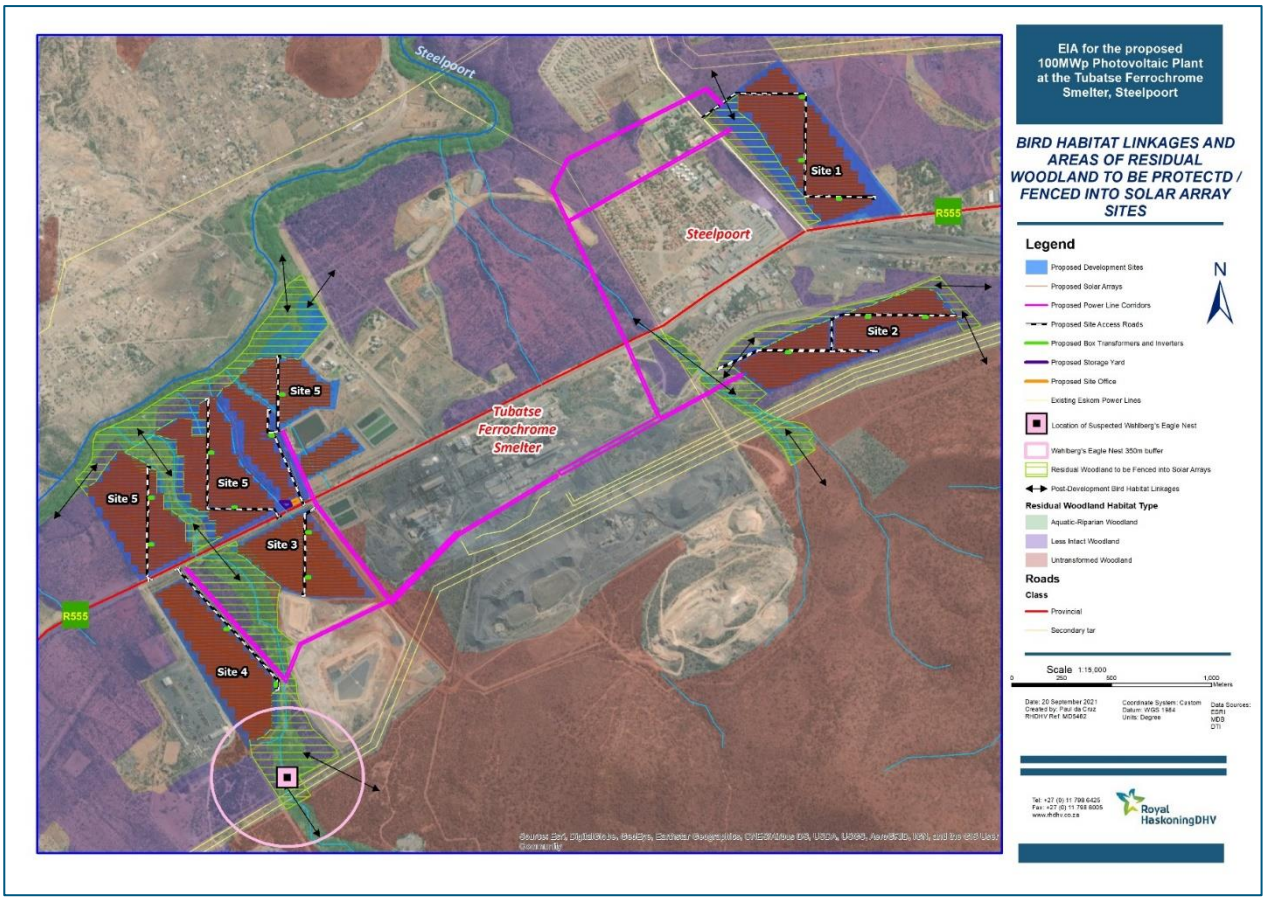


Figure 9-1: Bird habitat linkages on the development site and areas of residual woodland proposed to be protected

c) Raptor-specific impacts

The Lanner Falcon was that only raptor recorded on the site to be included in the list of priority species. There were a number of Lanner Falcon sightings, mostly in the eastern part of the study area, close to the town of Steelpoort and its surrounds and in the vicinity of the Steelpoort River riparian zone. The species appears to favour the Steelpoort riparian zone (where there is a high density of prey species) and the vacant areas surrounding Steelpoort, being associated with the various powerlines to hunt its avian prey. Sites 1 and 5 are proposed to be developed in the area in which the species was most regularly observed, and along with other raptors, the transformation of habitat could lessen the available area in which the bird hunts. This impact would be mitigated by the non-development of the Steelpoort riparian corridor in which its arguably most productive hunting area would remain undisturbed. The development of the five development sites is thus assessed to be associated with a low level of impact on this species.

The Black-chested Snake-Eagle was observed on several occasions during both the Scoping- and EIR-phase field assessments, typically a single bird in flight at a relatively low altitude over the site. The sightings were primarily in the vicinity of Sites 4 and 5. Accordingly the development sites are likely to form part of the territory of a resident bird, with the bird hunting over the woodland in these areas. The transformation of the woodland on the sites would thus have an effect on the area available to the resident bird(s) in which to hunt, but the relatively low overall area that would be transformed would limit the significant of the impact on this species. The development of the five development sites is thus assessed to be associated with a low level of impact on this species.

African Fish Eagles were recorded on a number of occasions during the EIR-phase field assessments, always at high altitudes when observed from the development sites. It is highly unlikely that the species would visit the artificial waterbodies located close to the TFC Smelter as these waterbodies are not expected to hold any fish. The Tubatse Dam is located at sufficient distance and altitude in relation to the development site that the development would be unlikely to exert an impact on this species. Of the other raptor species recorded, loss of hunting habitat would be the most significant impact, especially for the Little Sparrowhawk. However, the non-development of the Steelpoort riparian corridor in which this species is most likely and regularly to hunt is a strong ameliorating factor.

d) Impacts on waterbirds

Waterbirds were noted to inhabit/ visit a number of surface water features in the vicinity of the development sites, the most significant of which is the Steelpoort River. The exclusion of the Steelpoort River's riparian corridor from the development footprint (including powerlines) is an important mitigation measure that is likely to greatly minimise any potential impact of the development on the waterbirds (along with other birds) that either forage within the river's aquatic habitats, roost in its riparian corridor or regularly move along the river. The low altitude at which most of the birds fly is likely to prevent any occurrence of the 'lake effect' of birds moving along the river mistaking the PV solar panel arrays for waterbodies. The development is thus not expected to have an impact on the river's waterbird assemblage, provided no construction activities occur within the riparian corridor.

e) Impacts on priority species

The Lanner Falcon was recorded on numerous occasions on certain of the development site in both the Scoping and EIR-phase field visits. The likelihood of Verreaux's Eagles occurring in the immediate vicinity of the development sites and interacting with the proposed infrastructure is deemed to be very low. Of the other priority species, all were likely to be very occasional visitors to the site, in many cases ranging high above the sites, or very unlikely to visit the study area due to absence of suitable habitat or high human presence in the area. The likelihood of the development impacting the priority species (other than the Lanner Falcon) has thus been assessed to be very low.

f) Wahlberg's Eagle breeding impacts

A potential nest site for a Wahlberg's Eagle nest was located in close proximity to Site 4 along the ephemeral watercourse that drains from the south. The confirmed presence of breeding at this location was not able to be ascertained due to the timing of the site assessments that were limited by the EIA timeframes and it remains unknown whether the pair is actively nesting and egg-laying at this site. If breeding was occurring at this site, breeding activities in the next (spring 2022) or subsequent breeding seasons could be adversely affected if Site 4 is developed.

The nest site is located 220m from the closest part of the Site 4 boundary and 230m from the closest proposed solar arrays on Site 4. The construction of the solar arrays in particular could cause breeding at the next site to be abandoned due to the high level of noise associated with construction activities, especially vegetation clearing and site levelling and the erection of the arrays. The sensitivity of this species to disturbance in the vicinity of the nest site is unknown, however it must be assumed that as eagles, the pair

would be sensitive to such disturbance to a certain degree. It must be noted that the nest site is not located in an entirely undisturbed area – in addition to the presence of the TFC Smelter which adds a constant level of ambient noise to this area, the nest is located in relatively close proximity to the truck depot (330m to the boundary of the depot) to the north-west, and around 770m to the northern H:H Waste Facility dam where construction is currently occurring. The area is thus characterised by a relatively high degree of human activity, noise and existing habitat transformation, and in this context the eagle pair thus can be assumed to have a reasonable degree of tolerance to disturbance in the context of the surrounding activities.

It is difficult to determine whether the operation of the arrays on Site 4 would adversely affect breeding at the suspected nest site. Accordingly, the transformation of woodland on Sites 3 and 4 would lessen the area available for foraging but may not cause breeding to be abandoned if noisy activities do not occur at the arrays during operation. Operation of PV solar arrays is not typically associated with high levels of noise, and the presence of solar arrays on Site 4 would arguably not deleteriously affect breeding, provided the riparian zone of the watercourse remains an area in which human activity is restricted. Along with other raptors that frequent the study area, the loss of foraging habitat may affect the occurrence of this species in the study area, although suitable habitat would remain in the surrounding area.

Due to the degree of uncertainty associated with the nest site and the occurrence of nesting at this location it is thus important for pre-construction monitoring to determine whether the nest is actively utilised and to accordingly specify mitigation measures. Should breeding be confirmed at the suspected nest location, the following mitigation measures are recommended:

- A 350m buffer of the nest site in which no development should occur is recommended; 350m is the distance of southern part of the truck depot from the nest location, and which the pair appears to tolerate human activity. This would result in the restriction of a portion of the Site 4 solar arrays not being developed - Figure 9-1.
- The highest risk of impact on breeding would be related to high noise construction activities. The impact of the construction activities on Site 4 would not be an issue if construction of Site 4 and Site 3 (the closest development sites to the nest location) were to occur during the periods in which Wahlberg's Eagles are not present within South Africa – i.e. the period between April and August. Accordingly, the construction of the arrays on Sites 3 and 4, in particular the early phases of construction (i.e. vegetation clearing, earth levelling, any required bedrock extraction/ blasting, and other noisy activities including road construction and erection of large structures must be timed to occur during the months of April to August when the species is not present or has completed breeding.
- Even if breeding does not occur at the nest location, the watercourse and its associated riparian zone, especially the reach to the south-east of Site 4 must be maintained as a No-Go area that must not be affected by any construction activities or plant/ people access during construction, except for the stringing activities for the construction of the proposed powerline. Access to the riparian zone of the watercourse must be directly prohibited through the erection of fencing.

The impacts to avifauna in the study area remains a **moderate (SP = -60)** pre-mitigation to **moderate (SP = -55)** post-mitigation with the implementation of mitigation measures proposed above.

9.8.2 Operations

Powerlines have been dealt with separately as they constitute an important component of the proposed development and can be associated with significant impacts on birds. Each of the five development sites is associated with a powerline of varying length that will carry power generated at the PV sites to two existing substations at the TFC Smelter.

Powerlines are large structures and can have significant negative, as well as some positive impacts on birds. The primary powerline-related impacts on birds are listed below:

- Electrocutions, leading to bird mortalities.
- Collisions with overhead wires, leading to bird mortalities.
- Habitat destruction.
- Disturbance.
- New nesting and roosting opportunities (positive impact).
- Impacts by birds on the electrical infrastructure (streamers causing shorts on the line).

As the substations are located in very close proximity to the TFC Smelter and its associated operations, much of the powerline alignments would run in close proximity to the area in which the TFC Smelter operations take place.

The majority of the Site 1 powerline alignment, including the two alternative sections are proposed to traverse, or run-in immediate proximity to urban developed (residential) areas within Steelpoort. Such areas being transformed due harbour a certain assemblage of birds – much altered from a natural species composition, but not typically containing collision-prone or threatened species which would not typically occur within transformed urban residential settings. The sections of the alternative corridors for the Site 1 powerline that run from the R37 link road to the edge of the residential areas are deemed low risk. The powerline corridor runs south, running roughly 140m from the edge of the residential area to the point at which the powerline crosses the R555 road. Due to the proximity of the proposed powerline to an urban area and mitigated by the presence of an existing powerline that runs parallel to the western edge of the housing complexes, this part of the Site 1 proposed powerline, and the section to the south of the R555 road that also traverses transformed, light industrial land uses is also considered low risk from a bird impact perspective.

