AGGENEYS 2, NORTHERN CAPE PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

May 2019

Prepared for
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PROJECT DETAILS

DEA Reference	:	14/12/16/3/3/1/2020
Title	:	Environmental Impact Assessment Process Environmental Management Programme: Aggeneys 2, Northern Cape Province
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Applicant	:	ABO Wind Aggeneys 2 PV (Pty) Ltd
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DEFINITIONS AND TERMINOLOGY

The following definitions and terminology may be applicable to this project and may occur in the report below:

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: 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: 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. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that is made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant 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 well-being.

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental Control Officer (ECO): An individual appointed by the Owner prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

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 plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

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.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within

restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red Data Species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Vulnerable species: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*.

ABBREVIATIONS

The following abbreviations may be applicable to this project and may occur in the report below:

AIA	Archaeological Impact Assessment
BGIS	Biodiversity Geographic Information System
CDSM	Chief Directorate Surveys and Mapping
CEMP	Construction Environmental Management Plan
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DENC	Northern Cape Department of Environment and Nature Conservation
DME	Department of Minerals and Energy
DWS	Department of Water and Sanitation
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
KNP	Karoo National Park
KOP	Key Observation Point
kV	Kilo Volt
LAeq,T	Time interval to which an equivalent continuous A-weighted sound level
LLRC	Low Level River Crossing
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NID	Notice of Intent to Develop
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
PIA	Paleontological Impact Assessment
PM	Post Meridiem; "Afternoon"
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute

SANS	South Africa National Standards
SDF	Spatial Development Framework
SMME	Small, Medium and Micro Enterprise
SAPD	South Africa Police Department

TABLE OF CONTENTS

APPENDICES

CHAPTER 1: INTRODUCTION

This Environmental Management Programme (EMPr) has been compiled for the Aggeneys 2 solar PV facility and associated infrastructure proposed by ABO Wind Aggeneys 2 PV (Pty) Ltd (the developer). The project is proposed on the Remaining Extent of the Farm Bloemhoek 61 (the study area), which is located approximately 11km south-east of Aggeneys in the Khâi-Ma Local Municipality (LM) and within the greater Namakwa District Municipality (DM), in the Northern Cape Province. The project will be designed to have a contracted capacity of up to 100MW alternate current (AC), and will make use of either fixed-tilt, single-axis tracking, or dual-axis (double-axis) tracking photovoltaic (PV) solar technology for the generation of electricity.

This EMPr has been developed on the basis of the findings of the Basic Assessment (BA), and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. In terms of the Duty of Care provision in S28(1) of NEMA, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, halted or minimised. The document must therefore be adhered to and updated as relevant throughout the project life cycle. This document fulfils the requirement of the EIA Regulations, 2014 (as amended) and forms part of the BA Report for the project.

CHAPTER 2: PROJECT DETAILS

ABO Wind Aggeneys 2 PV (Pty) Ltd, a Special Purpose Vehicle (SPV) established by ABO Wind Renewable Energies (Pty) Ltd, proposes the development of a 100MW solar PV facility, as well as associated infrastructure on a site located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Aggeneys 2 and is intended to form part of the Department of Energy's (DoE's) Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). A study area has been identified for the development of Aggeneys 2 which contains the entire extent of the Remaining Extent of the Farm Bloemhoek 61. The study area is located approximately 11km south-east of the town of Aggeneys (measured from the centre of the study area). The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

2.1 Study area

Table 2.1 provides information regarding the proposed study area identified for Aggeneys 2.

Table 2.1: A description of the study area identified for the Aggeneys 2 solar PV facility

Province	Northern Cape Province
District Municipality	Namakwa District Municipality
Local Municipality	Khâi-Ma Local Municipality
Ward number(s)	4
Nearest town(s)	Aggeneys, (11km to the north-west); Pofadder (58km to the east) and Springbok (116km to the south-west).
Affected Properties: Farm name(s), number(s) and portion numbers	The Remaining Extent of the Farm Bloemhoek 61
SG 21 Digit Code (s)	C05300000000006100000
Current zoning	Agricultural
Current land use	Grazing
Study area	~12 226ha
Project Site (PV facility)	~250ha
Site Co-ordinates (centre of the project site)	29°17'16.73"S 18°57'20.34"E

A locality map illustrating the location of the Aggeneys 2 solar PV facility project site and development footprint is provided in **Error! Reference source not found.**.

2.2 Project Description

The proposed project will comprise the following key infrastructure and components:

- Arrays of PV panels (either a static or single or double tracking PV system) with a contracted capacity of up to 100MW.
- Mounting structures to support the PV panels.
- Cabling between the project components, to be laid underground where practical.
- On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).

- An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- Offices and workshop areas for maintenance and storage.
- Laydown areas.
- Internal access roads and fencing around the development area.

A summary of the associated infrastructure proposed as part of Aggeneys 2 is provided in **Table 2.2**, and described in more detail under the sub-headings below. **Figure 2.2** provides an overview of the layout proposed for the project.

Table 2.2: Planned infrastructure proposed as part of Aggeneys 2

Component	Description / Dimensions
Total Extent of the Affected Property (i.e. the Remaining Extent of the Farm Bloemhoek 61)	~12 226ha
Total Extent of the Project Site (i.e. total area to be occupied by Aggeneys 2)	~250ha
Contracted capacity of the facility	Up to 100MW
Technology	Static or tracking solar photovoltaic systems.
PV panels	» Height: ~3.5m from ground level (installed). » Between 300 000 – 400 000 panels required. » Up to a maximum of 233ha » Fixed-tilt, single-axis tracking, and/or double-axis tracking systems.
On-site Substation	» Located within the project site. » Up to a maximum of 1ha » Stepping up from 22kV or 33kV to 132kV or 220kV
Site Access	» Direct access to the study area and project site is provided by the unsurfaced gravel road (Loop 10 road) running from the N14 national route (located along the western boundary of the study area).
Laydown Areas	» ~5ha (Temporary Laydown Area)
Temporary infrastructure required during the construction phase (estimated to be ~ 18 months)	» Construction equipment camps » Construction yard; and » Storage areas.
Other infrastructure	» Gate House and Security Office » Control Centre » Office Building » Warehouses and storage under roof » Rainwater Tank » Perimeter Fences

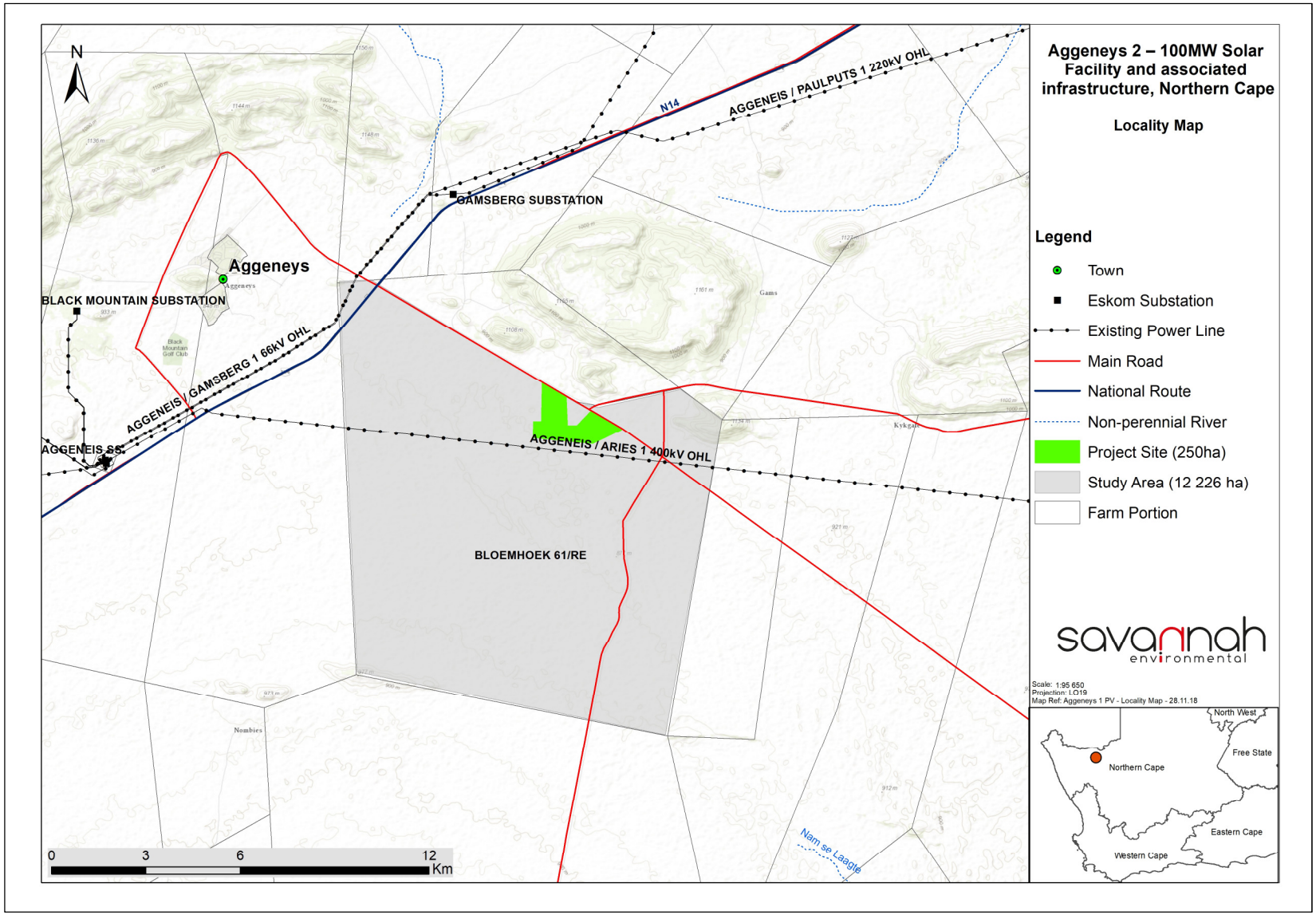


Figure 2.1: Locality map illustrating the location of the project site for the establishment of Aggeneys 2

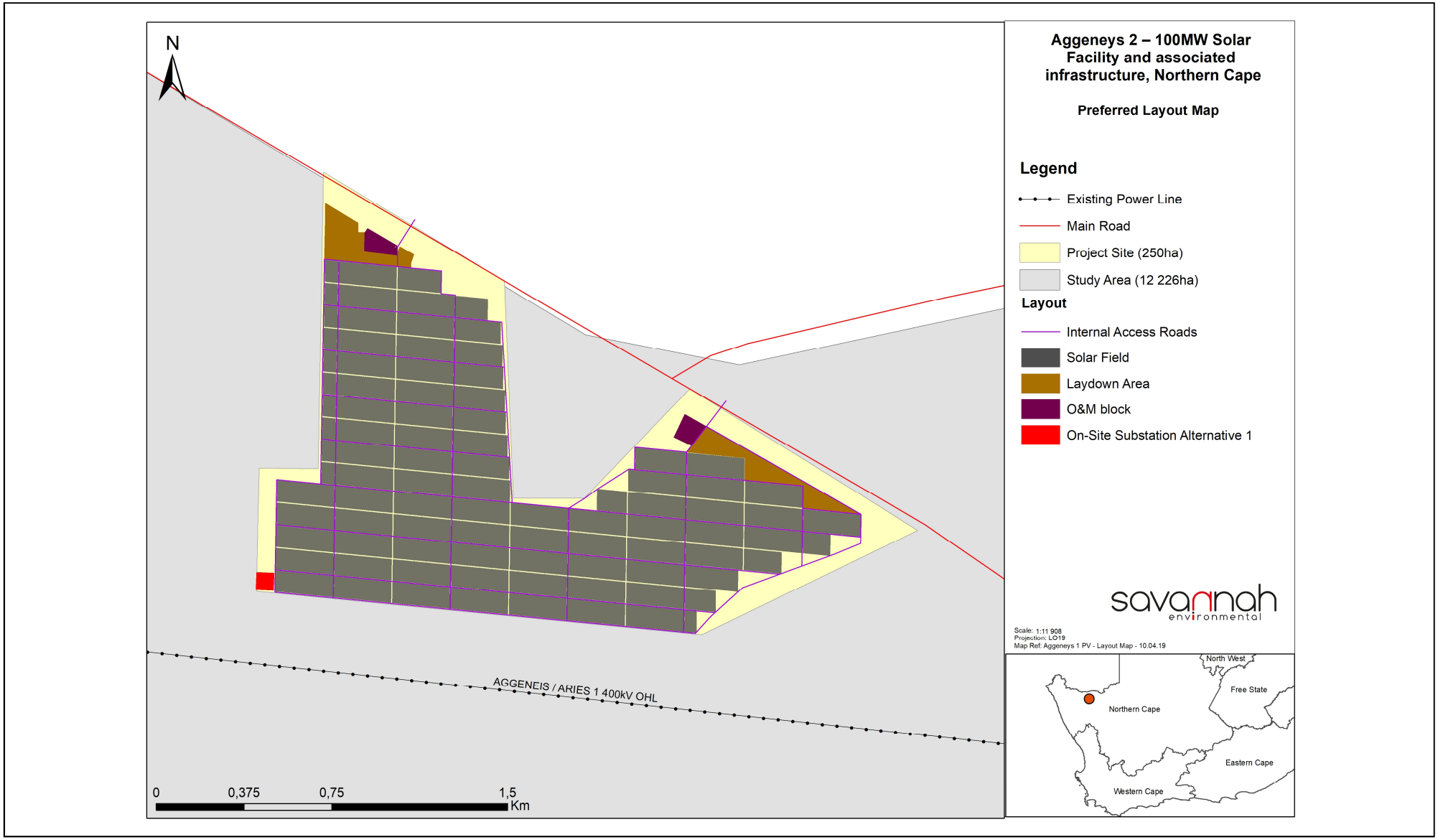


Figure 2.2: Final preferred layout map of the preferred project site for Aggeneys 2, as was assessed as part of the BA process

2.3. Life-cycle Phases of the Aggeneys 2

A series of activities are proposed as part of the design, pre-construction, construction, operation, and decommissioning phases associated with the development of Aggeneys 2. These are discussed in more detail under the respective sub-headings below.

2.3.1. Design and Pre-Construction Phase

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array and/or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction phase of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will take place. This BA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DEA will need to be notified and where relevant, approval obtained.

Conduct Surveys: Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, on-site substation and the plant's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed project site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.3.2. Construction Phase

The construction phase will entail a series of activities including:

Procurement and employment

Aggeneys 2 is likely to create approximately ~400 (at its peak) employment opportunities (temporary) for a period of ~12 to 18 months, depending on the final design, during the construction phase. Of this, approximately 60% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 15% of employment opportunities will be for skilled individuals (engineers, project managers, site managers etc.). Solar PV facilities make use of high numbers of low skilled and semi-skilled labour so there will be good opportunity to use local labour. Employment opportunities for Aggeneys 2 will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the greater Aggeneys area.

Establishment of an Access Road to the Site

The study area is accessible via the N14 which traverses the western section of the study area. Within the project site itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). Internal access roads of a gravel nature and up to 5m in width will be required.

Water Usage and Waste Requirements and the use of Hazardous Substances

During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase ~10 000m^3 of water over a 12-18 month period will be required. Water for the construction phase will be sourced directly from the Khai-Ma Local Municipality following a Service Level Agreement between the municipality and the developer. Alternatively, water will be transported to site by trucks, or water will be made available at the municipality's nearest Water Treatment Plant via a metered standpipe.

During the construction phase solid waste will be generated. Solid waste will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

The use of hazardous substances will form part of the construction phase. The substances anticipated to be used includes cement powder associated with the concrete/ brick works; petrol/ diesel for trucks, cranes, bulldozers etc.; limited amounts of transformer oils. The dangerous goods stored during construction (e.g. limited quantities of fuel, oil, lubricants etc.) will be done in compliance with relevant legislation (i.e. stored in covered area/bin and disposal at registered hazardous waste site).

Services Required

During the construction phase specific services will be required for the undertaking of the construction activities. The services required includes refuse material disposal and sanitation. Chemical toilets will be the primary source of effluent collection. Any other effluent discharge during the construction phase will be collected in sealed containers/tanks, and collected via a honey-sucker truck and treated by a service provider (either the local municipality or a Contractor) at a licensed disposal site.

Other services required includes the provision of electricity for the undertaking of the construction activities. A service level agreement will be entered into with the local municipality or Eskom for the provision of electricity via an 11kV or 22kV feeder line.

Undertake Site Preparation

Site preparation activities will include the clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For Aggeneys 2, transport of components would be via the N14 and Loop 10 roads. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[1] by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

[1] A permit will be required for the transportation of these abnormal loads on public roads.

Establishment of Laydown Areas on Site

Laydown and storage areas will be required for the typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area (of approximately 5ha in extent) will be established. The equipment construction camp serves to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for the storage of the PV panels and the general placement/storage of construction equipment.

Erect PV Cells and Construct Substation and Invertors

The construction phase involves installation of the solar PV panels and the entire necessary structural and electrical infrastructure to make the plant operational. In addition, preparation of the soil and improvement of the access roads would continue for most of the construction phase. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micro-pile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. Trenches are dug along the internal access roads as far as possible, for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site substation.

The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Establishment of Ancillary Infrastructure

Ancillary infrastructure will include cabling for the connection to the Eskom national grid, workshop and maintenance building, storage and laydown areas, gatehouse, security offices, and other storage areas under roof. The establishment of these facilities/buildings will require the localised clearing of vegetation and levelling of the project site and the excavation of foundations prior to construction.

Undertake Site Remediation

Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the solar PV facility, any access points to the site which are not required during the operation phase must be closed and rehabilitated.

2.3.3. Operation Phase

Aggeneys 2 is expected to be operational for a minimum of 20 years. The facility will, under normal operating conditions, operate continuously, 7 days a week.

Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operation phase of the solar energy facility will create a maximum of approximately 60 full-time employment opportunities. The number of skilled and semi-skilled personnel will

comprise 30% and unskilled will comprise 70% of the workforce during the operation phase. Employees that can be sourced from the local municipal pool include the less skilled and semi-skilled such as safety and security staff and certain maintenance crew. Highly skilled personnel may need to be recruited from outside the local area.

Water will be required for the operation phase of Aggeneys 2. Approximately 5 000m^3 of water per annum will be required for the operation of the solar PV facility, which is anticipated to be 20 years. The water required will be sourced directly from the Khai-Ma Local Municipality following a Service Level Agreement between the municipality and the developer. Alternatively, water will be transported to site by trucks, or water will be made available at the Municipality's nearest water treatment plant via a metered standpipe.

Other services required for the operation of Aggeneys 2 includes refuse material disposal and sanitation. No effluent is anticipated to be produced during the operation phase, except for normal sewage due to the presence of the operations staff. The sewage generated over this period will be collected and treated as per normal standards using a septic or conservancy tank. Should the local municipality not permit the use of the septic tank, sewage will be stored in the conservancy tank and collected either by a honey-sucker truck or by a service provider (contractor) for treatment at a licensed disposal site.

Limited electricity will be required for the operation of Aggeneys 2. A service level agreement will be entered into with the local municipality or Eskom for the provision of electricity via an 11kV or 22kV feeder line

2.3.4. Decommissioning Phase

Depending on the continued economic viability of Aggeneys 2 following the initial 20-year operation period, the solar PV facility will either be decommissioned or the operation phase will be extended. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the solar PV facility, the following activities will form part of the project scope.

Site Preparation
Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components
When the solar PV facility is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. At this time, all above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will be removed, and the surface restored. Much of the above ground wire, steel, and PV panels, of which the system is comprised, are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and returned to a beneficial land use.

Future plans for the site and infrastructure after decommissioning
The capacity of Aggeneys 2 would have degraded by ~15% over 20 years. The expectation is that the project site will be used for future renewable energy procurement as the operation phase approaches the termination date of the 20-year Power Purchase Agreement (PPA). If decommissioning were to occur it would

be 20 years (or the stated years) after the commencement of the PPA. Another option for the site after decommissioning is for grazing to resume.

2.4 Findings of the Environmental Impact Assessment (EIA)

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of highly sensitive features within the project site and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with Aggeneys 2 identified and assessed through the BA process include:

- Impacts on ecology, flora and fauna.
- Impacts on avifauna.
- Impacts on watercourses.
- Impacts on heritage resources, including archaeology and palaeontology.
- Visual impacts on the area imposed by the components of the facility.
- Positive and negative socio- economic impacts.
- Traffic impacts.

2.4.1 Impacts on Ecology

The Ecological Impact Assessment assessed the impact of Aggeneys 2 on the sensitive ecological features present within the project site for the life-cycle of the project. The assessment identified impacts within the construction, operation and decommissioning phases of the project.

During the construction phase (and the decommissioning phase), the impacts include impacts on vegetation and listed or protected plant species and direct faunal impacts. The significance of the construction phase impacts range from medium to low, following the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified prior to the implementation of mitigation.

During the operation phase, the anticipated impacts include faunal impacts and habitat degradation due to erosion and alien plant invasion. The significance of the impacts for the operation phase will be low, following the implementation of the mitigation measures recommended by the specialist. No impacts of a high significance were identified.

From the findings of the Ecological Impact Assessment (**Appendix D** of the BA Report) it can be concluded that no impacts of high ecological significance were identified which would hinder the development of Aggeneys 2 and its associated infrastructure within the project site. The proposed development is considered to be appropriate and acceptable from an ecological perspective and will not result in detrimental impacts to ecosystems and habitat features present within the project site and within the surrounding properties. The specialist has, therefore, indicated that the development may be authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

2.4.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E** of the BA Report) is based on the findings of two site visits undertaken in mid-winter (26 to 28 June 2018) and again in late summer (20 to 22 March 2019). The avifauna impacts identified to be associated with Aggeneys 2 will be negative and local in extent. The duration of the operation phase impacts will be long-term, for the lifetime of the PV facility.

During the construction phase (and decommissioning phase) of Aggeneys 2 direct avifauna impacts include habitat loss and disturbance related to vegetation clearance, the operation of heavy machinery (noise) and increased human presence. The significance of the construction phase impacts will be medium, with the implementation of the mitigation measures recommended by the specialist. No impacts of high significance are expected to occur during the construction phase of Aggeneys 2.

Impacts on avifauna during the operation phase of Aggeneys 2 include collisions with PV panels, entrapment along perimeter fencing, and disturbance due to traffic and night lighting. The significance of the impacts will be low, with the implementation of the recommended mitigation measures. No impacts of a high significance are expected to occur during the operation of the solar PV facility.

From the results of the avifauna assessment, it can be concluded that the project site for Aggeneys 2 is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the study area supports a typical bioregional avifaunal assemblage within an extensive vegetation type, and that there are no known breeding or roosting sites of red-listed priority species within close proximity (<3 km), there are no impacts associated with the development that are considered to be of high residual significance and which cannot be mitigated to a low acceptable level. Therefore the development of Aggeneys 2 is considered to be acceptable from an avifaunal perspective.

From the results of the avifauna impacts assessment, it can be concluded that no fatal-flaws will be associated with the development of Aggeneys 2.

2.4.3 Impacts on Freshwater Features

The assessment of freshwater features assessed the impact of Aggeneys 2 on the freshwater features present within the project site for the life-cycle of the project.

During the construction phase, impacts include vegetation clearance in watercourses, impacts to water quality in the watercourses and impacts associated with the movement of vehicles through watercourses. The significance of the construction phase impacts will be low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of mitigation.

During the operation phase, the impact relates to the movement of vehicles through watercourses located within the development footprint. The significance of the impact will be low following the implementation of the mitigation measures by the recommended specialist. No impacts of a high significance were identified for the project.

From the findings it can be concluded that the development of Aggeneys 2 will have an overall negative impact of low significance with the implementation of the recommended mitigation measures. The construction of the solar PV facility and the associated infrastructure is therefore supported from a freshwater

features perspective and considered acceptable subject to obtaining of the necessary water use license from the Department of Water and Sanitation.

2.4.4 Impacts on Soil and Agricultural Potential

Two impacts have been identified to be associated with the development of Aggeneys 2 from a soils perspective. These impacts include the loss of potentially productive agricultural land through the undertaking of construction activities and panel installation; and increased wind erosion due to disturbance of the soil. Both impacts are expected to occur during the construction and operation phases.

No fatal flaws have been identified from a soils and agricultural potential perspective and all impacts can be mitigated to be within low and acceptable levels of impact. Therefore, the development of Aggeneys 2 is considered to be acceptable from a soils and agricultural perspective.

2.4.5 Impacts on Heritage Resources

The heritage impacts expected during the construction phase include impacts to palaeontological resources, archaeological resources and graves and impacts to the cultural landscape. There are no heritage resources present within the development footprint, although several isolated stone artefacts attributable to background scatter were noted. Impacts to heritage resources were identified to be associated with Aggeneys 2 for the construction phase. No impacts are expected to occur during the operation phase of the solar PV facility.

The significance of the impacts ranges from medium to low, with the implementation of the recommended mitigation measures. No impacts of high significance are expected, and the development of Aggeneys 2 is considered to be acceptable from a heritage perspective.

2.4.6 Visual Impacts

The Visual Impact Assessment identified negative impacts on visual receptors during the construction and the operation phases of Aggeneys 2. The impacts includes a change in the character of a relatively natural area, a change in the character of the landscape as seen from the N14, the Loop 10 road and local homesteads, a change in the landscape as seen from local settlement areas, glare impacts which could affect travellers on the Loop 10 road and the northern flight path of the Aggeneys Aerodrome and visual impacts related to the operational, safety and security lighting of the solar PV facility on observers. The significance of the impacts ranges between medium and low, with the implementation of the recommended mitigation measures. No impacts of a high significance are expected to occur.

The Visual Impact Assessment concluded that the development of Aggeneys 2 will largely impact visually on an area where there currently is strong influence of urban and urban fringe development and therefore changes to the landscape quality are unlikely to be problematic. In conclusion, the development of Aggeneys 2 is considered to be acceptable from a landscape and visual impact perspective.

2.4.7 Social Impacts

The Social Impact Assessment identified that most social impacts associated with the development of Aggeneys 2 will have a short term duration associated with the construction phase and long-term duration during the operation phase of the project. Both positive and negative impacts have been identified for both the construction and operation phases of the development.

During the construction phase, negative impacts include nuisance, dust and noise impacts, an increase in crime, an increased risk of HIV and AIDS, an influx of construction workers and job seekers to the area, exposure to hazards, disruption of daily living patterns and disruption of services supplied and impacts on infrastructure. The significance of the negative construction phase impacts ranges between low, medium and high, with the implementation of recommended mitigation measures. The positive social impacts associated with the construction of Aggeneys 2 includes positive economic impacts and the stimulation of the area's economy. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures.

Impacts associated with the operation of the solar PV facility will be both positive and negative. The negative impacts are related to a transformation in the sense of place which has a significance of medium to high, with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of Aggeneys 2 relates to positive economic impacts, including the creation of jobs, business opportunities and a source of revenue for local authorities. The significance of the positive impacts will be medium high with the implementation of the recommended enhancement measures.

2.4.8 Impacts on Traffic

During the construction phase, traffic will be generated through the transportation of project components and employees to the site. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

During the operation phase, traffic will be generated and will relate to the presence of the operation and maintenance staff at the solar PV facility. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

No fatal flaws and no impacts of high significance are expected, and the development of Aggeneys 2 is therefore considered to be acceptable from a traffic perspective.

2.5. Environmental Sensitivity Mapping

From the specialist investigations undertaken for Aggeneys 2, the following sensitive areas/environmental features have been identified and demarcated within the project site (refer to **Figures 2.3**). These features have been considered by the developer for the development of Aggeneys 2.

» **Ecology** – The entire Aggeneys 2 project site is located within a plains habitat considered to be of a low ecological sensitivity. Sensitive ecological areas only occur outside of the project site, and includes a rocky outcrop within the central portion and outside of the project site, as well as a wash located to the south east.

» **Bird habitat and Sensitive Areas** – The entire Aggeneys 2 project site is located within a plains habitat considered to be of low sensitivity to avifauna. Sensitive avifauna areas only occur outside of the project site, and includes a rocky outcrop within the central portion and outside of the project site, as well as a wash located to the south east.

» **Freshwater features:** Five ephemeral watercourse reaches were identified within the project site which can be classified as Lower Foothill Rivers in terms of the national classification system[2]. The ephemeral watercourses emanated from culverts under the Loop 10 road north of the project site boundary, which allows water run-off from the inselbergs north of the study area to drain through onto the project site. It is acceptable for PV panels to span over the ephemeral watercourses given their nature and extent and limited vegetation cover. However, the mounting structures of the PV panels must not be placed directly inside the watercourses. Internal roads and underground cables are also permissible through the watercourses provided that the necessary water use license or general authorisation is obtained from the Department of Water and Sanitation. No other buildings or infrastructure are allowed in the watercourses and the associated 15m buffer zone.

» **Heritage features:** No heritage resources were identified within the development footprint, although two rock cairns (likely graves) are located outside of the project site near the rocky outcrop. These features are considered to be no-go from a heritage perspective, however these features are avoided and no impact is expected to occur with the development of Aggeneys 2.

[2] These features are very typical for the Northern Cape and the site is not considered to be unique considering the presence of these systems.

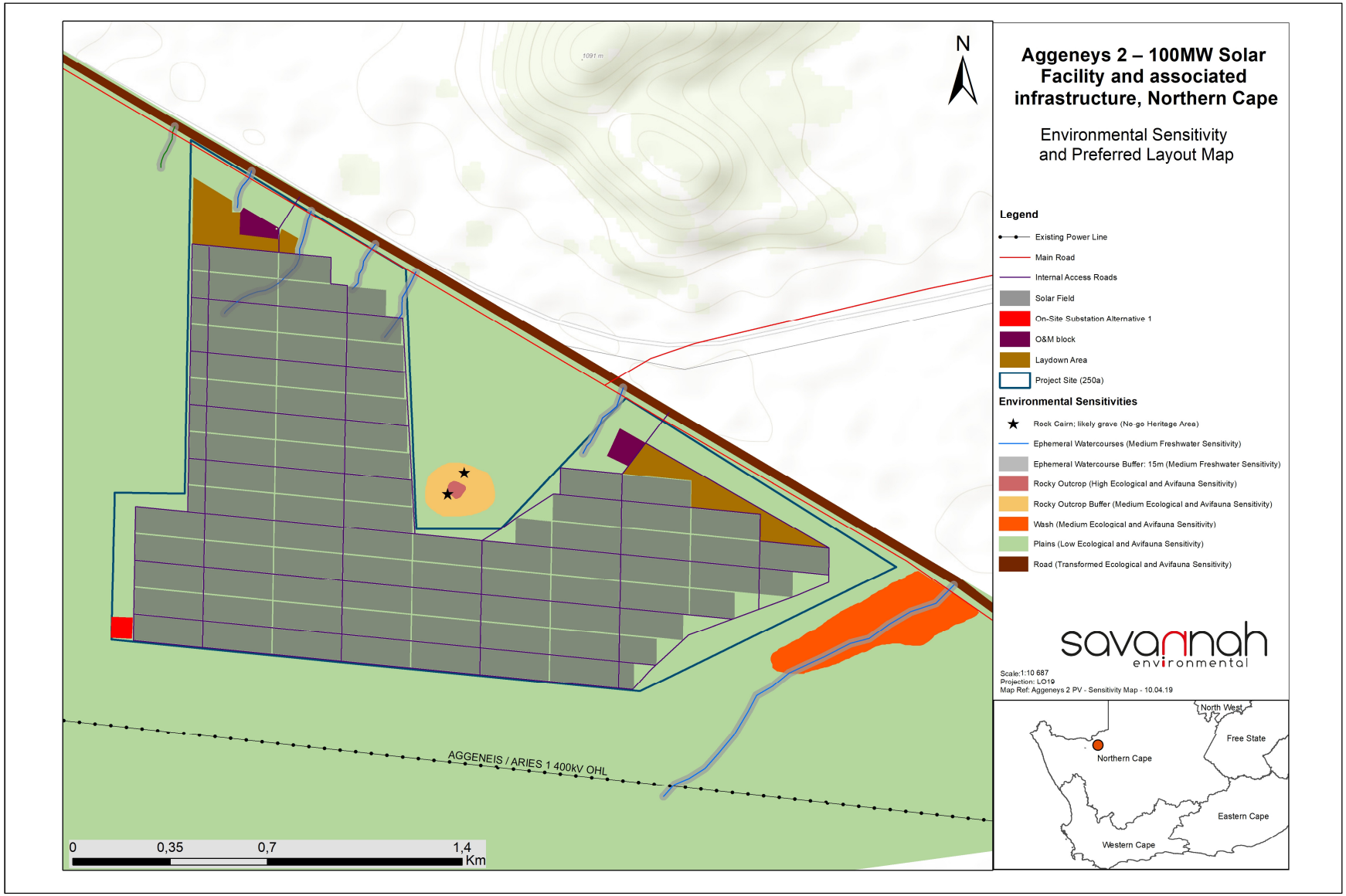


Figure 2.3: Final preferred layout map of the preferred development footprint for Aggeneys 2, as was assessed as part of the BA process, overlain with the environmental sensitivities.

CHAPTER 3 : PURPOSE AND OBJECTIVES OF THE EMPR

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced". The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through to those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, re-vegetation) and operation. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of Aggeneys 2. The document must be adhered to and updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) (refer to Table 4.1). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for Aggeneys 2 and/or as the project develops. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

The EMPr has the following objectives:

- Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the Aggeneys 2 development.
- Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance, and prevent long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the BA process.

The mitigation measures identified within the BA process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

The Developer must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. Since this EMPr is part of the BA process for the Aggeneys 2 solar PV facility, it is important that this document be read in conjunction with the BA Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental Authorisation, the stipulations in the Environmental Authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the planning, construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as relevant throughout the project life cycle.

CHAPTER 4: STRUCTURE OF THIS EMPR

The preceding chapters provide background to the EMPr and the proposed project, while the chapters that follow consider the following:

- Planning and design activities;
- Construction activities;
- Operation activities; and
- Decommissioning activities.