However other sections of the proposed powerline corridors would pose a greater risk of bird-related impacts. The Site 5 powerline connects to the solar array in immediate proximity to the stormwater dam that is located to the north of the R555 road and the TFC Smelter. The stormwater dam forms one of a number of artificial waterbodies that are clustered in relatively close proximity, including the settling ponds associated with the Water Treatment Plant and the brine dams. To the south of the R555 the powerline would also run in very close proximity to two brine dams. Although all of these waterbodies are artificial, they attract a certain assemblage of waterbirds. These waterbirds fly to and from the various water bodies, likely arriving from the north where the Steelpoort River – a waterbird movement corridor – is located.

Certain species may use the waterbodies as roosting sites, and accordingly arriving/ departing from the water bodies in low light conditions. The presence of powerlines located in close proximity to the stormwater dam and the brine dams would thus pose a greater possibility of bird strike/ collision impacts. There is a low density of waterbirds that would be likely to occur at these artificial waterbodies (as suggested by the waterbird survey results) and accordingly the overall significance of the collision risk posed by powerlines located immediately adjacent to the stormwater dam and brine dams has been assessed to be moderate. In spite of the lower level of significance of bird-related impacts associated with the section of the Site 5 powerline, mitigation measures in the form of the proposal to install underground cabling rather than an overhead line, or to install bird diverters (flappers) on the powerline sections have been stipulated as mitigation measures.

The Site 4 powerline corridor would traverse an area that is cleared of woody between the H:H Waste Facility and the leachate pond. It is important to note that the H:H Waste Facility is proposed to be expanded northwards towards the proposed powerline corridor. In addition, there is an existing powerline along with the proposed Site 4 powerline would run. The H:H Waste Facility and the leachate pond are not currently utilised by waterbirds and a number of inspections of these waterbodies have not revealed any waterbirds

at these waterbodies (although during the time of the assessment the leachate pond was empty). This section of the Site 4 powerline is not considered to be a high risk of bird impacts. To the west the powerline would need to span the watercourse that drains northwards between Sites 3 and 4. The proposed Site 4 powerline is not proposed to continue to run in parallel to the existing powerlines, rather being diverted to the south-west before bending sharply northwards to run in parallel to the boundary of Site 4. A bend tower would accordingly need to be placed within the riparian zone of the watercourse, very close to the channel. The development of the new powerline parallel to one of two existing powerlines, especially at the watercourse crossing, is strongly preferred a realignment is proposed in the section below.

9.8.2.1 Recommendations for Preferred Powerline Infrastructure

The following mitigation measures (Figure 9-2) are specified for certain powerline spans/ sections on the development sites:

- Site 1 powerline in the section between the R555 and the north-western edge of the Steelpoort residential area: unless there are clear technical reasons not to do so, the proposed powerline must be aligned to run parallel to the existing powerline that is aligned along the western edge of the residential area. This measure will reduce fragmentation of natural habitat that would result, will place the powerline where an existing powerline to which birds are accustomed is present, will avoid a new crossing of the watercourse and resultant destruction of sensitive riparian habitat, and will place the powerline closer to a transformed urban area which will minimise the potential impact on birds.
- Site 5 powerline located to the north of the R555 road: the section of the Site 5 powerline located to the north of the R555 road must be changed to be underground cabling. If this is technically-not feasible or prohibitively expensive, then the spans of the powerline located to the north of the R555 road must be fitted with bird diverter devices.
- Site 5 powerline located to the south of the R555 road: due to the presence of a brine dam located to the south of the R555, adjacent to which the powerline is proposed to be aligned, the spans of the powerline located adjacent to, and within 200m of the edge of the brine dam must be fitted with bird diverter devices.
- Site 4 powerline located to the east of Site 4 that crosses the watercourse: the current alignment of the Site 4 powerline would necessitate the placement of a bend tower within the riparian zone of the watercourse crossed and very close to the channel of the watercourse, resulting in unnecessary disturbance of sensitive riparian habitat along an important bird movement corridor. Accordingly, the proposed powerline must be realigned to firstly span the watercourse in one span and to run adjacent to one of the two powerlines that span the watercourse in this area. Ideally design and engineering should consider piggybacking the proposed powerline on one of the existing lines that cross the watercourse to avoid the further impacting of the riparian zone of the watercourse at this location.

During operations, the permanent transformative impact on natural vegetation that would lead to the loss of habitat for the current bird species inhabiting/ visiting the development site and surrounding area is rated as being **moderate (SP = -55)** before mitigation and **moderate (SP = -55)** post-mitigation.

Bird fatalities due to collisions with overhead powerlines is rated as being **moderate (SP = -42)** before mitigation and **low (SP = -24)** post-mitigation with the implementation of mitigation measure proposed above.

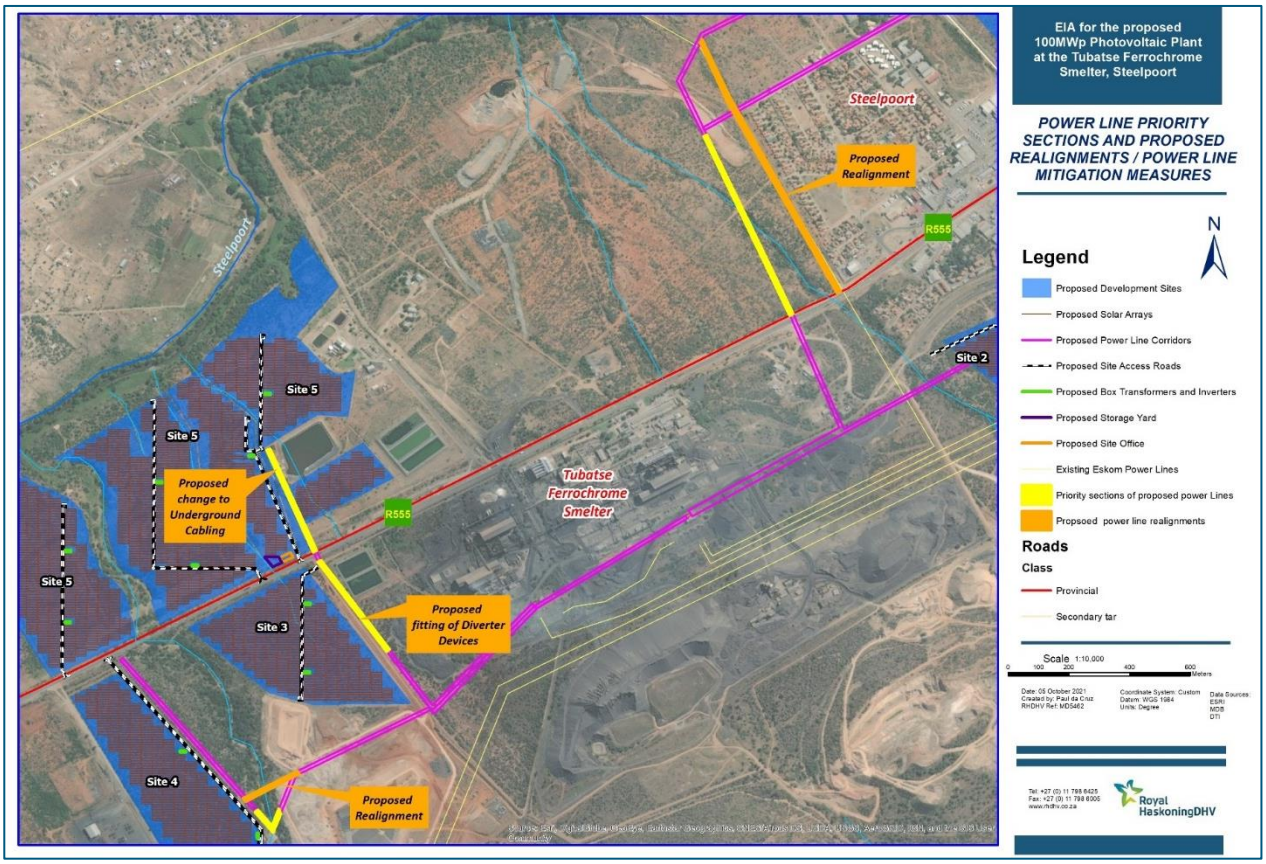


Figure 9-2: Powerline priority section and the proposed realignment recommendations

9.8.3 Cumulative

The development sites are located in close and relatively proximity to the town of Steelpoort. In the medium- to long-term, the town is likely to expand, with the development of more commercial and residential areas, which would expand into currently undeveloped areas around the town. The proposed development would accordingly form one part of a trend of increasing areas of natural habitat that are transformed from a natural state. Such trends are not unexpected in the radius of existing urban (and industrial) developments, within which the study is located.

The cumulative loss of natural habitat through the different causes of land transformation, were these to all materialise in the near future, would combine to reduce the habitat available to the bird species that currently inhabit the area. The wider area would accordingly be likely to be characterised by a loss in species diversity and richness as the area becomes increasingly developed. This trend may be aggravated by the continued and increasing utilisation and harvesting of natural resources by residents in the area who would continue to remove woody vegetation (especially trees and larger shrubs) for firewood. Such natural resource use that leads to degradation of woodland habitats would be particularly pronounced in sensitive habitats for bird such as riparian corridors, thus worsening the impacts of increasing transformation of natural habitats.

9.9 Heritage and Palaeontology

9.9.1 Construction

The impact on burial grounds and graves is rated as a **moderate (SP = -64)** significance before mitigation and **low (SP = -10)** post-mitigation. The following mitigation is proposed:

- Implement a chance to find procedures in case where possible heritage finds are uncovered.
- An appropriately qualified heritage practitioner/ archaeologist must be identified to be called upon if any possible heritage resources or artefacts are identified. The area should be demarcated, and construction activities halted.
- Burial grounds and graves should be demarcated with a 30m buffer as a No-Go area.
- It is recommended that consultation with regards to Site 5-8 is done with the local authorities before construction commence to determine the site's social significance.
- The qualified heritage practitioner/ archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner/ archaeologist.

The impact on archaeological sites is rated as a **high (SP = -85)** significance before mitigation and **moderate (SP = -36)** post-mitigation. The following mitigation is proposed:

- If any of the identified archaeological sites on Sites 3, 4 and 5 are to be impacted a Phase 2 archaeological mitigation process must be implemented. This will include, surface collections, test excavations and analysis of recovered material. A permit issued under Section 35 of the NHRA will be required to conduct such work.
- On completion of the mitigation work the Developer can apply for a destruction permit together with a mitigation report.
- Refer to further mitigation for burial grounds and graves above.

The impact on palaeontological sites is rated as a **low (SP = -16)** significance before mitigation and **low (SP = -10)** post-mitigation. If fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments.

9.9.1.1 Comparative Assessment of Sites

From a heritage perspective the first management principle is conservation *in situ*. The locality of burial grounds and graves on Site 1 and Site 2 will require the adjustment of designs for these alternatives, but do not exclude the whole area. The position and significance of the archaeological sites at Site 3, 4 and 5 will required the implementation of mitigation as described above, however these mitigation measures will be costly for Site 4 due to the extent and significance of the archaeological site.

9.10 Climate Vulnerability Assessment

9.10.1.1 Impact of Climate Change on the Project

The facility's performance may be affected by increased temperatures and increased dust mobilisation that reduce the efficiency of the panels, and intense rainfall, hail or wind that threatens its physical integrity. Neither of these categories of effects are likely fatal flaws and can be managed as part of the routine planning and management of the project. Appropriate site management such as erosion control through vegetation management and soil stabilisation will manage the risk sufficiently, as long as regular monitoring can ensure early detection of issues.

9.10.1.2 Impacts of the Facility on the Biophysical and Social Environment

Preliminary links have been identified between the PV plant and its social and biophysical environment as related to drivers and effects of climate change. An assessment of the potential links between the construction and operation of the project, and its biophysical and social impacts, as contextualised by climate change, is provided in. Important inputs into the assessment are the two main climatic stressors that are expected to play the biggest role in future – water availability and increased temperatures.