These chapters set out the procedures necessary for the project owner to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation for the project, an overarching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, that is necessary to meet the overall goal; which takes into account the findings of the BA specialist studies

Project Component/s	List of project components affecting the objective, i.e.: » PV Panels » Access roads; and » Associated infrastructure.
Potential Impact	Brief description of potential environmental impact if objective is not met.
Activity/Risk Source	Description of activities which could affect achieving the objective.
Mitigation: Target/Objective	Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management programme.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- Planned activities change (i.e. in terms of the components and/or layout of the facility);
- Modification to or addition to environmental objectives and targets;
- Additional or unforeseen environmental impacts are identified and additional measures are required to be included in the EMPr to prevent deterioration or further deterioration of the environment.
- Relevant legal or other requirements are changed or introduced; and
- Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

4.1 Contents of this Environmental Management Programme (EMPr)

This Environmental Management Programme (EMPr) has been prepared as part of the BA process being conducted in support of the application for Environmental Authorisation (EA) for the Aggeneys 2 solar PV facility. This EMPr has been prepared in accordance with DEA's requirements as contained in Appendix 4 of the 2014 EIA Regulations (GNR 326). . It provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EMPr, as prescribed by Appendix 4 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within this EMPr is provided in Table 4.1.

Table 4.1: Summary of where the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (GNR 326) are provided in this EMPr.

Requirement	Location in this EMPr
(1) An EMPr must comply with section 24N of the Act and include – (a) Details of – (i) The EAP who prepared the EMPr. (ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	Chapter 4 Appendix K
(b) A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Chapter 2
(c) A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.	Chapter 2 Figure 2.2 to Figure 2.5 Appendix A
(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –	
(i) Planning and design.	Chapter 5
(ii) Pre-construction activities.	Chapter 5
(iii) Construction activities.	Chapter 6
(iv) Rehabilitation of the environment after construction and where applicable post closure.	Chapter 7
(v) Where relevant, operation activities.	Chapter 8
(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to – (i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation. (ii) Comply with any prescribed environmental management standards or practices.	Chapters 5 - 8

Requirement	Location in this EMPr
(iii) Comply with any applicable provisions of the Act regarding closure, where applicable. (iv) Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Chapters 5 - 8
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Chapters 5 - 8
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Chapter 6
(m) An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 6
(n) Any specific information that may be required by the competent authority.	Table 4.2
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

4.2 Project Team

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326) the applicant appointed Savannah Environmental (Pty) Ltd as the independent environmental consultants responsible for managing the application for EA and the supporting BA process. The application for EA and the BA process, is being managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

4.2.1 Details and Expertise of the Environmental Assessment Practitioner (EAP)

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

This BA process is being managed by Jo-Anne Thomas. She is supported by Lisa Opperman, Reuben Maroga and Thalita Botha.

» **Lisa Opperman** the principle author of this report. She holds a Bachelor degree with Honours in Environmental Management and has three and a half years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She is currently involved in several EIAs for energy generation projects across South Africa

» **Reuben Maroga** is the co-author of this report. He holds a Bachelor degree in Environmental Management and has 2.5 years of experience in the environmental management field. His key focus is on environmental impact assessments, public participation, environmental management programmes, water use licence applications, as well undertaking ECO reporting for a variety of projects.

» **Thalita Botha** - the co-author of this report. She holds a Bachelor degree with Honours in Environmental Management and has three years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects.

» **Jo-Anne Thomas** is the registered EAP for the EIA for this project. Jo-Anne holds a Master of Science Degree in Botany (M.Sc. Botany) from the University of the Witwatersrand, and is registered as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time she has managed and coordinated a multitude of large-scale infrastructure EIAs, and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. Jo-Anne has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPrs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development, and therefore have extensive knowledge and experience in EIAs and environmental management, having managed and drafted EMPrs for numerous other power generation projects throughout South Africa. Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix K** of the EMPr.

4.2.2 Details of the Specialist Consultants

A number of independent specialist consultants have been appointed as part of the BA project team in order to adequately identify and assess potential impacts associated with the project (refer to **Table 1.1**). The specialist consultants have provided input into the BA Report as well as this EMPr.

Table 1.1: Specialist Consultants which form part of the BA project team.

Specialist Area of Expertise	Specialist Company	Specialists Names
Ecology and Avifauna	3Foxes Biodiversity Solutions	Simon Todd Eric Hermann
Freshwater	Savannah Environmental & Peer reviewed by Steven Burton of SiVEST.	Shaun Taylor Gideon Raath Steven Burton
Visual Impact Assessment	Environmental Planning and Design	Jon Marshall
Soils and Agricultural Potential Impact Assessment	Agricultural Research Council : Climate, Soil and Water	Garry Paterson
Heritage (Archaeology and Palaeontology)	Asha Consulting (in consultation with John Almond of Natura Viva)	Jayson Orton
Social Impact Assessment	Neville Bews & Associates	Dr Neville Bews
Traffic Impact Assessment	Knight Piésold	Andrew Cleghorn

CHAPTER 5: PLANNING AND DESIGN MANAGEMENT PROGRAMME

Overall Goal: undertake the pre-construction activities (planning and design phase) in a way that:

- Ensures that the preferred design and layout of the PV panels, on-site substation and associated infrastructure responds to the identified environmental constraints and opportunities.
- Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- Ensures that the best environmental options are selected for the linear components (underground cable network, short distribution power line), including the access roads.
- Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1 Objectives

OBJECTIVE 1: Ensure the facility design responds to identified environmental constraints and opportunities

The Aggeneys 2 project site will not infringe on areas or features considered to be of a high environmental sensitivity. All impacts associated with the layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. Through the assessment of the development of Aggeneys 2 within study area and project site, it was concluded that the development of the solar PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

Project Component/s	» PV panels » Access roads » On-site substation » Inverter stations » Transformer » Underground cabling » Associated buildings
Potential Impact	» Impact on identified sensitive areas. » Design fails to respond optimally to the environmental considerations.
Activities/Risk Sources	» Positioning of all project components » Pre-construction activities, e.g. geotechnical investigations, site surveys and environmental walk-through surveys. » Positioning of temporary sites.
Mitigation: Target/Objective	» The design of the PV facility, power line responds to the identified environmental constraints and opportunities.

	» Optimal planning of infrastructure to minimise visual impact. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Developer Geotechnical specialist	Pre-construction
Finalise layout of all components, and submit to DEA for approval prior to commencement of construction.	Developer	Prior to construction
If the layout of the development is amended, an archaeologist must be contacted to provide an assessment of the altered layout. A report/letter detailing the results of the new layout must be provided to SAHRA for comments.	Developer	Prior to construction
The EMPr should form part of the contract with the Contractors appointed to construct the PV facility and associated infrastructure, and must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.	Developer Contractor	Tender Design and Design Review Stage
Before the construction phase commences, all sensitive habitats, such as wetlands, protected trees must be clearly demarcated with fencing or orange mesh netting. Barricading measures to be utilized should not restrict the movement of fauna in the area.	Developer Contractor	Pre-construction
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible and to avoid habitat loss and disturbance to adjoining areas.	Developer	Pre-construction
The construction equipment camps must be planned as close to the site as possible to minimise impacts on the environment.	Developer	Pre-construction
Ensure that laydown areas, construction camps and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible.	Developer	Project planning
Plan development levels to minimise earthworks to ensure that levels are not elevated.	Developer	Project planning
The red sand dunes to the south of the project site should be considered to be a no-go area to avoid disturbance to avifauna, apart from where there are already existing access roads.	Developer	Project planning
The construction site must be fenced off. The fence around the facility should be designed to be animal and bird friendly, to prevent entrapment and electrocutions of ground-dwelling birds and animals. In practical terms this means that the perimeter fence of the facility should only include the developed areas and as little undeveloped ground or natural veld as possible. No electrified strands should be placed within 30cm of the ground as	Developer	Project planning

Mitigation: Action/Control	Responsibility	Timeframe
some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.		
Clear rules and regulations for access to the proposed site must be developed.	Developer Contractor	Pre-Construction
The Loop 10 gravel is also known as TR84/1 which a class 3 rural road. A maintenance plan (for the duration of the construction phase) must be submitted to the Northern Cape Department of Roads and Public Works (DPRW) for review prior to any construction activities.	Developer	Planning and Design
A detailed bell – mouth design must be submitted to the DRPW. This design must comply with the Technical Recommendations for Highways (TRH) No. 7 and 26 Standards.	Developer Traffic Engineer	Planning and Design
Side drainage must be installed at the bell mouth if considered necessary.	Developer	Design and Planning
No work may be undertaken within the statutory width of a building restriction road/public before sunrise or after sunset, except in the case of an emergency.	Developer Contractor	Pre-construction and construction
Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.	Developer	Planning and design
A designated access to the site must be planned to ensure safe entry and exit.	Developer Contractor	Design
The access road must be altered or shifted should the road authority deem it necessary at some future date.	Developer	Planning and Design Duration of contract
No laydown areas, operation and maintenance buildings are allowed in the watercourse areas and associated buffer zones.	Developer Contractor	Design
Plan and placement of light fixtures for the plant and the ancillary infrastructure in such a manner so as to minimise glare impacts on the surrounding area. All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects, and should be directed downwards	Developer Contractor	Planning
Where discharge of rainwater on roads will be channelled directly into the natural environment, the application of diffuse flow measures must be included in the design.	Developer Contractor	Planning
New elements should be designed to blend as naturally as possible with their backdrop.	Developer Design engineer	Design and planning
Plan to maintain the height of structures as low as possible.	Developer Design engineer	Design and planning
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.	Developer Design engineer	Design and planning
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction
No temporary site camps must be planned outside the development footprint of the project.	Developer	Design and planning

Mitigation: Action/Control	Responsibility	Timeframe
Consider planning and design level mitigation measures recommended by the specialists as part of the BA process.	Engineering Design Consultant	Design Phase
No construction activity should occur near active raptor nests should these be discovered prior to or during the construction phase. If active nests are discovered near construction areas, these should be reported to the ECO and should be monitored until the birds have finished nesting and the fledglings have left the nest.	Developer Contractor	Design and Planning
The perimeter fence around the facility should be designed with potential impacts on ground-dwelling avifauna in mind. Double-fence designs where the inner electric fence is positioned within one (1) meter of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped between these (Visser, 2016). Single-fence designs, whereby the electrical fencing component is attached to the inside of the mesh fence, are considered preferable as ground-dwelling birds cannot be trapped between these components	Developer Contractor	Design and Planning
If any fence along the road boundaries is removed or damaged through the development of the solar PV facility, it must be restored to its original standard.	Developer Contractor	Duration of contract
Should any water storage reservoirs be required, these should be covered with fine mesh or other exclusion material in order to exclude and prevent birds from accessing potentially contaminated water contained therein.	Developer Contractor	Design and Planning
If any change in the footprint occurs, then an archaeologist must be consulted for an opinion on whether a survey is required.	Developer Contractor	Construction
No advertising is permitted on the fence and/or within the road reserve and any outdoor advertising within 95m from the road centre line must be submitted to the Northern Cape Department of Roads and Public Works for review.	Developer Contractor	Duration of contract

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Demarcated sensitive areas are avoided at all times. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. » Monitor ongoing compliance with the FMP and method statements.

OBJECTIVE 2: Ensure that relevant permits and plans are in place to manage impacts on the environment

Project Component/s	» PV panels » Access roads » On-site substation » Inverter stations » Transformer » Underground cabling

	» Associated buildings
Potential Impact	» Impact on identified sensitive areas and protected species. » Design fails to respond optimally to the environmental considerations.
Activities/Risk Sources	» Positioning of all project components. » Pre-construction activities, e.g. geotechnical investigations, site surveys of substation footprint, power line servitude and internal access roads and environmental walk-through surveys. » Positioning of temporary sites.
Mitigation: Target/Objective	» To ensure that the design of the power plant responds to the identified environmental constraints and opportunities. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner. » To ensure that the design of the power plant responds to the identified constraints identified through pre-construction surveys.

Mitigation: Action/Control	Responsibility	Timeframe
Obtain any additional environmental permits required prior to the commencement of construction. Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Developer	Pre-construction
Obtain abnormal load permits for transportation of project components to site (if required).	Contractor(s)	Prior to construction
Pre-construction walk-through of the facility's final layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC permit conditions.	Developer Specialist	Pre-construction
Undertake search and rescue for identified species of concern before construction with an Ecologist.	Developer Contractor Specialist	Pre-construction
All species listed in terms of TOPs and Red Data must not be disturbed or removed without a permit from the relevant authorities.	Developer Contractor	Pre-construction
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	Developer Contractor	Pre-construction
Water use licence or general authorisation must be obtained from the Department of Water and Sanitation (DWS) prior to commencing with construction activities.	Developer Contractor	Pre-construction
Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.	Developer Contractor	Pre-construction
A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found.	Developer Contractor	Pre-construction
Prepare a detailed Fire Management Plan (FMP) in collaboration with surrounding landowners.	Developer	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Communicate the FMP to surrounding landowners and maintain records thereof.	Developer	Pre-construction Construction
A Stormwater Management Plan (SWMP) should be developed and should provide for a drainage system sufficiently designed to prevent water run-off from the solar panels to cause soil erosion.	Developer Design engineer	Pre-construction
Develop and implement an alien, invasives and weeds eradication/control plan.	Developer Specialist	Pre-construction
Compile and implement a construction period traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted.	Contractor	Pre-construction
Any permits required for the transportation of material to the project site must be obtained from the relevant road and public works authority.	Developer	Prior to construction.

Performance Indicator	» Permits are obtained and relevant conditions complied with. » Impact on protected plant species reduced to some degree through Search and Rescue. » Relevant management plans and Method Statements prepared and implemented.
Monitoring	» Review of the design by the Project Manager and the ECO prior to the commencement of construction. » Monitor ongoing compliance with the EMPr and method statements.

OBJECTIVE 4: Ensure appropriate planning is undertaken by contractors

Project Component/s	» PV panels » Access roads » On-site substation » Inverter stations » Transformer » Underground cabling » Associated buildings
Potential Impact	» Impact on identified sensitive areas. » Design and planning fail to respond optimally to the environmental considerations.
Activities/Risk Sources	» Positioning of all project components. » Pre-construction activities. » Positioning of temporary sites. » Employment and procurement procedures.
Mitigation: Target/Objective	» To ensure that the design of the PV facility responds to the identified environmental constraints and opportunities. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner.

Mitigation: Action/Control	Responsibility	Timeframe
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and contractors contracts.	Developer Contractor	Pre-construction
Develop a database of local companies, specifically Historically Disadvantaged (HD), that qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) prior to the tender process and invite them to bid for project-related work where applicable.	Developer	Pre-construction
Pre-construction environmental induction for all construction staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.	EO	Pre-construction
A local procurement policy must be adopted to maximise the benefit to the local economy.	Developer Contractor	Pre-construction
Recruitment of temporary workers onsite is not to be permitted. A recruitment office with a Community Liaison Officer should be established to deal with jobseekers.	Developer Contractor	Pre-Construction
Set up a labour desk in a secure and suitable area to discourage the gathering of people at the construction site.	Developer Contractor	Pre-Construction
Local community organisations and policing forums must be informed of construction times and the duration of the construction phase. Procedures for the control and removal of loiterers at the construction site should be established.	Developer Contractor	Pre-Construction
Security company must be appointed and appropriate security procedures implemented.	Developer Contractor	Pre-Construction
A comprehensive employee induction programme must be developed and utilised to cover land access protocols, fire management and road safety.	Contractor	Pre-construction
Perform a skills audit to determine the potential skills that could be sourced in the area	Developer Contractor	Pre-construction

Performance Indicator	» Conditions of the EMPr form part of all contracts. » Local employment and procurement is encouraged.
Monitoring	» Monitor ongoing compliance with the EMPr and method statements.

OBJECTIVE 5: Ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operation phases of the development. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» PV facility. » Access road. » Associated infrastructure.
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with construction » Activities associated with operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners, and communities. » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public to be implemented during both the construction and operation phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operation and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowners must be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer Contractor	Pre-construction
Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for.	Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), must be informed of the details of the contractors, size of the workforce and construction schedules.	Developer Contractor	Pre-construction and construction
Clearly inform the local municipality of the potential impact of the proposed project in order for the necessary preparations to take place	Developer	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» A Public Complaints register must be maintained by the Contractor to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be in writing. » Developer and contractor must keep a record of local recruitments and information on local labour; to be shared with the ECO for reporting purposes during construction.

CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION

Overall Goal: Undertake the construction phase in a way that:

- Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
- Minimises impacts on fauna (including birds) in the study area.
- Minimises the impact on heritage sites should they be uncovered.
- Establish an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, ABO Wind Aggeneys 2 PV (Pty) Ltd must ensure that the project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. The Developer will retain various key roles and responsibilities during the construction phase.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to the overall implementation of the EMPr

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager, Site Manager, Internal Environmental Officer (EO) , Safety and Health Representative, Independent Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 6.1** provides an organogram indicating the organisational structure for the implementation of the EMPr.

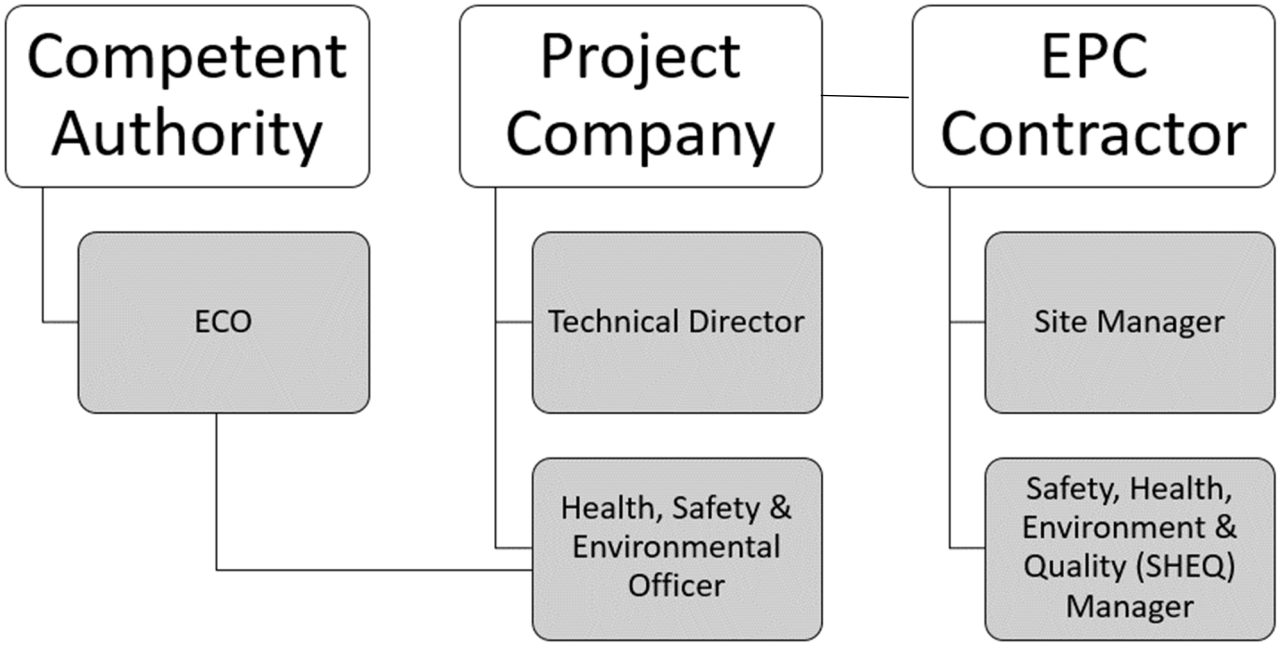


Figure 6.4: Organisational structure for the implementation of the EMPr

Construction Manager will:

- Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that the Developer and its Contractor(s) are made aware of all stipulations within the EMPr.
- Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes through input from the independent ECO.
- Be fully conversant with the BA for the project, the EMPr, the conditions of the Environmental Authorisation, and all relevant environmental legislation.
- Be fully knowledgeable with the contents of all relevant licences and permits.

Site Manager (The Contractor's on-site Representative) will:

- Be fully knowledgeable with the contents of the BA.
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation.
- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- Have overall responsibility of the EMPr and its implementation.
- Conduct audits to ensure compliance to the EMPr.
- Ensure there is communication with the Technical Director, the ECO, the Internal EO and relevant discipline engineers on matters concerning the environment.
- Be fully knowledgeable with the contents of all relevant licences and permits.

- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

An independent **ECO** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- Be fully knowledgeable of the contents of the BA.
- Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- Be fully knowledgeable of the contents of the EMPr.
- Be fully knowledgeable of the contents of all relevant environmental legislation, and ensure compliance therewith.
- Be fully knowledgeable with the contents of all relevant licences and permits issued for the project.
- Ensure that the contents of the EMPr are communicated to the Contractor's site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- Ensure that compliance with the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- Ensure that activities on site comply with all relevant environmental legislation.
- Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- Ensure that any non-compliance or remedial measures that need to be applied are reported.
- Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- Independently report to the Department of Environmental Affairs (DEA) in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- Keep records of all reports submitted to DEA.

As a general mitigation strategy, the ECO should be present on site full-time for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and to supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter, weekly site compliance inspections would probably be sufficient, which must be increased if required. The ECO will be supplemented with the EPC Contractor's/Project Company's Environmental Officer (EO) who will be located on site on a daily basis and will guide the EPC Contractor's/Project Company to ensure compliance with the environmental considerations. Therefore, in the absence of the ECO there will be a designated owner's EO present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractor's Safety, Health and Environment Representative and/or Environmental Officer: The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to

the Site Manager and Contractor. In some instances, a separate EO may be appointed to support this function.

The Contractor's Safety, Health and Environment Representative and/or EO should:

» Be well versed in environmental matters.
» Understand the relevant environmental legislation and processes and the implementation thereof.
» Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
» Know the background of the project and understand the implementation programme.
» Be able to resolve conflicts and make recommendations on site in terms of the requirements of this specification.
» Keep accurate and detailed records of all EMPr-related activities on site. The EO shall keep a daily diary for monitoring the site specific activities as per project schedule.
» Supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations) and therefore needs the relevant training/ experience. The EO will have overall responsibility for day-to day environmental management and implementation of mitigations.
» The EO is responsible for reporting to the ECO on the day-to-day on-site implementation of this EMPr and other Project Permits/Authorisations.
» Ensure or otherwise train and induct all contractor's employees prior to commencement of any works.
» Ensure that there is daily communication with the Site Manager regarding the monitoring of the site.
» Compilation of Weekly and Monthly Monitoring Reports to be submitted to the ECO and Site Manager.
» In addition, the EO/ Environmental Representative must act as project liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager, ECO and Contractor(s).

Contractors and Service Providers: It is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractors must appoint an Internal EO who will be responsible for informing contractor employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Internal EO and Contractor's obligations in this regard include the following:

» Must be fully knowledgeable on all environmental features of the construction site and the surrounding environment.
» Be fully knowledgeable with the contents and the conditions of the Environmental Authorisation.
» Be fully knowledgeable with the contents with the EMPr.
» Be fully knowledgeable of all the licences and permits issued for the site.
» Ensure a copy of the Environmental Authorisation and EMPr is easily accessible to all on-site staff members.
» Ensure contractor employees are familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
» Ensure that prior to commencing any site works, all contractor employees and sub-contractors must have attended environmental awareness training included in the induction training which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

- Manage the day-to-day on-site implementation of this EMPr, and the compilation of regular (usually weekly) Monitoring Reports.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken, including those of the Independent ECO.
- Inform staff of the environmental issues as deemed necessary by the Independent ECO.

All Contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- Ensuring adherence to the environmental management specifications.
- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken.
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- Ensuring that a register of all public complaints is maintained.
- Ensuring that all employees, including those of sub-contractors, receive training before the commencement of construction in order for the sub-contractors to constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained on the environmental obligations).

Community Liaison Officer (CLO) will represent the community and assist the Owner, Contractor and the Engineer with communication between them and the community. The CLO will inform the community regarding the project details, safety precautions and programme. Duties and responsibilities of the community liaison officer include:

- Be available at the site offices generally between the hours of 07:00 and 09:00 and again from 15:00 until the end of working day. Normal working hours will be from 07:00 till 17:00.
- Maintain an up-to-date record of potential employees within the community and provide the contractor with copies of this information.
- To identify, screen and nominate labour from the community in accordance with the Contractor's requirements and determine, in consultation with the Contractor, the needs of local labour for employment and relevant technical training, where applicable.
- Liaise between Contractor and labour regarding wages and conditions of employment.
- Communicate daily with the Contractor on labour related issues such as numbers and skills.
- Identify possible labour disputes, unrest, strikes, etc., in advance and assist in their resolution.
- Have a good working knowledge of the contents of the contract document regarding labour and training matters.
- Attend all meetings at which the community and/or labour is represented or discussed.
- Attend contract site meetings and report on community and labour issues at these meetings.
- Co-ordinate and assist with the obtaining of information regarding the community's needs (questionnaires, etc.).
- Inform local labour of their conditions of temporary employment, to ensure their timeous availability and to inform them timeously of when they will be relieved.
- Ensure that all labour involved in activities when tasks have been set, are fully informed of the principle of task-based work.
- Attend disciplinary proceedings to ensure that hearings are fair and reasonable.
- Keep a daily written record of interviews and community liaison.

» Arrange venues for training if required.
» Assist with the training and education of the community regarding the correct usage of the services, where applicable.
» Any other duties that may become necessary as the works progress.

6.2 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE 2: Minimise impacts related to inappropriate site establishment

Project Component/s	» Area infrastructure (i.e. PV panels, substation, inverters, transformers, switchgear and ancillary buildings). » Linear infrastructure (i.e. underground cabling, main access road and internal access roads and fencing).
Potential Impact	» Hazards to landowners and the public. » Damage to indigenous natural vegetation. » Loss of threatened plant species. » Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.
Activities/Risk Sources	» Any unintended or intended open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site. » Transport to and from the temporary construction area/s.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint. » Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.

Mitigation: Action/Control	Responsibility	Timeframe
All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or hunting ground-dwelling species (i.e. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.	Developer Contractor	Site establishment and duration of construction
Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer.	Contractor	Site establishment and duration of construction.
All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	Developer Contractor	Duration of construction
No laydown areas, operation and maintenance buildings are allowed in the watercourse areas and associated buffer areas.	Developer Contractor	Site establishment, and duration of construction.

Mitigation: Action/Control	Responsibility	Timeframe
Where mounting structures are within the buffer zone of the ephemeral watercourses, these areas need to be temporarily bunded using an appropriate structure (i.e. silt nets, sand bags, pegged wooden planks) until construction is complete at each point.	Contractor	Site establishment and duration of construction.
No in-stream vegetation is to be removed unnecessarily.	Contractor	Site establishment and duration of construction.
Where in-stream vegetation is to be cleared, vegetation is not to be completely removed. Rather, vegetation should be trimmed to 300mm height above ground level to ensure surface roughness is maintained	Contractor	Site establishment and duration of construction.
The ECO must be present when vegetation is trimmed to supervise this process and ensure compliance with this control measure.	Contractor	Site establishment and duration of construction.
All soil stockpiles on the project site that are within 100m of a watercourse must be bunded using an appropriate structure (i.e. silt nets, sand bags, pegged wooden planks).	Contractor	Site establishment and duration of construction.
The outer areas of the cleared lay-down, operation and maintenance buildings, and on-site substation areas that are within 100m of the watercourse, must make use of sedimentation preventative measures such as silt nets, sand bags or any other suitable sedimentation preventative technique to prevent sedimentation entering watercourses via surface water run-off during construction.	Contractor	Site establishment and during construction.
All vehicles and machinery must be checked for leaks before being allowed to operate on the project site. Should leaks be detected, the relevant vehicles and machinery must be repaired before being allowed to operate on the project site.	Contractor	Site establishment and duration of construction
No construction in the watercourses is to take place over the two rain peak periods associated with the watercourses (i.e. during November, and between February to March). This will avoid impacts to flow, as construction will be limited to periods when the watercourse is likely to be dry.	Developer Contractor	Site establishment and duration of construction
Suitable crossing through the watercourse are to be implemented where required. In general, it is not expected that hard structures (road culverts) will be required in the watercourses, and that the establishment of vehicle tracks will be sufficient. However, it is recommended that gravel be used through the watercourses to assist with stabilization and to prevent erosion within the watercourses.	Developer Contractor	Site establishment and duration of construction.
Temporary sanitation may not be placed directly or within 100m of any ephemeral watercourse.	Contractor	Site establishment and duration of construction.
Temporary sanitation facilities must be regularly checked for leaks and spillages, and repaired where any leakages are detected before being allowed for use on the project site.	Contractor	Site establishment and duration of construction.
Necessary water use license or general authorisation must be obtained from the Department of Water and Sanitation (DWS) prior to commencing with construction activities.	Contractor	Site establishment and duration of construction.
Internal roads are not be tarred.	Contractor	Site establishment and duration of construction.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movement through the watercourse is to be limited as far as possible.	Contractor	Site establishment and duration of construction.
All internal roads through watercourses are to be monitored for erosion regularly during the construction phase.	Contractor	Construction
Where erosion takes place, the EO must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.	Contractor EO	Construction
A construction stormwater management plan must be compiled by a suitable engineer to address drainage and run-off issues.	Contractor Traffic Engineer	Site establishment and duration of construction.
Secure site, working areas and excavations in an appropriate manner.	Contractor	Site establishment, and duration of construction
Ensure that no activities infringe on identified no-go, very high and high sensitivity areas.	Contractor	Duration of construction
Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.	Contractor	Site establishment, and duration of construction
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Contractor	Construction
Access to adjacent areas to be strictly controlled.	Developer Contractor	Pre-construction Construction
Any open reservoirs required should be covered with fine mesh or other exclusion material in order to exclude birds.	Contractor	Construction
The fence around the facility should be designed to be bird friendly, to prevent entrapment and electrocutions of ground-dwelling birds. Double-fence designs where the inner electric fence is positioned within one (1) meter of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped between these. Single-fence designs, whereby the electrical fencing component is attached to the inside of the mesh fence, are considered preferable as ground-dwelling birds cannot be trapped between these components.	Contractor	Construction
If there are active nests near construction areas, these should be reported to the ECO and should be monitored until the birds have finished nesting and the fledglings have left the nest.	Contractor	Pre-construction Construction
No construction activity should occur near to active raptor nests should these be discovered prior to or during the construction phase.	Contractor	Pre-construction Construction
EO to monitor and enforce ban on hunting and collecting of avifauna or their products (e.g. eggs and nestlings).	EO	Construction
Any avifauna threatened or injured by the construction activities should be removed to safety by the appropriately qualified EO.	EO Avifauna Specialist	Pre-construction Construction Duration of contract
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
The construction site must be fenced and security provided.	Contractor	Construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes.	Contractor	Construction
All unattended open excavations must be adequately demarcated and/or fenced.	Contractor	Construction
Establish appropriately bunded areas for storage of hazardous materials (e.g. fuel to be required during construction).	Contractor	Site establishment, and duration of construction
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Site establishment, and duration of construction
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but must be temporarily stored in a demarcated area.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (at least one sanitary facility for each sex and for every 30 workers as per the 2014 Construction Regulations; Section 30(1)(b)) at appropriate locations on site). The facilities must be placed within the construction area.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities must not be located within 100m from a watercourse or within the 1:100 year flood.	Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at the site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. Provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction
Foundations and trenches must be backfilled to originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas, or, if suitable, stockpiled for use in reclamation activities.	Contractor	Site establishment, and duration of construction and rehabilitation
Eskom's rights and services must be acknowledged and respected at all times. Eskom shall at all times retain unobstructed access to and egress from its servitudes.	Contractor	Site establishment, and duration of construction, rehabilitation and operation

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site. » Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion. » Avifaunal microhabitat loss restricted to infrastructure footprint.

	» Low disturbance and impact on red-listed avifaunal species. » Avifauna do not have access to water contained in reservoirs. » Low mortality of avifauna due to construction machinery and activities. » No disturbance of breeding raptors (i.e. no nest abandonment due to disturbance). » No poaching or collecting of avifauna or their products (e.g. eggs and nestlings) by construction personnel. » Removal to safety of entrapped/injured avifauna encountered during construction.
Monitoring	» An incident reporting system is used to record non-conformances to the EMPr. » EO and ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the Site Manager. » Monitoring of vegetation clearing during construction (by contractor as part of construction contract). » Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract). » Vegetation is cleared only within footprint areas during construction. » Perimeter fencing is constructed in a manner that is considered bird friendly, especially with respect to ground-dwelling birds. » Open reservoirs on site are covered with mesh to exclude birds. » No birds or eggs are disturbed or removed by construction personnel. » Any raptor nests (especially of red-listed species) discovered on site or nearby, are monitored weekly until post-fledging period.

OBJECTIVE 3: Appropriate management of the construction site and construction workers

Project Component/s	» Area infrastructure (i.e. PV panels, substation, inverters, transformers, switchgear and ancillary buildings). » Linear infrastructure (i.e. underground cabling, main access road and internal access roads and fencing).
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
Restrict public access to works area including construction areas, laydown and storage sites via appropriate security. Only allow site access after appropriate induction and use of appropriate personal protective equipment (PPE).	Contractors	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Contractors and construction workers must be clearly informed of the no-go, very high and high sensitivity areas.	Developer Contractor	Prior to the commencement of construction
In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.	Contractors	Construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	Contractor and sub-contractor/s	Pre-construction
Introduce an incident reporting system to be tabled at weekly/monthly project meetings.	Contractor and sub-contractor/s	Pre-construction
All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the development boundary must be permitted.	Contractor	Construction
Ensure all construction equipment and vehicles are properly maintained at all times.	Contractor	Construction
Restrict work activities that require power tools and plant that generates noise to normal working hours and limit such activities over weekends.	Contractor	Construction
Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.	Contractor	Construction
Appoint a community liaison officer to deal with complaints and grievances from the public.	Contractor	Construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community and/or environment.	Contractor	Construction
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid should be on site to deal with smaller incidents that require medical attention.	Contractor	Construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan must be developed with emergency procedures in the event of a fire.	Contractor	Site establishment, and during construction
Encourage contractors and local people to report any suspicious activity associated with crime to the appropriate authorities.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that the local municipalities, police, security companies, and policing forums are alerted to the increased construction activities in the region and the risk it poses in respect of crime.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	During construction.
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.	Contractor	Construction
No disturbance of flora or fauna must be undertaken outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Workers must be aware of the importance of watercourses and drainage systems (especially those located within and surrounding the project site) and the significance of not undertaking activities that could result in pollution of the features..	Contractor and EO	Pre-construction Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction
When possible, no activity should be undertaken at the site between sunset and sunrise, except for security personnel guarding the development.	Contractor and sub-contractor/s	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Keep record of all accidents or transgressions of safety in accordance with OHS Act and implement corrective action.	Contractor	Construction
Implement an HIV/AIDS Awareness and Training Programme for the Contractor's workforce and if feasible the local community within two weeks of commencement of construction. Ensure that the HIV/AIDS Awareness and Training Programme is consistent with national guidelines and/or IFC's Good Practice.	Contractor	Construction
Provide voluntary and free counselling, free testing and condom distribution services.	Contractor	Construction

Performance Indicator	» The construction camps and laydown areas have avoided sensitive areas. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of the construction phase. » Compliance with OHS Act.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the EO. » Proof of disposal of sewage at an appropriate licensed wastewater treatment works. » Proof of disposal of waste at an appropriate licensed waste disposal facility. » An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout the construction phase by the EO. » Complaints are investigated and, if appropriate, acted upon. » Comprehensive record of accidents and incidence and related investigations, findings and corrective action in accordance with the OHS Act.