Table 9-4: Assessment of links between climate change and environmental effects on the project

Climate Change Concerns	Relation to the Proposed Development	Assessment of Impacts	Mitigation Options
Surface and groundwater			
River, wetlands and other freshwater resources supply drinking water for people and animals and are a vital resource for farming and industry. Lower than normal precipitation levels and increased drought result in water shortages.	Use of water (construction & operation).	Water is to be sourced from a sustainable source. Alternatively, water will be trucked in from a municipal source. During construction it is proposed that 1 x 15 000ℓ tanker mainly to be used for dust suppression and 1 x 15 000ℓ tanker which will mainly be used for the drilling activities and other use. The total water consumption for a single cleaning cycle is approximately 1200m^3. Recycled de-mineralised water will be provided from the Samancor Chrome's Tubatse RO Plant during operations which can also be seen as a water re-use initiative in that no new water will have to be abstracted from a ground- or surface water resource. The Tubatse RO Plant is currently connected to the grid. However, the long-term plan is to convert it run on electricity from the PV plant.	Limit water use to sustainable levels.
Water resources will degrade under drier, hotter climate regime.	Erosion and sedimentation of the non-perennial watercourses and the Steelpoort River.	The Freshwater Assessment identified some freshwater ecosystems on site. The Freshwater Assessment defines these as watercourses with associated riparian zones of varying degrees of development. These systems are associated with proposed Sites 3, 4 and 5. The expected drier hotter climate may lead to erosion and sedimentation of watercourses which in turn can alter the natural drainage lines and runoff patterns. Both these impacts are subject to the adequacy of mitigation measures in the form of soil cover and storm water management during construction and operation. It is important that the species selection for re-vegetation work remains sensitive to anticipated climatic conditions – i.e. groundcover and tree introduction must be drought and heat resistant.	Re-vegetation must consider drought and heat resistant species. Monitoring of erosion must be included in the construction and operational management plans. Adequate stormwater measures as described in the Freshwater Assessment and the Hydrological Assessment must be implemented.

Climate Change Concerns	Relation to the Proposed Development	Assessment of Impacts	Mitigation Options
Extreme rainfall events leading to localised flooding.	Impediment and/ or exacerbation of natural stormwater runoff, polluted overflows and access to site.	The increased hardened surfaces of the solar arrays can potentially exacerbate localised flooding during extreme rainfall events. Flooding can also threaten the physical integrity of the plant and surrounding environment. This in turn can result in damage to the surrounding environment by debris, impacting on water availability (due to impendent) and water quality (due to polluted overflows). Access by staff to and from the site may also be compromised during extreme flooding. As noted by the Hydrological Assessment, Site 5 in particular, has a major drainage line running through it and flooding in this zone will be significant. It will not be possible to develop the area within the floodlines and is therefore a No-Go area.	Appropriate site management such as regular site monitoring during heavy rain, proper stormwater management systems and maintenance thereof can ensure early detection of issues. Appropriate Emergency Procedures should be developed and implemented on site during construction and operation. See Section 9.3.
Biodiversity			
Increased pressure to find microclimatic refuge and surface water as natural habitat and water sources deteriorate due to desertification and degradation.	Exclusion and/ or interruption of wildlife and bird movement (especially for waterbirds), associated with the Steelpoort River and other identified water sources with regards to water use (refer to Surface and Groundwater section above).	The Avifaunal Assessment regards the project area as medium in terms of avifaunal sensitivity. The Biodiversity Assessment indicates that the preservation of habitat with a high ecological connectivity, for example all drainage lines and the riparian thicket corridor along the Steelpoort River is regarded as a high priority in order to maintain and facilitate existing animal dispersal corridors across the study area. The facility may therefore cause an impediment to sensitive faunal and avifaunal movement.	Limit interruption of access to water sources. Wildlife-friendly fencing, with ground-level openings of at least 150mm and no electrification of the lower section. Limit water use to sustainable levels and re-vegetate and monitor erosion during construction and operation to minimise deterioration of water sources (Note that detailed mitigation options are evaluated under Section 9.5, 9.6, and 9.8).
Soils and Agriculture			

Climate Change Concerns	Relation to the Proposed Development	Assessment of Impacts	Mitigation Options
Progressive reduction in water availability and desertification that increases erodibility and threat of serious erosion when intense rainfall follows a period of drought.	Localised disruption of ru-off pattern (panel array, access road, cabling). Reduction in vegetation cover will have a negligible effect on the sequestration effect of natural biomass, and hence a negligible impact on the national GHG accounts.	The project site will be subject to increased intensity runoff due to the concentrating effect of the installed PV panels. This will increase the risk of soil erosion and the resultant sedimentation of non-perennial river. Both these impacts are subject to the adequacy of mitigation measures in the form of soil cover and stormwater management during construction and operation. It is important that the species selection for re-vegetation work remains sensitive to anticipated climatic conditions – i.e. groundcover and tree introduction must be drought and heat resistant.	Re-vegetation and monitoring of erosion must be included in the construction and operational management plans.
Heritage			
Damage or destruction of heritage resources when intense rainfall follows a period of drought or if persistent drought leads to desertification and degradation of the surrounding environment.	The Heritage impact assessment (HIA) has shown that the study area and surrounding area has some heritage resources situated within the proposed development boundaries.	Extreme weather events like severe storms or long periods of drought may lead to the damage or loss of the associated heritage resources. The project site will be subject to increased intensity runoff due to the concentrating effect of the installed PV panels. This will increase the risk of damage or destruction of heritage resources.	Mitigation measures provided in Section 9.9 must be adhered to. Appropriate site management such as regular site monitoring during heavy rain, proper stormwater management systems (as discussed in the Section 9.3) and maintenance thereof can ensure early detection of potential damage to any heritage resources. A monitoring plan should be put in place to ensure that the identified resources are protected and that should any changes or damage be noted, the proper authorities be contacted.
Air quality and emissions			
Use of fossil fuels will increase GHG emissions.	Increased GHG emissions.	The use of fossil fuels on site is inevitable, as construction equipment and vehicles typically operate on liquid fuels. These emit various GHG, depending on the nature of the fuels, the equipment or machinery in use and the efficiency of use. The total GHG emissions footprint is therefore highly sensitive to operational and design parameters. Major construction activities will include basic earthworks (preparing access roads, laying of	Currently, the use of fossil fuels for manufacturing and transport is unavoidable, but its contribution to global GHG emissions can be mitigated through the use of less carbon intensive alternatives and construction methods that reduce the overall needs for transportation and materials haulage.

Climate Change Concerns	Relation to the Proposed Development	Assessment of Impacts	Mitigation Options
		cabling, stormwater attenuation and preparation of foundations) and limited above-ground installations (powerlines and solar panel arrays). Given this limited scale of the development, and duration of the construction phase, the total on-site (territorial) emissions contribution can be assumed as insignificant relative to other GHG sources such as industrial facilities. Further quantification is therefore not necessary.	Construction activities must avoid the use of old or improperly functioning equipment that use fossil fuels in an inefficient manner or that release fugitive emissions. Site administration (e.g. site camp) can also be run off renewable energy sources as far as possible.
Vehicle movement and construction activities will mobilise dust, which may be exacerbated by increased air temperature and drought conditions	Construction activities will affect human activities where dust is mobilised.	Easterly winds predominate, accompanied by strong winds occurring within the north and north-easterly sectors. Excessive dust generated on Site 1 will therefore be blown towards Steelpoort, possibly leading to air quality concerns. Although wind speeds will increase as anticipated climatic changes take effect, the impact is likely to be limited to the construction period, meaning that longer-term climate changes are not a concern.	Appropriate road maintenance, activity staging and re-vegetation activities must be imposed to reduce the extent of bare surfaces or travel speeds on roads. The use of water for dust suppression must be considered in context of reduced water availability.
Fires			
Warmer, drier conditions expected in the region may increase the risk and extent of wildfires.	Wildfire can result in damage or loss of property and lives.	Wildfires have been noted as a concern in the region. Warmer, drier conditions expected may increase the risk and extent of wildfires that may affect the site.	No fires should be permitted on site during the construction or operational phase of the project. Emergency Procedures should be developed and implemented on site during construction and operation. Fire breaks to be created annually prior to fire season.
Human vulnerability			
Energy security will be affected by increased uncertainty in the current energy sector.	National energy security will be improved by increasing the solar power inputs into the national power grid.	The installation of the envisaged 100MWp PV plant will reduce Samancor's reliance on government-supplied electricity and hence improve the country's energy security and carbon footprint.	No mitigation required.

In summary the climate change impacts are rated in significance before and after mitigation measures:

- Climate change impacts on the movement of animals and birds related to water use – **low (SP = -16)** before mitigation and **low (SP = -10)** post-mitigation.
- Soil erosion and sedimentation of water resources – **moderate (SP = -52)** before mitigation and **low (SP = -10)** post-mitigation.
- Climate change impacts on heritage resources - **moderate (SP = -36)** before mitigation and **low (SP = -16)** post-mitigation.
- Vehicle movement and construction activities will mobilise dust, which may be exacerbated by increased air temperature and drought conditions - **moderate (SP = -50)** before mitigation and **low (SP = -16)** post-mitigation.
- Avoided GHG emissions - **moderate (SP = +70)** before mitigation and **moderate (SP = +70)** post-mitigation.
- Water availability for operations - **moderate (SP = -60)** before mitigation and **low (SP = -14)** post-mitigation.
- Localised flooding - **moderate (SP = -36)** before mitigation and **low (SP = -16)** post-mitigation.
- GHG emissions during construction and operations - **moderate (SP = -30)** before mitigation and **moderate (SP = -30)** post-mitigation.
- Warmer, drier conditions expected in the region may increase the risk and extent of wildfires - **moderate (SP = -36)** before mitigation and **low (SP = -16**) post-mitigation.
- Energy security - **high (SP = +80)** before mitigation and **high (SP = +80)** post-mitigation.

9.10.2 Cumulative

GHG emissions are inherently cumulative in nature to the global atmosphere. Whilst the impact of the PV plant to the surrounding environment might be small or negligible, the combined or cumulative effects of multiple developments may have a greater impact. According to the Renewable Energy EIA Application Database for SA there are no proposed renewable energy projects within 30km of the project site. The closest project situated to the south-east of the study area consists of five hydropower stations to be established on the farms: Doornhoek 535LT, Tambotieboom 686 KS, De Hoop 886 KS, Loskop 81 JS and Blyderivierpoort 595 KS.

The project is expected to have a positive level of change to the total amount of GHG emissions released over the lifespan of the project.

9.11 Visual

9.11.1 Construction

Direct transformative impact on natural habitat related to the construction of solar panel arrays, cable trenching and internal access roads, as well as other construction-related activities including uncontrolled movement of vehicles and other construction machinery. The impact would relate to the transformation of currently uncopied land parcels on which natural vegetation is present which could cause a visual impact. With the implementation of mitigation measures, the pre-mitigation significance of **moderate (SP = -50)** can be reduced to a **moderate (SP = -40)** significance. The following mitigation is proposed:

- The retention of a natural buffer (of a minimum width of 15-20m) of natural vegetation - i.e. the natural trees and shrubs that are present on the development sites would assist in the screening of the arrays from receptor locations located in closest proximity to these sites. In this context this natural vegetation would need to be fenced into the plant footprint to prevent it from being felled for firewood over time. This is particularly important for Sites 1 and 5, on which trees and shrubs (woody vegetation) is being felled by local residents at a rapid rate. Accordingly, the portion of the Steelpoort riparian zone located to the north of Site 5 and located on land owned by Samancor is recommended to be fenced off to prevent public access and to allow the trees and shrubs occurring in the river's

riparian zone to naturally regenerate. In addition to the ecological benefits of such a measure, this would assist in the screening of the arrays from the residential areas on the northern side of the river.
- Clearing of vegetation to be completed in a phased manner.
- Dust suppression must be applied to areas of cleared vegetation in very windy conditions and especially along construction access routes.
- In the context of the powerline alternatives, only the powerline linking to Site 1 still has alternative alignments presented. Of the alternatives running west of the north-western boundary of Site 1, the alternative corridor that is aligned along Anthracite Street is preferred from a visual perspective, as an existing corridor is already located along the road and would thus consolidate visual impacts associated with the existing impacts.

9.11.2 Operations

The permanent transformative impact on natural vegetation on the five development sites with the development of solar arrays and associated powerlines would permanently alter parts of the landscape as viewed from surrounding receptor locations. This visual change could lead to perceptions of visual intrusion and impact as is rated as **moderate (SP = -36)** before mitigation and **low (SP = -20)** with the implementation of the following mitigation:

- Retention of residual natural vegetation on the parts of the five development sites that do not fall within the solar array or other infrastructure footprint.
- As the structures supporting the panels could create cumulative glint and glare if these are metallic and reflective, the consideration of non-reflective material for such supports is recommended.
- For the proposed powerlines, it is recommended that the monopole powerline tower be used (as opposed to the steel lattice tower) in order to reduce the visibility of powerline towers.
- The development of the Site 1 powerline along Anthracite Road rather than across the school sports field is preferred and recommended.