OBJECTIVE 4: Maximise local employment, skills development and business opportunities associated with the construction phase

Employment opportunities will be created during the construction phase, specifically for semi-skilled and unskilled workers. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the PV facility. » Availability of required skills in the local communities for the undertaking of the construction activities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.

	» Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally, where required.
Enhancement: Target/Objective	» The contractor should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities. Ensure that the majority of the low-skilled workforce is recruited locally.	Contractor	Construction
Undertake a skills audit to determine level of skills and establish the development and training requirements.	Contractor	Construction
Commence with skill development programmes within the first month of construction	Contractor	Construction
Identify employment opportunities for women and ensure that women are employed on the construction site and are trained.	Contractor	Construction
Facilitate the transfer of knowledge between experienced employees and the staff.	Contractor	Construction
Identify opportunities for local businesses and ensure that the services from local businesses are prioritised.	Contractor	Construction

Performance Indicator	» Composition of labour force and value of procurement from local businesses. » Level of skills imparted to local workforce.
Monitoring	» Human Resources and Finance function to monitor and report on through audits.

OBJECTIVE 5: Protection of sensitive areas, flora, fauna and soils

Project Component/s	» PV panels. » Underground cabling. » Ancillary buildings. » Construction of the internal access roads. » On-site substation.
Potential Impact	» Impacts on natural vegetation, habitats and fauna. » Loss of indigenous natural vegetation due to construction activities. » Impacts on soil. » Loss of topsoil. » Erosion.
Activity/Risk Source	» Vegetation clearing. » Site preparation and earthworks. » Excavation of foundations. » Construction of infrastructure. » Site preparation (e.g. compaction). » Excavation of foundations.

	» Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To minimise the development area as far as possible. » To minimise impacts on surrounding sensitive areas. » To minimise impacts on soils. » Minimise spoil material. » Minimise erosion potential.

Mitigation: Action/Control	Responsibility	Timeframe
Contractor's EO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pans.	Developer Contractor EO	Construction
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.	Developer Contractor	Construction
Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	Contractor	Pre-construction Construction
All disturbed and cleared areas must be re-vegetated with indigenous perennial shrubs and grasses from the local area.	Contractor	Duration of contract
In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited to the minimum necessary to accommodate the required infrastructure.	Contractor	Duration of contract
The red sand dunes to the south of the project site should be considered to be a no-go area to avoid disturbance to avifauna, apart from where there are already existing access roads.	Contractor	Construction
Land clearance must only be undertaken immediately prior to construction activities.	Contractor	Construction
Retain and augment natural vegetation on all sides of the proposed project.	Contractor	Construction
During vegetation clearance, methods should be employed to minimise potential harm to fauna species.	Contractor	Construction
Prior and during vegetation clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery.	Contractor	Construction
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing. No vegetation removal must be allowed outside the designated project development footprint. Restrict construction activity to demarcated areas.	Contractor	Duration of Construction
Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. Where possible work should be restricted to one area at a time.	Contractor	Construction
Access to adjacent areas to be strictly controlled.	Developer Contractor	Pre-construction Construction
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Contractor	Construction
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Enforce ban on hunting, collecting etc. of all plants and animals or their products.	Contractor EO	Construction
No construction activity should occur near to active raptor nests should these be discovered prior to or during the construction phase.	Contractor	Construction
Areas beyond the development footprint should be expressly off limits to construction personnel and construction vehicles and this should be communicated to them.	Contractor	Construction
If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	Contractor	Construction
Any fauna threatened or injured during construction should be removed to safety by a suitably qualified person, or allowed to passively vacate the area.	Suitably qualified person	Construction
A suitable perimeter fence should be constructed around the facility to restrict access of fauna to the site and to restrict/control access of staff to adjacent natural areas. No electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.	Contractor	Construction
Education of employees on the conservation importance of natural areas and fauna must be provided.	Contractor	Construction
Access to high sensitivity and no-go areas to be restricted and controlled. This should be clearly communicated to all employees.	Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads	Contractor	Construction
No collecting of flora species to be permitted.	Contractor	Construction
Topsoil must be removed and stored separately from subsoil and must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.	Contractor	Construction
Soil stockpiles must be dampened with dust suppressant or equivalent to prevent erosion by wind.	Contractor	Construction
Soil stockpiles must be located away from any waterway or preferential water flow path in the landscape, to minimise soil erosion from these	Contractor	Construction
All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised using appropriate erosion control measures.	Contractor	Construction
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing.	Contractor	Before and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Stockpiles are not to be used as stormwater control features.	Contractor	Construction
Any stockpiling of materials may not exceed two metres in height to reduce materials being blown away during high wind velocity events.	Contractor	Construction
Any erosion problems observed within the development area as a result of the construction activities must be rectified immediately and monitored thereafter to ensure that they do not re-occur.	Contractor	Construction
Where vegetation is not re-establishing itself in areas where surface disturbance occurred, soil samples must be collected, analysed for pH levels, electrical conductivity (EC) and major plant nutrient levels (calcium, magnesium, potassium) and sodium. When vegetation re-establishment still remains unsatisfactory, the bulk density of the soil should be measured with a penetrometer to determine whether compaction is an issue. The results must be submitted to a professional soil or agricultural scientist for recommendations on the amendment of the issue to ensure that the vegetation cover is established and erosion prevented.	Contractor Specialist	Construction
Any signs of soil erosion on site should be documented (including photographic evidence and coordinates of the problem areas) and submitted to the management team for further action.	Contractor	Construction
During construction the contractor shall protect areas susceptible to erosion by installing appropriate temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.	Contractor	construction
Create energy dissipation at discharge areas to prevent scouring	Contractor	construction
Activity at the site must be reduced after large rainfall events when the soils are wet. No driving off of hardened roads should occur at any time and particularly immediately following large rainfall events.	Contractor	Construction
Silt traps or cut-off berms downslope of working areas should be used where there is a danger of topsoil or material stockpiles eroding and entering watercourses and other sensitive areas.	Contractor	Construction
Erosion control measures to be regularly maintained.	Contractor	Construction
Bush clearing of all bushes and trees taller than one meter; Ensure proper storm water management designs are in place.	Contractor	Construction
If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place.	Contractor	Construction
If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks.	Contractor	Construction
Topsoil is to be stripped when the soil is dry, as to reduce compaction.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly	Contractor	Construction
Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles.	Contractor	Construction
The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Compacted areas are to be ripped to loosen the soil structure.	Contractor	Construction
Place the above cleared vegetation were the topsoil stockpiles are to be placed.	Contractor	Construction
All construction vehicles must adhere to a low speed limit (40km/h) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction Operation
Outside lighting should be designed to minimise impacts on fauna.	Contractor	Before construction
All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution.	Contractor	Construction
Fluorescent and mercury vapour lighting should be avoided and sodium vapor (yellow) lights should be used wherever possible.	Contractor	Construction
In order to reduce low intensity noise levels, work areas need to be effectively screened to reduce or deflect noise. Engineering controls such as modifications to equipment or work areas to make it quieter, the acquisition of equipment designed to emit low noise and vibration, creation of noise barriers, proper maintenance of tools and equipment must be considered. Noise from vehicles and powered machinery and equipment on-site should not exceed the manufacturer's specifications, based on the installation of a silencer. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.	Contractor	Construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing vegetation. » Vegetation and habitat loss restricted to infrastructure footprint. » No poaching etc. of fauna by construction personnel during construction. » Removal to safety of fauna encountered during construction » Low mortality of fauna due to construction machinery and activities » Topsoil appropriately stored, managed and rehabilitated. » Limited soil erosion around site. » No activity in restricted areas. » Minimal level of soil degradation.
Monitoring	» Contractor's EO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pan. » Supervision of all clearing and earthworks. » Ongoing monitoring of erosion management measures within the site.

	» Monthly inspections of sediment control devices by the EO. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 6: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices. Consequences of this may include:

» Loss of indigenous vegetation;
» Change in vegetation structure leading to change in various habitat characteristics;
» Change in plant species composition;
» Change in soil chemical properties;
» Loss of sensitive habitats;
» Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
» Fragmentation of sensitive habitats;
» Change in flammability of vegetation, depending on alien species; and
» Hydrological impacts due to increased transpiration and runoff.

Project Component/s	» PV facility. » Access road. » Associated infrastructure.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species. » Impacts on soil. » Impact on faunal habitats. » Degradation and loss of agricultural potential.
Activities/Risk Sources	» Transport of construction materials to site. » Movement of construction machinery and personnel. » Site preparation and earthworks causing disturbance to indigenous vegetation. » Construction of site access roads. » Stockpiling of topsoil, subsoil and spoil material. » Routine maintenance work – especially vehicle movement.
Mitigation: Target/Objective	» To significantly reduce the presence of weeds and eradicate alien invasive species. » To avoid the introduction of additional alien invasive plants to the site. » To avoid distribution and thickening of existing alien plants in the site. » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the site.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an Alien Invasive Plant (AIP) Control and Eradication Programme.	Contractor	Construction
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.	Contractor	Construction
Eradicate all weeds and alien invasive plants as far as practically possible and ensure that material from invasive plants are adequately destroyed and not further distributed. Continually monitor the re-emergence of these species and manage according to the invasive species management plan.	Contractor	Construction
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species.	Contractor	Construction
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that World Health Organisation (WHO) Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Contractor	Construction
Concurrent rehabilitation and alien vegetation control program within all sensitive areas must be implemented.	Contractor	Duration of contract
Alien invasive plant species in and around the project site must be removed in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and follow – up actions for at least five (5) years need to be implemented.	Contractor	Duration of contract

Performance Indicator	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
Monitoring	» On-going monitoring of area by EO during construction. » Annual audit of development footprint and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site. » The environmental manager/site agent should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 7: Minimise impacts on water resources

Project component/s	» Construction activities » Storage of dangerous goods. » Ablution facilities. » Compaction of soil.

Potential Impact	» Pollutants such as lime-containing (high pH) construction materials such as concrete, cement, grouts, etc. could be harmful to aquatic biota, particularly during low flows when dilution is reduced. » Removal of freshwater habitat. » Compaction of soils within and surrounding the watercourses. » Erosion of soils surrounding watercourses. » Potential proliferation of alien and invasive species within the watercourses. » Vegetation clearance in watercourses. » Movement of vehicles in watercourses.
Activity/risk source	» Fuelling, usage and maintenance of construction vehicles. » Cement batching and usage. » Labourer using ablution facilities. » Use of any chemicals or hazardous materials/dangerous goods during construction.
Mitigation: Target/Objective	» Reduce potential loss of habitat and ecological structure » No incidents related to spills of chemicals and hazardous materials. » No release of contaminated water in watercourses including streams and pans. » No misbehaviour of construction workers (i.e. ablution activities, washing).

Mitigation: Action/control	Responsibility	Timeframe
The project will comply and adhere to Section 19 & 20 of the National Water Act (Act No. 36 of 1998) during the life -cycle of the development.	Contractor	Duration of contract
No laydown areas, operation and maintenance buildings are to be established in the watercourse areas and associated buffer zones.	Contractor	Construction
No in-stream vegetation is to be removed unnecessarily.	Contractor	Construction
Where in-stream vegetation is to be cleared, vegetation is not to be completely removed. Rather, vegetation should be trimmed to 300mm height above ground level to ensure surface roughness is maintained.	Contractor	Construction
The ECO must be present when vegetation is trimmed to supervise this process and ensure compliance with this control measure.	Contractor	Construction
Alien invasive and control management plan is to be formulated and implemented.	Contractor	Construction
Ensure strict management of potential sources of pollution (hydrocarbons from vehicles and machinery, cement during construction, etc.). Bunded containment to be provided below and around any fuel storage containers.	Contractor	Construction
No construction in the watercourses is to take place over the two rain peak periods associated with the watercourses (i.e. during November & between February – March). This will avoid impacts to flow, as construction will be limited to periods when the watercourse is likely to be dry.	Contractor	Construction
Where mounting structures are within the buffer zone of the ephemeral watercourses, these areas need to be temporarily bunded using appropriate structures (i.e. silt nets, sand bags, pegged wooden planks) until construction is complete at each point.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
All soil stockpiles on the project site that are within 100m of a watercourse must be bunded using an appropriate structure (i.e. silt nets, sand bags, pegged wooden planks).	Contractor	Construction
All vehicles and machinery must be checked for leaks before being allowed to operate on the project site. Should leaks be detected, the relevant vehicles and machinery must be repaired before being allowed to operate on the project site.	Contractor	Construction
Vehicles and other machinery must be serviced well above the 1:100 year flood line or within a horizontal distance of 100 meters from any watercourse or 500m of a wetland/pan. Oils and other potential pollutants must be deposited at an appropriate licensed site, with the necessary agreement from the owner of the site	Contractor	Construction
No storage of fuels, oils or any other hazardous substance are allowed directly in the watercourses or within 100m from any watercourse.	Contractor	Duration of contract
Temporary sanitation facilities may not be placed directly or within 100m of any ephemeral watercourse.	Contractor	Construction
Temporary sanitation facilities must be regularly checked for leaks and spillages, and repaired where any leakages are detected before being allowed for use on the project site.	Contractor	Construction
Suitable crossings through the watercourses are to be implemented where required. In general, it is not expected that hard structures (road culverts) will be required in the watercourses, and that the establishment of vehicle tracks will be sufficient. However, it is recommended that gravel be used through the watercourses to assist with stabilization and to prevent erosion within the watercourses.	Contractor	Construction
Vehicle movement through the watercourses is to be limited as far as possible.	Contractor	Construction
Where erosion takes place, the EO must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.	Contractor EO	Construction
Construction equipment is to be checked daily (by Contractor) to ensure that no fuel spillage takes place from construction vehicles or machinery.	Contractor	Construction
Proper use of ablutions should be strictly enforced.	Contractor	Construction
Sand, stone and cement are stored in demarcated areas, and are covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation.	Contractor	Construction
Any excess sand, stone and cement must be removed from site at the completion of the construction period.	Contractor	Construction
Measures must be put in place to control illegal dumping of construction waste as this may result in the pollution of surface water run-off. Furthermore, no pollution of groundwater resources may occur.	Contractor	Construction
Any areas disturbed during the construction phase should be encouraged to rehabilitate as fast and effective as possible.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Compilation of a soil stripping guideline to preserve high value topsoil for rehabilitation. Also input into the location of stockpiles away from preferential flow paths.	Contractor	Construction
Where possible, reduce the footprint area of exposed ground during periods of high rainfall. Prioritise vegetation clearing for the winter months as far as possible.	Contractor	Construction
Exposed areas must be ripped and vegetated to increase surface roughness.	Contractor	Construction
Concurrent rehabilitation of the watercourses impacted by the proposed development activities is to take place, and footprint areas should be minimised as far as possible.	Contractor	Construction
Surface and storm water run-off needs to be diverted through an oil/water separator before leaving the site.	Contractor	Construction

Performance Indicator	» No major preventable spillages are recorded. » No erosion recorded within the ephemeral watercourses within the development area. » No degradation of the water resources within the development area.
Monitoring	» Monitor management measures in place for potentially hazardous materials. » Monitoring occurrence of erosion and degradation within the watercourses.

OBJECTIVE 8: Appropriate Storm Water Management

The storm water management is covered under the Pre-construction and Construction Phase management, but aspects thereof will also continue into the Operation Phase. It is important that the engineers and contractors responsible for the detailed design of the storm water systems take into account the requirements of this EMPr, as well as the recommendations by the participating specialists.

Project Component/s	» Alteration of natural areas into hard surfaces impacting on the local hydrological regime of the area.
Potential Impact	» Poor storm water management and alteration of the hydrological regime.
Activities/Risk Sources	» Placement of hard engineered surfaces.
Mitigation: Target/Objective	» Reduce the potential increase in surface flow velocities and the impact on localised drainage systems.

Mitigation: Action/Control	Responsibility	Timeframe
Stormwater management around the construction footprint areas must be considered to ensure that sediment-laden run-off does not enter the surrounding watercourses.	Contractor	Construction
Any storm water within the site must be handled in a suitable manner. Contaminated water must not be discharged into the watercourses.	Contractor and Engineers	Construction
All roads and other hardened surfaces must have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The access road should be permeable to allow for drainage from the road surface. In this regard, suitable stormwater management should be implemented to allow for water to drain from the road without causing erosion.	Contractor	Construction
Where discharge of rainwater on roads will be channelled directly into the natural environment, the application of diffuse flow measures must be included in the design	Contractor	Construction
Storm water control systems must be implemented to reduce erosion on the project site.	Contractor	Construction
New access roads within the site are to be constructed according to design and contract specifications. The access routes must have suitable storm water management plans and erosion control measures.	Contractor	Construction
Drainage measures must promote the dissipation of storm water run-off.	Contractor	Construction
Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed.	Contractor	Construction
Site surface water and wash water must be contained and treated before reuse or discharge from site	Contractor	Construction

Performance Indicator	» No impacts due to runoff. » Minimise erosion as far as possible. » Appropriate storm water management system in place.
Monitoring	» Ongoing monitoring of erosion management measures within the site. » Monthly inspections of sediment control devices by the EO. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 9: Protection of Heritage Resources

The small rocky hill and associated no-go areas close to the project site would require monitoring, to ensure the site remains undisturbed throughout the duration of the project. However, no significant heritage resources have been identified, and there are no fatal flaws for the proposed development of Aggeneys 2. As such, the site is seen as an appropriate place for the development of a solar PV facility. The no-go area described above is located outside the project site and can easily be managed. The area has been demarcated through the addition of a minimum 30m buffer around the various finds associated with the rocky hill.

Project Component/s	» PV facility. » Access roads. » Associated infrastructure.
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed.
Activity/Risk Source	» Site preparation and earthworks. » Foundations or plant equipment installation. » Mobile construction equipment movement on site.

Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
The small rocky hill and the associated no-go areas to the east of the site remain undisturbed throughout the duration of the project. The EO would need to ensure that this happens.	Developer Contractor EO	Construction
Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow if they find sites. All staff should also be familiarised with procedures for dealing with heritage objects/sites.	Contractor, ESA and heritage specialist	Duration of contract, particularly during excavations
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Contractor EO	Pre-construction, Construction and Duration of contract.
EO to alert workers to the importance of reporting fossil bones seen on site and to the possibility of encountering human remains..	EO	Construction
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor	Construction
A Chance Find Procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.	Developer Contractor	Construction and duration of contract
Chance fossil finds such as vertebrate bones and teeth or shells should be safeguarded preferably in-situ and reported by the EO as soon as possible to the South Africa Heritage Resources Agency, SAHRA. Contact Details: 111 Harrington Street, Cape Town P.O Box 4637 Cape Town 8001 Tel: +27 (021) 462 4502 Fax: +27 (021) 462 4509 www. sahra.org.za	EO Archaeologist	Construction and duration of contract.

Performance Indicator	» No disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	» Observation of excavation activities by the EO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites (if required). » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 10: Management of dust and air emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project component/s	» PV facility. » Access roads. » Associated infrastructure.
Potential Impact	» Dust generation and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment.
Activity/risk source	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling and associated construction activities. » Transport of materials, equipment, and components on internal access roads and the associated increased traffic. » Vehicle movement on gravel roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase. » Suppression of dust, pollution control and minimise dust generation.

Mitigation: Action/control	Responsibility	Timeframe
Implement appropriate dust suppression measures on a regular basis along the gravel access road and on the proposed site.	Contractor	Construction
Use of dust suppressants on roads and limit development of new roads.	Contractor	Construction
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	Contractor	Construction
Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources is not visibly excessive.	Contractor	Construction
Apply appropriate dust suppressant to gravel roads on a regular basis.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material tarpaulins shade cloth.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Duration of contract
Speed of construction vehicles must be restricted to 40km/hr on all roads within the site.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.	Contractor	Duration of contract
Should a batching plant be required, this must be enclosed with shade cloth to reduce the amount of cement particulates/ particles released into the environment.	Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Visual presence of dust and air quality. » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility). » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis. » A complaints register must be maintained, in which any complaints from neighbouring farmers will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon.
Monitoring	Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident register and non-conformance must be used to record incidents and non-conformances to the EMPr. » A complaints register must be used to record grievances by the public.

OBJECTIVE 11: Minimise impacts related to traffic management and transportation of equipment and materials to site

Project Component/s	» Delivery of any component required for the construction phase of the facility.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix concrete to the site. » Mobile construction equipment movement on-site.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a construction period traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted.	Contractor	Pre-construction
Undertake regular maintenance of gravel roads by the Contractor during the construction phase.	Contractor	Construction
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government. Alert traffic authorities well in advance of any heavy loads that will be transported on local roads and elicit their assistance in controlling traffic associated with the transportation of these loads.	Contractor (or appointed transportation contractor)	Pre-construction
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer Contractor	Construction
Limit the need for transportation over long distances by sourcing as much materials and goods as is feasible from local suppliers.	Contractor	Construction
Heavy vehicles used for construction purposes should be inspected regularly to ensure their road-worthiness.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Construction
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Construction
Heavy construction vehicles should be restricted to off-peak periods. Schedule the delivery hours to avoid peak hour traffic, weekends and evenings and stagger component delivery to site.	Contractor	Construction
Staff and general trips to the site should occur outside of peak traffic periods.	Contractor	Construction
Any traffic delays expected because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Construction
When upgrading, constructing and maintaining the access road ensure that proper hazard warnings signage and traffic control mechanisms such as flags men and traffic control barriers, chevrons and traffic cones separating the road from the worksite are in place at all times	Contractor	Construction
Visible signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Signage must be appropriately maintained throughout the construction period.	Contractor	Construction
Erect temporary road signage on either side of the Loop 10 gravel road, warning motorists of construction traffic activity in order to enhance road safety during construction.	Contractor	Construction
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Construction
All construction vehicles must remain on properly demarcated roads. No off-road driving to be allowed.	Contractor	Construction
Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.	Contractor	Construction
Staff and general trips must occur outside of peak traffic periods.	Contractor	Construction
The contractors must ensure that there is a dedicated access and an access control point to the site.	Contractor	Construction
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Contractor	Construction
Partner with local municipalities and other prominent users of the local roads to upgrade them to meet the required capacity and intensity of the vehicles related to the planned construction activities.	Contractor	Construction
Provide public transportation service for workers in order to reduce congestion on roads.	Contractor	Construction
All construction vehicles must be road worthy.	Contractor	Construction
All construction vehicle drivers must have the relevant licenses of the use of the vehicles and need to strictly adhere to the rules of the road.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Heavy construction vehicles should be restricted to off-peak periods.	Contractor	Construction
Abnormal load vehicles require specific permit for transporting loads, and require liaison with relevant road authorities to ensure route suitability.	Contractor	Construction
Provide flagmen at the access road when accommodating abnormal load vehicles.	Contractor	Construction
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Contractor	Construction
On-site parking and safe turn-around facilities should be provided for private vehicles and for buses and mini-buses transporting workers to and from site.	Contractor	Construction
Provide clearly defined roadway, parking and pedestrian walkway areas with adequate lighting	Contractor	Construction

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed EO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 12: Appropriate handling and management of waste

The construction of Aggeneys 2 will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated by the construction activities include:

» general solid waste
» hazardous waste
» inert waste (rock and soil)
» liquid waste (including grey water and sewage)

Project Component/s	» PV facility. » Access roads. » Associated infrastructure.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging. » Other construction wastes. » Hydrocarbon use and storage.

	» Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties, and that the waste is disposed of at dumping site as approved by the Council.	Contractor	Duration of contract
Waste disposal at the construction site must be avoided by separating and trucking out of waste.	Contractor	Construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste must be removed at least weekly for disposal, if feasible; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
All liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use.	Contractor	Duration of contract
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous	Contractor	During and post construction.

Mitigation: Action/Control	Responsibility	Timeframe
substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered landfill site.		
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Contractor	Duration of construction
Under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the materials re-used for an appropriate purpose.	Contractor	Completion of construction
Upon the completion of construction, all sanitation facilities (including chemical toilets) must be removed, as well as the associated waste to be disposed of at a registered waste disposal site.	Contractor	Completion of construction
Litter generated by the construction crew must be collected in rubbish bins and disposed of weekly, or at an appropriate frequency, at registered waste disposal sites.	Contractor	Duration of construction
All building rubble, solid and liquid waste etc. generated during the construction activities must be disposed of as necessary at an appropriately licensed refuse facility.	Contractor	Duration of construction
Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires will be allowed on site.	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project and that the waste is disposed of at dumping site as approved by the Council.	Contractor	Duration of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » Proof of disposal of sewage at an appropriate wastewater treatment works. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 13: Appropriate handling and storage of chemicals, hazardous substances

The construction phase may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	» Laydown areas. » Subcontractors' camps. » Temporary hydrocarbon and chemical storage areas.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers. » Soil pollution.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon spills by vehicles and machinery during levelling, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks. » Accidental spills of hazardous chemicals. » Polluted water from wash bays and workshops. » Pollution from concrete mixing.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. » Prevent and contain hydrocarbon leaks. » Undertake proper waste management. » Store hazardous chemicals safely in a bunded area.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an emergency preparedness plan during the construction phase.	Contractor	Duration of Contract
Any liquids stored on site, including fuels and lubricants, should be stored in accordance with applicable legislation.	Contractor	Duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing.	Contractor	Construction
Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to: » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents.	Contractor	Duration of Contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required, a NEMA Section 30 report must be submitted to DEA within 14 days of the incident.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. Check vehicles and machinery daily for oil, fuel and hydraulic fluid leaks and undertake regular high standard maintenance on vehicles.	Contractor	Duration of contract
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within an appropriate bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and any relevant by-laws.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Contractor	Construction
As much material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site.	Contractor	Construction
All chemicals and toxicants used during construction must be stored in bunded areas.	Contractor	Construction
All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site (pre-use inspection).	Contractor	Construction
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Contractor	Construction
Have appropriate action plans on site, and training for contactors and employees in the event of spills, leaks and other potential impacts to the aquatic systems. All waste generated on-site during construction must be adequately managed.	Contractor	Construction
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Contractor	Construction
Minimise fuels and chemicals stored on site.	Contractor	Construction
Install bunds on storage areas and take other precautions to reduce the risk of spills.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
No refuelling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Drip trays should be used during al fuel/chemical dispensing.	Contractor	Construction
Drip trays to be placed beneath standing machinery/plant.	Contractor	Construction
In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction
Mitigation includes a regional (industrial area-wide) emergency response plan with involvement by the local authorities as well as alarms and communication systems which allow for fast and effective communication to neighbouring facilities such as the Mondi facility to the north. The area around the site is sparsely populated, so any impact would not be experienced by a large number of people.	Contractor	Construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. » Safe storage of hazardous chemicals. » Proper waste management.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr. » On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures. » Monitor hydrocarbon spills from vehicles and machinery during construction continuously and record volume and nature of spill, location and clean-up actions. » Monitor maintenance of drains and intercept drains weekly. » Analyse soil samples for pollution in areas of known spills or where a breach of containment is evident when it occurs. » Records of accidental spills and clean-up procedures and the results thereof must be audited on an annual basis by the ECO. » Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to management annually.

OBJECTIVE 14: Effective management of concrete batching plants

Concrete is required during the construction of the PV facility. In this regard there could be a need to establish a batching plant within the site. Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and storm water include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant. » Storm water system.

Potential Impact	» Dust emissions. » Release of contaminated water. » Generation of contaminated wastes from used chemical containers. » Inefficient use of resources resulting in excessive waste generation.
Activity/risk source	» Operation of the batching plant. » Packaging and other construction wastes. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons.

Mitigation: Action/control	Responsibility	Timeframe
Concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised.	Contractor	Construction phase
Concrete batching plants should be sited away from identified sensitive areas.	Contractor	Construction phase
Where there is a regular movement of vehicles, access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment.	Contractor	Construction phase
Good maintenance practices must be implemented, including regular sweeping to prevent dust build-up.	Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage.	Contractor	Construction phase
Process wastewater collected from the entire batching plant area should be diverted to an impervious settling tank or pond. Water should be reused in the concrete batching process, where possible.	Contractor	Construction phase
A contaminated storm water system must be specifically designed for the batching plant to ensure effective control of contaminated storm water originating from the batching plant and prevent contamination to the surrounding environment.	Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	Contractor	Construction phase
Artificial wind barriers must be installed around the batching plant to minimise air, land and water pollution. Wind barriers must enclose the entire batching plant and not allow fly ash and other dusts from moving through the barrier. The artificial barrier must be maintained daily for any defects and corrected when necessary.	Contractor	Pre-construction/ construction
The concrete wash bay structure must be constructed in a double brick arrangement or be reinforced to maintain its integrity throughout operation.	Contractor	Construction phase

Performance Indicator	» No complaints regarding dust » No water or soil contamination by chemical spills

	» No complaints received regarding waste on site or indiscriminate dumping
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident and non-conformance register will be used to record incidents and non-conformances to the EMPr. » The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

6.3 Detailing Method Statements

OBJECTIVE 15: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- Responsible person/s;
- Construction procedures;
- Materials and equipment to be used;
- Getting the equipment to and from site;
- How the equipment/material will be moved while on-site;
- How and where material will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Timing and location of activities;
- Compliance/non-compliance with the Specifications; and
- Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Specific areas to be addressed in the method statement: pre, during and post construction include:

- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- Storm water method statement.
- Ablution facilities (placement, maintenance, management and servicing).
- Solid Waste Management:

- Description of the waste storage facilities (on site and accumulative).
- Placement of waste stored (on site and accumulative).
- Management and collection of waste process.
- Recycle, re-use and removal process and procedure.

» Liquid waste management.
» Design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment. Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure no seepage into the surrounding environment occurs.
» Dust and noise pollution:
  - Describe the necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
  - Procedure to control dust at all times on the site, access roads and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
» Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  - Lists of all potentially hazardous substances to be used.
  - Appropriate handling, storage and disposal procedures.
  - Prevention protocol of accidental contamination of soil at storage and handling areas.
  - All storage areas, (i.e. for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
» Fire prevention and management measures on site.
» Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
  - Rehabilitation, re-vegetation process and bush clearing.
» Incident and accident reporting protocol.
» General administration.
» Designate access road and the protocols while roads are in use.
» Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager (with input from the ECO), except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

6.4 Awareness and Competence: Construction Phase

OBJECTIVE 16: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that all personnel involved in the project are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The ECO is responsible for monitoring compliance pre, during and post construction. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity are to have copies of the relevant Method Statements and be aware of the contents thereof.
- Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff are aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
    - Records must be kept of those that have completed the relevant training.
    - Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
    - Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.
- All sub-contractors must have a copy of the EMPr and sign a declaration/ acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
- Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- Ensuring that employee information posters, outlining the environmental “do’s” and “don’ts” (as per the environmental awareness training course) are erected at prominent locations throughout the site.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness and Induction Training

The EO, in consultation with the contractor, shall ensure that all construction workers receive an induction presentation, as well as on-going environmental education and awareness, on the importance and implications of the EMPr and the environmental requirements it prescribes. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The contractor should provide a translator from their staff for the purpose of translating should this be necessary.

As a minimum, induction training should include:

- Explanation of the importance of complying with the EMPr;
- Explanation of the importance of complying with the Environmental Authorisation;
- Discussion of the potential environmental impacts of construction activities;
- Awareness regarding sensitivities on the site, including sensitive plant species (including the use of visual aids and on-site identification);
- The benefits of improved personal performance;
- Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractor's Health and Safety Representative);
- Explanation of the mitigation measures that must be implemented when carrying out their activities; and
- Explanation of the specifics of this EMPr and its specification (no-go areas, etc.).

Environmental Awareness Training must take the form of an on-site talk and demonstration by the EO/ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO/ECO on site. Proof of awareness training should be kept on record. Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor's EO and should include discussing ABO Wind Aggeneys 2 PV (Pty) Ltd's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the EO/ECO on site.

6.4.2 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and ones recommended by the on-site EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Monitoring Programme: Construction Phase

OBJECTIVE 17: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/ Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- Ensure adequate and appropriate interventions to address non-compliance
- Ensure adequate and appropriate interventions to address environmental degradation
- Provide a mechanism for the lodging and resolution of public complaints
- Ensure appropriate and adequate record keeping related to environmental compliance
- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- Aid in communication and feedback to authorities and stakeholders

All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the DEA in terms of the Environmental Authorisation, must be submitted to the Director: Compliance Monitoring of the Department.

Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to the Director: Compliance Monitoring at DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out. The contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the DEA regarding waste related activities.

6.5.3. Audit Reports

The holder of the Environmental Authorisation must, for the period during which the Environmental Authorisation and EMPr remain valid, ensure that project compliance with the conditions of the Environmental Authorisation and the EMPr are audited, and that the audit reports are submitted to the Director: Compliance Monitoring of the DEA.

An environmental internal audit must be conducted and submitted every 3 months and an external audit must be conducted once a year. An annual audit report must be compiled and submitted to DEA until the completion of the construction and rehabilitation. This report must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014, as amended, and indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

6.5.4. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to DEA upon completion of the construction and rehabilitation activities. The report must be submitted within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Construction camps. » Laydown areas. » Access roads. » Ancillary buildings.
Potential Impact	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Temporary access roads/tracks. » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an appropriate Revegetation and Rehabilitation Plan.	Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
Laydown areas and construction camps are to be checked for spills of substances such as oil, paint, etc. Any spills recorded must be cleaned up and the contaminated soil appropriately disposed of.	Contractor	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
All voids must be backfilled. Any gullies or dongas must also be backfilled.	Contractor	Following completion of construction activities in an area
Where disturbed areas are not to be used during the operation of the PV facility, these areas must be rehabilitated/re-vegetated with appropriate natural indigenous vegetation and/or local seed mix. A seed mix must be applied to rehabilitated and bare areas. No exotic plants must be used for rehabilitation purposes. No grazing must be permitted to allow for the recovery of the area.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
The area must be shaped to a natural topography. Trees (or vegetation stands) removed must be replaced.	Contractor	Following completion of construction activities in an area
Attenuation ponds mimicking flats should be created in the area to retain water in the catchment.	Contractor	Following completion of construction activities in an area
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Following completion of construction activities in an area
Compacted areas must be ripped (perpendicularly) to a depth of 300mm, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. The temporary access roads must be rehabilitated.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation. Soils must be replaced in the correct sequence / profile.	Contractor	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Proponent in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage systems if necessary.	Proponent in consultation with EO and rehabilitation specialist (if required)	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Proponent	Post-rehabilitation

Performance Indicator	» All portions of the site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.