9.12 Social

9.12.1 Construction

Construction activities may be a danger to proximate residents (Mohlakwana, Matholeng, Stocking, Steelpoort Town) through increased road traffic, dust and potential noise. The impact will have a **moderate (SP = -48)** significance before mitigation and **low (SP = -24)** post-mitigation. The following mitigation is proposed:

- Road signage, maintaining speed limits, watering down of access roads during dry periods and the acknowledgement of free roaming cattle must be addressed.
- A policy on Contractor Health and Safety for the duration of their work on site, must apply, and be monitored.
- In addition, a Contractor's Code of Conduct (especially in terms of respecting local by-laws and specific practical community concerns on which agreement may be reached), should be applied for the duration of the construction period.
- Regular information sharing discussions with the Contractors must be pursued, giving residents an opportunity to voice concerns and grievances throughout the duration of the project construction.
- In addition, it is vitally important that a formal grievance management system be put in place (and should remain throughout the life of the plant).

The influx of Contractors and staff will result in the proliferation of social ills and issues such as crime, prostitution, alcohol consumption, abuse, the spread of HIV/ AIDs, COVID19 etc. The impact will have a

moderate (SP = -48) significance before mitigation and **low (SP = -20)** post-mitigation. The following mitigation is proposed:

- The Developer needs to be actively involved in the prevention of social ills associated with Contractors.
- Communication with local communities is also an important tool that will assist in monitoring such a situation.
- Formal grievance system to be maintained throughout project.
- Due to the concentration of a workforce in the area over the construction period, the Contractor must implement an HIV/ AIDS Awareness Programme, annually on site.
- COVID19 protocols (wearing of masks, sanitising) must be observed.
- Strict penalties must be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc.

Local job creation opportunities may be realised during the construction phase. The following is recommended:

- All labour (skilled and unskilled) and Contractors must be sourced locally where possible.
- Job creation expectations will have to be well managed via management systems and communication mechanisms that regularly informs the local community (on site and at local community centres) of the progress and job/ skills needs at the development site.
- A formal job application process must be communicated (should this be a requirement). It is expected that the Contractor will have a Human Resource Procedure/ Policy in place in order to respond to Local labour legislation.
- A formal grievance system to be maintained throughout the project
- A Community Liaison Officer must be appointed to deal with the employment of local labour and to interface between the Contractor and the local community.
- The principles of equality, BEE, gender equality and non-discrimination must be implemented.

This will result in a positive impact of **moderate (SP = +36)** without mitigation and **moderate (SP = +48)** with mitigation.

9.13 Dust and Emissions

9.13.1.1 Construction

Dust and emissions will be generated during construction activities e.g. site clearing, excavation, drilling, operation of vehicles, plant and equipment. The impact will have a **moderate (SP = -36)** significance before mitigation and **low (SP = -21)** post-mitigation. The following mitigation is proposed:

- The retention of a natural buffer (with a minimum width of 15-20m) comprising of natural vegetation (i.e. the natural trees and shrubs that are present on the development sites) along the boundary of each site would assist with dust mitigation.
- Dust must be suppressed on construction site and during the transportation of material during dry periods by the regular application of water. Water used for this purpose to be used in quantities that will not result in runoff generation.
- Loads to be covered to avoid loss of material in transport, especially if material is transported off site.
- Speed limit of 40km/hr to be set for all vehicles travelling over exposed areas.
- During the transfer of materials, drop heights should be minimised to control the dispersion of mater being transferred.
- Equipment used by the Contractor must be maintained in good working order to prevent smoke emissions.
- Chemical toilets must be provided and cleaned on a regular (weekly) basis.

9.14 Waste

9.14.1.1 Construction and Closure/ Rehabilitation

Waste generation during the construction and closure/ rehabilitation phases will have a negative impact on the environment, if not controlled adequately. Waste includes general construction rubble, existing redundant infrastructure and hazardous waste (used oil, cement and concrete etc.). The significance is **low (SP = -28)** pre-mitigation that can be reduced to a **low (SP = -14)** significance post-mitigation with the implementation of the following mitigation measures:

- Adequate rubbish bins and waste disposal facilities must be provided on site and at the construction camp.
- The construction site must be kept clean and tidy and free from rubbish.
- Recycling/ re-use of waste must be encouraged.
- No solid waste must be burned on site.
- Bins must be provided to all areas that generate waste e.g. worker eating and resting areas and the camp site. General refuse and construction material refuse must not be mixed.
- Should rubble be required as a raw material for the construction, it must be taken to a designated stockpile area - which must be approved by the ECO.
- Spoil material must be hauled to a designated spoil site. No spoil material must be pushed down slope or discarded on site.
- The Municipality has one licensed landfill site situated at Apel. The site is a general waste facility, no hazardous waste is allowed, therefore all the general waste generated during construction and operational phase must be disposed at the Malogeng Landfill site in Apel.

9.15 Summary of Environmental Impacts

Table 9-5 summarises those impacts related to the construction, operations and where applicable decommissioning/ closure and rehabilitation phases of the proposed project and provides a significance rating for each impact before and after mitigation.

Table 9-5: Environmental impact assessment summary

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
Agriculture Potential													
Construction	Soil degradation leading to loss of agricultural potential	-2	-1	-2	-2	-10	Low	-2	-1	-2	-1	-5	Low
Operation	Protection of soils resources during operations	-3	-1	-2	-2	-12	Low	-3	-1	-2	-1	-6	Low
Decommissioning /Closure and Rehabilitation	Protection of soil resources during decommissioning	-2	-1	-2	-2	-10	Low	-2	-1	-2	-1	-5	Low
Hydrology													
Construction	Disturbing the vadose zone during soil excavations/ activities	-1	-1	-2	-5	-20	Low	-1	-1	0	-5	-10	Low
	Surface water contamination	-1	-1	-2	-5	-20	Low	-1	-1	0	-5	-10	Low
	Spillage of fuels and chemicals and the movement of construction vehicles and equipment	-1	-1	-2	-5	-20	Low	-1	-1	0	-5	-10	Low
	Increased runoff altering flow regimes of receiving watercourses due to vegetation removal and compacting of soil	-1	-1	-2	-5	-20	Low	-1	-1	0	-5	-10	Low
Operations	Increased runoff due to compacted surfaces from the proposed site onto surrounding soils may cause higher velocities and frequency of occurrence and sediment transport to the nearby streams	-4	-2	-2	-4	-32	Moderate	-4	-2	-2	-2	-16	Low
	Potential sedimentation several months after the site has been constructed.	-3	-2	-2	-5	-35	Moderate	-3	-1	-2	-2	-12	Low
	Water quality impacts due to chemical spills, vehicle pollutants, fuel and oil spillages and leaks	-4	-1	-2	-4	-28	Low	-4	-1	-2	-2	-14	Low

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	Erosion due to change in topography, land use and vegetation removal	-4	-2	-2	-4	-32	Moderate	-4	-1	-2	-2	-14	Low
Freshwater													
Construction	Removal of vegetation and associated disturbances to soils (outside of the Steelpoort River and non-perennial rivers and associated floodlines, but within the 32m and 100m ZOR)	-2	-1	-6	-4	-36	Moderate	-2	-1	-4	-2	-14	Low
	Removal of vegetation and associated disturbances to soils relating to the construction of new roads and installation of underground cables traversing through watercourses	-2	-1	-6	-3	-27	Low	-2	-1	-4	-2	-14	Low
	Earthworks relating to foundations and trenches, backfilling of excavated and disturbed areas and miscellaneous activities by construction personnel (outside of the Steelpoort River and non-perennial rivers and associated floodlines, but within the 32m and 100m ZOR)	-2	-1	-6	-4	-36	Moderate	-2	-1	-4	-2	-14	Low
	Construction of new road crossings and trenching through the watercourses (impact on the Steelpoort River)	-2	-2	-6	-3	-30	Moderate	-2	-2	-2	-2	-12	Low
	Construction of new road crossings and trenching through the watercourses (direct impact on the drainage lines)	-2	-2	-8	-4	-48	Moderate	-2	-2	-6	-3	-30	Moderate
	Canalisation of two ephemeral drainage lines located in Site 5 (impact on the Steelpoort River)	-2	-2	-8	-4	-48	Moderate	-2	-2	-6	-2	-20	Low
	Canalisation of two ephemeral drainage lines located in Site 5 (direct impact on the drainage lines)	-3	-2	-8	-4	-52	Moderate	-3	-2	-6	-3	-33	Moderate

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
Operations	Operation and maintenance of the surface infrastructure outside the Steelpoort River and non-perennial rivers and associated floodlines (but within the 32m and 100m zones of regulation)	-2	-1	-6	-4	-36	Moderate	-2	-1	-4	-3	-21	Low
	Operation and maintenance of roads traversing watercourses	-2	-1	-6	-3	-27	Low	-2	-1	-4	-2	-14	Low
Decommissioning /Closure and Rehabilitation	Removal of all surface infrastructure from the study area	-2	-1	-6	-4	-36	Moderate	-2	-1	-4	-2	-14	Low
Flora/ Vegetation – Site 1													
Construction	Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance	-5	-1	-4	-4	-40	Moderate	-5	-1	-4	-2	-20	Low
	Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types	-5	-1	-4	-3	-30	Moderate	-5	-1	-4	-1	-10	Low
	Depletion of local floristic diversity and loss of rare species or flora communities	-5	-1	-4	-3	-30	Moderate	-5	-1	-4	-2	-20	Low
	Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale	-5	-2	-4	-2	-22	Low	-5	-2	-2	-1	-9	Low
	Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat	-5	-1	-4	-2	-20	Low	-4	-1	-4	-1	-9	Low

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	Introduction of exotic and invasive species to the area, or exacerbating the spread of existing infestations	-5	-2	-6	-4	-52	Moderate	-4	-2	-4	-2	-20	Low
Flora/ Vegetation – Site 2													
Construction	Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance	-5	-2	-8	-5	-75	High	-4	-2	-8	-5	-70	High
	Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
	Depletion of local floristic diversity and loss of rare species or flora communities	-5	-2	-8	-2	-30	Moderate	-4	-1	-6	-2	-22	Low
	Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale	-5	-2	-6	-4	-52	Moderate	-4	-1	-4	-2	-18	Low
	Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat	-5	-2	-6	-2	-26	Low	-5	-1	-4	-2	-20	Low
	Introduction of exotic and invasive species to the area, or exacerbating the spread of existing infestations	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
Flora/ Vegetation – Site 3													
Construction	Impacts on/ losses of conservation important and protected plant species (individuals, stands,	-5	-2	-8	-5	-75	High	-4	-2	-8	-5	-70	High

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	populations) as well as habitat that is associated with plants of conservation importance												
	Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types	-5	-2	-8	-5	-75	High	-4	-1	-6	-5	-55	Moderate
	Depletion of local floristic diversity and loss of rare species or flora communities	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-4	-44	Moderate
	Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
	Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat	-5	-2	-6	-2	-26	Low	-4	-1	-4	-2	-18	Low
	Introduction of exotic and invasive species to the area, or exacerbating the spread of existing infestations	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
Flora/ Vegetation – Site 4													
Construction	Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance	-5	-2	-8	-5	-75	High	-4	-2	-8	-5	-70	High
	Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types	-5	-2	-8	-5	-75	High	-4	-1	-6	-5	-55	Moderate