	» Completed site free of erosion and alien invasive plants.
Monitoring	» Rehabilitated areas should be monitored (responsibility of EO) on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has rehabilitated to a satisfactory level. » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

CHAPTER 8: OPERATION MANAGEMENT PROGRAMME

Overall Goal: To ensure that the operation of Aggeneys 2 does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr during operation

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Operations Manager, and Environmental Manager for the operation phase of this project are detailed below.

The **Power Station Manager** will:
» Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
» Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
» Take appropriate action as a result of findings and recommendations in management reviews and audits.
» Provide forums to communicate matters regarding environmental management.

The **Technical/SHEQ Manager** will:

» Develop and Implement an Environmental Management System (EMS) for the PV facility and associated infrastructure.
» Manage and report on the facility's environmental performance.
» Maintain a register of all known environmental impacts and manage the monitoring thereof.
» Conduct internal environmental audits and co-ordinate external environmental audits.
» Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
» Conduct environmental training and awareness for the employees who operate and maintain the facility.
» Compile environmental policies and procedures.
» Liaise with interested and affected parties on environmental issues of common concern.
» Track and control the lodging of any complaints regarding environmental matters.

OBJECTIVE 2: Limit the ecological footprint of the PV Facility

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project Component/s	» PV panels. » Access roads. » Rehabilitated areas.
Potential Impact	» Disturbance to or loss of vegetation and/or habitat in surrounding areas. » Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention. » Mortality and disturbance of avifauna within and beyond the footprint of the facility due to collisions with solar panels, presence of personnel and vehicle traffic
Activities/Risk Sources	» Avifaunal collisions with PV panels » Birds entrapped along perimeter fencing » Human presence » Movement of vehicles to and from the site. » Presence of the PV infrastructure and site fencing.
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbed areas should the previous attempt be unsuccessful.	Developer	Operation
Site access and access to adjacent areas should be controlled and only authorised staff and contractors should be allowed on-site.	Developer	Operation
All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Developer	Operation
Maintain and augment natural vegetation around the proposed project	Developer	Operation
Vegetation control should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner.	Developer	Operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that World Health Organisation (WHO) Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
All incidents of collision with PV panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Site security video surveillance records could be used if available, as this will contribute towards understanding bird interactions with solar panels.	Developer	Operation
If birds nest on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds with eggs or nestlings should be allowed to fledge their young before nests are removed.	Developer	Operation
If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.	Developer	Operation
Should any open reservoirs be required, these should be covered with fine mesh or other exclusion material in order to prevent birds from falling in and drowning.	Developer	Operation
Soil surfaces where no revegetation seems possible will have to be covered with gravel or small rock fragments to increase porosity of the soil surface, slow down runoff and prevent wind and water erosion.	Developer	Operation
The red sand dunes to the south of the project site should be considered to be a no-go area to avoid disturbance to avifauna, apart from where there are already existing access roads.	Developer	Operation
Any vegetation clearing that needs to take place as part of the maintenance activities must be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.	Developer	Operation
If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.	Developer	Operation
Vehicle movements must be restricted to designated access roads.	Developer	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Developer	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (bags, logs), silt fences, storm water catch-pits, and shade nets).	Developer	Operation
Develop and implement an appropriate stormwater management plan for the operation phase of the facility.	Developer	Operation
No harvesting of plants for firewood, medicinal or any other purposes are to be permitted	Developer	Operation
No killing and poaching of any wild animal to be allowed. This should be clearly communicated to all employees, including subcontractors.	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location.	Developer	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Developer	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.	Developer	Operation
Maintenance of the perimeter fencing must ensure that it minimises impacts on ground-dwelling species susceptible to entrapment between the fencing components, where double-fence designs are used (though not recommended). If double-fence designs must be used instead of preferred single-fence designs, the space between the outer mesh fence and inner electrical fence should be kept clear of vegetation which may attract ground-dwelling species to forage there, while also ensuring that there are no gaps/holes in these fences that will allow ground-dwelling birds to enter the space between the two fences.	Developer	Operation

Performance Indicator	» Limited soil erosion around site. » No further disturbance to vegetation or terrestrial faunal habitats. » No disturbance of breeding raptors, if present (i.e. no nest abandonment due to disturbance). » No disturbance of red-listed avifaunal species perched or foraging in the vicinity of the project site. » No poaching or collecting of avifauna or their products (e.g. eggs and nestlings) by maintenance personnel. » Removal to safety of entrapped/injured avifauna encountered during routine maintenance. » Low impact on nocturnal and crepuscular species along roads. » Continued improvement of rehabilitation efforts. » Removal to safety of entrapped/injured avifauna encountered during routine maintenance. » Low impact on nocturnal and crepuscular species along roads
Monitoring	» Observation of vegetation on-site by environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas. » No birds or eggs are disturbed or removed by personnel. » Perimeter fencing is maintained in a manner that ensures it is bird friendly, with respect to ground-dwelling species. » Any raptor nests (especially of red-listed species) discovered on site or nearby, are monitored weekly until post-fledging period. » Any open reservoirs on site are covered with mesh to exclude birds.

OBJECTIVE 3: Minimise the establishment and spread of alien invasive plants

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices. Consequences of this may include:

- Loss of indigenous vegetation;
- Change in vegetation structure leading to change in various habitat characteristics;
- Change in plant species composition;
- Change in soil chemical properties;
- Loss of sensitive habitats;
- Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
- Fragmentation of sensitive habitats;
- Change in flammability of vegetation, depending on alien species; and
- Hydrological impacts due to increased transpiration and runoff.

Project Component/s	» PV facility. » Access road. » Associated infrastructure.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species. » Impacts on soil. » Impact on faunal habitats. » Degradation and loss of agricultural potential.
Activities/Risk Sources	» Transport of construction materials to site. » Movement of construction machinery and personnel. » Site preparation and earthworks causing disturbance to indigenous vegetation. » Construction of site access roads. » Stockpiling of topsoil, subsoil and spoil material. » Routine maintenance work – especially vehicle movement.
Mitigation: Target/Objective	» To significantly reduce the presence of weeds and eradicate alien invasive species. » To avoid the introduction of additional alien invasive plants to the site. » To avoid distribution and thickening of existing alien plants in the site. » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the site.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an AIP Control and Eradication Programme.	Developer	Operation
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Developer	Operation
Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan to be developed for the site. When alien	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.		
Eradicate all weeds and alien invasive plants as far as practically possible and ensure that material from invasive plants are adequately destroyed and not further distributed.	Developer	Operation
Any alien and invasive vegetation removed should be taken to a registered landfill site to prevent the proliferation of alien and invasive species	Developer	Operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	Developer	Operation

Performance Indicator	» Low abundance of alien plants. For each alien species: number of plants and aerial cover of plants within the site and immediate surroundings.
Monitoring	» On-going monitoring of area by EO during construction. » Annual audit of development footprint and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the site. » The environmental manager/site agent should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 4: Minimise dust and air emissions

During the operation phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles). Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	» Gravel surfaces. » On-site vehicle movement.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

	» To ensure emissions from the power generation process are minimised.

Mitigation: Action/Control	Responsibility	Timeframe
Implement appropriate dust suppression on gravel roads on a regular basis.	Developer	Operation
Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Developer	Operation
Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues.	Developer	Operation
Implement appropriate dust suppression measures on a regular basis in any exposed surfaces.	Developer	Operation
Re-vegetation of cleared areas as soon as practically feasible.	Developer	Operation
Speed of vehicles must be restricted on site to 40km/hr.	Developer	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Developer	Operation

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance or dust to the Power Station Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 5: Ensure the implementation of an appropriate fire management plan and general management measures during the operation phase

The following recommendations below must be considered with regards to fire protection on site:

» Alien Invasive species should be completely eradicated in order to decrease the fire risk associated with the site.
» Cigarette butts may not be thrown in the veld, but must be disposed of correctly. Designated smoking areas must be established with suitable receptacles for disposal.
» In case of a fire outbreak, contact details of the local fire and emergency services must be readily available.
» Contractors must ensure that basic firefighting equipment is available on site as per the specifications defined by the health and safety representative / consultant.
» The fire risk on site is a point of discussion that must take place as part of the environmental induction training prior to commencement of construction.
» The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection.

The following below can be used as a guide for appropriate fire management (also refer to **Appendix J**):

Project Component/s	» Operation and maintenance of the PV facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the PV facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site and establish a fire-fighting management plan during operation.	O&M Contractor	Operation
Provide fire-fighting training to selected operation and maintenance staff.	O&M Contractor	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Contractor	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor	Operation
Contact details of emergency services should be prominently displayed on site.	O&M Contractor	Operation
Road borders must be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	O&M Contractor	Operation
Should panels be required to be replaced, the following will apply: » Materials and panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur. » Full clean-up of all materials must be undertaken after the removal and replacement of the solar panel arrays and associated infrastructure is complete, and disturbed areas appropriately rehabilitated. » Most of the materials used for solar panel systems can be recycled. The majority of the glass and semiconductor materials can be recovered and re-used or recycled. Recyclable materials must be transported off-site by truck and managed at appropriate facilities in accordance with relevant waste management regulations. No waste materials may be left on-site. » Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.	O&M Contractor	Operation

Performance Indicator	» Firefighting equipment and training provided before the operation phase commences. » Appropriate fire breaks in place.
Monitoring	» The O&M operator must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 6: Maximise local employment, skills development and business opportunities associated with the construction phase

Project Component/s	» Operation and maintenance activities associated with the facility. » Availability of required skills in the local communities for the undertaking of the construction activities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Limited use of local labour, thereby reducing the employment and business opportunities for locals. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area. » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Higher skilled positions might be sourced internationally, where required.
Enhancement: Target/Objective	» The Developer should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors. » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building.

Mitigation: Action/Control	Responsibility	Timeframe
Where feasible, effort must be made to employ locally in order to create maximum benefit for the communities.	Developer	Operation
In order to maximise the positive impact, it is suggested that the Developer provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience.	Developer	Operation
Facilitate the transfer of knowledge between experienced employees and the staff.	Developer	Operation
Perform a skills audit to determine the potential skills that could be sourced in the area.	Developer	Operation
Effort should be made to use locally sourced inputs where feasible in order to maximize the benefit to the local economy. Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the construction of the facility, as far as feasible.	Developer	Operation
Local Small and Medium Enterprises are to be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible	Developer	Operation

Performance Indicator	» Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed. » Employment and business policy document that sets out local employment and targets is completed before the construction phase commences. » Skills training and capacity building initiatives are developed and implemented.
Monitoring	» Developer must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

OBJECTIVE 7: Minimise impacts related to traffic management

Project Component/s	» Operation and maintenance vehicles.
Potential Impact	» Impact of vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Operation and maintenance vehicle movement. » Speeding on local roads. » Degradation of local road conditions.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the operation and maintenance of the facility on local traffic volumes, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that, at all times, people have access to their properties as well as to social facilities.	Developer	Operation
Vehicles used for operation and maintenance purposes should be inspected regularly to ensure their road-worthiness.	Developer	Operation
Strict vehicle safety standards should be implemented and monitored.	Developer	Operation
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Developer	Operation
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas within the site with adequate lighting	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Road signage and road markings in the vicinity of the site should be well maintained to enhance road safety.	Developer	Operation
On-site parking and safe turn-around facilities should be provided for private vehicles and for buses and mini-buses transporting workers to and from site.	Developer	Operation
Provide clearly defined roadway, parking and pedestrian walkway areas with adequate lighting	Developer	Operation
Staff and general trips to the site should occur outside of peak traffic periods.	O&M Contractor	Operation

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Environmental manager must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 8: Appropriate handling and management of hazardous substances, waste and dangerous goods

The operation of the PV facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and sewage waste.

Project Component/s	» PV facility. » Associated infrastructure.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Substation, transformers, switchgear and supporting equipment. » Workshop / control room.
Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Developer	Operation and maintenance
Storage areas for hazardous substances must be appropriately sealed and bunded.	Developer	Operation
Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.		
All hazardous materials (such as used/new transformer oils, etc.) must be stored in the appropriate manner (stored in sealed containers within a clearly demarcated designated area) to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	Developer	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Developer	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Developer	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Developer	Operation
All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.	Developer	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Developer	Operation
All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal.	Developer	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Developer	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Developer	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Developer	Operation
All servicing and re-fuelling of machines and equipment must either take place off-site, or in controlled and bunded working areas.	Developer	Operation
Separation and recycling of different waste materials should be supported.	Developer	Operation
Should a chemical spill take place, an aquatic ecologist must be contracted to identify the extent of the impact and assist with additional mitigation measures.	Developer	Operation
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	Developer	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Regular quality monitoring of waste before discharge.	Developer	Operation
The dirty water dam will need to be lined to prevent any seepage of waste water.	Developer	Operation
Emergency response arrangements and systems such as foam pourers, fire-fighting systems and cooperation with emergency responders. Preventive measures could include maintenance procedures to prevent the occurrence of a catastrophic loss of containment, as well as strict control of ignition sources and other measures which may be required according to standards such as those prescribed by the South African National Standards system.	Developer	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the O&M operator. » All appropriate waste disposal certificates accompany the monthly reports.

CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

The lifespan of the proposed Aggeneys 2 will be more than 20 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. The lifespan of Aggeneys 2 could be extended depending on the condition of the infrastructure. An assessment will be undertaken prior to the end of the lifecycle of the plant to determine whether the plant should be decommissioned or whether the operation of the plant should continue.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in the BA process would comprise the disassembly, removal and disposal of the infrastructure. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use. Future use of the site after decommissioning of the Aggeneys 2 could possibly form part of an alternative industry that would be able to utilise some of the existing infrastructure associated with the facility. This would however be dependent on the development plans of the area at the time.

As part of the decommissioning phase the developer will undertake the required permitting processes applicable at the time of decommissioning.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore are not repeated in this section.

9.1. Objectives

Within a period of at least 12 months prior to the decommissioning of the site, a Decommissioning Method Statement must be prepared and submitted to the Local Planning Authority, as well as the Provincial and National Environmental Authority. This method statement must cover site restoration, soil replacement, landscaping, conservation, and a timeframe for implementation. Furthermore, this decommissioning must comply with all relevant legal requirements administered by any relevant and competent authority at that time.

The objectives of the decommissioning phase of the proposed project are to:

- Follow a process of decommissioning that is progressive and integrated into the short- and long-term project plans that will assess the closure impacts proactively at regular intervals throughout project life.
- Implement progressive rehabilitation measures, beginning during the construction phase.
- Leave a safe and stable environment for both humans and animals and make their condition sustainable.
- Return rehabilitated land-use to a standard that can be useful to the post-project land user.
- Where applicable, prevent any further soil and surface water contamination by maintaining suitable storm water management systems.
- Maintain and monitor all rehabilitated areas following re-vegetation, and if monitoring shows that the objectives have been met, apply for closure.

9.2. Approach to the Decommissioning Phase

It is recommended that planning of the decommissioning of the project and rehabilitation of the site should take place well in advance (at least two years) of the planned decommissioning activities. Important factors that need to be taken into consideration are detailed below.

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF PV FACILITY.

If the decision is taken at the end of the project lifespan to totally decommission the facility, i.e. make the land available for an alternative land use, the following should take place:

- All concrete and imported foreign material must be removed from the PV facility i.e. panels, support structures etc.
- The holes where the panel support structures are removed must be levelled and covered with subsoil and topsoil.
- Infrastructure not required for the post-decommissioning use of the site must be removed and appropriately disposed of.
- Access roads and servitudes not required for the post-decommissioning use of the site must be rehabilitated. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- Tracks that are to be utilised for the future land use operations should be left *in-situ*. The remainder of the tracks to be removed (ripped) and topsoil replaced.
- All ancillary buildings and access points are to be removed unless they can be used for the future land use.
- Underground electric cables are to be removed if they cannot be used in the future land use.
- All material (cables, PV Panels etc.) must be re-used or recycled wherever possible.
- The competent authority may grant approval to the owner not to remove the landscaping and underground foundations.
- The site must be seeded with locally sourced indigenous vegetation (unless otherwise dictated by the future land use) to allow revegetation of the site.
- Monitor rehabilitated areas quarterly for at least three years (expected) following decommissioning, and implement remedial action as and when required.

SCENARIO 2: PARTIAL DECOMMISSIONING OF ENERGY FACILITY.

Should more advanced technology become available it may be decided to continue to use the site as a PV facility. Much of the existing infrastructure is likely to be re-used in the upgraded facility. In this case, all infrastructure that will no longer be required for the upgraded facility must be removed as described for Scenario 1. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. Any upgrades to the facility at this stage must comply with relevant legislation.

9.2.1. Identification of structures for post-closure use

Access roads should be assessed in conjunction with the future land users to determine if these could be used. Where not required, these access roads should be decommissioned and rehabilitated.

9.2.2. Removal of infrastructure

All infrastructure must be dismantled and removed. Inert material must be removed from site and disposed of at a suitably registered landfill site. The PV facility components must be removed and recycled where possible or disposed of at a suitably registered landfill site. All foundations must be removed to a depth of 1m. Hard surfaces must be ripped to a depth of 1m and vegetated.

9.2.3. Soil rehabilitation

The steps that should be taken during the rehabilitation of soils are as follows:

- The deposited soils must be ripped to ensure reduced compaction;
- An acceptable seed bed should be produced by surface tillage;
- Restore soil fertility;
- Incorporate the immobile fertilisers in to the plant rooting zone before ripping; and
- Apply maintenance dressing of fertilisers on an annual basis until the soil fertility cycle has been restored.

9.2.4. Establishment of vegetation

The objective is to restore the project site to a self-sustaining cycle, i.e. to realise the re-establishment of the natural nutrient cycle with ecological succession initiated.

The objectives for the re-vegetation of reshaped and top-soiled land are to:

- Prevent erosion;
- Restore the land to the agreed land capability;
- Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions; and
- Restore the biodiversity of the area as far as possible.

9.2.5. Maintenance

Established vegetation requires regular maintenance. If the growth medium consists of low-fertility soils, then regular maintenance will be required until the natural fertility cycle has been restored.

9.2.6. Monitoring

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the progress of establishment of desired final ecosystems.

The following items should be monitored continuously:

- Erosion status;
- Vegetation species diversity; and
- Faunal re-colonisation.
- No birds, eggs or nestlings are disturbed or removed by personnel.
- Any raptor nests (especially of red-listed species) discovered on site or nearby, are monitored weekly to ensure zero disturbances.

APPENDIX A:
Layout and Sensitivity Maps

Aggeneys 2 – 100MW Solar Facility and associated infrastructure, Northern Cape

Locality Map

N

AGGENEIS / PAULPUTS 1 220kV OHL

N14

GAMSBERG SUBSTATION

Aggeneys

Aggeneys

BLACK MOUNTAIN SUBSTATION

Black Mountain Golf Club

AGGENEIS / GAMSBERG 1 66kV OHL

AGGENEIS SS

AGGENEIS / ARIES 1 400kV OHL

BLOEMHOEK 61/RE

Gams

Kykgate

Nombies

Nam se Laagte

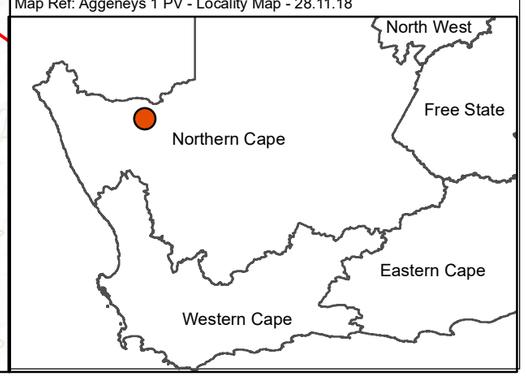
0 3 6 12 Km

Legend

- Town
- Eskom Substation
- Existing Power Line
- Main Road
- National Route
- Non-perennial River
- Project Site (250ha)
- Affected Property (12 226 ha)
- Farm Portion

savannah environmental

Scale: 1:95 650
Projection: LO19
Map Ref: Aggeneys 1 PV - Locality Map - 28.11.18



Aggeneys 2 – 100MW Solar Facility and associated infrastructure, Northern Cape

Layout Map

N

1000 m

1091 m

AGGENEIS / ARIES 1 400kV OHL

0 0,375 0,75 1,5 Km

Legend

- Existing Power Line
- Main Road
- Project Site (250ha)
- Study Area (12 226ha)

Layout

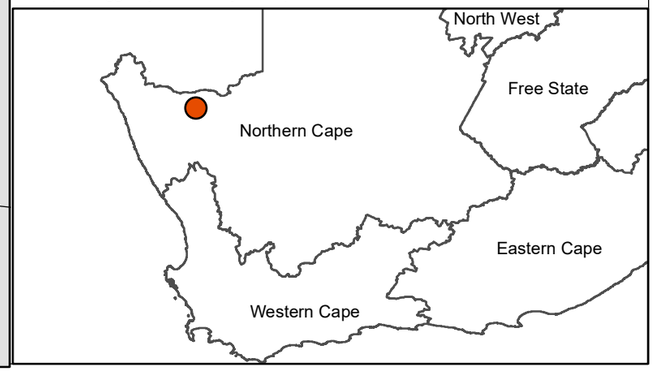
- Internal Access Roads
- Solar Field
- Laydown Area
- O&M block

Substation Alternatives

- Substation Alternative 1
- Substation Alternative 2

savannah environmental

Scale: 1:11 908
Projection: LO19
Map Ref: Aggeneys 1 PV - Layout Map - 10.04.19



Aggeneys 2 – 100MW Solar Facility and associated infrastructure, Northern Cape

Environmental Sensitivity and Layout Map

N

1091 m

AGGENEIS / ARIES 1 400kV OHL

0 0,35 0,7 1,4 Km

Legend

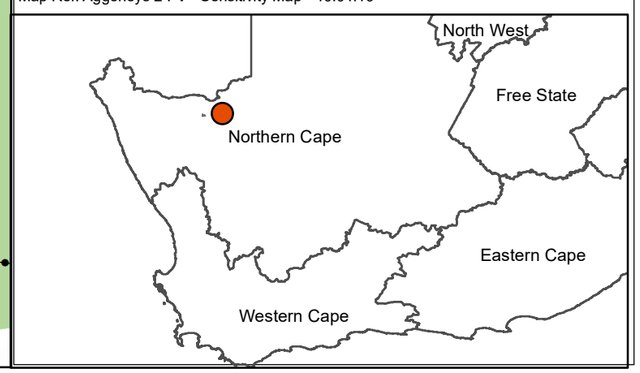
- Existing Power Line
- Main Road
- Internal Access Roads
- Solar Field
- Substation Alternative 1
- Substation Alternative 2
- O&M block
- Laydown Area
- Project Site (250a)

Environmental Sensitivities

- Rock Cairn; likely grave (No-go Heritage Area)
- Ephemeral Watercourses (Medium Freshwater Sensitivity)
- Ephemeral Watercourse Buffer: 15m (Medium Freshwater Sensitivity)
- Rocky Outcrop (High Ecological and Avifauna Sensitivity)
- Rocky Outcrop Buffer (Medium Ecological and Avifauna Sensitivity)
- Wash (Medium Ecological and Avifauna Sensitivity)
- Plains (Low Ecological and Avifauna Sensitivity)
- Road (Transformed Ecological and Avifauna Sensitivity)

savannah environmental

Scale: 1:10 687
Projection: LO19
Map Ref: Aggeneys 2 PV - Sensitivity Map - 10.04.19



Aggeneys 2 – 100MW Solar Facility and associated infrastructure, Northern Cape

Preferred Layout Map

N

AGGENEIS / ARIES 1 400kV OHL

0 0,375 0,75 1,5 Km

Legend

- Existing Power Line
- Main Road
- Project Site (250ha)
- Study Area (12 226ha)

Layout

- Internal Access Roads
- Solar Field
- Laydown Area
- O&M block
- On-Site Substation Alternative 1

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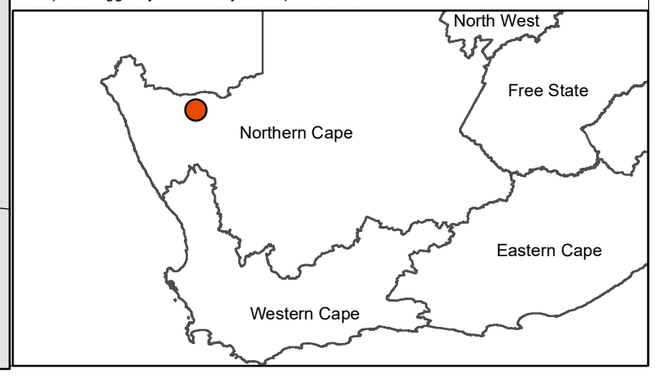
Scale: 1:11 908
Projection: LO19
Map Ref: Aggeneys 1 PV - Layout Map - 10.04.19



Aggeneys 2 – 100MW Solar Facility and associated infrastructure, Northern Cape

Environmental Sensitivity and Preferred Layout Map

N

1091 m

AGGENEIS / ARIES 1 400kV OHL

0 0,35 0,7 1,4 Km

Legend

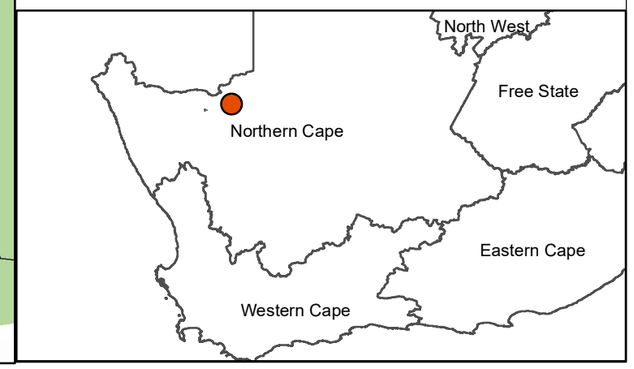
- Existing Power Line
- Main Road
- Internal Access Roads
- Solar Field
- On-Site Substation Alternative 1
- O&M block
- Laydown Area
- Project Site (250a)

Environmental Sensitivities

- Rock Cairn; likely grave (No-go Heritage Area)
- Ephemeral Watercourses (Medium Freshwater Sensitivity)
- Ephemeral Watercourse Buffer: 15m (Medium Freshwater Sensitivity)
- Rocky Outcrop (High Ecological and Avifauna Sensitivity)
- Rocky Outcrop Buffer (Medium Ecological and Avifauna Sensitivity)
- Wash (Medium Ecological and Avifauna Sensitivity)
- Plains (Low Ecological and Avifauna Sensitivity)
- Road (Transformed Ecological and Avifauna Sensitivity)

savannah environmental

Scale:1:10 687
Projection: LO19
Map Ref: Aggeneys 2 PV - Sensitivity Map - 10.04.19



Aggeneys 2 - 100MW Solar Facility and associated infrastructure, Northern Cape

Environmental Sensitivity Map

MIDWAY SUBSTATION

Mlk

GAMSBERG / MIDWAY 1 66kV OHL

AGGENEIS / PAULPUTS 1 220kV OHL

Biotherm Aggeneys PV Solar Energy Facility (1x 40MW PV)

AGGENEIS / HARIB 1 220kV OHL

GAMSBERG SUBSTATION

Aggeneys

Boesmanland Solar (1 x 75MW PV)

BLACK MOUNTAIN SUBSTATION

Aurora Power Solution Black Mountain Mine Solar (1 x 19MW PV)

AGGENEIS / HARIB 2 220kV OHL

AGGENEIS / GAMSBERG 1 66kV OHL

AGGENEIS SS

AGGENEIS / ARIES 1 400kV OHL

AGGENEIS / NAMA 1 220kV OHL

Sato Zuurwater (5 x 75MW PV & 1x 60MW PV)

N14

BLOMHOEK 61

Solar Capital Blomhoek (12 x 75MW PV)

Biotherm_Enamandla (4 x 75MW PV) & Letsoai (2 x 150MW CSP)

Nam se Laagte

0 4,5 9 18 Km

N

Legend

- Town
- Eskom Substation
- Perennial River
- Non-perennial River
- National Route
- Existing Power Line
- Main Road
- Other known renewable energy facilities

Layout

- Internal Access Roads
- Collector Station Alternative 1
- Collector Station Alternative 2
- Substation Alternative 1
- Substation Alternative 2
- Power Line Corridor Alternative 1
- Power Line Corridor Alternative 2
- Solar Field
- Project Site (250ha)

Aggeneys 1 & 2 Environmental Sensitivities

- Insignificant Background Heritage Scatter (no impact)
- Ephemeral Watercourse (Medium Freshwater Sensitivity)
- Ephemeral Watercourse 15m Buffer (Medium Freshwater Sensitivity)
- Gravel Plains (High Ecological Sensitivity)
- Wash (Medium Ecological and Avifauna Sensitivity)
- Plains (Low Ecological and Avifauna Sensitivity)
- Road (Transformed Ecological and Avifauna Sensitivity)

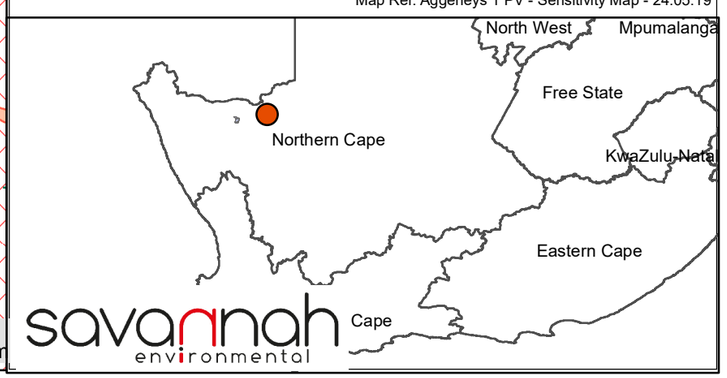
Grid Infrastructure Environmental Sensitivities

- Very High Sensitivity
- High Sensitivity
- Medium Sensitivity
- Low Sensitivity

Formal Sensitivities

- NFEPA Wetlands
- Critical Biodiversity Area One
- Critical Biodiversity Area Two
- Ecological Support Area

Scale: 1:150 000
Projection: LO19
Map Ref: Aggeneys 1 PV - Sensitivity Map - 24.05.19



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Appendix M: Site Coordinates

Corner point coordinates (Project Site):

Coordinates		
	Latitude (S)	**Longitude (E)**
01 (Northern most point (moving in a clockwise direction))	29° 16' 27,188" S	18° 56' 45,613" E
02	29° 16' 42,366" S	18° 57' 14,342" E
03	29° 17' 12,600" S	18° 57' 15,632" E
04	29° 17' 12,597" S	18° 57' 26,833" E
05	29° 16' 57,361" S	18° 57' 43,547" E
06	29° 17' 17,004" S	18° 58' 19,548" E
07	29° 17' 31,512" S	18° 57' 45,387" E
08	29° 17' 25,462" S	18° 56' 34,968" E
09	29° 17' 8,346" S	18° 56' 35,475" E
10	29° 17' 8,449" S	18° 56' 44,752" E
Centre Point	29°17'18.55"S	18°57'19.97" E

Substation Alternative 1 coordinates (preferred Alternative):

Coordinates		
	Latitude (S)	**Longitude (E)**
Centre Point	29° 17' 23,916" S	18° 56' 36,268" E

Substation Alternative 2 coordinates:

Coordinates		
	Latitude (S)	**Longitude (E)**
Centre point	29° 16' 36,517" S	18° 56' 46,693" E

APPENDIX B:
Grievance Mechanism for Public Complaints and Issues

GRIEVANCE MECHANISM / PROCESS

PURPOSE

This Grievance Mechanism has been developed to receive and facilitate the resolution of concerns and grievances regarding the project's environmental and social performance. The aim of the Grievance Mechanism is to ensure that grievances or concerns raised by stakeholders are addressed in a manner that:

- Provides a predictable, accessible, transparent, and credible process to all parties, resulting in outcomes that are fair and equitable, accountable and efficient.
- Promotes trust as an integral component of broader community relations activities.
- Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to provide a process to address grievances in a manner that does not require a potentially costly and time-consuming legal process. This plan should be updated through the project development process to ensure relevance at all project stages.

PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

The following proposed grievance procedures are to be complied with throughout the construction, operation and decommissioning phases of the project. These procedures should be updated as and when required to ensure that the Grievance Mechanism is relevant for the project and effective in providing the required processes.

- Local landowners, communities and authorities must be informed in writing by the Developer of the grievance mechanism and the process by which grievances can be brought to the attention of the Developer through its designated representative. This must be undertaken with the commencement of the construction phase.
- A company representative must be appointed as the contact person to which grievances can be directed. The name and contact details of the contact person must be provided to local landowners, communities and authorities when requested.
- Project related grievances relating to the construction, operation and or decommissioning phases must be addressed in writing to the contact person. The contact person should assist local landowners and/ or communities who may lack resources to submit/prepare written grievances, by recording grievances and completing written grievance notices where applicable, translating requests or concerns or by facilitating contact with relevant parties who can address the raised concerns. The following information should be obtained, as far as possible, regarding each written grievance, which may act as both acknowledgement of receipt as well as record of grievance received:
    a. The name and contact details of the complainant;
    b. The nature of the grievance;
    c. Date raised, received, and for which the meeting was arranged;
    d. Persons elected to attend the meeting (which will depend on the grievance); and
    e. A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be desired, they must be conducted in a separate process and do not form part of this grievance mechanism.

- The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and, if required, agree on suitable date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.
- The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed and only if required).
- A grievance register must be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.
- Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting, as well as a suitable venue. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or Developer are entitled to invite their legal representatives to attend the meeting/s, it should be made clear to all the parties involved in the process that the grievance mechanism process is not a legal process, and that if the Complainant invites legal representatives, the cost will be their responsibility. It is therefore recommended that the involvement of legal representatives be limited as far as possible, as a matter of last resort, and that this process be primarily aimed at stakeholder relationship management as opposed to an arbitration or litigation mechanism.
- The meeting should be chaired by the Developer's representative appointed to address grievances. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- Draft copies of the minutes must be made available to the Complainant and the Developer within 5 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days of receipt of the draft minutes.
- The meeting agenda must be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to put into effect the proposed measures and interventions to successfully resolve the grievance.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the Developer regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- In the event that the parties agree to appoint a mediator, the Developer will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Developer, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Developer. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.

- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report must be made available to the Complainant and the Developer for comment before being finalised and signed by all parties, which signature may not be unreasonably withheld by either party. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action is required, or indeed possible. Closure status must be classified and captured following mediation or successful resolution in the Complaints Register as follows:

- Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- Unresolved. Complaints where it has not been possible to reach an agreed resolution despite mediation.
- Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Developer, either party may be entitled to legal action if an appropriate option, however, this grievance mechanisms aims to avoid such interactions by addressing the grievances within a short timeframe, and to mutual satisfaction, where possible.

APPENDIX C:
Alien Plant Management Plan

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of Aggeneys 2 and associated infrastructure. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts of the site, or the whole site, through the control and management of alien and invasive species presence, dispersal and encroachment.
- Develop and implement a monitoring and eradication programme for alien and invasive plant species.
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

This plan should be updated throughout the life-cycle of the solar PV facility, as required in order to ensure that appropriate measures are in place to manage and control the establishment of alien and invasive plant species and to ensure compliance with relevant legislation.

2. ALIEN PLANT SPECIES RECORDED IN THE AREA

Prosopis glandulosa (Mesquite) a Category 3 invader species (refer below) is known to occur in the area. This is a multi-stemmed acacia-like shrub or small tree up to 10m in height with paired, straight spines and reddish-brown branchlets (refer to Photograph 1 below).

Photograph 1: *Prosopis glandulosa* (Mesquite)

Prosopis trees are extravagant users of readily available groundwater and dense stands could seriously affect the hydrology of the ecosystems they invade. Dense stands compete with and replace indigenous woody and grassland species. Dense stands produce few pods and thus replace natural pasturage without providing pods in return. Dense stands are virtually impenetrable, restricting the movement of domestic and wild animals and causing injuries.

3. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act alien invasive plant species are ascribed to one of the following categories:

- Category 1: Prohibited and must be controlled.
- Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

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

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

- **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

4. ALIEN PLANT MANAGEMENT PRINCIPLES

4.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

4.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The uses of chemicals are not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

4.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

» **Mechanical control**

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion.

» **Chemical Control**

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.
- The use of chemicals is not recommended for wetland areas.

For all herbicide applications, the following Regulations and guidelines should be followed:

- Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- South African Bureau of Standards, Standard SANS 10206 (2010).

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, Forestry and Fisheries.

» **Biological control**

Biological weed control consists of the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plant's reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

4.4. General management practices

The following general management practices should be encouraged or strived for:

- Establish an on-going monitoring programme for construction phase to detect and quantify any alien species that may become established.
- Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- The effectiveness of vegetation control varies seasonally and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.
- Alien plant management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the

cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.

- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

4.5. Monitoring

In order to assess the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the magnitude of alien plant invasion on site, as well as an assessment of the efficacy of the management programme.

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- » Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.
- » It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien plant species	Preconstruction Monthly during Summer and Autumn (Middle November to end March) 3 Monthly during Winter and Spring
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien plant control measures implemented	Record of clearing activities	3 Monthly

Operation Phase

Monitoring Action	Indicator	Timeframe
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and	Biannually

Monitoring Action	Indicator	Timeframe
	cover over time at the site	
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

APPENDIX D
Plant Search and Rescue Plan

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the Aggeneys 2 plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the development of the solar facility and associated infrastructure on listed and protected plant species and their habitats during construction and operation. This subplan is required in order to ensure compliance with national and provincial legislation for vegetation clearing and any required destruction or translocation of provincially and nationally protected species within the footprint of the development area.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, under the Northern Cape Conservation Act (2009) and trees protected under the National List of Protected Tree Species. This is followed by an identification of protected species present at the Aggeneys 2 site and actions that should be implemented to minimise impact on these species and comply with legislative requirements.

2. IDENTIFICATION OF SPECIES OF CONSERVATION CONCERN

Plant species are protected at the national level as well as the provincial level and different permits may be required for different species depending on their protection level. At the national level, protected trees are listed by DAFF under the National List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from DAFF. At the provincial level, all species red-listed under the Red List of South African plants (http://redlist.sanbi.org/) as well as species listed under the Northern Cape Nature Conservation Act (No. 9 of 2009) are protected and require provincial permits. The Northern Cape Conservation Act lists a variety of species as protected but also several whole families and genera as protected. Of particular relevance to the current study are the following, which are extracted from the legislation and are not intended to provide a comprehensive list of all protected species, only those which are likely to be encountered in the area. The reader is referred to the schedules of the Act for a full list of species listed under the act.

Under the Northern Cape Nature Conservation Act (No. 9 of 2009), the following are highlighted as potentially being present around the broader study area: :

Schedule 2 Protected Flora

- Family AIZOACACEAE – *Conophytum ficiforme and Lithops julii subsp. fulleri*
- Family CAPPARACEAE – *Boscia foetida subsp. foetida*
- Family APOCYNACEAE – *Hoodia gordonii*

A full list of plant species known from the study area around the Aggeneys 2 project site is provided in Annex 1.

3. IDENTIFICATION OF LISTED SPECIES

In this section, the listed species observed to occur within the broader area are identified and listed below. Those present and the number affected within the development footprint would be clarified following the preconstruction walk-through. The list is not considered exhaustive and additional species may be observed to be present during the preconstruction walk-through, which should be conducted at a favourable time of year, such that there is a maximal chance of picking up geophytes and other species which may not be easily observed at other times of the year.

Family	Species	IUCN Status	NC Status
CAPPARACEAE	*Boscia foetida subsp. foetida*	LC	Schedule 2
APOCYNACEAE	*Hoodia gordonii*	LC	Schedule 2
AZOACEAE	*Lithops julii subsp fulleri*	LC	Schedule 2
AIZOACEAE	*Conophytum ficiforme*	LC	Schedule 2

4. MITIGATION & AVOIDANCE OPTIONS

The primary mitigation and avoidance measure that must be implemented at the preconstruction phase is the Preconstruction Walk-Through of the development footprint. This defines which and how many individuals of listed and protected species are found within the development footprint. This information is required for the DAFF and Northern Cape Nature Conservation permits which must be obtained before construction can commence.

Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well and it is generally not recommended to try and attempt to translocate such species. Recommendations in this regard would be made following the walk-through of the facility footprint before construction, where all listed and protected species within the development footprint will be identified and located.

5. RESCUE AND PROTECTION PLAN

5.1. Preconstruction

» Identification of all listed species which may occur within the site, based on the SANBI POSA database as well as the specialist EIA studies for the site and any other relevant literature.
» Before construction commences at the site, the following actions should be taken:
- A walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This should happen during the flowering season at the site which, depending on rainfall, is likely to be during spring to early summer (August-October).
- A walk-through report following the walk-through which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. The report should also contain a full list of localities where listed species occur within

the development footprint and the number of affected individuals in each instance, so that this information can be used to comply with the permit conditions required by the relevant legislation. Those species suitable for search as rescue should be identified in the walk-through report.

- A permit to clear the site and relocate species of concern is required from Northern Cape DENC before construction commences. A tree clearing permit is also required from DAFF to clear protected trees from the site.
- Once the permits have been issued, there should be a search and rescue operation of all listed species that cannot be avoided, which have been identified in the walk-through report as being suitable for search and rescue within the development footprint. Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes.

5.2. Construction

» Vegetation clearing should take place in a phased manner, so that large cleared areas are not left standing with no activity for long periods of time and pose a wind and water erosion risk. This will require coordination between the contractor and EO, to ensure that the EO is able to monitor activities appropriately.
» All cleared material should be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.
» EO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the EO and any listed species present which are able to survive translocation should be translocated to a safe site.
» All areas to be cleared should be demarcated with construction tape, survey markers or similar. All construction vehicles should work only within the designated area.
» Plants suitable for translocation or for use in rehabilitation of already cleared areas should be identified and relocated before general clearing takes place.
» Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site before clearing commences.
» Many listed species are also sought after for traditional medicine or by collectors and so the EO and ECO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.
» The EO should monitor construction activities in sensitive habitats such as in dune areas carefully to ensure that impacts to these areas are minimised.

5.3. Operation

» Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers.
» The collecting of plants of their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.

6. MONITORING & REPORTING REQUIREMENTS

The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- Preconstruction walk-through report detailing the location and distribution of all listed and protected species. This should include a walk-through of all infrastructure including all new access roads, cables, buildings and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full account of how many individuals of each listed species will be impacted by the development. Details of plants suitable for search and rescue mjst also be included.
- Permit applications to NC-DENC and DAFF. This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development footprint. The permit is required before any search and rescue or vegetation clearance can take place. Where large numbers of listed species are affected, a site inspection and additional requirements may be imposed by NC-DENC and/or DAFF as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing permit should be kept at the site.
- Active daily monitoring of clearing during construction by the EO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.
- Post construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.

ANNEX 1. LIST OF PLANT SPECIES

List of plant species known from the broad area around the Aggeneys 2 project site, based on observations from the site as well as the SANBI SIBIS database.

Family	Species
ACANTHACEAE	*Acanthopsis disperma*
ACANTHACEAE	*Acanthopsis hoffmannseggiana*
ACANTHACEAE	*Barleria lichtensteiniana*
ACANTHACEAE	*Barleria rigida*
ACANTHACEAE	*Blepharis mitrata*
ACANTHACEAE	*Monechma genistifolium subsp. australe*
ACANTHACEAE	*Monechma genistifolium subsp. genistifolium*
ACANTHACEAE	*Monechma incanum*
ACANTHACEAE	*Monechma spartioides*
AIZOACEAE	*Aizoon asbestinum*
AIZOACEAE	*Aizoon schellenbergii*
AIZOACEAE	*Galenia africana*
AIZOACEAE	*Galenia crystallina*
AIZOACEAE	*Galenia sarcophylla*
AIZOACEAE	*Plinthus cryptocarpus*
AIZOACEAE	*Plinthus karooicus*
AIZOACEAE	*Plinthus sericeus*
AIZOACEAE	*Tetragonia arbuscula*
AIZOACEAE	*Tetragonia reduplicata*
AIZOACEAE	*Trianthema parvifolia var. parvifolia*
AMARANTHACEAE	*Amaranthus praetermissus*
AMARANTHACEAE	*Amaranthus thunbergii*
AMARANTHACEAE	*Leucosphaera bainesii*
AMARANTHACEAE	*Sericocoma avolans*
AMARANTHACEAE	*Sericocoma pungens*
AMARYLLIDACEAE	*Boophone disticha*
AMARYLLIDACEAE	*Crinum bulbispermum*
AMARYLLIDACEAE	*Haemanthus humilis subsp. humilis*
AMARYLLIDACEAE	*Nerine laticoma*
ANACARDIACEAE	*Searsia lancea*
ANACARDIACEAE	*Searsia pendulina*
APOCYNACEAE	*Adenium oleifolium*
APOCYNACEAE	*Cynanchum orangeanum*
APOCYNACEAE	*Gomphocarpus fruticosus subsp. fruticosus*
APOCYNACEAE	*Hoodia gordonii*
APOCYNACEAE	*Larryleachia marlothii*
APOCYNACEAE	*Sarcostemma viminale subsp. viminale*
APOCYNACEAE	*Tridentea marientalensis subsp. marientalensis*
ASPARAGACEAE	*Asparagus denudatus*
ASPARAGACEAE	*Asparagus pearsonii*
ASPHODELACEAE	*Aloe claviflora*
ASPHODELACEAE	*Aloe dichotoma*
ASPHODELACEAE	*Aloe gariepensis*
ASPHODELACEAE	*Aloe hereroensis var. hereroensis*

Family	Species
ASTERACEAE	*Amellus tridactylus subsp. arenarius*
ASTERACEAE	*Arctotis leiocarpa*
ASTERACEAE	*Berkheya annectens*
ASTERACEAE	*Berkheya spinosissima subsp. namaensis var. namaensis*
ASTERACEAE	*Berkheya spinosissima subsp. spinosissima*
ASTERACEAE	*Bidens bipinnata*
ASTERACEAE	*Dicoma capensis*
ASTERACEAE	*Dimorphotheca polyptera*
ASTERACEAE	*Eriocephalus ambiguus*
ASTERACEAE	*Eriocephalus microphyllus var. pubescens*
ASTERACEAE	*Felicia deserti*
ASTERACEAE	*Felicia muricata subsp. cinerascens*
ASTERACEAE	*Felicia muricata subsp. muricata*
ASTERACEAE	*Geigeria filifolia*
ASTERACEAE	*Geigeria ornativa*
ASTERACEAE	*Geigeria pectidea*
ASTERACEAE	*Helichrysum gariepinum*
ASTERACEAE	*Helichrysum micropoides*
ASTERACEAE	*Hirpicium echinus*
ASTERACEAE	*Ifloga molluginoides*
ASTERACEAE	*Kleinia longiflora*
ASTERACEAE	*Laggera decurrens*
ASTERACEAE	*Leysera tenella*
ASTERACEAE	*Litogyne gariepina*
ASTERACEAE	*Nolletia arenosa*
ASTERACEAE	*Osteospermum microcarpum subsp. microcarpum*
ASTERACEAE	*Pegolettia retrofracta*
ASTERACEAE	*Pentzia pinnatisecta*
ASTERACEAE	*Pentzia sp.*
ASTERACEAE	*Pentzia spinescens*
ASTERACEAE	*Pteronia leucoclada*
ASTERACEAE	*Pteronia mucronata*
ASTERACEAE	*Pteronia unguiculata*
ASTERACEAE	*Rosenia oppositifolia*
ASTERACEAE	*Senecio consanguineus*
ASTERACEAE	*Senecio glutinarius*
ASTERACEAE	*Tripteris microcarpa subsp. microcarpa*
ASTERACEAE	*Verbesina encelioides var. encelioides*
AZOLLACEAE	*Azolla filiculoides*
BIGNONIACEAE	*Rhigozum obovatum*
BIGNONIACEAE	*Rhigozum trichotomum*
BORAGINACEAE	*Codon royenii*
BORAGINACEAE	*Ehretia rigida subsp. rigida*
BRASSICACEAE	*Heliophila carnosa*
BRASSICACEAE	*Heliophila minima*
BRASSICACEAE	*Heliophila sp.*
BRASSICACEAE	*Heliophila trifurca*
BRASSICACEAE	*Sisymbrium burchellii var. burchellii*
BURSERACEAE	*Commiphora gracilifrondosa*

Family	Species
CAMPANULACEAE	*Wahlenbergia denticulata var. denticulata*
CAPPARACEAE	*Boscia foetida subsp. foetida*
CAPPARACEAE	*Boscia albitrunca*
CAPPARACEAE	*Cadaba aphylla*
CAPPARACEAE	*Cleome angustifolia subsp. diandra*
CAPPARACEAE	*Cleome gynandra*
CARYOPHYLLACEAE	*Pollichia campestris*
CELASTRACEAE	*Gymnosporia linearis subsp. lanceolata*
CHENOPODIACEAE	*Atriplex semibaccata var. appendiculata*
CHENOPODIACEAE	*Atriplex semibaccata var. typica*
CHENOPODIACEAE	*Chenopodium glaucum*
CHENOPODIACEAE	*Salsola barbata*
CHENOPODIACEAE	*Salsola glabrescens*
CHENOPODIACEAE	*Salsola kali*
CHENOPODIACEAE	*Salsola namibica*
CHENOPODIACEAE	*Salsola rabieana*
CHENOPODIACEAE	*Salsola tuberculata*
CHENOPODIACEAE	*Suaeda caespitosa*
CHENOPODIACEAE	*Suaeda merxmuelleri*
COLCHICACEAE	*Androcymbium melanthioides subsp. melanthioides*
COLCHICACEAE	*Colchicum melanthoides subsp. melanthoides*
COLCHICACEAE	*Ornithoglossum vulgare*
CONVOLVULACEAE	*Convolvulus sagittatus*
CRASSULACEAE	*Adromischus sp.*
CRASSULACEAE	*Cotyledon orbiculata var. dactylopsis*
CRASSULACEAE	*Crassula muscosa var. muscosa*
CUCURBITACEAE	*Coccinia rehmannii*
CUCURBITACEAE	*Cucumis africanus*
CUCURBITACEAE	*Kedrostis capensis*
CYPERACEAE	*Bulbostylis hispidula*
CYPERACEAE	*Cyperus capensis*
CYPERACEAE	*Cyperus fulgens var. contractus*
CYPERACEAE	*Cyperus longus var. tenuiflorus*
CYPERACEAE	*Cyperus marginatus*
CYPERACEAE	*Cyperus usitatus*
CYPERACEAE	*Scirpoides dioecus*
ERIOSPERMACEAE	*Eriospermum bakerianum subsp. bakerianum*
EUPHORBIACEAE	*Euphorbia glanduligera*
EUPHORBIACEAE	*Euphorbia inaequilatera var. inaequilatera*
EUPHORBIACEAE	*Euphorbia rudis*
EUPHORBIACEAE	*Euphorbia spinea*
FABACEAE	*Acacia erioloba*
FABACEAE	*Acacia karroo*
FABACEAE	*Acacia mellifera subsp. detinens*
FABACEAE	*Acacia pendula*
FABACEAE	*Adenolobus garipensis*
FABACEAE	*Cullen tomentosum*
FABACEAE	*Cyamopsis serrata*
FABACEAE	*Hoffmannseggia lactea*

Family	Species
FABACEAE	*Indigastrum argyraeum*
FABACEAE	*Indigofera alternans var. alternans*
FABACEAE	*Indigofera auricoma*
FABACEAE	*Indigofera heterotricha*
FABACEAE	*Indigofera pungens*
FABACEAE	*Indigofera rhytidocarpa subsp. rhytidocarpa*
FABACEAE	*Lebeckia spinescens*
FABACEAE	*Lotononis platycarpa*
FABACEAE	*Lotononis rabenaviana*
FABACEAE	*Melolobium candicans*
FABACEAE	*Melolobium macrocalyx*
FABACEAE	*Parkinsonia africana*
FABACEAE	*Prosopis chilensis*
FABACEAE	*Prosopis glandulosa var. glandulosa*
FABACEAE	*Prosopis glandulosa var. torreyana*
FABACEAE	*Prosopis sp.*
FABACEAE	*Prosopis velutina*
FABACEAE	*Ptycholobium biflorum subsp. biflorum*
FABACEAE	*Requienia sphaerosperma*
FABACEAE	*Senna italica subsp. arachoides*
FABACEAE	*Tephrosia burchellii*
FABACEAE	*Tephrosia dregeana var. dregeana*
GERANIACEAE	*Monsonia burkeana*
GERANIACEAE	*Monsonia luederitziana*
GERANIACEAE	*Sarcocaulon patersonii*
GISEKIACEAE	*Gisekia africana var. africana*
GISEKIACEAE	*Gisekia pharnacioides var. pharnacioides*
HYACINTHACEAE	*Dipcadi ciliare*
HYACINTHACEAE	*Dipcadi glaucum*
HYACINTHACEAE	*Dipcadi gracillimum*
HYACINTHACEAE	*Dipcadi papillatum*
HYACINTHACEAE	*Drimia intricata*
HYACINTHACEAE	*Drimia physodes*
HYACINTHACEAE	*Ledebouria sp.*
HYACINTHACEAE	*Ledebouria undulata*
HYACINTHACEAE	*Ornithogalum suaveolens*
HYACINTHACEAE	*Ornithogalum tenuifolium subsp. aridum*
HYACINTHACEAE	*Ornithogalum tenuifolium subsp. tenuifolium*
IRIDACEAE	*Ferraria variabilis*
IRIDACEAE	*Gladiolus saccatus*
IRIDACEAE	*Moraea polystachya*
LAMIACEAE	*Leucas capensis*
LAMIACEAE	*Salvia verbenaca*
LOASACEAE	*Kissenia capensis*
LOPHIOCARPACEAE	*Lophiocarpus polystachyus*
LORANTHACEAE	*Tapinanthus oleifolius*
MALVACEAE	*Abutilon angulatum var. angulatum*
MALVACEAE	*Corchorus asplenifolius*
MALVACEAE	*Hermannia abrotanoides*

Family	Species
MALVACEAE	*Hermannia bicolor*
MALVACEAE	*Hermannia coccocarpa*
MALVACEAE	*Hermannia minutiflora*
MALVACEAE	*Hermannia modesta*
MALVACEAE	*Hermannia sp.*
MALVACEAE	*Hermannia spinosa*
MALVACEAE	*Hermannia stricta*
MALVACEAE	*Hermannia tomentosa*
MALVACEAE	*Melhania didyma*
MALVACEAE	*Sida rhombifolia subsp. rhombifolia*
MELIACEAE	*Nymania capensis*
MESEMBRYANTHEMACEAE	*Dinteranthus wilmotianus*
MESEMBRYANTHEMACEAE	*Lithops bromfieldii*
MESEMBRYANTHEMACEAE	*Mesembryanthemum crystallinum*
MESEMBRYANTHEMACEAE	*Mesembryanthemum guerichianum*
MESEMBRYANTHEMACEAE	*Prenia tetragona*
MESEMBRYANTHEMACEAE	*Psilocaulon articulatum*
MESEMBRYANTHEMACEAE	*Psilocaulon coriarium*
MESEMBRYANTHEMACEAE	*Psilocaulon subnodosum*
MESEMBRYANTHEMACEAE	*Ruschia barnardii*
MESEMBRYANTHEMACEAE	*Ruschia divaricata*
MESEMBRYANTHEMACEAE	*Ruschia kenhardtensis*
MOLLUGINACEAE	*Limeum aethiopicum subsp. aethiopicum var. aethiopicum*
MOLLUGINACEAE	*Limeum argute-carinatum var. argute-carinatum*
MOLLUGINACEAE	*Limeum fenestratum var. fenestratum*
MOLLUGINACEAE	*Limeum myosotis var. confusum*
MOLLUGINACEAE	*Limeum sulcatum var. gracile*
MOLLUGINACEAE	*Mollugo cerviana var. cerviana*
MONTINIACEAE	*Montinia caryophyllacea*
NEURADACEAE	*Grielum humifusum var. humifusum*
NYCTAGINACEAE	*Phaeoptilum spinosum*
OXALIDACEAE	*Oxalis lawsonii*
PAPAVERACEAE	*Argemone mexicana forma mexicana*
PEDALIACEAE	*Pterodiscus luridus*
PEDALIACEAE	*Sesamum capense*
PHYLLANTHACEAE	*Phyllanthus humilis*
PHYLLANTHACEAE	*Phyllanthus maderaspatensis*
PLUMBAGINACEAE	*Dyerophytum africanum*
POACEAE	*Anthephora pubescens*
POACEAE	*Aristida adscensionis*
POACEAE	*Aristida congesta subsp. barbicollis*
POACEAE	*Aristida congesta subsp. congesta*
POACEAE	*Aristida diffusa subsp. burkei*
POACEAE	*Aristida engleri var. engleri*
POACEAE	*Aristida vestita*
POACEAE	*Brachiaria glomerata*
POACEAE	*Cenchrus ciliaris*
POACEAE	*Centropodia glauca*
POACEAE	*Digitaria sanguinalis*

Family	Species
POACEAE	*Digitaria sp.*
POACEAE	*Dinebra retroflexa*
POACEAE	*Echinochloa holubii*
POACEAE	*Echinochloa stagnina*
POACEAE	*Enneapogon cenchroides*
POACEAE	*Enneapogon desvauxii*
POACEAE	*Enneapogon scaber*
POACEAE	*Eragrostis annulata*
POACEAE	*Eragrostis aspera*
POACEAE	*Eragrostis biflora*
POACEAE	*Eragrostis brizantha*
POACEAE	*Eragrostis lehmanniana var. lehmanniana*
POACEAE	*Eragrostis porosa*
POACEAE	*Eragrostis procumbens*
POACEAE	*Eragrostis rotifer*
POACEAE	*Eriochloa fatmensis*
POACEAE	*Fingerhuthia africana*
POACEAE	*Melinis repens subsp. grandiflora*
POACEAE	*Melinis repens subsp. repens*
POACEAE	*Melinis sp.*
POACEAE	*Phalaris canariensis*
POACEAE	*Schmidtia kalahariensis*
POACEAE	*Setaria italica*
POACEAE	*Setaria pumila*
POACEAE	*Setaria sp.*
POACEAE	*Setaria verticillata*
POACEAE	*Stipagrostis amabilis*
POACEAE	*Stipagrostis anomala*
POACEAE	*Stipagrostis ciliata var. capensis*
POACEAE	*Stipagrostis hochstetteriana var. hochstetteriana*
POACEAE	*Stipagrostis obtusa*
POACEAE	*Stipagrostis uniplumis var. neesii*
POACEAE	*Stipagrostis uniplumis var. uniplumis*
POACEAE	*Tragus berteronianus*
POACEAE	*Tragus racemosus*
POACEAE	*Triraphis purpurea*
POACEAE	*Triraphis ramosissima*
POACEAE	*Urochloa panicoides*
POLYGALACEAE	*Polygala seminuda*
POLYGONACEAE	*Oxygonum alatum var. alatum*
PORTULACACEAE	*Anacampseros baeseckei*
PORTULACACEAE	*Anacampseros filamentosa subsp. filamentosa*
PORTULACACEAE	*Anacampseros filamentosa subsp. namaquensis*
PORTULACACEAE	*Anacampseros filamentosa subsp. tomentosa*
PORTULACACEAE	*Avonia albissima*
PORTULACACEAE	*Portulaca hereroensis*
PORTULACACEAE	*Portulaca kermesina*
PORTULACACEAE	*Portulaca pilosa*
PORTULACACEAE	*Portulaca quadrifida*

Family	Species
PORTULACACEAE	*Talinum arnotii*
RESEDACEAE	*Oligomeris dipetala var. dipetala*
RHAMNACEAE	*Ziziphus mucronata subsp. mucronata*
RUBIACEAE	*Kohautia cynanchica*
RUBIACEAE	*Kohautia ramosissima*
SALICACEAE	*Salix mucronata subsp. mucronata*
SANTALACEAE	*Thesium hystricoides*
SANTALACEAE	*Thesium lineatum*
SCROPHULARIACEAE	*Aptosimum albomarginatum*
SCROPHULARIACEAE	*Aptosimum elongatum*
SCROPHULARIACEAE	*Aptosimum junceum*
SCROPHULARIACEAE	*Aptosimum lineare*
SCROPHULARIACEAE	*Aptosimum lineare var. lineare*
SCROPHULARIACEAE	*Aptosimum marlothii*
SCROPHULARIACEAE	*Aptosimum procumbens*
SCROPHULARIACEAE	*Aptosimum spinescens*
SCROPHULARIACEAE	*Jamesbrittenia argentea*
SCROPHULARIACEAE	*Jamesbrittenia aridicola*
SCROPHULARIACEAE	*Jamesbrittenia integerrima*
SCROPHULARIACEAE	*Manulea schaeferi*
SCROPHULARIACEAE	*Peliostomum leucorrhizum*
SCROPHULARIACEAE	*Selago divaricata*
SCROPHULARIACEAE	*Selago paniculata*
SOLANACEAE	*Lycium bosciifolium*
SOLANACEAE	*Lycium cinereum*
SOLANACEAE	*Lycium oxycarpum*
SOLANACEAE	*Lycium pumilum*
SOLANACEAE	*Nicotiana glauca*
SOLANACEAE	*Solanum burchellii*
SOLANACEAE	*Solanum capense*
TAMARICACEAE	*Tamarix usneoides E.Mey. ex Bunge x T. ramosissima Ledeb.*
TECOPHILAEACEAE	*Cyanella lutea*
THYMELAEACEAE	*Gnidia polycephala*
URTICACEAE	*Forsskaolea candida*
VERBENACEAE	*Chascanum garipense*
VERBENACEAE	*Chascanum incisum*
VERBENACEAE	*Chascanum pumilum*
ZYGOPHYLLACEAE	*Augea capensis*
ZYGOPHYLLACEAE	*Fagonia sinaica var. minutistipula*
ZYGOPHYLLACEAE	*Tribulus cristatus*
ZYGOPHYLLACEAE	*Tribulus pterophorus*
ZYGOPHYLLACEAE	*Tribulus terrestris*
ZYGOPHYLLACEAE	*Tribulus zeyheri subsp. zeyheri*
ZYGOPHYLLACEAE	*Zygophyllum dregeanum*
ZYGOPHYLLACEAE	*Zygophyllum flexuosum*
ZYGOPHYLLACEAE	*Zygophyllum simplex*
ZYGOPHYLLACEAE	*Zygophyllum sp.*
ASTERACEAE	*Geigeria ornativa subsp. ornativa*

APPENDIX E:
Re-vegetation and Rehabilitation Plan

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the Revegetation and Rehabilitation Plan is to ensure that areas cleared or impacted during construction activities within the site for Aggeneys 2, and that are not required for operation are rehabilitated to their original state before the operation phase commences, and that the risk of erosion from these areas is reduced. The purpose of the Rehabilitation Plan for the site can be summarised as follows:

- Achieve long-term stabilisation of all disturbed areas.
- Re-vegetate all disturbed areas with suitable local plant species.
- Minimise visual impact of disturbed areas.
- Ensure that disturbed areas are rehabilitated to a condition similar to that found prior to disturbance.

This Revegetation and Rehabilitation Plan should be read in conjunction with other site-specific plans, including the Erosion Management Plan, Soil Management Plan, Alien Invasive Management Plan and Plant Rescue and Protection Plan. Prior to the commencement of construction, a detailed Revegetation and Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a suitably qualified, professionally registered specialist (with a botanical or equivalent qualification).

2. RELEVANT ASPECTS OF THE SITE

The vegetation of the project site consists of an arid, open grassland on shallow soils. There is gradient evident across the site, with shallow, more gravelly soils present in the north towards the base of the Gamsberg along the Loop 10 road, which give way to somewhat deeper more sandy soils as one moves towards the Koa River valley south of the development boundary. The Koa River valley itself consists of an extensive dune system as well as broad plains with deep red soils, classified as Bushmanland Sandy Grassland.

The vegetation associated with the project site for the Aggeneys 2 solar PV facility is homogenous and consists of *Stipagrostis* grasslands with occasional areas of more shrubby vegetation. The diversity of the vegetation is low, and while rainfall temporarily increases the abundance of forbs and annuals, diversity is never very high. Dominant and typical species include grasses such as *Stipagrostis ciliata, S.obtusa, S.anomala, Aristida adscenionis* and *Enneapogon scaber*, and low woody shrubs such as *Hermannia spinosa, Lycium cinereum, Salsola rabieana, Asparagus capensis, Galenia africana, Tetragonia arbuscula, Melolobium candicans, Eriocephalus spinescens, Zygophyllum retrofractum, Pteronia glomerata, Rhigozum trichotomum and Aptosimum spinescens* as well as forbs such as *Zygophyllum simplex*, *Tribulis zeyheri, Leysera tenella, Galenia sarcophylla, Hypertelis salsoloides, Sesamum capense, Cucumis myriocarpus, Gazania lichtensteinii, Augea capensis and Mesembryanthemum crystalinum*. The abundance of listed or protected species within the study area is low and apart from a low density of *Hoodia gordonii*, no other significant species were observed.

3. REHABILITATION METHODS AND PRACTISES

The following general management practices should be encouraged or strived for:

- Clearing of invaded areas should be conducted as per the Alien Management Plan, included in the EMPr.
- No harvesting of vegetation may be undertaken outside the area to be disturbed by construction activities.
- Indigenous plant material must be kept separate from alien material.
- Indigenous seeds may be harvested for purposes of revegetation in areas that are free of alien invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
- Topsoil should be reserved wherever possible on site, to be utilised during rehabilitation.
- Sods used for revegetation should be obtained directly from the site, but not from the sensitive areas. Sods should contain at least a 50 mm topsoil layer and be minimally disturbed, in particular to existing root systems. Sods must ideally be obtained from areas as close as possible to the region that is to be rehabilitated.
- Water used for the irrigation of re-vegetated areas should be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.
- On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.
- In areas where soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface.
- The final rehabilitated area should resemble the current composition and structure of the soil as far as practicably possible.
- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.
- No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been rehabilitated.
- Where rehabilitation sites are located within actively grazed areas, they should be fenced off, this must be undertaken in consultation with the landowner.
- Any runnels, erosion channels or wash-aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.
- Re-vegetated areas should be monitored frequently and prepared and revegetation from scratch should inadequate signs of surface coverage or grown be evident after two growth seasons. Adequate recovery must be assessed by a qualified botanist or rehabilitation specialist.
- The stockpiled vegetation from the clearing operations should be reduced to mulch where possible, and retained along with topsoil to encourage seedbank regrowth and soil fertility.
- Mulches must be collected in such a manner as to restrict the loss of seed.
- Mulch must be stored for as short a period as possible.
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants.

- Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited, and only the correct herbicide type should be applied.
- Once rehabilitated, areas should be protected to prevent trampling and erosion.
- Fencing should be removed once a sound vegetative cover has been achieved.

4. MONITORING AND FOLLOW-UP ACTION

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Officer (EO) and EPC Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the Developer will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Associated nature and stability of surface soils.
- Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately, as per the alien management plan and mitigation measures contained within the EMPr.

Rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

- Rehabilitation areas should be monitored every 4 months for the first 12 months following construction, or as per the recommendations of specialist.
- Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the timeframe between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control and rehabilitation strategy.
- Any areas showing erosion, should be adaptively managed with particular erosion control measures, depending on the situation.

If the current state of the environment prior to construction (which will be disturbed during the construction phase) is not achieved post impact, within the specified rehabilitation period, maintenance of these areas must continue until an acceptable state is achieved (excluding alien plant species or weeds). Additional rehabilitation methods may be necessary to achieve the current state before construction commenced.

Monitoring of the rehabilitation success, as well as follow-up adaptive management, combined with the clearing of emerging alien plant species should all continue for as long as is considered necessary, depending on regrowth rates.

APPENDIX F
Erosion Management Plan

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this Erosion Management Plan, the Storm Water Management Plan and the Revegetation and Rehabilitation Plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
» An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

This plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The broader study area (including the project site) consists of gently undulating topography, with slopes of less than 5% over most of the area, and with an altitude above sea level of between 850 and 1 000m. The climate of the area has a mostly all year rainfall distribution, but the annual average is very low, at around 75 mm per year, although this might be slightly higher in the higher parts of the landscape (Koch *et al.*, 1987). Temperatures are warm to very hot in summer, with daily maximums regularly exceeding 40°C, but cool to cold in winter, with almost no occurrence of frost.