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	Depletion of local floristic diversity and loss of rare species or flora communities	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-4	-44	Moderate
	Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
	Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat	-5	-2	-6	-2	-26	Low	-4	-1	-4	-2	-18	Low
	Introduction of exotic and invasive species to the area, or exacerbating the spread of existing infestations	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
Flora/ Vegetation – Site 5													
Construction	Impacts on/ losses of conservation important and protected plant species (individuals, stands, populations) as well as habitat that is associated with plants of conservation importance	-5	-2	-10	-5	-85	High	-4	-2	-8	-5	-70	High
	Losses, and deterioration, of natural and sensitive habitat types, including essential habitat refugia, atypical and unique/ restricted habitat types	-5	-2	-8	-5	-75	High	-4	-1	-6	-5	-55	Moderate
	Depletion of local floristic diversity and loss of rare species or flora communities	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-4	-44	Moderate
	Deterioration and changes to untransformed habitat in the surrounds, with specific reference to sensitive habitat types and habitat types of limited representation on a local scale	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	Disruption of important ecological processes, services, and infrastructure and altered ecological functionality (including fire, erosion) of surrounding areas and natural habitat	-5	-2	-6	-2	-26	Low	-4	-1	-4	-2	-18	Low
	Introduction of exotic and invasive species to the area, or exacerbating the spread of existing infestations	-5	-2	-8	-4	-60	Moderate	-4	-1	-6	-2	-22	Low
Fauna (all sites)													
Construction	Direct and permanent loss of natural fauna habitat within the development footprints	-5	-2	-8	-5	-75	High	-4	-1	-6	-4	-44	Moderate
	Indirect losses of animal taxa, especially threatened and near threatened animal species due to the displacement from the area during construction	-3	-2	-8	-5	-65	Moderate	-3	-2	-6	-2	22	Low
	Indirect ecological impacts during all phases pertaining to the loss of the ecological connectivity and faunal dispersal corridors	-4	-3	-8	-4	-60	Moderate	-3	-2	-6	-3	-33	Moderate
	Indirect impacts related to anthropogenic encroachment (job-seeking people, increased plundering of natural resources and poaching of wildlife due to increased human encroachment)	-4	-2	-8	-2	-28	Low	-4	-2	-8	-2	-28	Low
Operations	Secondary impacts related to infrastructure attracting animals (nesting and roosting on structures, foraging underneath panels, bird pollution)	-4	-2	-8	-4	-56	Moderate	-4	-2	-6	-2	-24	Low
Avifauna													
Construction	Direct transformative impact on natural habitat related to construction of solar panel arrays, cable trenching and internal access roads, as well as other	-4	-2	-6	-5	-60	Moderate	-4	-1	-6	-5	-55	Moderate

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	construction-related activities including uncontrolled movement of vehicles and other construction machinery. The impact would relate to the loss of habitat for the current bird species inhabiting/ visiting the development site and surrounding area												
Operations	Operation of the solar power plant utilising the current layout i.e. developing all five of the development sites.	-4	-1	-6	-5	-55	Moderate	-4	-1	-6	-5	-55	Moderate
	Development (operation) of the solar power plant utilising the current layout i.e. developing all five of the development sites, as well as the development of powerlines linking each of the five development sites to the two substations at the TFC Smelter	-4	-2	-8	-3	-42	Moderate	-4	-2	-6	-2	-24	Low
Heritage and Palaeontology													
Construction	Impact on burial grounds and graves	-5	-1	-10	-4	-64	Moderate	-5	-1	-4	-1	-10	Low
	Impact on archaeological sites	-5	-2	-10	-5	-85	High	-5	-1	-6	-3	-36	Moderate
	Impact on palaeontological resources	-5	-1	-2	-2	-16	Low	-2	-1	-2	-2	-10	Low
Climate Change													
Construction	Climate change impacts on the movement of animals and birds related to water use	-2	-2	-4	-2	-16	Low	-2	-1	-2	-2	-10	Low
	Climate change impacts on soil erosion and sedimentation of water resources	-4	-3	-6	-4	-52	Moderate	-2	-1	-2	-2	-10	Low
	Climate change impacts on heritage resources	-5	-1	-6	-3	-36	Moderate	-5	-1	-2	-2	-16	Low

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	Vehicle movement and construction activities will mobilise dust, which may be exacerbated by increased air temperature and drought conditions	-2	-2	-6	-5	-50	Moderate	-1	-1	-2	-4	-16	Low
	GHG emissions	-2	-2	-2	-5	-30	Moderate	-2	-2	-2	-5	-30	Moderate
	Avoided GHG emissions	+4	+4	+6	+5	+70	Moderate	+4	+4	+6	+5	+70	Moderate
Operations	Lower than normal precipitation levels and increased drought result in water shortages	-4	-3	-8	-4	-60	Moderate	-2	-1	-4	-2	-14	Low
	Extreme rainfall events resulting in localized flooding	-1	-2	-6	-4	-36	Moderate	-1	-2	-4	-2	-14	Low
	Warmer, drier conditions expected in the region may increase the risk and extent of wildfires can result in damage or loss of property and lives	-2	-2	-8	-3	-36	Moderate	-2	-2	-4	-2	-16	Low
	GHG emissions produced during plant operation	-2	-2	-2	-5	-30	Moderate	-2	-2	-2	-5	-30	Moderate
	Energy security	+4	+4	+8	+5	+80	Moderate	+4	+4	+8	+5	+80	Moderate
Visual													
Construction	Direct transformative impact on natural habitat related to the construction of solar panel arrays, cable trenching and internal access roads, as well as other construction-related activities including uncontrolled movement of vehicles and other construction machinery. The impact would relate to the transformation of currently uncopied land parcels on which natural vegetation is present which could cause a visual impact	-2	-2	-6	-5	-50	Moderate	-2	-2	-4	-2	-40	Moderate
Operations	Permanent transformative impact on natural vegetation on the five development sites with the development of solar arrays and associated powerlines, that would	-4	-2	-6	-3	-36	Moderate	-4	-2	-4	-2	-20	Low

Phase	Potential Environmental Impact	Impact Significance											
		Pre-mitigation						Post-mitigation					
		D	S	M	P	SP	Rating	D	S	M	P	SP	Rating
	permanently alter parts of the landscape as viewed from surrounding receptor locations. This visual change could lead to perceptions of visual intrusion and impact												
Social													
Construction	Danger to proximate residents (Mohlakwana, Matholeng, Stocking, Steelpoort Town) through increased road traffic, dust and potential noise	-2	-2	-8	-4	-48	**Moderate**	-2	-2	-4	-3	-24	**Low**
	Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, alcohol consumption, abuse, the spread of HIV/ AIDs, COVID19 etc.	-2	-2	-8	-4	-48	**Moderate**	-2	-2	-6	-2	-20	**Low**
	Local job creation opportunities	+2	+2	+8	+3	+36	**Moderate**	+2	+2	+8	+4	+48	**Moderate**
Dust and Emissions													
Construction and Decommissioning/Closure and Rehabilitation	Dust and emissions during construction	-2	-1	-6	-4	-36	**Moderate**	-2	-1	-4	-3	-21	**Low**
Waste													
Construction and Decommissioning/Closure and Rehabilitation	Waste generation during the construction phase will have a negative impact on the environment, if not controlled adequately. Waste includes general construction rubble, existing redundant infrastructure and hazardous waste (used oil, cement and concrete etc.)	-2	-1	-4	-4	-28	**Low**	-2	-1	-4	-2	-14	**Low**

10 ENVIRONMENTAL AND CUMULATIVE IMPACT STATEMENT

10.1 Key Findings

10.1.1 Agriculture

The proposed site has high sensitivity for impacts on agricultural resources as a result of it having land capability values of 9 and 10 across much of its area. This land capability reflects the suitability of the climate, terrain and soils for the production of cultivated crops. However, factors related to the ownership and industrial activity on the site prevent it from being used for agriculture and so effectively limit its agricultural potential. The high sensitivity is therefore disputed and assessed, for the purposes of the impact of this proposed development, to be low.

It is however still important to protect the agricultural potential of the natural resource base. The recommended mitigation measures for this are implementation of an effective system of stormwater runoff control; maintenance of vegetation cover; and stripping, stockpiling and re-spreading of topsoil.

The proposed development will therefore not have an unacceptable negative impact on the agricultural production capability of the site. The proposed development is therefore acceptable. This is substantiated by the facts that the proposed development will occupy land that cannot currently be utilised for agriculture, that the proposed development poses a low risk in terms of causing soil degradation, and that the occupation is not permanent, allowing the land to potentially be used for agriculture after the proposed activity ceases.

From an agricultural impact point of view, it is recommended that the development be approved.

10.1.2 Hydrology

In terms of the conceptual SWMP, all sites were allowed to free drain to the environment as far as possible as the runoff from the sites will be considered clean and by not concentrating the site flows, impacts to the receiving environment will be minimized. It is recommended that the sites be re-vegetated around and between the PV panels once construction is complete in order to encourage infiltration of rainfall into the soil, with the objective of reducing the runoff volume from the site.

It is imperative that during the construction phase, stormwater management interventions are implemented particularly to manage sediment washing off the sites. The sediments result from the removal of vegetation disturbance of the soils and stockpiling of materials. From all these sources, particles are transported during rainfall events and if not managed can cause a problem in receiving waterways. Site 1 will not require any

The following is noted:

- Site 1 will be free draining and does not require any stormwater infrastructure.
- Site 2 will be free draining and will not require any stormwater infrastructure within its footprint. Site 2 will require a protection berm and drain system along its southern perimeter to divert flows from the upstream sub-catchments draining towards it. This drain will discharge to the environment via a release structure.
- Site 3 will be free draining with a protection berm and drain system on its eastern perimeter to divert flows from the upstream sub-catchments around it.
- Site 4 will be free draining and will not require any stormwater infrastructure.
- Site 5 – the main watercourse will be preserved in its natural condition and no riparian vegetation must be removed. The second minor drainage line will not require any infrastructure but panels should be placed away from it, as per the current layout. The third drainage line shall be formalized

into a trapezoidal channel that is concrete-lined and shall discharge via a release structure into the Steelpoort River. The fourth drainage line will be formalized into a trapezoidal Terrafix® or similar lined channel (see Section 2.8).

Ongoing inspection and maintenance of drainage management measures should be carried out throughout the construction period. As the site changes during the progression of construction, the drainage system may need to be re-evaluated and altered.

10.1.2.1 Monitoring

There are no permanent surface water features or flowing water on or nearby the proposed sites. The drainage lines are non-perennial and only have flow when there are storm events. The Steelpoort River is a major watercourse downstream of the sites. Samancor Chrome currently has a surface water monitoring program. It is recommended that monitoring of the water quality take place at the beginning of construction of the sites through to their completion and operation in order to identify impacts to the river water quality resulting from them.

10.1.3 Freshwater

No wetlands were identified on site or within 500m of the planned infrastructure, with the freshwater ecosystems best defined as watercourses with associated riparian zones of varying degrees of development. These systems are associated with the proposed Site 3,4 and 5 as such these watercourses will potentially be impacted upon, should the PV plant be approved.

The aquatic ecological assessment included three sites located on the Steelpoort River, site TS1 (upstream of the proposed construction), site TS2 (downstream of Sites 3, 4 and 5) and site TS3 (located downstream of the proposed construction). Water quality of the Steelpoort River was considered good at all three sites, with largely natural EC, pH and DO concentrations observed during the site assessment. Considering the Ecostatus Categories for both sites TS1 and TS2, the MIRAI, FRAI, VEGRAI and the IHI classifications concur with the RQO of the Steelpoort River [PES Category D]. The MIRAI classification of site TS3 also concurred with the RQO (FRAI, VEGRAI and IHI not applied to site TS3). The Integrated Ecological Category (IEC) for both sites TS1 and TS2 have resulted in Ecostatus scores of 73.7% (Category C: Moderately Modified) at site TS1, and 75.2% (Category C: Moderately Modified) at site TS2, respectively.

Overall, the Steelpoort River is considered moderately modified (Class C), of high Ecological Importance and Sensitivity (EIS) and also considered a fish support area (*Opsaridium peringueyi)*.

The outcome of the assessment proved that the proposed construction of the PV plant would have an overall medium risk significance on the aquatic environment. The strict implementation of the stipulated mitigation measures as recommended in this report and EMPrs (***Appendix G - I***), with specific mention of limiting the potential of additional sediment to enter the watercourses, and limiting erosion from stormwater runoff, will enable the reduction of the perceived impacts.

Furthermore, with rehabilitation and long-term management of erosion and alien and invasive plant species the overall PES of the Steelpoort River and its associated watercourses will not be impacted by the PV plant.

10.1.3.1 Monitoring

Prudent monitoring of the Steelpoort River will be required for the duration of the proposed project and into the operational phase, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage any potential impacts which may arise from the proposed construction activities. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Site walkthrough surveys should be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
  - Erosion monitoring (for the duration of the construction and operational phase);
  - Sedimentation (for the duration of the construction and operational phase);
  - Alien and invasive vegetation proliferation (at the start and end of the growing season);
  - Surface water monitoring; and
  - Waste and litter problems.
- Aquatic biomonitoring of the Steelpoort River. Biomonitoring should continue biannually for a period of at least three years to determine if any impacts to the Steelpoort River as a result of the proposed PV plant have stabilised.
- Habitat monitoring of the non-perennial watercourses should be conducted in conjunction with the biomonitoring programme.
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable;
- Data should be auditable; and
- Reports should present and interpret the data obtained.