During construction, there will be a lot of disturbed and loose soil at the site which will render the area vulnerable to erosion. Erosion is one of the greater risk factors associated with the development and it is therefore critically important that proper erosion control structures are built and maintained over the lifespan of the project.

Soil compaction and increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may potentially impact the downstream watercourses, wetlands and aquatic habitats, mainly due to an increase of surface water and silt inflow from the surrounding disturbed areas. These potential impacts may result in a reduction in the buffering capacities of the landscape during extreme weather events.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

» Protect the land surface from erosion;

» Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
» Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

» Due to the sandy nature of soils in the study area, soil loss will be greater during dry periods as it is more prone to wind erosion. Therefore, precautions to prevent erosion should be present throughout the year.
» Soil loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
» Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
» The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
» Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
» Where necessary, new roads constructed should include water diversion structures with energy dissipation features present to slow and disperse the water into the receiving area.
» Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
» Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion.
» Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
» All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
» Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
» Gabions and other stabilisation features must be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
» Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced. No driving off of hardened roads should occur at any time, and particularly immediately following large rainfall events.

- Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities (as per the recommendations in the EMPr). Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
- Regular monitoring of the site for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The ECO will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1. Erosion Control Mechanisms

The Contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- Reno mattresses;
- Slope attenuation;
- Hessian material;
- Shade catch nets;
- Gabion baskets;
- Silt fences;
- Storm water channels and catch pits;
- Soil bindings;
- Geofabrics;
- Hydro-seeding and/or re-vegetating;
- Mulching over cleared areas;
- Boulders and size varied rocks; and
- Tilling.

3.2. Engineering Specifications

A detailed engineering specifications Storm Water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm Water Management Plan (**Appendix G** of the EMPr) and this should include erosion control measures. Requirements for project design include:

- Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- All temporary and permanent water management structures or stabilisation methods must be indicated within the Storm water Management Plan.
- An on-site Engineer or Environmental Officer (EO)/ SHE Representative to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO should monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm water Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on-site the Environmental Officer (EO)/ SHE Representative (during construction) or Environmental Manager (during operation) must:

- Assess the significance of the situation.
- Take photographs of the soil degradation.
- Determine the cause of the soil erosion.
- Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
- Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- Report and monitor the progress of rehabilitation weekly and record all the findings in a site register (during construction).
- All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

- Select a system/mechanism to treat the erosion.
- Design and implement the appropriate system/mechanism.
- Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- Continue monitoring until the area has been stabilised.

4. CONCLUSION

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project (if and where applicable). During the construction phase, the contractor must prepare an Erosion Control Method Statement to ensure that all construction methods adopted on site do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of this plan are met before, during and after construction. The designated responsible person on site, must be indicated in the Method Statement and shall ensure that relevant erosion control measures are in place throughout the construction phase.

An operation phase Erosion Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

5. REFERENCES

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APPENDIX G:
Storm Water Management Plan

AGGENEYS 2 PHOTOVOLTAIC FACILITY AND ASSOCIATED INFRASTRUCTURE

CONCEPTUAL STORMWATER MANAGEMENT PLAN

MARCH 2019

Knight Piésold CONSULTING

P O Box 381
Century City
7441
Tel. +27 21 555 0400

Rev	Description	Date
0	Issued in Draft	March 2019

This report was prepared and reviewed by the undersigned.

Prepared:

Sonet Gerber,
Civil Technologist

Reviewed:

Andrew Cleghorn
Principal Civil Engineer

SPECIALIST EXPERTISE

ANDREW CLEGHORN

Profession:	Civil Engineer
Position in Firm:	Regional Head – Western Cape, Shareholder, Principal Civil Engineer
Qualifications:	Pr Eng 20030171, MEng (Civil)
Years of Experience:	17 years

Summary of Experience: Andrew Cleghorn has more than 17 years engineering experience. Andrew obtained his Master of Engineering degree in 2016 from the University of Stellenbosch. Andrew was recently promoted to the position of Regional Head of the Western Cape Transport and Infrastructure branch. Andrew has technical and professional skills in pavement engineering, non-motorised transport planning, design and development of transport systems, project planning and management and construction monitoring.

Specialist Experience:

2017- Current	**Project:**	**N2 Wildcoast Highway, Section 20 from Miskaba River Bridge to the Mtentu River Bridge**
	Position:	Project Leader, Lead Designer
	Description:	Design and Construction supervision of 18km of Greenfields portion of the N2
	Activities Performed:	Project Leader and Design Specialist
	Project Value:	R 1 bn
2011-2016	**Project:**	**N2 Upgrades Myddleton near Caledon**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements
	Activities Performed:	Project Management and Lead Designer, Pavement Engineering
	Project Value:	R 40 000 000.00 (Construction)
2011-2016	**Project:**	**Cape Town Northern Areas Road Rehabilitation**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements
	Activities Performed:	Project Management and Lead Designer, Pavement Engineering
	Project Value:	R 110 000 000.00 (Construction cost)
2011-2012	**Project:**	**Phillipi Plaza Shopping Complex**
	Position:	Project Leader and Lead Designer
	Description:	Parking and roads to new shopping complex
	Project Value:	R 12 000 000.00 (Construction)
2008-2011	**Project:**	**Bredasdorp Main Road Rehabilitation**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements

	Activities Performed:	Project Management and Lead Designer, Pavement Engineering
2007-2018	**Project:**	**Muizenberg Main Road Phase 1 2 3**
	Position:	Lead Designer
	Description:	Road Rehabilitation and Civil Engineering Services
	Activities Performed:	Lead Designer
	Project Value:	R 600 000 000.00 (Construction)

SPECIALIST DECLARATION

I, **Andrew Cleghorn**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable on terms of section 24F of the Act.

Signature of Specialist:

Name of Specialist: Andrew Cleghorn

Date:

Table of Contents

List of Figures

Figure 3.1: Locality Plan 2
Figure 3.2: Drainage Pattern of Existing Site 3
Figure 3.3: Catchment Areas 4
Figure 3.4: Monthly Rainfall for Aggeneys 5
Figure 3.5: Average Monthly Temperatures for Aggeneys 6
Figure 4.1: Conceptual Layout of PV Panels 9
Figure 4.2: Drainage pattern for conceptual layout of PV panels 10
Figure 4.3: Access Roads 12
Figure 6.1: Typical Stone Pitched Side Drain 14
Figure 6.2: Typical Concrete Lined Side Drain 14
Figure 6.3: Typical inlet erosion protection measures 15
Figure 6.4: Typical outlet erosion protection measures 15

List of Tables

1. INTRODUCTION

Knight Piésold Consulting was appointed by ABO Wind Aggeneys 2 PV (Pty) Ltd to investigate and compile a Conceptual Stormwater Management Plan for the proposal of a photovoltaic (PV) energy facility and associated infrastructure.

The purpose of this study is to prepare a conceptual Stormwater Management Plan (SMP) to support the Environmental Impact Assessment Process of the proposed Aggeneys 2 PV facility. This report should be viewed as a localised high-level study and not as a detailed design report. The objective is purely to demonstrate that stormwater from the new development could be managed and controlled in an optimised and non-destructive manner.

This SMP includes the following:

- Determining the catchment area of the project site;
- Defining the topography, slope gradients and rainfall intensities;
- Estimating expected floods for the catchment;
- Confirming of existing drainage patterns and streams; and
- Proposing drainage elements such as side drains, outlets and other mitigation measures to accommodate the resultant stormwater flows.

2. DEFINITIONS AND ASSUMPTIONS

The following assumptions are made on stormwater calculations and are deemed to be adequate for a conceptual investigative report:

- The Rational Method will be used for flood calculations, which is widely accepted to be very accurate for areas of this size;
- The recurrence period applied is a 1:50 year design flood; and
- There are no rivers or streams that will affect the planning and design of the solar facility therefore the 1:100 year design flood was not applied.

3. EXISTING SITE CONDITIONS

3.1. Location

The Remaining extent of Farm Bloemhoek 61 is situated approximately 7km south-east of Aggeneys. Other towns in proximity of the project include Pofadder, located approximately 57km north-east, and Springbok located approximately 116km south-west of the project site, see *Figure 3.1*. The site falls within the Khâi-Ma Local Municipality of the Namakwa District Municipality. The Loop 10 Road is situated along the northern boundary of the property with the R358 (Gamoep Road) situated along the eastern boundary.

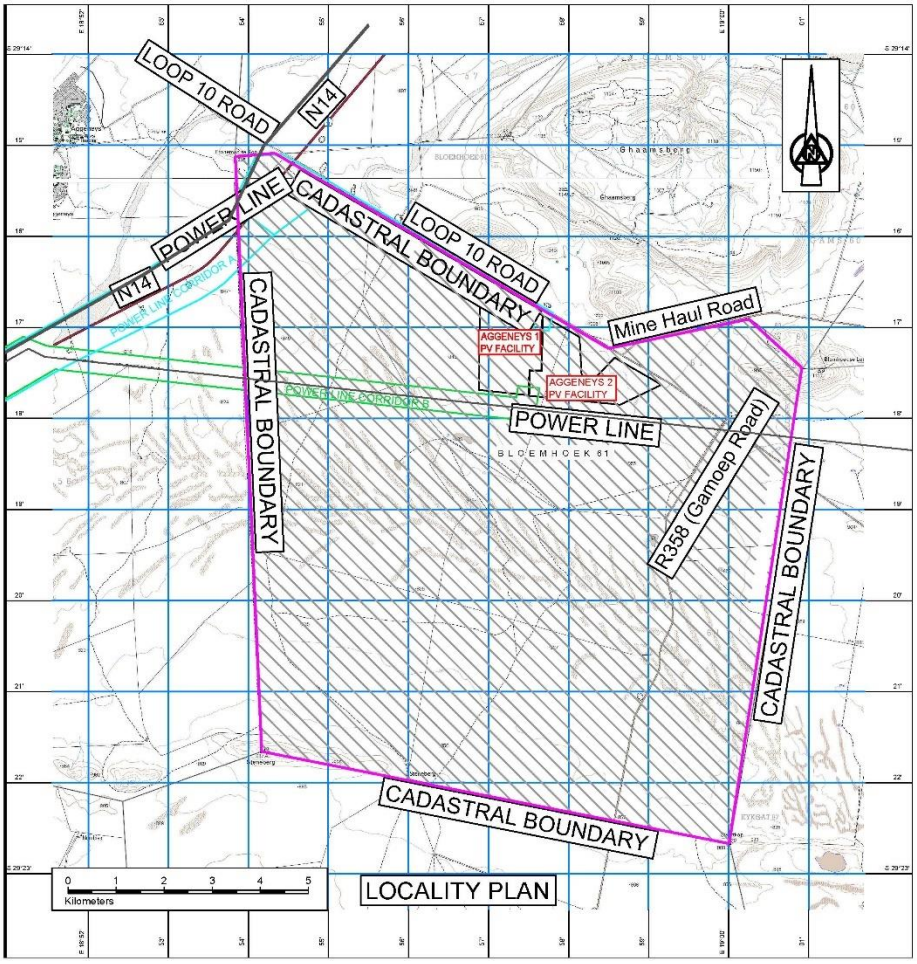

Figure 3.1: Locality Plan

3.2. Topography, Geomorphology and Vegetation (Drainage Characteristics)

The Northern Cape Province is situated in the north-western extent of South Africa and is the country's largest province. The Remaining extent of Farm Bloemhoek 61 has a fairly level topography with a slope gradient of 0.7%. It is currently not being utilised and is characterised by Bushmanland sandy grassland.

3.2.1. Drainage Patterns and Runoff Characteristics

The approximate drainage area of the existing site is in excess of 12 379 hectares. The site reflects evidence of a dry watercourse, the drainage pattern slopes towards the centre of the site and then west, with the lowest point on the site being on the centre of the western border. Approximately one third of the site drains in a north-westerly direction and the remaining two-thirds drain in a south-westerly direction, see *Figure 3.2.* The slope gradient for the longest drainage path length within the catchment area is 0.7%.

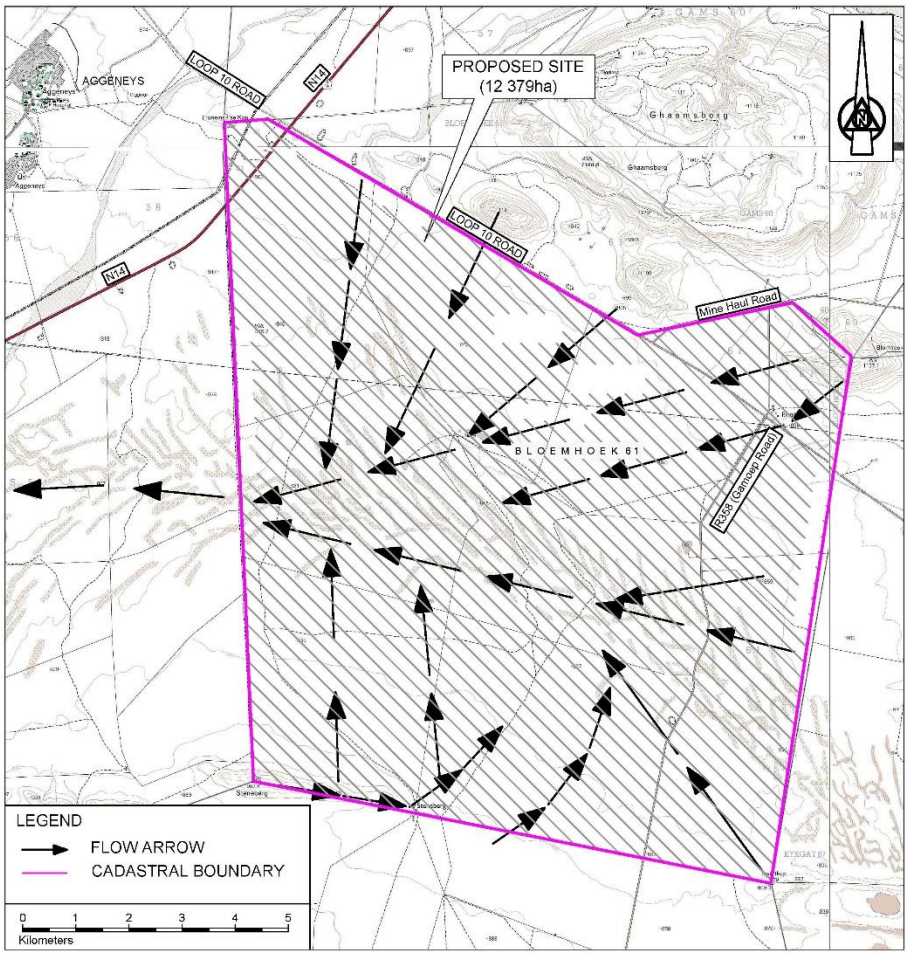

Figure 3.2: Drainage Pattern of Existing Site

It should be noted that, in the absence of detailed topographical survey information, 1:10 000 orthographical maps and 1:50 000 geographical maps together with spot height data taken on site were used to establish the drainage patterns. The greater catchment area is 38 772ha, see *Figure 3.3* below. The sparse vegetation, together with the flat gradient and permeable soils yield very low runoff coefficients.

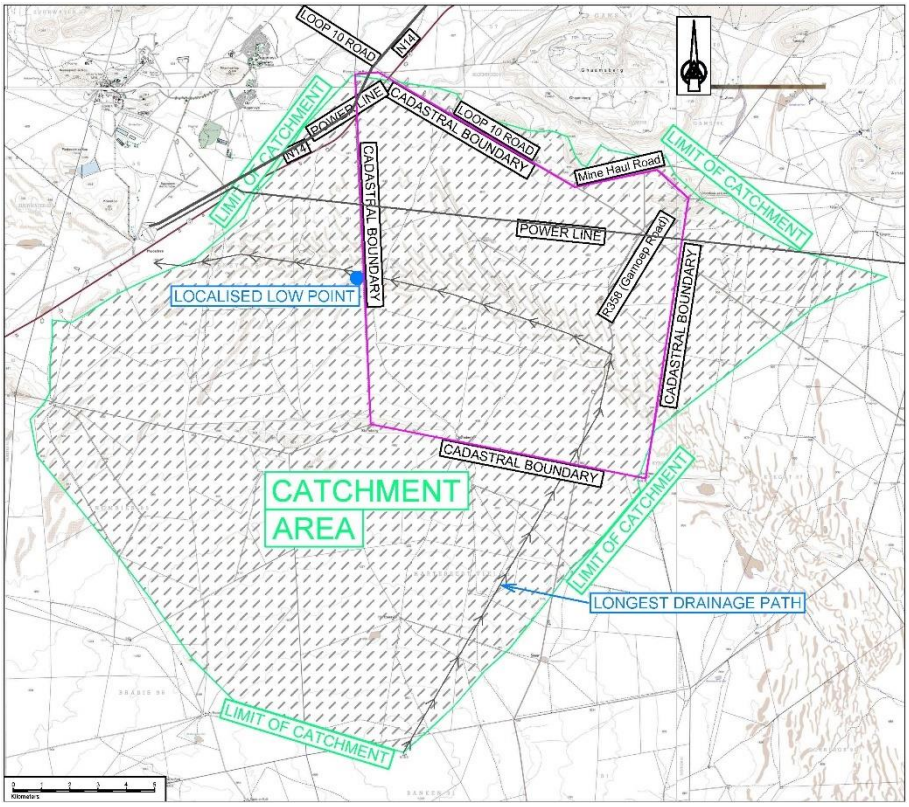

Figure 3.3: Catchment Areas

3.3. Geology and Soils

The Black Mountain and Gamsberg Mines are copper and zinc mines operating within close proximity of the project site. The Gamsberg Mine is located immediately north of the project site and as a result, waste rock dumps associated with the zinc mines are located within the vicinity of the project site.

The geological map as well as field studies in the region show that the area around the mines and the town of Aggeneys is characterised by two distinct landform types; very flat plains characterised by dunes in places and rugged low mountains that rise in distinction from the surrounding plains, due to the presence of quartzite and iron formation layers within the stratigraphy that are less prone to weathering than the other rocks.

The altitude of the catchment area ranges between 800 and 1500 metres above sea level, sloping towards the low lying plain or dry watercourse situated in the central region of the catchment area. The ephemeral stream slopes towards the national route N14 to the west.

Soil forms in the region can be described as red, excessively drained sandy soils with high base status, on bedrock with presence of lime.

3.4. Climate and Hydrology

Aggeneys gets minimal rain, resulting in desert-like conditions, although more rain tends to fall in the summer months than in the winter months. Extended droughts are a common feature, and in the recent past, some parts of the Bushmanland did not have any rain for a period of ten years. In Aggeneys the annual rainfall varies between 50mm and 190mm, averaging just over 90mm based on rainfall data available from the mines. Rainfall data indicating the average monthly rainfall figures, depicted in *Figure 3.4* has been recovered from the weather station at Pofadder, which is located approximately 57km to the east of the site.

The Northern Cape boasts the highest solar radiation intensity anywhere in South Africa and with an average temperature of 31.4 °C, January is the hottest month of the year. July has the lowest average temperature of the year, which is 17.7 °C; see *Figure 3.5* for average monthly temperatures.

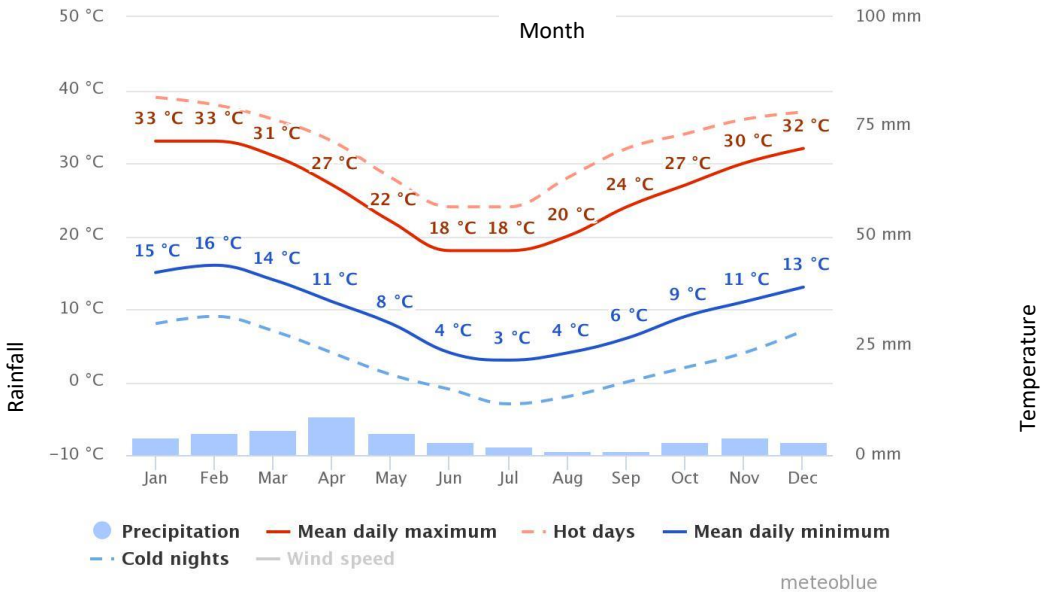

Figure 3.4: Monthly Rainfall for Aggeneys

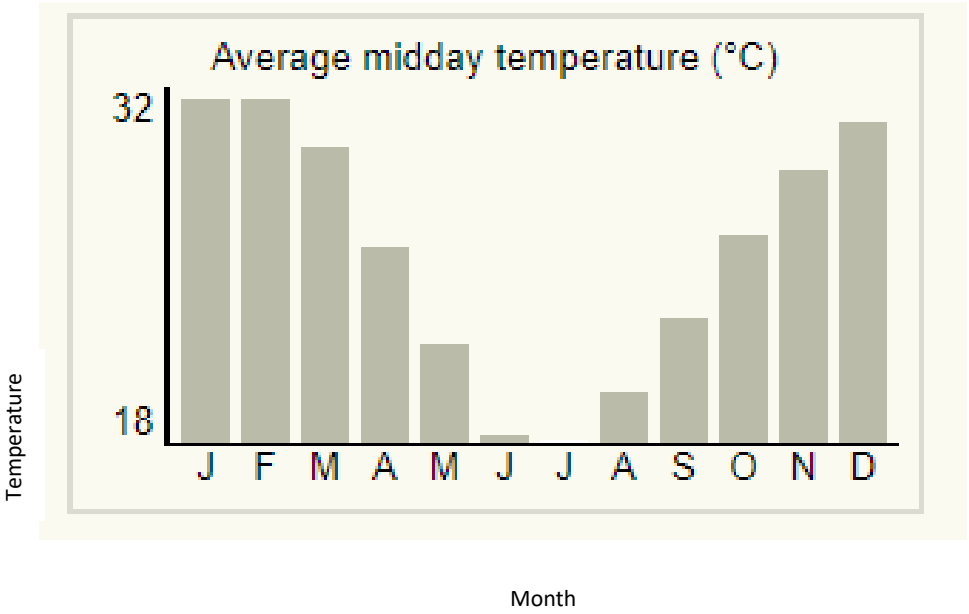

Figure 3.5: Average Monthly Temperatures for Aggeneys

4. STORMWATER CALCULATIONS

As mentioned previously, the calculations to determine the run off volumes and intensities of the site are based on the Rational Method with a return period of 1:50 years.

4.1. Runoff Coefficient

4.1.1. Pre-development

The pre-development runoff coefficient was calculated by making an allowance for rock outcrop; and a 10% was therefore allowed for semi-permeable soil. Because the site consists mainly of Bushmanland Sandy Grassland, 60% was allowed for in the calculations; see run-off coefficient percentages listed in *Table 4.1* below.

Table 4.1: Pre-development Runoff Coefficient Percentages

Permeability	% Applied	Vegetation	% Applied
Very	50	Thick bush & Forest	0
Permeable	40	Light Bush & Cultivated Land	00
Semi-Permeable	10	Grasslands	60
Impermeable	0	Bare	40
TOTAL	*100*	*TOTAL*	*100*

The calculated runoff coefficient based on the above for the pre-development phase is 0.326; refer *Annexure A* for further detail calculations in this regard.

4.1.2. Post-development

The post-development runoff coefficient takes the installation of the panels into account, as well as the vegetation alterations that may occur post-construction. An area of 250ha (approximately 0.7% of the catchment area and 2.2% total project site) is required for the development of Aggeneys 2 PV. Even though the PV panels are impermeable, they will be mounted on bases that only cover a small surface area. A small percentage of the run-off coefficient was thus allowed for hardened surface. The Aggeneys 2 Solar facility will make use of driven/ rammed piles, or ground/ earth screw mounting systems, and in certain instances resort to concrete foundations,

should geotechnical studies necessitate this. Concrete foundations may be used for the solar panel sun tracker at the end of each row.

The vegetation that will be lost during construction may not fully recover due to the shade that will be created by the panels post-construction. Allowance was made for this by amending the vegetation area when calculating the post-development peak runoff flows, increasing the bare areas by 5%. These percentage figures are reflected in *Table 4.2* below.

Table 4.2: Post-development Runoff Coefficient Percentages

Permeability	% Applied	Vegetation	% Applied
Very	45	Thick bush & Forest	0
Permeable	40	Light Bush & Cultivated Land	00
Semi-Permeable	10	Grasslands	55
Impermeable	5	Bare	45
TOTAL	*100*	*TOTAL*	*100*

The calculated runoff coefficient, based on the above, for the post-development phase is 0.340; refer *Annexure B* for further detail calculations in this regard.

4.2. Time of Concentration

The following formula was used to calculate the time of concentration, which is the time it takes for surface water at the furthest point on the site to reach the lowest area:

$$Tc = \left(\frac{0.87 \times L^{2}}{1000.S}\right) 0.385$$

Where Tc = Time of Concentration (hours), L = Length of waterway (km), S = average slope.

4.3. Point Intensity

Point Intensity is based on standard time of concentration, and information was extracted from rain fall intensity depth graphs for the area.

4.4. Runoff

4.4.1. *PV Area*

The runoff distribution of the respective catchment area will be dictated by the layout of the larger PV area, as well as the internal roads and channels. Each PV area which is a combination of smaller blocks, should preferably be orientated in such a way to minimise the impact on natural drainage patterns. A typical PV panel configuration (subject to the final site development plan) is indicated in *Figure 4.1,* with the resultant drainage pattern in *Figure 4.2* as follows:

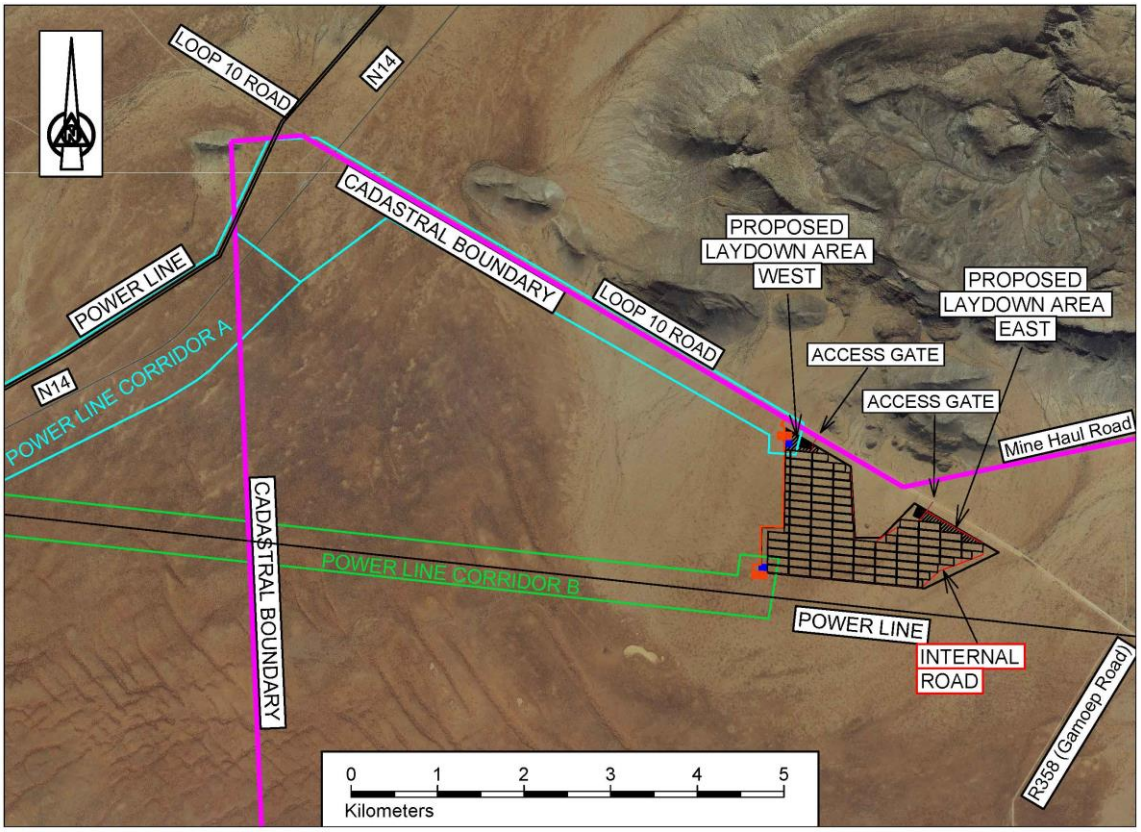

Figure 4.1: Conceptual Layout of PV Panels

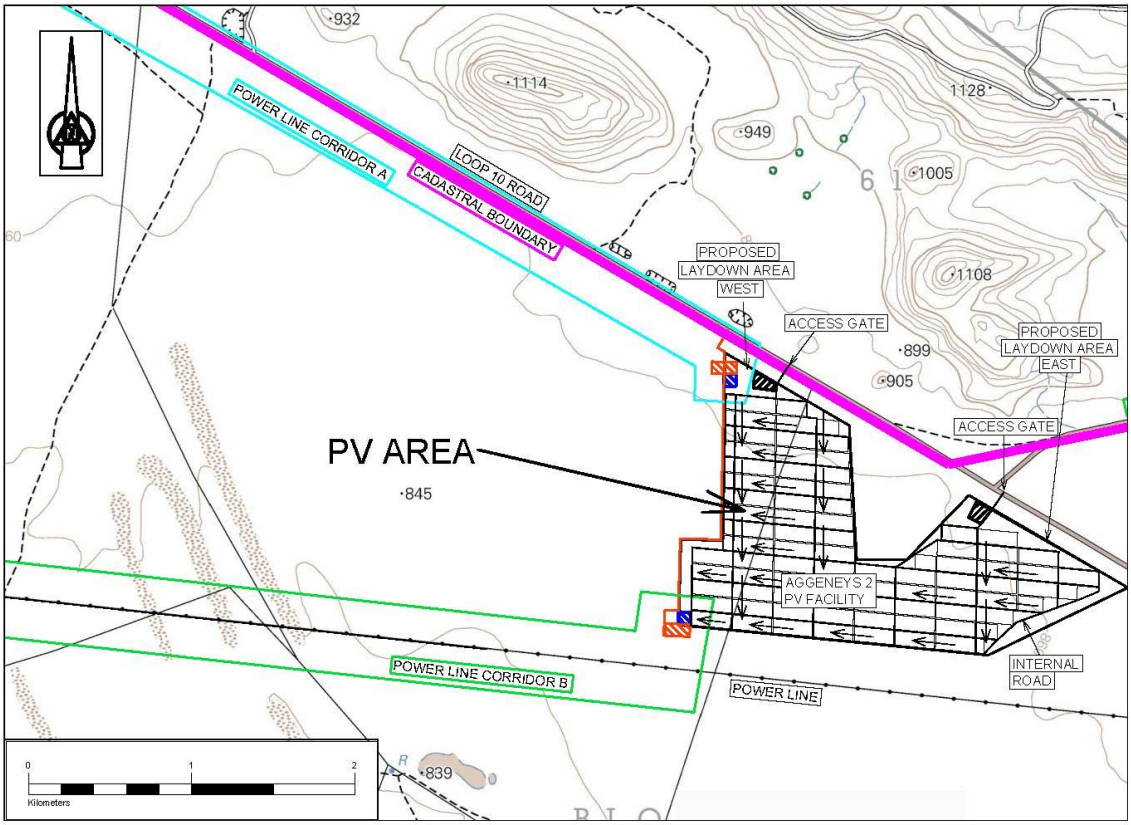

Figure 4.2: Drainage pattern for conceptual layout of PV panels

There are no waterbodies or places of ponding visible on the proposed site. The 1:50 year flood occurrence for pre and post-development runoff for the catchment area is shown below:

Catchment Area = 388 km2

Pre-Development C = 0.326

Post-Development C = 0.340

TC = 5.6 hours

Intensity = 5.7 mm/hr

Rational Method Pre-Development Q = $\frac{CIA}{3.6}$ = **188.69 m³/s**

Rational Method Post-Development Q = $\frac{CIA}{3.6}$ = **196.50 m³/s**

4.4.2. Access Roads

A formal gravel access road (Loop 10 Road) currently provides access, from the national road (N14), to the property (see *Figure 4.3)*. During construction the project site will be accessed via the existing roads which will subsequently be utilised for maintenance purposes during operation. The final site layout will determine the exact extent of the internal roads.

Permanent access roads will be constructed between the solar panels as follows, depending on the final layout design:

a. The first 200m from the Loop 10 Road into the site area will be stabalised gravel, depending on the detailed design;
b. Internal access road(s) approximately 5m wide, to be gravel;
c. Internal gravel access roads in between solar panels of approximately 10ha, depending on final layout design.

The intersection of the access road and the N14, has been recently upgraded to a blacktop surfacing through the maintenance contract on the N14. The access to the Gamsberg mine is also off the Loop 10 Road, that is currently 8m wide. The access road (Loop 10 Road) from the intersection towards the accesses is a gravel graded road with drainage provisions. There are 2 existing 1m wide concrete box culverts and some smaller pipe culverts across the Loop 10 Road as well as longitudinal drainage channels along the Loop 10 Road in sections where necessary.

The envisaged run-off across the internal gravel access roads is viewed to be limited. The average velocity is in the order of 1.0 m/s for the gentle slopes on this site, which is around 0.7%. Such flows will not cause any serious erosion, but appropriate measures should be implemented at outlets and points of concentration caused by drainage channels in order to reduce the risk of erosion damage. Frequent nominal drainage measures, typically piped culverts and/or mitre drains cut by a grader, must be provided at 200m to 300m intervals, as dictated by the site conditions, and must be taken care of in the detail design. These could also be in-situ formed drifts where the road alignment is close to the natural ground level.

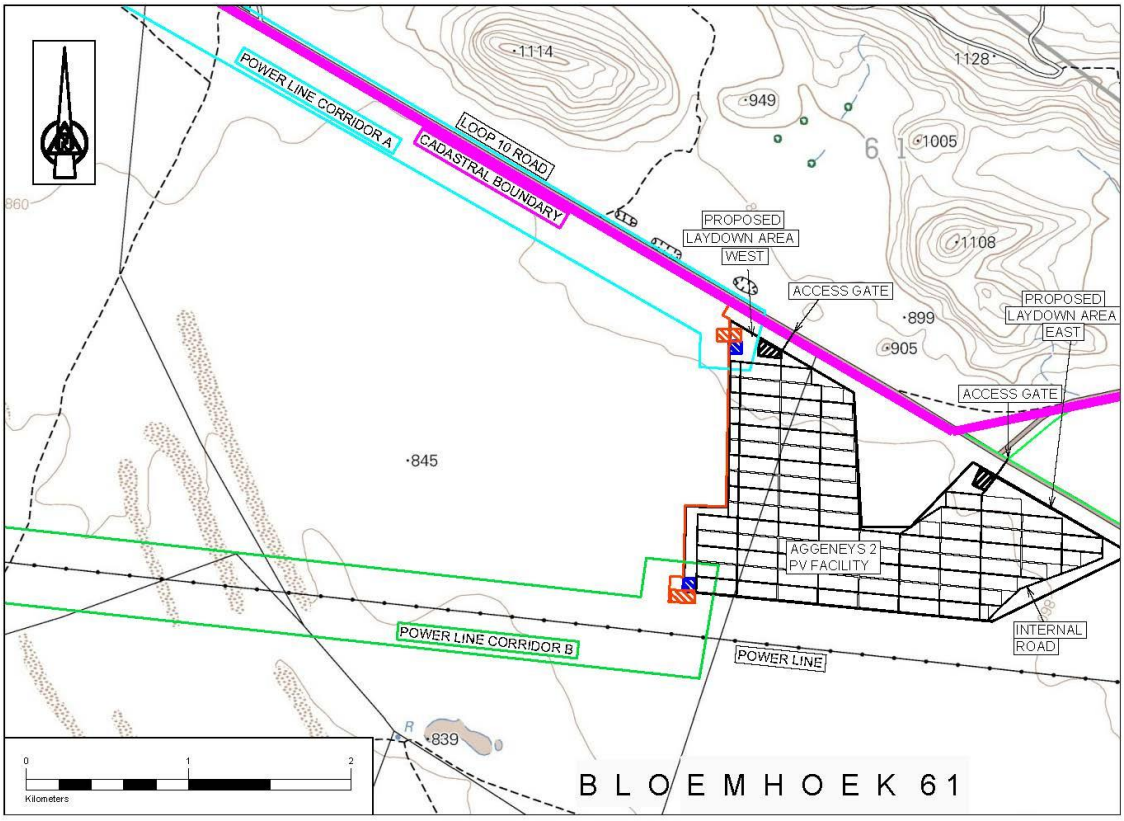

Figure 4.3: Access Roads

5. PROPOSALS FOR STORMWATER MANAGEMENT

The existing drainage patterns and characteristics should be preserved as far as practically possible. It is therefore suggested that the existing contours and vegetation be retained and that the internal roads are designed and constructed to minimum standards. The runoff calculations indicate that an additional 7.8 m^3/s or roughly a 4% increase in peak runoff will have to be accommodated when designing the stormwater management measures.

Drainage structures could include smaller diameter pipes (encased in concrete because of the low fill anticipated) or preferably concrete culverts or drifts. These drifts should have cut-off walls on the down-stream side as a minimum requirement

5.1. Side Drains

Open drains will be provided along the proposed internal roads. These drains would be gravel drains with concrete or edge beam protection at road crossings, where required.

5.2. Berms

Overland flow is in a south-westerly direction across the proposed PV facility. The Loop 10 Road serves to minimise runoff from the bigger catchment area across the PV area at the northern boundary and serves as a cut off drain from the larger catchment area, so too does the R358 near the eastern boundary (see Fig 3.3). Berms are therefore not proposed. As mentioned previously there are longitudinal earth drains along sections of the Loop 10 Road leading to culverts, most of which not being directly opposite the proposed site. Runoff through these culverts will discharge at concentrated points onto the farm and can therefore be managed at places where it does occur in the vicinity of the PV facility site.

5.3. Outlets

Any additional culverts on the access road must be provided with concrete outlets as well as erosion protection. Side drain outlets should be terminated with suitable erosion protection to reduce the velocity and the flow depth.

6. EROSION PROTECTION MEASURES

The volume and velocity of the stormwater runoff must be thoroughly evaluated during the detailed design phase. The following erosion protection measures should be considered:

- Side drains, see *Figure 6.1 and 6.2*
- Inlet and outlet structures, see *Figure 6.3 and 6.4*

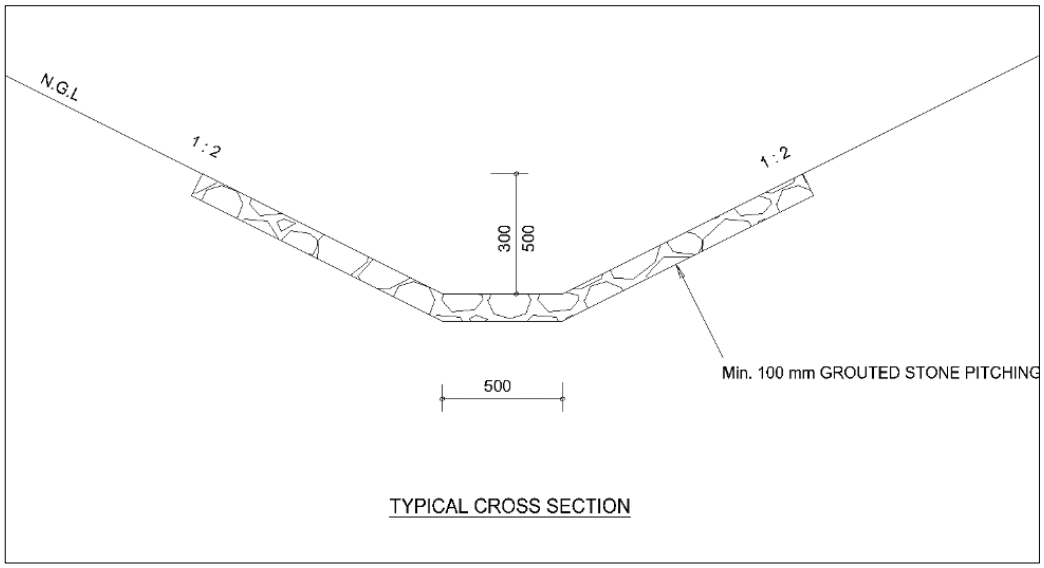

Figure 6.1: Typical Stone Pitched Side Drain

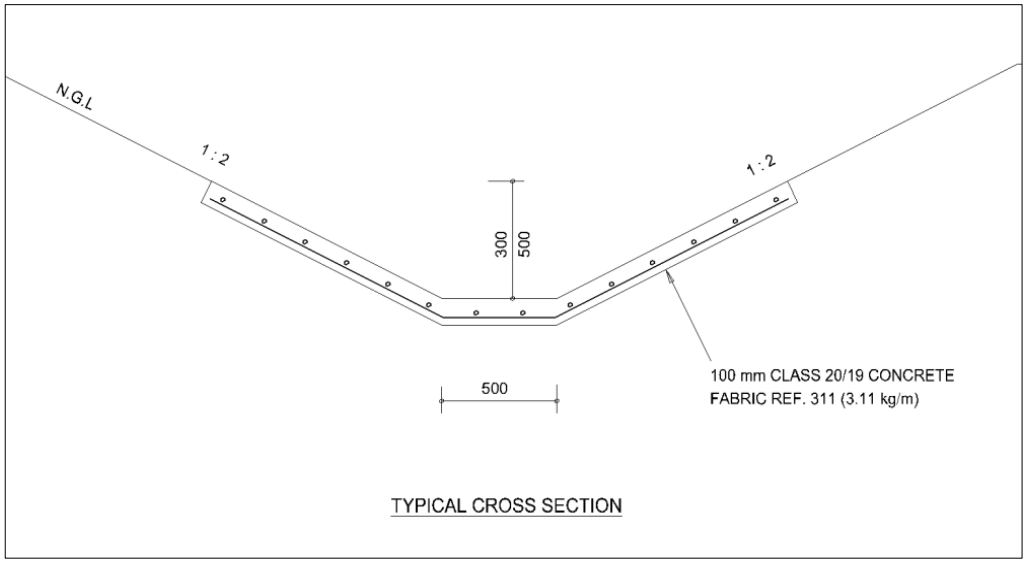

Figure 6.2: Typical Concrete Lined Side Drain

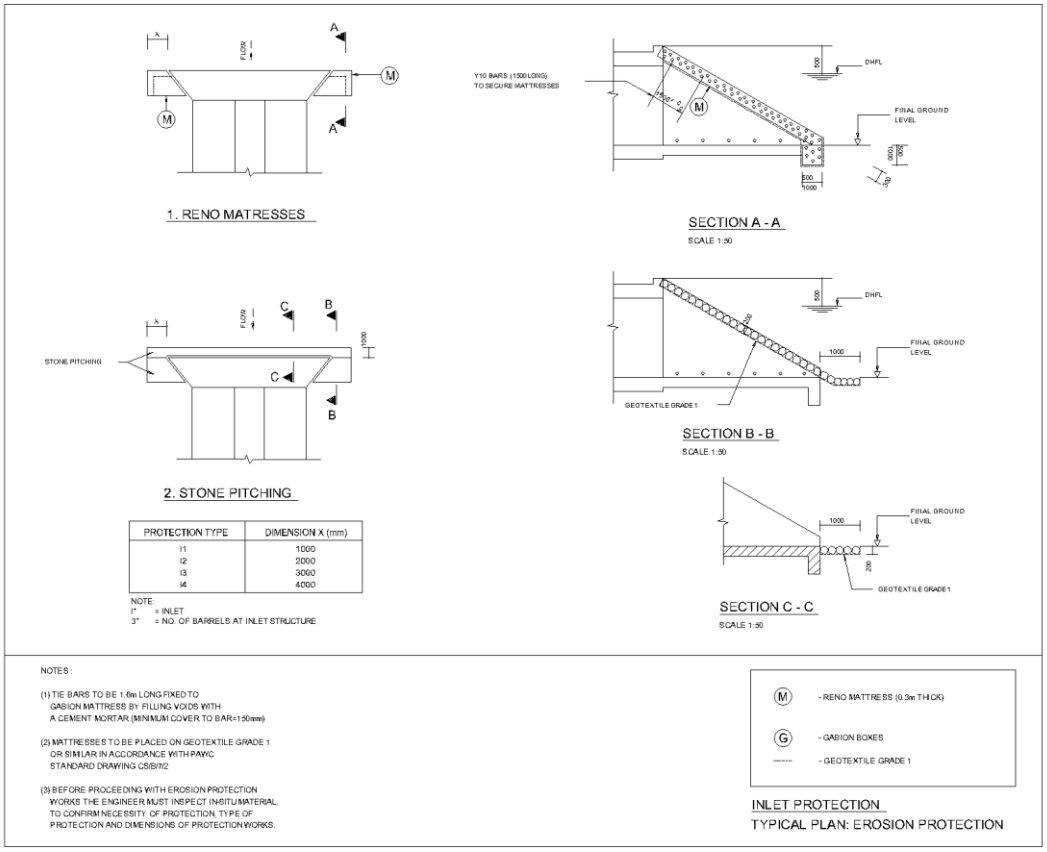

Figure 6.3: Typical inlet erosion protection measures

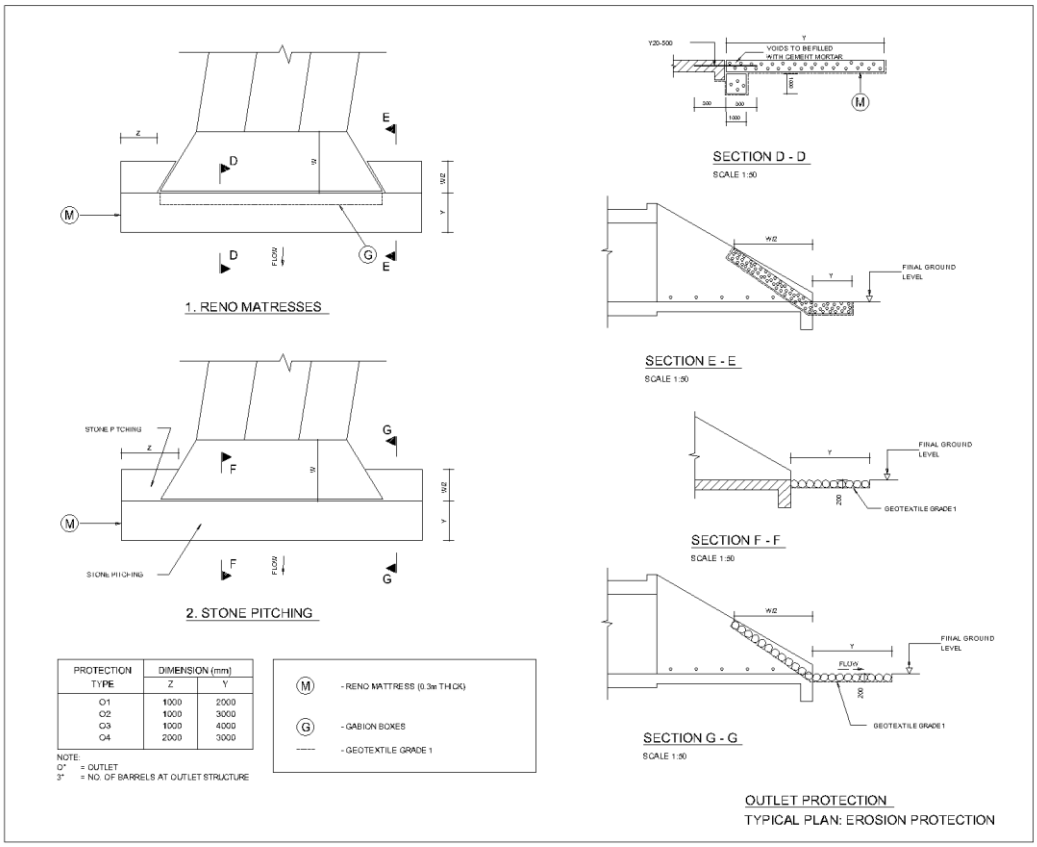

Figure 6.4: Typical outlet erosion protection measures

It is envisaged that in combination with the above the following are also likely to be required:

- Stone masonry walls to reduce the flow velocity in steeper areas;
- Side Drain Outlets with stone pitching to prevent erosion; and
- Temporary berms and straw bales during construction in the vicinity of identified streams to reduce flow and sediment transport during this phase.

During the construction phase, special attention must be given to stormwater so that construction activities do not result in any water ponding, especially in the vicinity of the roads and structures.

7. WASTE WATER MANAGEMENT

Gamsberg mine is located to the north of the Aggeneys 2 Solar site. Venturing closer to mining areas will expose the PV energy facility to increased dust levels, thus reducing the efficiency of the solar PV modules. After the installation of the panels, the cleaning (washing) of the solar panels is likely to generate small amounts of additional runoff. This process is estimated to occur twice a year and add approximately 3l/m³ of additional runoff to the site, over a period of approximately 2 weeks. This runoff would however be spread throughout the site, and due to the low localised water volumes would cause minimal, if any, erosion on the site and may even help as a form of dust control. The methods used for washing the panels determine the mitigation measures to be applied. This could be in the form of phasing the washing of panels or optimising the methods used. The overall effect on the site is expected to be very low, provided the cleaning water is free from detergents and includes only approved bio-degradable substances.

Rain will also aid in keeping the PV panels clean. The solar module surfaces are installed at a relatively large incline with gaps between modules. This does not allow significant water build-up on the modules while also reducing the energy generated by the falling rain droplets.

On large structures or buildings, appropriate guttering could be used around the building to avoid water erosion where roof water would be flowing off the roof. Wherever practically possible, stormwater run-off from the gutter/roofs will be captured and stored in rainwater tanks. If this water cannot be captured, water will be channelled into energy dissipating structures to spread the water and slow it down to reduce risk of erosion. Such a structure could be constructed from precast concrete or loosely packed rock or perforated bags filled with stone.

8. CONCLUSIONS AND RECOMMENDATIONS

The additional stormwater runoff generated from the new facility, post-development, is almost negligible compared to the pre-development. It is therefore envisaged to do limited stormwater management to reduce the impact of the proposed development on the environment. It would however be necessary to consider flow control measures along internal roads as well as erosion protection during the detail design stage. Erosion protection measures should protect the internal network of the site as well as be installed at stormwater discharge points to allow drainage into the landscape.

By implementing earth drains, lined drains and limited erosion protection structures, the stormwater on the site, between the PV panels and for the adjacent access roads may easily be accommodated safely and in a non-destructive way. The development of the site will also be done in accordance with the existing slopes. The contours will be followed closely in order to minimise impacts on the existing drainage patterns.

9. REFERENCES

- Various Municipal Management of Urban Stormwater Impacts Policies
- The Georgia Stormwater Management Manual
- The South African National Roads Agency Limited. (2006). Drainage Manual Fully Revised 5th Edition
- Adamson P.T. (1983). Technical Report TR 102. Southern African Storm Rainfall

10. ANNEXURES

Annexure A: Pre-Development Runoff Calculations

Project name: Aggeneys 2 PV Facility
Analysed by: SG
Name of river: N/A
Description of site: Pre-Development: Remainder of farm Bloemhoek 61
Filename: P:\303-00927\02\A\CALCULATIONS\Flood calculations\Aggeneys 2 Pre.fld
Date: 31 January 2019

Sinotech

Printed: 31 January 2019 Page 1

Flood Frequency Analysis: Rational Method

Project	= Aggeneys 2 PV Facility
Analysed by	= SG
Name of river	= N/A
Description of site	= Pre-Development: Remainder of farm Bloemhoek 61
Date	= 2019/01/31
Area of catchment	= 388.0 km²
Dolomitic area	= 0.0 %
Mean annual rainfall (MAR)	= 90.00 mm
Length of longest watercourse	= 33.0 km
Flow of water	= Overland flow
Height difference	= 233.0 m
Value of r for over land flow	= Sparse grass (r=0,3)
Rainfall region	= Inland
Area distribution	= Rural: 100 %, Urban: 0 %, Lakes: 0 %

Catchment description - Urban area (%)

Lawns		Residential and industry		Business	
Sandy, flat (<2%)	0	Houses	0	City centre	0
Sandy, steep (>7%)	0	Flats	0	Suburban	0
Heavy soil, flat (<2%)	0	Light industry	0	Streets	0
Heavy soil, steep (>7%)	0	Heavy industry	0	Maximum flood	0

Catchment description - Rural area (%)

Surface slopes		Permeability		Vegetation	
Lakes and pans	0	Very permeable	50	Thick bush & forests	0
Flat area	85	Permeable	40	Light bush & cultivated land	0
Hilly	15	Semi-permeable	10	Grasslands	60
Steep areas	0	Impermeable	0	Bare	40

Average slope	= 0.00706 m/m
Time of concentration	= 5.60 h
Run-off factor	
Rural - C1	= 0.326
Urban - C2	= 0.000
Lakes - C3	= 0.000
Combined - C	= 0.326

The HRU, Report 2/78, Depth-Duration-Frequency diagram was used to determine the point rainfall.

Return Period (years)	Time of concentration (hours)	Point rainfall (mm)	ARF (%)	Average intensity (mm/h)	Factor Ft	Runoff coefficient (%)	Peak flow (m³/s)
1:20	5.60	24.8	98.6	4.4	0.90	29.3	138.11
1:50	5.60	32.3	98.1	5.7	0.95	31.0	188.69
1:100	5.60	39.7	97.7	6.9	1.00	32.6	243.38

Run-off coefficient percentage includes adjustment saturation factors (Ft) for steep and impermeable catchments

Calculated using Utility Programs for Drainage 1.1.0

Annexure B: Post-Development Runoff Calculations

Project name: Aggeneys 2 PV Facility
Analysed by: SG
Name of river: N/A
Description of site: Post-Development: Remainder of farm Bloemhoek 61
Filename: P:\303-00927\02\A\CALCULATIONS\Flood calculations\Aggeneys 2 Post.fld
Date: 31 January 2019

Sinotech

Flood Frequency Analysis: Rational Method

Project	= Aggeneys 2 PV Facility
Analysed by	= SG
Name of river	= N/A
Description of site	= Post-Development: Remainder of farm Bloemhoek 61
Date	= 2019/01/31
Area of catchment	= 388.0 km²
Dolomitic area	= 0.0 %
Mean annual rainfall (MAR)	= 90.00 mm
Length of longest watercourse	= 33.0 km
Flow of water	= Overland flow
Height difference	= 233.0 m
Value of r for over land flow	= Sparse grass (r=0,3)
Rainfall region	= Inland
Area distribution	= Rural: 100 %, Urban: 0 %, Lakes: 0 %

Catchment description - Urban area (%)

Lawns		Residential and industry		Business	
Sandy, flat (<2%)	0	Houses	0	City centre	0
Sandy, steep (>7%)	0	Flats	0	Suburban	0
Heavy soil, flat (<2%)	0	Light industry	0	Streets	0
Heavy soil, steep (>7%)	0	Heavy industry	0	Maximum flood	0

Catchment description - Rural area (%)

Surface slopes		Permeability		Vegetation	
Lakes and pans	0	Very permeable	45	Thick bush & forests	0
Flat area	85	Permeable	40	Light bush & cultivated land	0
Hilly	15	Semi-permeable	10	Grasslands	55
Steep areas	0	Impermeable	5	Bare	45

Average slope	= 0.00706 m/m
Time of concentration	= 5.60 h
Run-off factor	
Rural - C1	= 0.340
Urban - C2	= 0.000
Lakes - C3	= 0.000
Combined - C	= 0.340

The HRU, Report 2/78, Depth-Duration-Frequency diagram was used to determine the point rainfall.

Return Period (years)	Time of concentration (hours)	Point rainfall (mm)	ARF (%)	Average intensity (mm/h)	Factor Ft	Runoff coefficient (%)	Peak flow (m³/s)
1:20	5.60	24.8	98.6	4.4	0.90	30.6	143.83
1:50	5.60	32.3	98.1	5.7	0.95	32.3	196.50
1:100	5.60	39.7	97.7	6.9	1.00	34.0	253.46

Run-off coefficient percentage includes adjustment saturation factors (Ft) for steep and impermeable catchments

Calculated using Utility Programs for Drainage 1.1.0

APPENDIX H:
Waste Management Plan

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste generated from the project activities on site.

This WMP has been compiled as part of the project EMPr and is based on waste stream information available at the time of compilation. Construction and operation activities must be assessed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated once further detail regarding waste quantities and categorisation become available, during the construction and/or operation stages. This plan should be updated throughout the life-cycle of the PV facility, as required in order to ensure that appropriate measures are in place to manage and control waste and to ensure compliance with relevant legislation.

Prior to the commencement of construction, a detailed Waste Management Method Statement for the site should be compiled by the Contractor.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of Aggeneys 2 will generate construction solid waste, as well as general waste and hazardous waste during the lifetime of the solar PV facility.

Waste generated on site, originates from various sources, including but not limited to:

- Concrete waste generated from spoil and excess concrete.
- Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- Hazardous waste from vehicle, equipment and machinery parts and servicing, fluorescent tubes, used hydrocarbon containers, batteries situated in specially adapted shipping containers, and waste ink cartridges.
- Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- Organic waste from food waste as well as alien and endemic vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from spoil material from site clearance and trenching works.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several regulations, including:

- National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008);
- National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014);
- The South African Constitution (Act 108 of 1996);

- Hazardous Substances Act (Act 5 of 1973);
- Health Act (Act 63 of 1977);
- Environment Conservation Act (Act 73 of 1989);
- Occupational Health and Safety Act (Act 85 of 1993);
- National Water Act (Act 36 of 1998);
- The National Environmental Management Act (Act 107 of 1998) (as amended);
- Municipal Structures Act (Act 117 of 1998);
- Municipal Systems Act (Act 32 of 2000);
- Mineral and Petroleum Resources Development Act (Act 28 of 2002); and
- Air Quality Act (Act 39 of 2004).

Storage of waste must be conducted in accordance with the National Norms and Standards for the Storage of Waste, published in GNR 926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management is needed on site. Such an approach is illustrated in **Figure 1**.

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- Reducing volumes of waste is the greatest priority;
- If reduction is not feasible, the maximum amount of waste is to be recycled; and
- Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner.

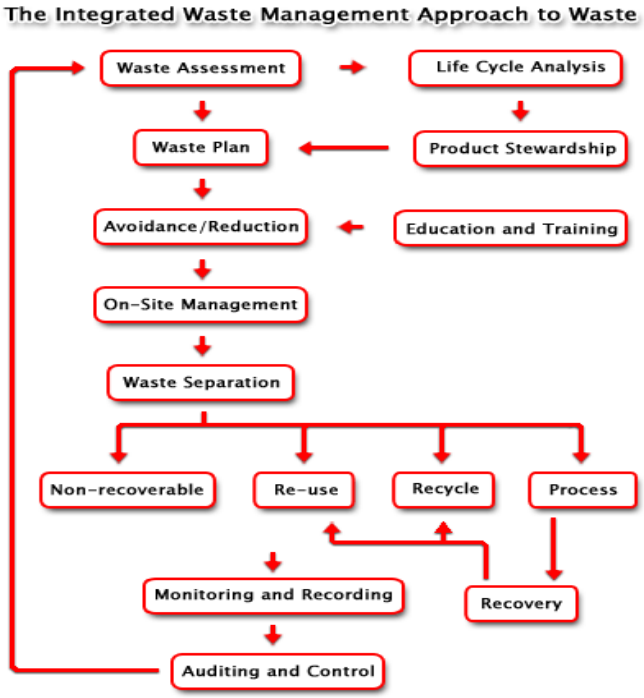

Figure 1: Integrated Waste Management Flow Diagram
(Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496)

4.1. Construction phase

A plan for the management of waste during the construction phase is detailed below. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction, for approval by the Resident Engineer.

4.1.1. Waste Assessment / Inventory

- The Environmental Officer (EO), or designated staff member, must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- Construction methods and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities, to be pro-actively implemented.
- Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- The EO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling and storage

- It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors.
- Waste manifests and waste acceptance approvals (i.e. receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- Septic tanks and portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at strategic locations around the site for the storage of organic, recyclable and hazardous waste.
- A dedicated waste area must be established on site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Hazardous waste must be stored within a bunded area constructed according to SABS requirements, and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank.
- Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.

- Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria.
- The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- A dedicated waste management team must be appointed by the principal contractors' SHE Officer, who will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the SHE Officer.
- All waste removed from site must be done by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

4.1.3. Management of waste storage areas

- Waste storage must be undertaken in accordance with the relevant Norms and Standards.
- The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and contaminated storm water.
- Collection bins placed around the site and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor to avoid overflowing receptacles.
- Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained. Monitor for rodents and take corrective action if they become a problem.
- Waste must be stored in designated containers and not on the ground.
- Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls.
- It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil/water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- If any leaks occur in the bund, these must be amended immediately.
- Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- No mixing of hazardous and general waste is allowed.

4.1.4. Disposal

- Waste generated on site must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process,

however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
» Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and ECO.

4.1.5. Record keeping

The success of the WMP is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

» Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
» Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

4.2. Operation phase

It is expected that the operation phase will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site or other facilities.

The following waste management principles apply during the operation phase:

» The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
» Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
» Recyclable waste must be removed from the waste stream and stored separately.
» All waste must be stored in appropriate temporary storage containers (separated between different operation wastes, and contaminated or wet waste).
» Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
» Waste generated on site must be removed on a regular basis throughout the operation phase.
» Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

5. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must from part of the EO's reports to the ECO on a monthly basis.

APPENDIX I:
Traffic Management Plan

PRINCIPLES FOR TRAFFIC AND TRANSPORTATION MANAGEMENT

1. PURPOSE

The purpose of this Traffic and Transportation Management Plan (TTMP) is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation of project components and the construction of temporary and long-term access within the vicinity of the Aggeneys 2 solar PV facility project site. The objectives of this plan include the following:

- To ensure compliance with all legislation regulating traffic and transportation within South Africa (National, Provincial, Local & associated guidelines).
- To avoid incidents and accidents while vehicles are being driven and while transporting personnel, materials, and equipment to and from the project site.
- To raise greater safety awareness in each driver and to ensure the compliance of all safe driving provisions for all the vehicles.
- To raise awareness to ensure drivers respect and follow traffic regulations.
- To avoid the deterioration of access roads and the pollution that can be created due to noise and emissions produced by equipment, machinery, and vehicles.

Prior to the commencement of construction, a detailed TTMP and Method Statement for the site should be compiled.

2. RELEVANT ASPECTS OF THE PROJECT

Direct access to the project site is possible via the national route (N14) and the Loop 10 gravel road off the N14. The Loop 10 gravel road is aligned to the northern boundary of the project site. This route will provide direct access to the main entrance of the Aggeneys 2 solar PV facility. Internal access roads will be constructed between the PV arrays for construction and maintenance purposes. These internal access roads will be gravel.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

The following principles apply in terms of transportation and traffic management:

- The Transport Contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the site. Specific abnormal load routes must be developed with environmental factors taken into consideration.
- Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging. The Construction Contractor must review the location of designated access and will be responsible for ensuring construction travel is limited to designated routes. The entrance of the main access road must not be constructed before a blind rise or on a bend of the public road.
- All employees must attend an environmental training programme (e.g. toolbox talks) by the Environmental Officer (EO). Through this programme, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.

- The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- Adjacent landowners must be notified of the construction schedule.
- Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- Signs must be posted in the project area to notify landowners and others of the construction activity.
- Flagging must be provided at access points to the site and must be maintained until construction is completed on the site.
- Speed limits must be established prior to commencement of construction and enforced over all construction traffic.
- Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.
- Throughout construction the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear view mirror, safety belts, signal indicators, and lenses.
- Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- No deviation from approved transportation routes must be allowed, unless roads are closed for reasons outside the control of the contractor.
- Impacts on local communities must be minimised. Consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

4. MONITORING

- The principal contractor must ensure that all vehicles adhere to the speed limits.
- A speeding register must be kept with details of the offending driver.
- Repeat offenders must be penalised.
- Where traffic signs are not being adhered to, engineering structures must be used to ensure speeds are reduced.

APPENDIX J:
Emergency Preparedness, Response and Fire Management Plan

EMERGENCY PREPAREDNESS, RESPONSE AND FIRE MANAGEMENT PLAN

1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective responses to possible events.
- To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas.
- To facilitate emergency responses and to provide such assistance on the site as is appropriate to the occasion.
- To ensure communication of all vital information as soon as possible.
- To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed.
- To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of the construction phase detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC Performance Standard 1 and include the following:

- Identification of areas where accidents and emergency situations may occur;
- Communities and individuals that may be impacted;
- Response procedure;
- Provisions of equipment and resources;
- Designation of responsibilities;
- Communication; and
- Periodic training to ensure effective response to potentially affected communities.

2. PROJECT-SPECIFIC DETAILS

ABO Wind Aggeneys 2 PV (Pty) Ltd proposes the development of Aggeneys 2, a solar PV facility and associated infrastructure on a site near Aggeneys, in the Northern Cape Province. The solar facility will be designed to have a contracted capacity of up to 100MW, and will make use of photovoltaic (PV) solar technology. The project will comprise the following key infrastructure and components:

- Arrays of PV panels (either a static or single or double tracking PV system) with a contracted capacity of up to 100MW.
- Mounting structures to support the PV panels.

- Cabling between the project components, to be laid underground where practical.
- On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- Offices and workshop areas for maintenance and storage.
- Laydown areas.
- Internal access roads and fencing around the development area.

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operation phases:

- Fires;
- Leakage of hazardous substances;
- Storage of flammable materials and substances;
- Flood events;
- Accidents; and
- Natural disasters.

3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

- Local Emergency: An alert confined to a specific locality.
- Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
- Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as to whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur.

3.1. Emergency Scenario Contingency Planning

3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the ECO. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or bunded designated areas.
- All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- No refuelling, storage, servicing, or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
- No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
- Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.
4. Contain the spill to limit entering surrounding areas.
5. Identify the substance spilled.
6. Quantify the spill (under or over guideline/threshold levels).
7. Notify the Site Manager and emergency response crew and authorities (in the event of major spill).
8. Inform users (and downstream users) of the potential risk.
9. Clean up of the spill using spill kit or by HazMat team.
10. Record of the spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies located outside of the project site. The following methods could be used:

» *Dykes* - Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.

» *Trenches* - Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of the trench required. Spilled substances can then be recovered using a pump or sorbent materials.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

3.1.2. Scenario: Fire (and fire water handling)

i. Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk.
2. Assess person safety, safety of others and environment.
3. If safe – attempt to extinguish the fire using appropriate equipment.
4. If not safe to extinguish, contain fire.
5. Notify the Site Manager and emergency response crew and authorities.
6. Inform users of the potential risk of fire.

7. Record the incident on the company database or filing register.

ii. Procedures

Because large scale fires may spread very fast it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided at strategic locations throughout the site, in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguishers, hose reels and hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and national standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

» They have not been trained or instructed in the use of a fire extinguisher.
» They do not know what is burning.
» The fire is spreading rapidly.
» They do not have the proper equipment.
» They cannot do so without a means of escape.
» They may inhale toxic smoke.

b) Reporting procedures

In terms of the requirements of NEMA, the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality.

» Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The Site Manager must have copies of the Report form to be completed.