10.1.4 Biodiversity

10.1.4.1 Flora

Significant to moderate levels of deterioration are noticeable from changes to compositional and structural aspects of the flora on a local scale, to the extent that portions of the proposed sites no longer can be considered entirely representative of the regional ecological type. Despite the deteriorated nature of the flora, the presence of several conservation important plant species resulted in a moderate-high floristic sensitivity of much of the receiving environment. A review of the anticipated impacts from the proposed development on the floristic receiving environment indicates that none of the anticipated impacts (if managed and mitigated correctly) can be highlighted or construed to represent unacceptable or severe threats to sensitive floristic elements within the study areas and immediate surrounds. However, caution is advised in the manner that protected and conservation plant species are dealt with. While any impact on these species is subject to a permitting process, the removal and relocation of some species is advised as a minimum measure. While *ex situ* conservation measures are not always regarded as a suitable option, it is nonetheless recommended in this particular instance.

It is therefore the considered opinion, based on results of the botanical investigation, that no specific objections are raised to the proposed development. This opinion is based on the explicit understanding that the recommended mitigation approach is timeously and comprehensively implemented and also adhered to during all stages of the development.

10.1.4.2 Fauna

The general faunal assemblages on the study area were mainly represented by widespread taxa that show large distribution ranges across the Savanna Biome. Charismatic and threatened animal taxa were in general uncommon on the respective sites, apart from the regular occurrences of the Vulnerable Lanner Falcon (*Falco biarmicus*) at Site 5 and Site 3, and the occurrence of an overlooked sub-population of the endangered Southern Mountain Reedbuck (*Redunca f. fulvorufula*) near Site 2. However, the preservation of habitat with a high ecological connectivity, for example all drainage lines and the riparian thicket corridor along the Steelpoort River is regarded as a high priority in order to maintain and facilitate extant animal dispersal corridors across the study area. Nevertheless, most of the project sites are located and surrounded by industrial infrastructure and areas where human activities are relatively of high frequency, which collectively contributed over time to the formation of short open deteriorated woodland habitat or habitat that are fragmented, thereby containing unspecialised and generalist taxa.

It is predicted that the impacts on the faunal component of the study area were likely to be of medium significance (prior to mitigation) at most of the proposed project sites, although the loss of habitat and dispersal corridors (e.g. Site 5) is regarded to be of high significance (prior to mitigation). The implementation of the suggested mitigation approach is expected to result in the amelioration of the anticipated impacts to an acceptable level, with priority given to the natural dispersal of animals between and among habitat units in the wider study area. Therefore, no specific objections to the project are raised, but with the understanding that the suggested mitigation protocol is timeous and comprehensively implemented.

10.1.4.3 Monitoring

It is proposed that an Annual Biodiversity Monitoring Programme be undertaken that include the following aspects will need to be executed:

- Selection of a suitable number of sampling points that is representative of the project activities within a natural, receiving environment, with particular reference to sensitive habitat types and species of conservation concern;
- Annual monitoring of vegetatal aspects, including aspects of diversity, compositional and structural attributes as well as accumulation of impacts within nearby habitat;
- Prevalence and continued persistence of plants of conservation concern;
- Prevalence and continued persistence of plants with ethno-botanical properties;
- Prevalence and management of alien and invasive plant species; and
- Land change/ habitat loss and transformation.

Through implementation and execution of a Biodiversity Monitoring Programme, the anticipated and actual impacts of the proposed activities can be established and monitored. Collated information data and results will contribute towards a responsive management approach to minimize the impact footprints and associated spheres of influence. A protocol must be drawn up by an Ecologist who must conform to the guidelines of the South African Council for Natural Scientific Professions Act (2019), and specifically adhere to regulations pertaining to the minimum requirements as per the National Environmental Management Act, 1998 (Act No. 107 of 1998).

10.1.5 Avifauna

The avifaunal assemblage in the study area has been studied and assessed, and it can be concluded that the development of the solar PV plant will not have highly significant impacts on the avifaunal environment in a wider study area context despite more significant localised impacts. The exclusion of certain sensitive areas from the development footprint, especially the riparian corridors on the site is a critical mitigation measure that in association with the active protection of these and other areas of residual woodland on the development sites will minimise the impacts of habitat loss and which will ensure that habitat connectivity is maintained.

A series of mitigation measures have been stipulated, and provided these are implemented, the development can proceed without resulting in significant impacts on the avifaunal assemblage on the site, in particular on priority species and other sensitive species such as raptors.

10.1.5.1 Monitoring

The development of solar power generation facilities is a relatively recent phenomenon in South Africa, and such facilities have only been in place for the last decade, concentrated in certain parts of the country. The localised impacts of such facilities are still poorly understood.

As such it is advised that monitoring be conducted in the pre-construction and post-construction phases of the project as detailed below:

a) Pre-construction

Pre-construction monitoring on the site must be focussed on the conformation of the active use of the Wahlberg's Eagle nest near Site 4. It is thus very important for the presence of breeding at the nest location during the current (2021-2022) breeding season to be confirmed. Accordingly, it is recommended that an avifaunal specialist undertake monitoring of the nest location and in the wider study area to determine the presence of breeding at this location, or at any other nesting sites within the study area. It is recommended that monitoring is conducted in the early summer of 2021/22 to confirm whether the nest site is being used, and in the latter stages of the nesting period to determine the success or otherwise of breeding.

This monitoring of the nest site must continue (as part of the general recommended pre-, during- and post-construction (operational) avifaunal monitoring on the development sites and wider study area) for each subsequent year in which construction occurs.

b) During construction

Should any part of construction at Sites 3 and 4 be undertaken during the period of Wahlberg's Eagle breeding (September to March), the nest site and any other nest sites located must be monitored in the manner described above.

c) Post-construction (operation)

Operational monitoring must be undertaken and focus on the following aspects/ areas on the development site and wider area:

- Breeding at the Wahlberg's Eagle nest site must be undertaken during the species' breeding period in order to determine how the presence of the development affects breeding.
- Assessment of habitat loss on bird species richness and relative abundance must be undertaken through the application of the same data collection and observation techniques as were applied in the EIR-phase field assessments. Surveys conducted twice a year in the first two years of operation must be conducted as a minimum.
- Quantifying bird mortalities – Regular searches for carcasses of any bird fatalities associated with the operational solar facility must be undertaken, by an avifaunal specialist or a suitably qualified ECO. Search focus must be directed at the areas/ components of the development highlighted as high risk for collisions, including all new powerline alignments, the arrays in the vicinity of the existing water bodies on the site, and the arrays located closest to the Steelpoort riparian corridor. The methods detailed in the BirdLife South Africa Guidelines must be applied.

10.1.6 Heritage and Palaeontology

During the field work several heritage features and resources were identified and logged. A total of 57 points of interest were logged that resulted in the delineation and identification of 24 separate heritage sites. These consist of five burial grounds with a High heritage significance and a heritage grading of IIIA. There are nine historic recent structures that vary in significance from medium to low and a grading of IIIB. The archaeological finds consisting of nine archaeological sites has in most cases a rating of Medium significance and a grading varying between IIIC and IIIA at the highest. Site 5-8 represents a possible memorial now in disuse it was rated as having a Low heritage significance but with a possible local significance.

Burial grounds have a high heritage rating and a heritage grading of IIIA. According to the SAHRA graves management policy a buffer of at least 30-meters, as No-Go area, must be kept around burial grounds and graves.

The identified archaeological sites have a low to high heritage significance. Sites 2, 3 and 5 will have the least impact on identified archaeological sites, although mitigation work will be required for Sites 3 and 5.

The archaeological site identified on Site 4 will require extensive mitigation work to mitigate the impact before any development. If any of the identified archaeological site are to be disturbed a Phase 2 archaeological mitigation process must be implemented.

The SAHRIS Palaeo-sensitivity Map rates the palaeontological sensitivity of the geology as low and will only require the inclusion of a chance finds procedure in the EMPr. Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

10.1.7 Climate Change

The impact assessment indicated the following relevant points:

- The climatic trends and projections indicate that water availability and temperature stress are likely to affect the region in future, and these effects must be taken into account.
- The project will contribute to the national GHG emissions mitigation by reducing national emissions – and will compensate for the small amount of emissions associated with the construction phase.
- A Phase 2 Climate Change Assessment must be completed once the detailed design and construction plan is available and must include a detailed assessment of the potential GHG emissions from the project, within the context of the national GHG emissions reduction commitments.

10.1.8 Visual

As the proposed development consists of five (5) separate parcels of land on which solar power arrays are proposed to be constructed that are distributed around the existing TFC Smelter, along with various sets of powerline corridors that would be associated with the five sites, there are differing sets of potential receptor locations for each of the sites.

The context of the landscape in which the solar power arrays are proposed to be located is likely to be an important factor that could mimimise any perceptions of visual impact. The existing altered visual baseline of the landscapes into which the developments would be located, and their location directly adjacent to existing areas of visual change due especially to urban or infrastructural development is a strong mitigating factor.

10.1.9 Social

Construction activities and impacts that pose a danger to proximate residents (Mohlakwana, Matholeng, Stocking, Steelpoort Town) through increased road traffic, dust and potential noise must be managed by the implementation of mitigation measures as proposed in the EMPrs (***Appendix G - I***).

The influx of Contractors and staff will result in the proliferation of social ills and issues such as crime, prostitution, alcohol consumption, abuse, the spread of HIV/ AIDs, COVID19 etc. Communication with local communities is also an important tool that will assist in monitoring such a situation as well as the implementation of a formal grievance system to be maintained throughout project.

The potential job creation at the construction phase of the project will be a positive for the local and regional economy as unemployment in the country is increasing.

10.1.10 Other Impacts (Dust, Emissions, Waste)

Other impacts relate to dust, emissions and waste must be managed during the constructions and decommissioning/ closure and rehabilitation. Mitigation measures proposed in the EMPrs (***Appendix G - I***) must be adhered to reduce the significance of these potential impacts.

10.2 Environmental Impact Statement

The project, in the EAPs opinion, does not pose a detrimental impact on the receiving environment and its inhabitants and although there are potentially high to moderate significant impacts, these impacts can be mitigated. There are no fatal flaws prohibiting the project from going ahead.

10.3 Cumulative Impact Statement

10.3.1 Renewable Energy Projects within a 30km Radius

Figure 10-1 provides an indication of solar projects within a 30km radius of the study area as obtained from the Renewable Energy EIA Application Database for South Africa (2020).[102] There are no solar projects within a 30km radius, with the closest project situated to the south-east of the study area consisting of five hydropower stations to be established on the farms: Doornhoek 535LT, Tambotieboom 686 KS, De Hoop 886 KS, Loskop 81 JS and Blyderivierpoort 595 KS.

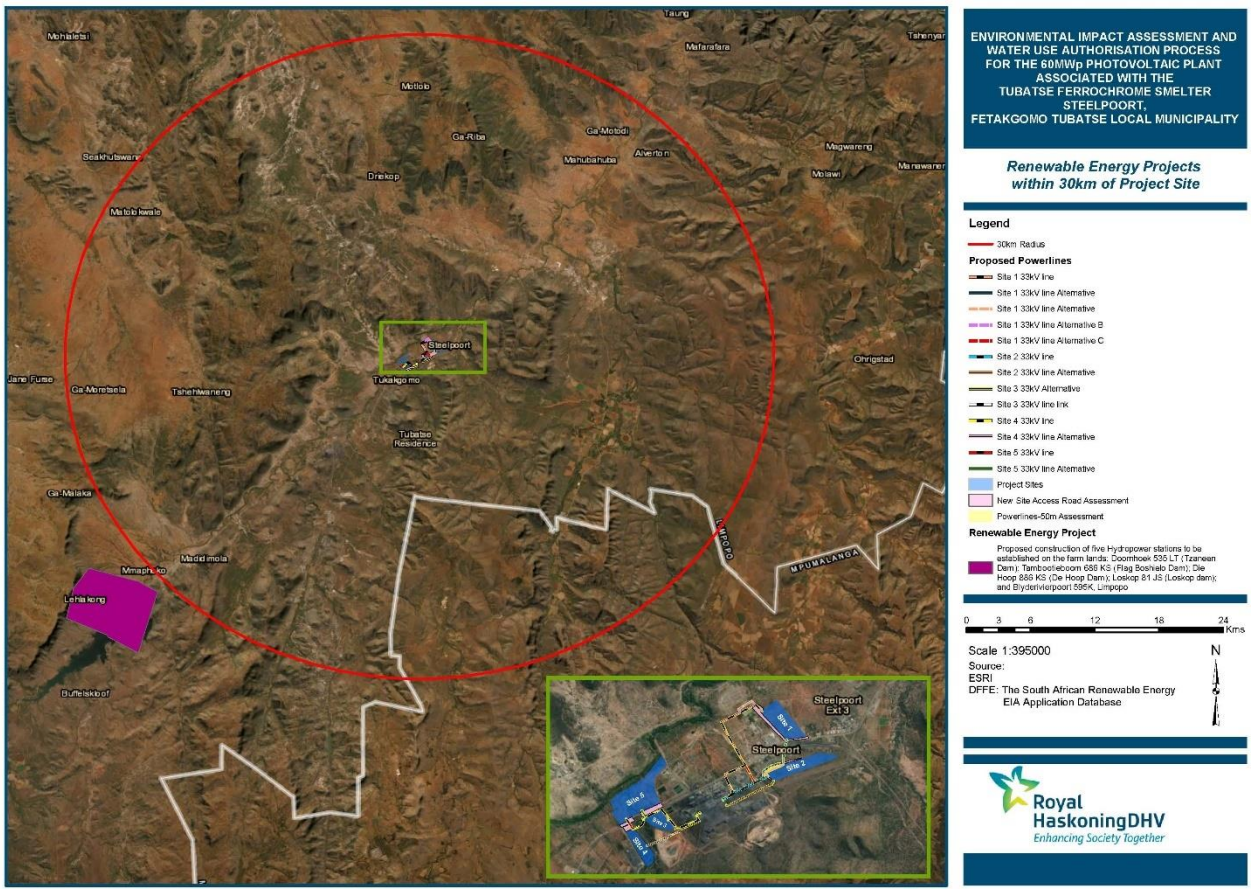


Figure 10-1: Renewable energy projects within 30km of the study area

[102] *https://egis.environment.gov.za/renewable_energy*

Various cumulative impacts have been identified in the preceding sections, and from a cumulative impact assessment perspective, the project is considered acceptable provided that the recommended mitigation approach is timeously and comprehensively implemented and also adhered to during all stages of the development.

10.4 Sensitivity Maps

The sensitivity maps presented in Figure 10-2 - Figure 10-6 must be considered when determining if the proposed project should be authorised.

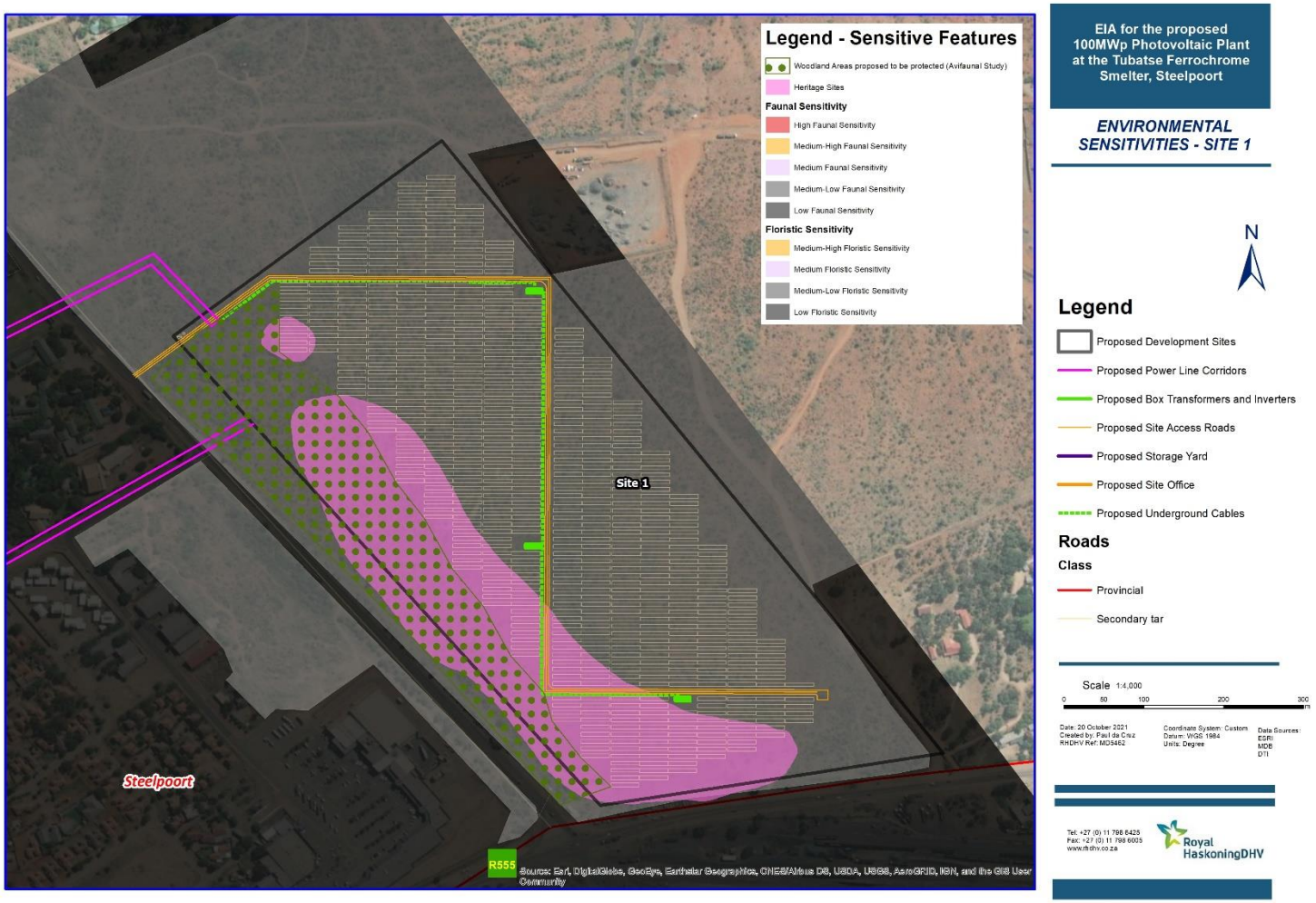


Figure 10-2: Sensitivity map – Site 1

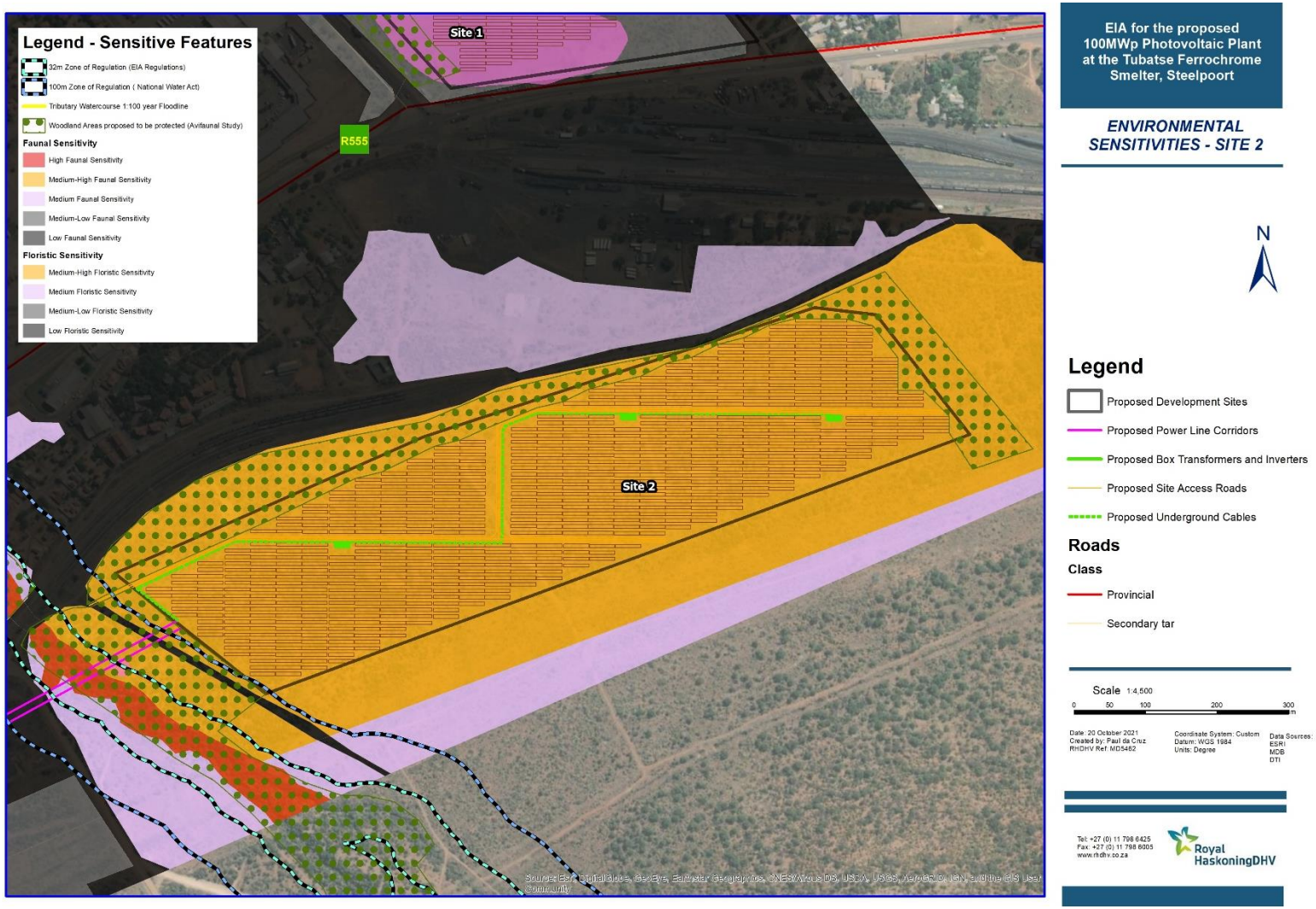


Figure 10-3: Sensitivity map – Site 2

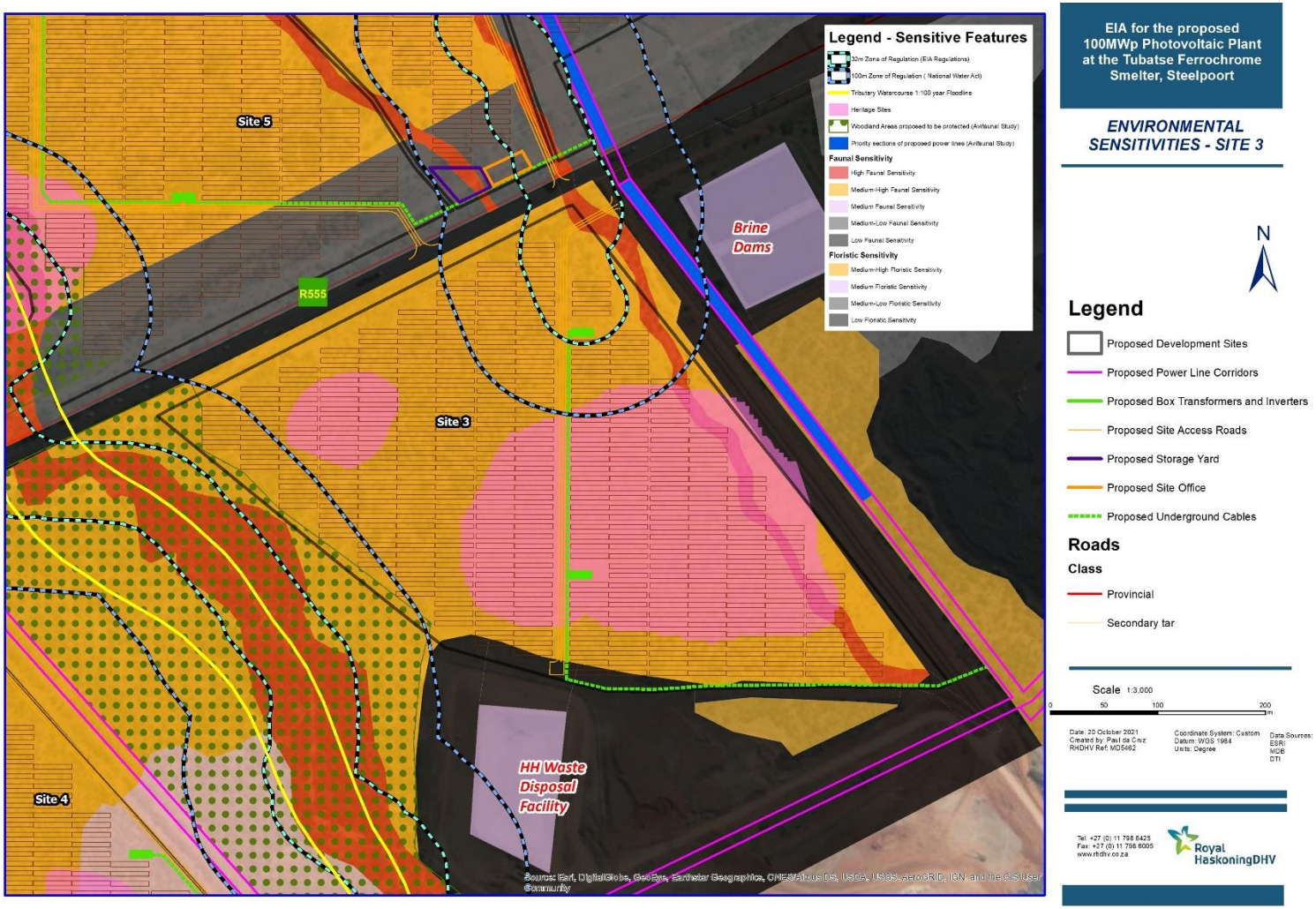


Figure 10-4: Sensitivity map – Site 3

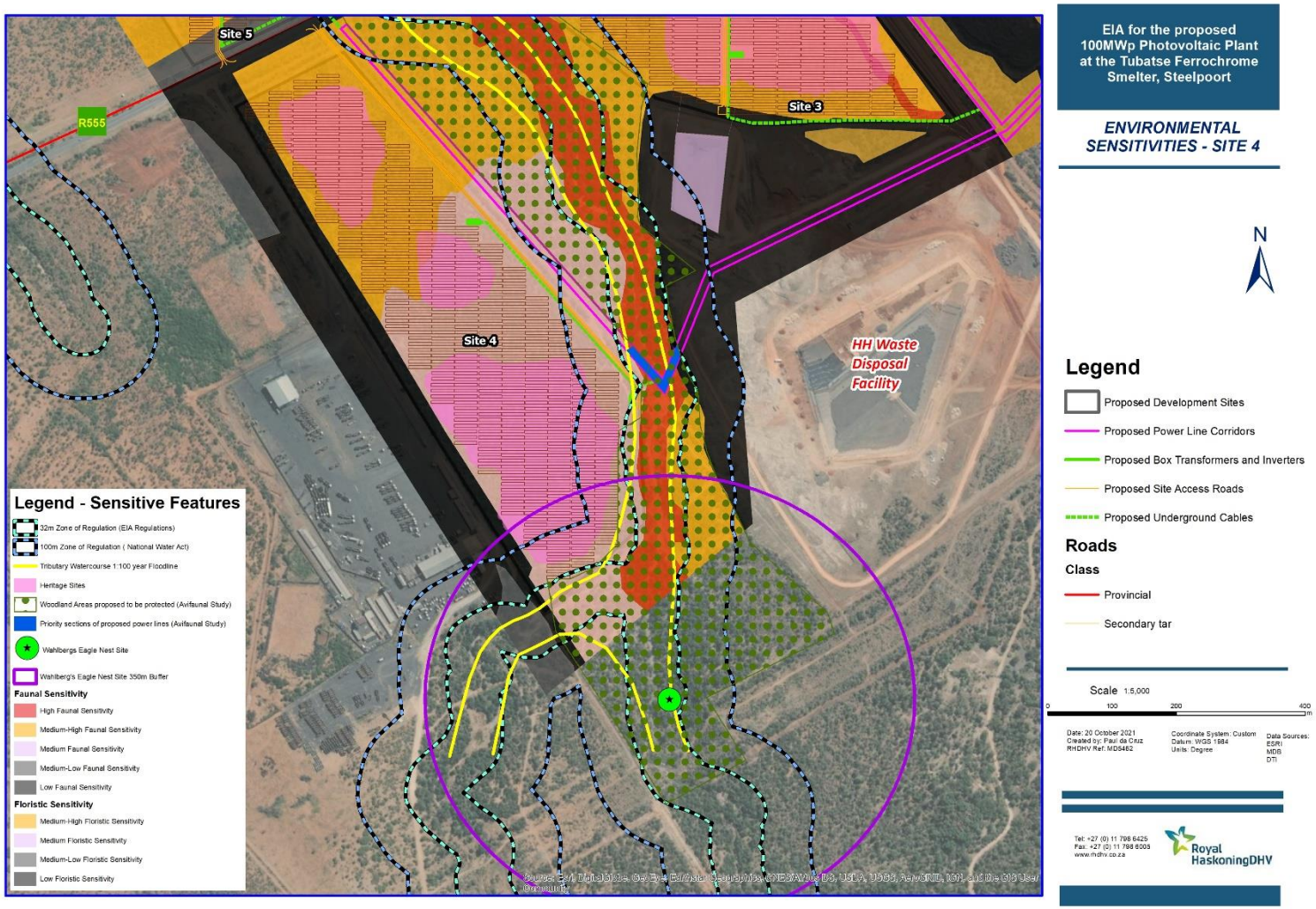


Figure 10-5: Sensitivity map – Site 4

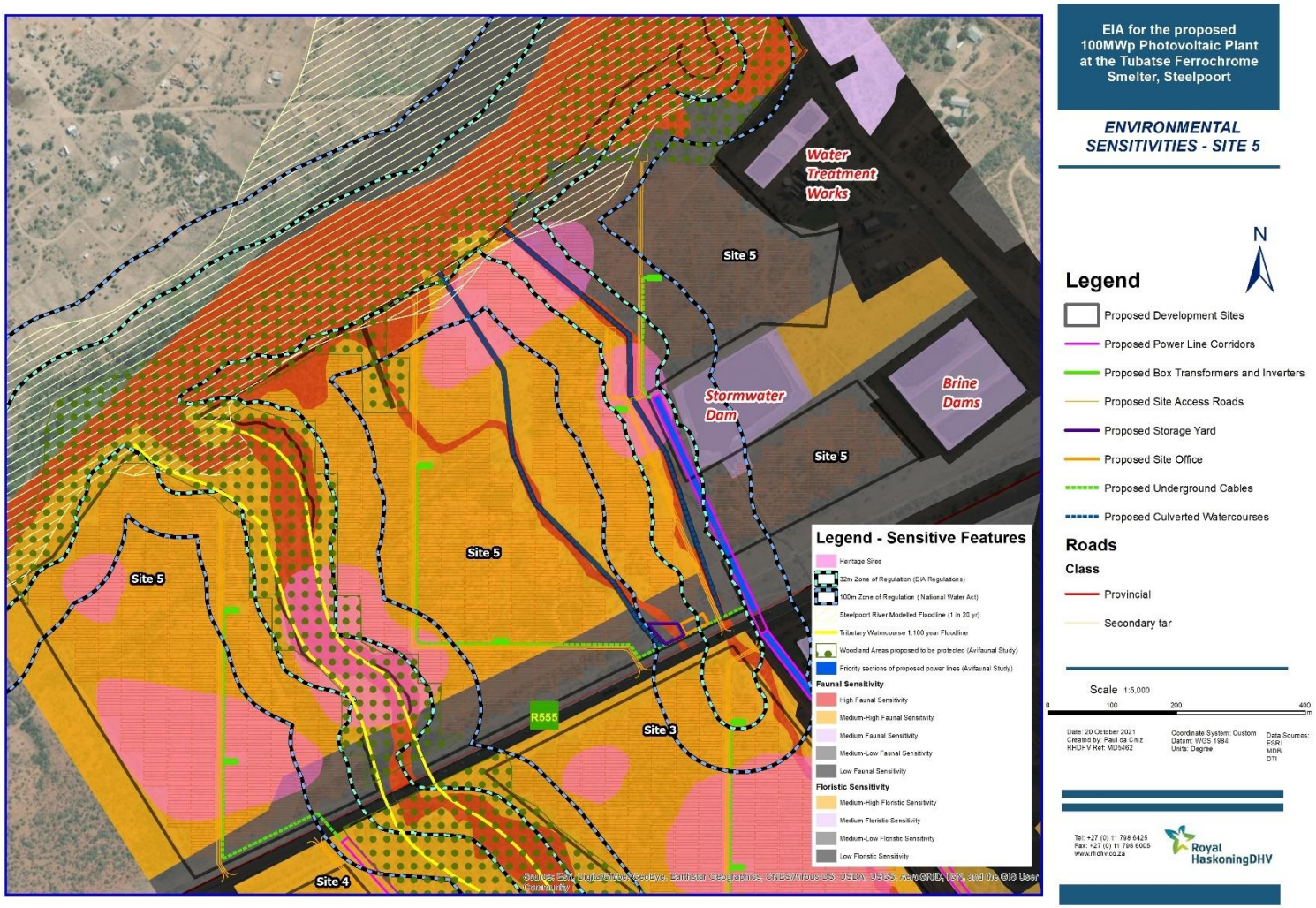


Figure 10-6: Sensitivity map – Site 5

10.5 Assumptions, Uncertainties or Gaps in Knowledge

The EIA study followed the legislated process required and as governed and specified by the EIA Regulations 2014 (as amended). Inevitably, when undertaking scientific studies, challenges and limitations are encountered. For this specific EIA study, the following should be noted:

- This EIA study is based on a concept design.
- All information provided by the Engineering team, to the EAP was correct and valid at the time it was provided.
- Although all effort was made by the project team to identify all environmental social and health aspects, impacts and mitigation measures, errors and omissions may have occurred.
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process.
- All data from unpublished research is valid and accurate.
- Every effort was made to engage I&APs and stakeholders, however not every I&AP and stakeholder may have been consulted. A grievance mechanism must be put in place at the commencement of construction through which I&APs and stakeholders are able to raise grievances and continue to contribute their concerns and issues with the project team.
- Specialist assessments have highlighted further assumptions, limitations and gaps – refer to ***Appendix G - I*** for the specific-discipline related assumption, limitations and gaps.

10.6 Recommendations

10.7 Recommendations to the Competent Authorisation and Conditions for Inclusion into the Environmental Authorisation

The following recommendations and conditions for inclusion into the EA is advised:

Construction is expected to commence before August 2022 and last 36 months. An EA with a validity of ten (10) years is recommended.

The Applicant must be bound to stringent conditions to maintain compliance and a responsible execution of the project.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIR are included within the EMPrs ***(Appendix G - I)***. The EMPrs must be used to ensure compliance with environmental specifications and management measures. The implementation of the EMPrs for the construction phase of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.

In addition, the following key conditions should be included as part of the authorisation:

a) The Developer is not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes inter alia:
    i. Provisions of the National Water Act, 1998 (Act No. 36 of 1998) (as amended).
    ii. National Heritage Resources Act (Act No. 25 of 1999).
    iii. National Forests Act (Act No. 84 of 1998).
    iv. Limpopo Environmental Management Act (Act No. 07 of 2003).
b) The Developer must appoint a suitably experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the

mitigation/ rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPrs ***(Appendix G - I)***.

c) All other necessary permits, licences and approvals must be obtained prior to the commencement of construction.
d) Prior to site clearance, a detailed 'walkthrough' must be conducted of the proposed site to ascertain the number, abundance and physical conditions of all protected tree species to assist with permit applications (DFFE).
e) Prior to site clearance, a detailed 'walkthrough' must be conducted of the proposed site to ascertain the number, abundance and physical conditions of all protected plant to assist with permit applications (LDEDET).
f) A 350m buffer must be demarcated around the Wahlberg's Eagle nest which no development should occur is recommended.

10.8 Recommendations to the Applicant

The Applicant must adhere to the recommendations provided by the specialists and the EAPs. The EMPrs ***(Appendix G - I)*** summarises these recommendations. The Applicant must take full responsibility for the execution of the project in a manner which does not negatively impact on the environment by ensuring that responsible decisions are made.

10.9 Oath and Declaration by the EAPs

The following is hereby affirmed by the EAPs to be included in this report:

- the correctness of the information provided in the report;
- the inclusion of all comments and inputs from stakeholders and I&APs (when received);
- the inclusion of all comments and inputs from stakeholders and I&APs on the Plan of Study for EIA;
- the inclusion of all inputs and recommendations from the specialist reports where relevant; and
- any information provided by the EAPs to I&APs and any responses by the EAPs to comments or inputs made by interested and affected parties.

_____

Signed: Prashika Reddy (*Pr Sci Nat*; *EAPASA)*

_____

Signed: Seshni Govender (*Pr Sci Nat)*

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