SUMMARY: RESPONSE PROCEDURE

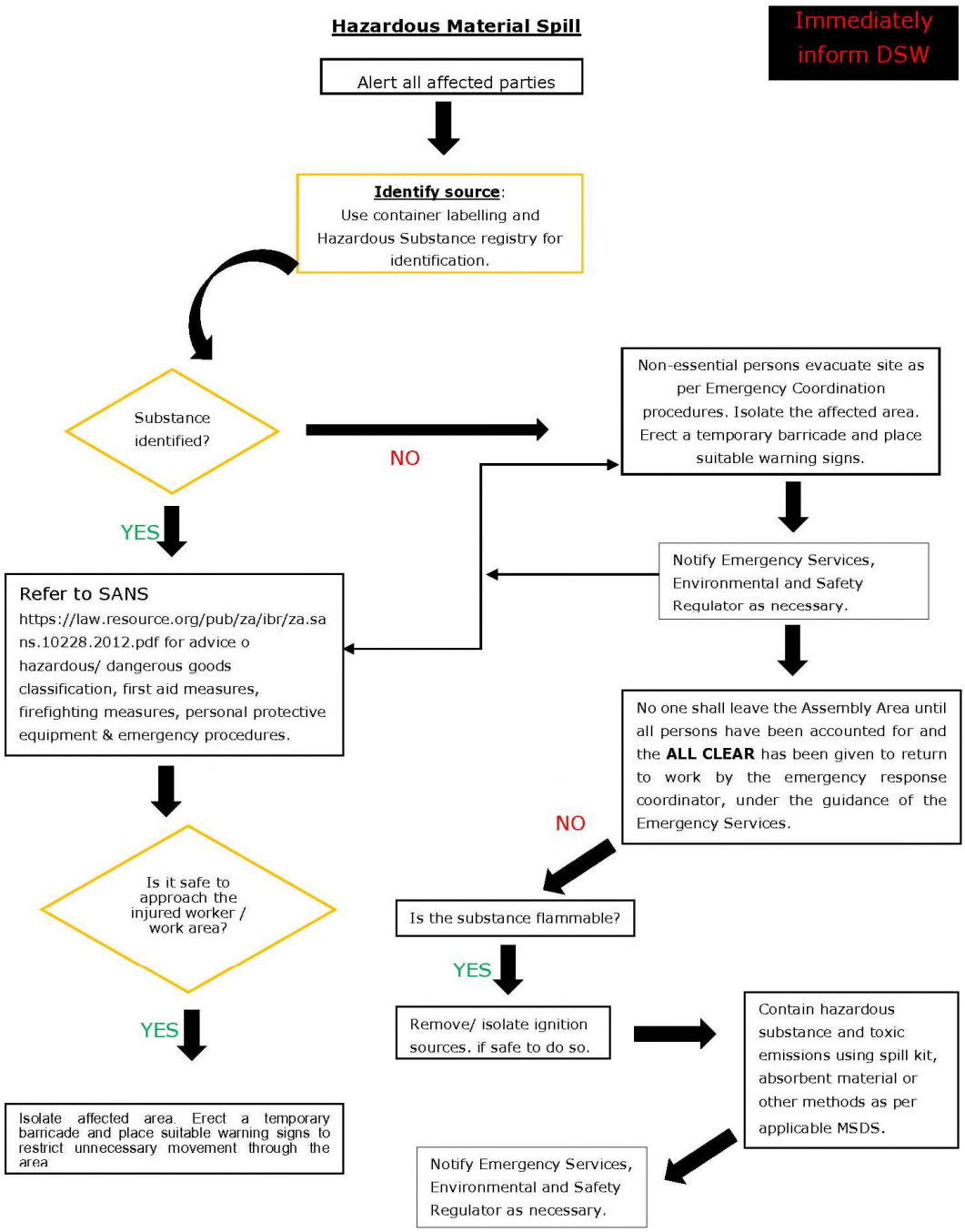

Figure 1: Hazardous Material Spill

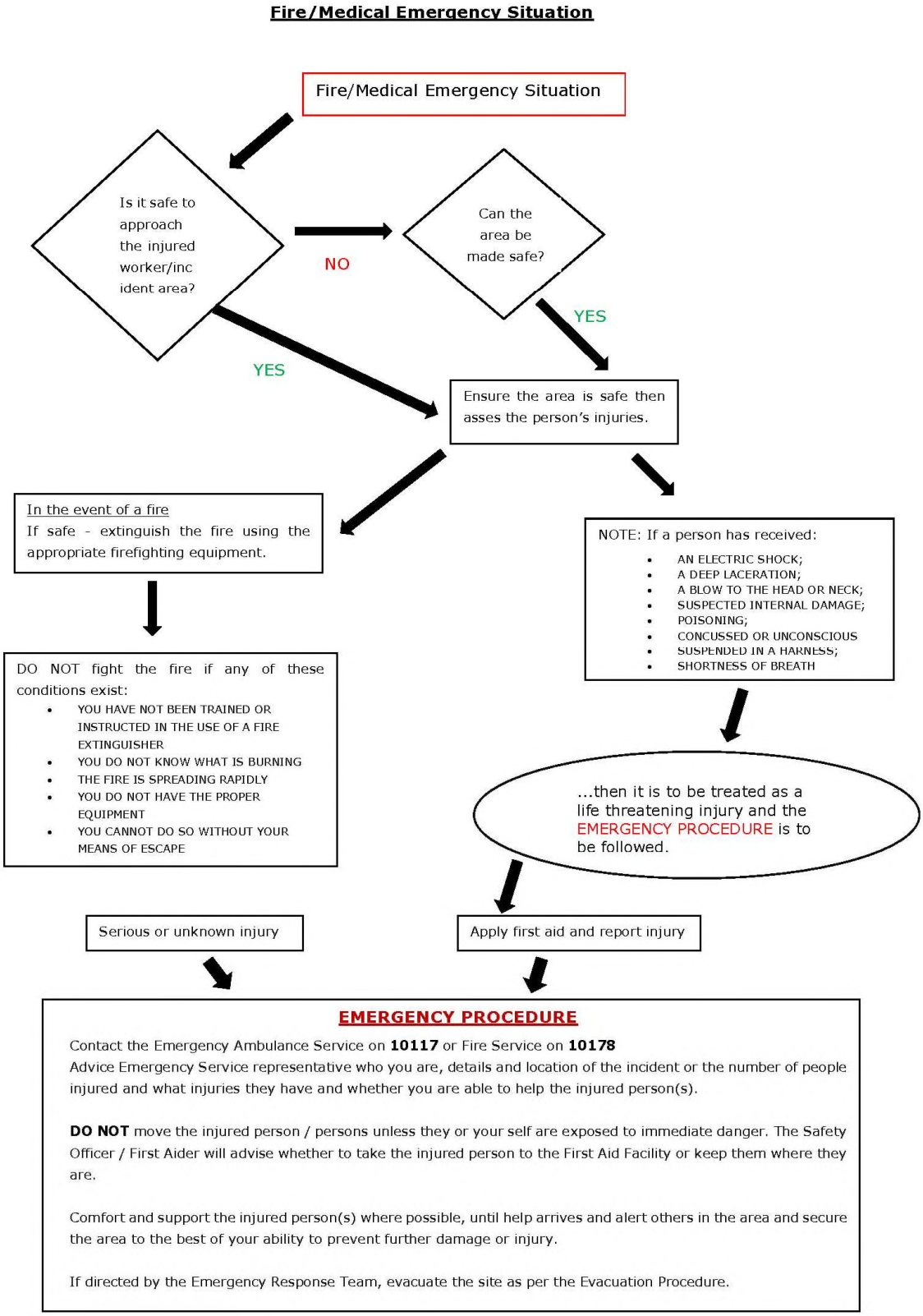

Figure 2: Emergency Fire/Medical

4. PROCEDURE RESPONSIBILITY

The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this Plan, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues.

The local authorities will provide their assistance when deemed necessary, or when it has been requested and/or indicated in Section 30 (8) of NEMA. The provincial authority will provide assistance and guidance where required and conduct awareness programmes.

APPENDIX K:
Curriculum Vitae

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Johannesburg, South Africa

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Tel: +27 (11) 656 3237

CURRICULUM VITAE OF LISA OPPERMAN

Profession : Environmental Assessment Practitioner and GIS Consultant

Specialisation: Environmental Impact Assessments, Basic Assessments, Site Screening and Site Selection reporting, compilation of maps through the use of ArcGIS

Work Experience: 4 years of experience in the environmental management and GIS field

VOCATIONAL EXPERIENCE

Lisa Opperman has four years of experience in the environmental field. She has worked on a variety of EIA processes including renewable energy projects, as well as industrial developments. She has also been involved in the undertaking of public participation for projects located in South Africa which has included the undertaking of public meetings, focus group meetings and key stakeholder meetings in both Afrikaans and English. She also has experience in working with ArcGIS 10 for the compilation of maps, the manipulation of data and screening for environmental sensitivities within areas with the potential for development.

SKILLS BASE AND CORE COMPETENCIES

- GIS Mapping
- EIA Report Writing
- Conducting of public involvement processes
- Administrative tasks
- Analysis and manipulation of geographical information and technical experience with the use of ArcGIS

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Environmental Management (2014), North-West University, Potchefstroom
- B.A Psychology, Geography and Environmental Studies (2013), North-West University, Potchefstroom

Courses:

- Environmental Legal Compliance and Auditing (2017), Janice Tooley at the Protea Hotel OR Thambo, Johannesburg

EMPLOYMENT

Date	Company	Roles and Responsibilities
February 2015 – current	Savannah Environmental (Pty) Ltd	Environmental Assessment Practitioner and GIS Consultant *Tasks include: Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessment Reports, Basic Assessments and Environmental management programmes; Environmental Screening Reports; Specialist management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications, GIS Mapping and data analysis and manipulation*

PROJECT EXPERIENCE

Renewable Power Generation Projects: Solar Energy Facilities

Screening Studies

Project Name & Location	***Client Name***	***Role***
Pre-feasibility Desktop Screening and Fatal Flaw Scan for a Solar PV Project near Lichtenburg, North West Province	*ABO Wind AG*	*EAP and GIS Consultant*
Pre-feasibility Desktop Screening and Fatal Flaw Scan for a Solar PV Project neat Aggeneys, Northern Cape Province	*ABO Wind AG*	*EAP and GIS Consultant*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Buffels PV 1 & Buffels PV 2 Solar Energy Facilities near Orkney, North West	*Kabi Solar*	*EAP and GIS Consultant*
Woodhouse Solar 1 & Woodhouse Solar 2 PV Facilities near Vryburg, North West	*Genesis Eco-Energy Developments*	*EAP and GIS Consultant*
Orkney Solar Farm, North West	*Genesis Eco-Energy Developments*	*EAP and GIS Consultant*
Tewa Isitha Solar 1 & Tewa Isitha Solar 2 PV facilities near Upington, Northern Cape	*AfriCoast Energy*	*EAP and GIS Consultant*
Lichtenburg 1, Lichtenburg 2 and Lichtenburg 3 PV Facilities, near Lichtenburg, North West Province (EIA Phase)	*ABO Wind AG*	*EAP and GIS Consultant*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Harmony Gold 3x PV Facilities, Welkom, Free State	*BBEntropie*	*EAP and GIS Consultant*

Renewable power generation projects: Wind Energy Facilities

Screening Studies

Project Name & Location	***Client Name***	***Role***
Juno Wind Farm Screening Assessment Report near Lamberts Bay, Western Cape Province	*AMDA Developments*	*EAP and GIS Consultant*
Lamberts Bay Wind Farm Screening Assessment Report near Lamberts Bay, Western Cape Province	*Windy World*	*EAP and GIS Consultant*
Pre-feasibility Desktop Screening and Fatal Flaw Scan for the Kudusberg and Rondekop Wind Energy Facilities, Northern Cape and Western Cape Provinces	*ABO Wind AG*	*EAP and GIS Consultant*
Pre-feasibility Desktop Screening and Fatal Flaw Scan for Wind Projects near Touws River, Western Cape Province	*ABO Wind AG*	*EAP and GIS Consultant*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Boulders Wind Farm, Western Cape Province	*Vredenburg Windfarm*	*EAP and GIS Consultant*
Namas Wind Farm, Northern Cape Province	*Genesis Namas Wind (Pty) Ltd*	*EAP and GIS Consultant*
Zonnequa Wind Farm, Northern Cape Province	*Genesis Zonnequa Wind (Pty) Ltd*	*EAP and GIS Consultant*

Grid Infrastructure Projects

Basic Assessments

Project Name & Location	***Client Name***	***Role***
132/11kV Olifantshoek Substation and Power Line, Northern Cape	*Eskom*	*EAP and GIS Consultant*
Grid connection infrastructure for the Namas Wind Farm, Northern Cape Province	*Genesis Namas Wind (Pty) Ltd*	*EAP and GIS Consultant*
Grid connection infrastructure for the Zonnequa Wind Farm ,Northern Cape Province	*Genesis Zonnequa Wind (Pty) Ltd*	*EAP and GIS Consultant*

Gas Projects

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Richards Bay Combined Cycle Power Plant (CCPP) power plant, KwaZulu-Natal (Scoping Phase)	*Eskom*	*EAP (assistance) and GIS Consultant*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Neopak Combined Heat and Power (CHP) Plant, Rosslyn, Gauteng	*Neopak*	*EAP, Public Participation and GIS Consultant*

Screening Studies

Project Name & Location	***Client Name***	***Role***
Richards Bay Combined Cycle Power Plant (CCPP) power plant, near Richards Bay, KwaZulu-Natal	*Eskom*	*EAP and GIS Consultant*

Infrastructure Development Projects (bridges, pipelines, roads, etc)

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Water Treatment Plant at the Neopak Facility, Rosslyn, Gauteng	*Neopak*	*EAP, Public Participation and GIS Consultant*

Housing and Urban Projects

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Metals Industrial Cluster near Kuruman, Northern Cape	*Northern Cape Department of Economic Development and Tourism*	*EAP and GIS Consultant*

Environmental Management Tools

Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Environmental Management Programme (EMPr) for the Nxuba Wind Farm, Eastern Cape	*ACED*	*EAP*
Operation Environmental Management Programme (EMPr) for Phase 1 of the Amakhala Emoyeni Wind Energy Facility, Eastern Cape	*Cennergi*	*EAP*
Operation Environmental Management Programme (EMPr) for the Tsitsikamma Community Wind Energy Facility, Eastern Cape Province	*Cennergi*	*EAP*
Environmental Management Programme (EMPr) for the Skuitdrift 1 Solar PV Energy Facility near Augrabies, Northern Cape Province	*Building Energy South Africa*	*EAP and GIS Consultant*
Environmental Management Programme (EMPr) for the Skuitdrift 2 Solar PV Energy Facility near Augrabies, Northern Cape Province	*Building Energy South Africa*	*EAP and GIS Consultant*

Environmental and Social Management System (ESMS)

Project Name & Location	***Client Name***	***Role***
Preparation of Policies and Plans for the Roggeveld Wind Farm, Western Cape Province	*Building Energy South Africa*	*EAP assistance*
Preparation of Policies and Plans for the Kruisvallei Hydro Scheme, Free State Province	*Building Energy South Africa*	*EAP assistance*

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Johannesburg, South Africa

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Tel: +27 (11) 656 3237

CURRICULUM VITAE OF KHOMOTJO REUBEN MAROGA

Profession : Environmental Consultant

Specialisation: Environmental Impact Assessments, Basic Assessments, Site Visits, Compilation of Environmental Management Programmes and Liaison with authorities

Work Experience: 2 years of experience in the environmental management field

VOCATIONAL EXPERIENCE

Khomotjo Reuben Maroga has two years of experience in the environmental field. He has worked on a mining infrastructure project in compiling environmental control officer's reports and conducting air and groundwater monitoring using the DustTrak DRX Aerosol Monitor and a Bailer as apparatuses. Additionally, he has provided assistance to Eco-Elementum & Engineering on WUL applications and EIAs.

SKILLS BASE AND CORE COMPETENCIES

- ECO Report writing
- Environmental monitoring
- Administrative tasks

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Geology, University of Johannesburg, 2016
- B.Sc. Geology and Environmental Management, University of Johannesburg, 2015

Courses:

- Business Communication, ProEarth Learning Academy (Pty) in Middelburg (2018)
- Describe the functions of a Health and Safety representative, Elite Training (Pty) Ltd in Middelburg (2017)
- Basic Fire Fighting, Elite Training (Pty) Ltd in Middelburg (2017)
- Combined OSHAS 18001: 2007 and ISO 14001: 2015 Introduction, NOSA in eMalahleni (2017)
- Combined OSHAS 18001: 2007 and ISO 14001: 2015 Implementation (2017), NOSA in eMalahleni (2017)
- Emotional Intelligence, LearnMe (Pty) Ltd in Middelburg (2017)

EMPLOYMENT

Date	Company	Roles and Responsibilities
October 2018 - current	Savannah Environmental (Pty) Ltd	Environmental Consultant *Tasks include: Applying applicable legislation, research of related environmental policy documentation required for EIAs, efficient and quality report writing, liaison with relevant environmental authorities, site visits, compilation of application forms, environmental management programmes (EMPrs) and public participation include documentation. Other related tasks include undertaking water use license applications, environmental auditing (Environmental Control Officer – ECO work) and any other related authorisation, permitting and licensing tasks (on an as and when required basis).*
September 2016 - October 2018	Yoctolux Collieries (Pty) Ltd	Environmental Management Intern Tasks included: Drafting monthly ECO reports, conducting monthly environmental monitoring, providing assistance on WULAs and EIAs to Eco-Elementum & Engineering (Pty) Ltd and providing oversight on IAPs eradication and management programme.
January – September 2016	University of Johannesburg Auckland Park, Kingsway Campus	Second-year Practical Demonstrator Tasks included: Marking of practical's, attending to any ad-hoc administrative duties and liaising with designated lecturers.

PROJECT EXPERIENCE

Mining Projects: Coal Mining

Water Use Licence Application

Project Name & Location	*Client Name*	*Role*
Compiling a water use licence report for an underground coal mining development (Tala Bethal Coal) in Hendrina, Mpumalanga.	*Diepsoils Investments (Pty) Ltd* *Vernon Siemelink: 072 196 9928*	*Assistant*

Waste Treatment Works

Project Name & Location	*Client Name*	*Role*
Kriel Power Station Lime Plant Upgrade, Kriel, Mpumalanga	*Eskom Holdings SOC Limited* *Khuliso Rasimphi : 017 615 2634*	*Junior EAP*

Renewable Energy

Basic Assessments

Project Name & Location	*Client Name*	*Role*
Basic Assessment Process for Sirius 2x 100MW Solar Photovoltaic facilities, Upington, Northern Cape	*SOLA Future Energy (Pty) Ltd Oliver Johnsto: 021 421 9764*	*Junior EAP*
Basic Assessment Process for Aggeneys 2x 100MW Solar Photovoltaic facilities, Aggeneys, Northern Cape.	*Atlantic Energy Partners (Pty) Ltd and ABO Wind AG Sonia Miszczak: 021 418 2596*	*Junior EAP*

Infrastructure Development

Basic Assessments

Project Name & Location	*Client Name*	*Role*
Basic Assessment Process for the Wilmar Vegetable Oil Pipeline, Richards Bay, Kwa-Zulu Natal.	*Wilmar Processing (Pty) Ltd Aidan Dowdle: 082 872 3628*	*Junior EAP*

Amendments

Part 1 Amendment

Project Name & Location	*Client Name*	*Role*
20MW Konkoonsies Solar Photovoltaic facility, Pofadder, Northern Cape.	*Biotherm Energy (Pty) Ltd Michael Barnes: 011 367 4600*	*Junior EAP*
10MW Aries Solar PV Photovoltaic facility, near Kenhardt, Northern Cape.	*Biotherm Energy (Pty) Ltd Michael Barnes: 011 367 4600*	*Junior EAP*
27MW Klipheuwel/Dassiefontein Wind Energy facility near Calendon, Western Cape.	*Biotherm Energy (Pty) Ltd Michael Barnes: 011 367 4600*	*Junior EAP*

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Johannesburg, South Africa

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CURRICULUM VITAE OF THALITA BOTHA

Profession: Environmental Assessment Practitioner (EAP)

Specialisation: Environmental Assessments, Report writing, report reviewing, Geographical Information Systems (GIS), development of project proposals for procuring new projects, project administration

Work Experience: 3 and a half years' experience in Environmental Assessments and GIS

VOCATIONAL EXPERIENCE

Professional execution of consulting services for projects in the environmental management field, specialising in Environmental Impact Assessment studies, environmental permitting, public participation, compilation of Environmental Management Plans and Programmes, environmental policy, and integrated environmental management. Responsibilities include report writing, analysis and the manipulation of geographical and technical experience with the use of ArcGIS, project management, review of specialist studies and the identification and assessment of potential negative environmental impacts and benefits. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Experience in conducting environmental impact assessments for Concentrated Solar Power (CSP) Projects, Wind Energy Projects and grid infrastructure projects as well as infrastructure projects. Recent projects have been undertaken for both the public- and private-sector, including electricity generation and transmission projects (wind and solar), linear developments (such local roads and power lines), as well as general environmental planning, development and management. The completion of a diverse set of environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements.

SKILLS BASE AND CORE COMPETENCIES

- Compilation of environmental impact assessment reports and environmental management programmes in accordance with relevant environmental legislative requirements;
- Analysis and manipulation of geographical information and data and technical experience with the use of ArcGIS;
- Identification and assessment of potential negative environmental impacts and benefits through the review of specialist studies;
- Public participation/involvement and stakeholder consultation;
- Identification of practical and achievable mitigation measures and the compilation of appropriate management plans; and
- Key experience in the assessment of impacts associated with renewable energy and large infrastructure projects.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons.) Environmental Management (2014), North-West University, Potchefstroom
- B.Sc. Environmental- and Biological Science (2013), North–West University, Potchefstroom

Courses:

- Integrated Water Resources Management, the National Water Act and Water Use Authorisations (2017), Carin Bosman Sustainable Solutions

EMPLOYMENT

Date	Company	Roles and Responsibilities
September 2015 - Current	Savannah Environmental (Pty) Ltd	Environmental Assessment Practitioner *Tasks include: Compilation of Environmental Impact Assessment (EIA) reports; Basic Assessment (BA) reports and Environmental Management Programmes; Environmental Screening reports; Co-ordination of the public participation process; Project management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications.* GIS (utilising ArcGIS), *Tasks include: Analysis and manipulation of data, screening assessments; compilation of maps.*

PROJECT EXPERIENCE

<u>Renewable Power Generation Projects: Solar Energy Facilities</u>

Basic Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Thaba Eco Hotel SEF, Gauteng	*Camco Clean Energy*	*EAP*
Moeding Solar PV Facility, North West Province	*Moeding Solar*	*EAP*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Hyperion Solar Development 1, Northern Cape Province	*Hyperion Solar Development 1*	*EAP*
Hyperion Solar Development 2, Northern Cape Province	*Cyraguard*	*EAP*
Hyperion Solar Development 3, Northern Cape Province	*Nomispark*	*EAP*
Hyperion Solar Development 4, Northern Cape Province	*Nomispan*	*EAP*
Allepad PV One, Northern Cape Province	*ILEnergy Development*	*EAP*

Allepad PV Two, Northern Cape Province	*ILEnergy Development*	*EAP*
Allepad PV Three, Northern Cape Province	*ILEnergy Development*	*EAP*
Allepad PV Four, Northern Cape Province	*ILEnergy Development*	*EAP*

Screening Studies

Project Name & Location	Client Name	Role
Pre-feasibility desktop screening and fatal flaw analysis for a solar PV project near Hotazel, Northern Cape Province	*ABO Wind*	*EAP*
Pre-feasibility desktop screening and fatal flaw analysis for a solar PV project near Vryburg, North West Province	*ABO Wind*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Sol Invictus PV 1, Aggeneys, Northern Cape	*Cyraclox*	*GIS*
Sol Invictus PV 2, Aggeneys, Northern Cape	*Cyracraft*	*GIS*
Sol Invictus PV 3, Aggeneys, Northern Cape	*Cyrafusion*	*GIS*
Sol Invictus PV 4, Aggeneys, Northern Cape	*Cyralex*	*GIS*
Pre-feasibility desktop screening and fatal flaw analysis for a solar PV project near Hotazel, Northern Cape Province	*ABO Wind*	*GIS*
Pre-feasibility desktop screening and fatal flaw analysis for a solar PV project near Aggeneys, North West Province	*ABO Wind*	*GIS*
Moeding Solar PV Facility, North West Province	*Moeding Solar*	*GIS*
Hyperion Solar Development 1, Northern Cape Province	*Hyperion Solar Development 1*	*GIS*
Hyperion Solar Development 2, Northern Cape Province	*Cyraguard*	*GIS*
Hyperion Solar Development 3, Northern Cape Province	*Nomispark*	*GIS*
Hyperion Solar Development 4, Northern Cape Province	*Nomispan*	*GIS*
Allepad PV One, Northern Cape Province	*ILEnergy Development*	*GIS*
Allepad PV Two, Northern Cape Province	*ILEnergy Development*	*GIS*
Allepad PV Three, Northern Cape Province	*ILEnergy Development*	*GIS*
Allepad PV Four, Northern Cape Province	*ILEnergy Development*	*GIS*

<u>Renewable power generation projects: Wind Energy Facilities</u>

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Hartebeest WEF, Moorreesburg, Western Cape	*Hartebeest Wind Farm*	*EAP*

Environmental Permitting & WUL Applications

Project Name & Location	Client Name	Role
Karusa WEF WUL Application, Northern Cape	*ACED*	*EAP*
Soetwater WEF WUL Application, Northern Cape	*ACED*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Hartebeest WEF, Moorreesburg, Western Cape	*Hartebeest Wind Farm*	*GIS*
Karusa WEF WUL Application, Northern Cape	*ACED*	*GIS*
Soetwater WEF WUL Application, Northern Cape	*ACED*	*GIS*

Renewable Power Generation Projects: Concentrated Solar Facilities (CSP)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Ilanga CSP 9, Northern Cape	*Emvelo Holdings*	*EAP*
Noupoort CSP, Northern Cape	*CRESCO Energy*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Noupoort CSP, Northern Cape	*CRESCO Energy*	*GIS*

Renewable Power Generation Projects: Hydroelectrical Power Generation Facilities

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Kruisvallei Hydroelectric Power Generation Scheme	*Zevobuzz*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Kruisvallei Hydroelectric Power Generation Scheme	*Zevobuzz*	*GIS*

Environmental Permitting & WUL Applications

Project Name & Location	Client Name	Role
WULA for the Kruisvallei Hydroelectric Power Generation Scheme	*Zevobuzz*	*EAP*
GA for the power line associated with the Kruisvallei Hydroelectric Power Generation Scheme	*Zevobuzz*	*EAP*

Steam Generation Projects:

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Clayville Thermal Plant, Gauteng	*Bellmall Energy*	*EAP*

Screening Studies

Project Name & Location	Client Name	Role
Fatal flaw analysis for the Clayville Thermal Plant, Gauteng	*Bellmall Energy*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Clayville Thermal Plant, Gauteng	*Bellmall Energy*	*GIS*

Grid Infrastructure Projects

Basic Assessments

Project Name & Location	Client Name	Role
Gunstfontein Switching Station and Power Line, Northern Cape	*ACED*	*EAP*
Zonnebloem Switching Station and Power Lines, Mpumalanga	*Eskom SOC Ltd*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
Zonnebloem Switching Station and Power Lines, Mpumalanga	*Eskom SOC Ltd*	*GIS*

Mining Sector Projects

Environmental Permitting & WUL Applications

Project Name & Location	Client Name	Role
S53 for Steynsrus PV 1, Western Cape	*Cronimet Power Solutions*	*EAP*
S53 for Steynsrus PV 2, Western Cape	*Cronimet Power Solutions*	*EAP*
S53 for Heuningspruit PV 1, Western Cape	*Cronimet Power Solutions*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
S53 for Steynsrus PV 1, Western Cape	*Cronimet Power Solutions*	*GIS*
S53 for Steynsrus PV 2, Western Cape	*Cronimet Power Solutions*	*GIS*
S53 for Heuningspruit PV 1, Western Cape	*Cronimet Power Solutions*	*GIS*

Infrastructure Development Projects (bridges, pipelines, roads, waste etc)

Basic Assessments

Project Name & Location	Client Name	Role
MN73 Road Realignment, Northern Cape	*Northern Cape Department of Roads and Public Works*	*EAP*
S24G for the unlawful commencement of activities within a watercourse, Honeydew, Gauteng	*Soror Language Services cc*	*EAP*
Access Roads and Watercourse Crossings for the Iziduli Emoyeni Wind Energy Facility	*Emoyeni Wind Farm Renewable Energy*	*EAP*
Access Roads and Watercourse Crossings for the Msenge Emoyeni Wind Energy Facility	*Amakhala Emoyeni Renewable Energy*	*EAP*
Masetjaba Water Reservoir and Elevated Tower, Gauteng	*City of Ekurhuleni Metropolitan Municipality*	*EAP*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
S24G for the operation of a Aluminium, Alumino-thermic, Briquetting, Separation and Manganese Plant, Gauteng Province	*GfE-MIR Alloys and Minerals SA*	*EAP*

Geographical Information Systems (GIS)

Project Name & Location	Client Name	Role
MN73 Road Realignment, Northern Cape	*Northern Cape Department of Roads and Public Works*	*GIS*
S24G for the unlawful commencement of activities within a watercourse, Honeydew, Gauteng	*Soror Language Services cc*	*GIS*
Access Roads and Watercourse Crossings for the Iziduli Emoyeni Wind Energy Facility	*Emoynei Wind Farm Renewable Energy*	*GIS*
Access Roads and Watercourse Crossings for the Msenge Emoyeni Wind Energy Facility	*Amakhala Emoyeni Renewable Energy*	*GIS*
S24G for the operation of a Aluminium, Alumino-thermic, Briquetting, Separation and Manganese Plant, Gauteng Province	*GfE-MIR Alloys and Minerals SA*	*GIS*
Masetjaba Water Reservoir and Elevated Tower, Gauteng	*City of Ekurhuleni Metropolitan Municipality*	*GIS*
Wilmar Vegetable Oil Pipeline, KwaZulu-Natal	*Wilmar Processing*	*GIS*
Desktop Screening Assessment for a Vegetable Oil Pipeline, KwaZulu-Natal	*Wilmar Processing*	*GIS*
Kriel Power Station Lime Plant Upgrade, Mpumalanga	*Eskom Holdings SOC*	*GIS*

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CURRICULUM VITAE OF JO-ANNE THOMAS

Profession:	Environmental Management and Compliance Consultant; Environmental Assessment Practitioner
Specialisation:	Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology
Work experience:	Twenty one (21) years in the environmental field

VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Key focus on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Undertaking of numerous environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements. Recent projects have been undertaken for both the public- and private-sector, including compliance advice and monitoring, electricity generation and transmission projects, various types of linear developments (such as National Road, local roads and power lines), waste management projects (landfills), mining rights and permits, policy, strategy and guideline development, as well as general environmental planning, development and management.

SKILLS BASE AND CORE COMPETENCIES

- Project management for a range of projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data and specialist studies
- Identification of practical and achievable mitigation and management measures and the development of appropriate management plans
- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- External and peer review of environmental reports & compliance advice and monitoring
- Formulation of environmental policies, strategies and guidelines
- Strategic and regional assessments; pre-feasibility & site selection
- Public participation processes for a variety of projects
- Strategic environmental advice to a wide variety of clients both in the public and private sectors
- Working knowledge of environmental planning processes, policies, regulatory frameworks and legislation

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc Earth Sciences, University of the Witwatersrand, Johannesburg (1993)
- B.Sc Honours in Botany, University of the Witwatersrand, Johannesburg (1994)
- M.Sc in Botany, University of the Witwatersrand, Johannesburg (1996)

Short Courses:

- Environmental Impact Assessment, Potchefstroom University (1998)
- Environmental Law, Morgan University (2001)
- Environmental Legislation, IMBEWU (2017)
- Mining Legislation, Cameron Cross & Associates (2013)
- Environmental and Social Risk Management (ESRM), International Finance Corporation (2018)

Professional Society Affiliations:

- Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Scientist (400024/00)
- Registered with the International Associated for Impact Assessment South Africa (IAIAsa): 5601
- Member of the South African Wind Energy Association (SAWEA)

EMPLOYMENT

Date	Company	Roles and Responsibilities
January 2006 - Current	Savannah Environmental (Pty) Ltd	Director Project manager Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor.
1997 – 2005	Bohlweki Environmental (Pty) Ltd	Senior Environmental Scientist at. Environmental Management and Project Management
January – July 1997	Sutherland High School, Pretoria	Junior Science Teacher

PROJECT EXPERIENCE

Project experience includes large infrastructure projects, including electricity generation and transmission, wastewater treatment facilities, mining and prospecting activities, property development, and national roads, as well as strategy and guidelines development.

RENEWABLE POWER GENERATION PROJECTS: PHOTOVOLTAIC SOLAR ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Christiana PV 2 SEF, North West	Solar Reserve South Africa	Project Manager & EAP
De Aar PV facility, Northern Cape	iNca Energy	Project Manager & EAP
Everest SEF near Hennenman, Free State	FRV Energy South Africa	Project Manager & EAP
Graafwater PV SEF, Western Cape	iNca Energy	Project Manager & EAP
Grootkop SEF near Allanridge, Free State	FRV Energy South Africa	Project Manager & EAP
Hertzogville PV 2 SEF with 2 phases, Free State	SunCorp / Solar Reserve	Project Manager & EAP
Karoshoek CPV facility on site 2 as part of the larger Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

Project Name & Location	Client Name	Role
Kgabalatsane SEF North-East for Brits, North West	Built Environment African Energy Services	Project Manager & EAP
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy Global	Project Manager & EAP
Lethabo Power Station PV Installation, Free State	Eskom Holdings SoC Limited	Project Manager & EAP
Majuba Power Station PV Installation, Mpumalanga	Eskom Holdings SoC Limited	Project Manager & EAP
Merapi PV SEF Phase 1 – 4 South-East of Excelsior, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Sannaspos Solar Park, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Ofir-Zx PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV Energy South Africa	Project Manager & EAP
Project Blue SEF North of Kleinsee, Northern Cape	WWK Development	Project Manager & EAP
S-Kol PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Sonnenberg PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Tutuka Power Station PV Installation, Mpumalanga	Eskom Transmission	Project Manager & EAP
Two PV sites within the Northern Cape	MedEnergy Global	Project Manager & EAP
Two PV sites within the Western & Northern Cape	iNca Energy	Project Manager & EAP
Upington PV SEF, Northern Cape	MedEnergy Global	Project Manager & EAP
Vredendal PV facility, Western Cape	iNca Energy	Project Manager & EAP
Waterberg PV plant, Limpopo	Thupela Energy	Project Manager & EAP
Watershed Phase I & II SEF near Litchtenburg, North West	FRV Energy South Africa	Project Manager & EAP
Alldays PV & CPV SEF Phase 1, Limpopo	BioTherm Energy	Project Manager & EAP
Hyperion PV Solar Development 1, 2, 3, 4, 5 & 6	Building Energy	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Aberdeen PV SEF, Eastern Cape	BioTherm Energy	Project Manager & EAP
Christiana PV 1 SEF on Hartebeestpan Farm, North-West	Solar Reserve South Africa	Project Manager & EAP
Heuningspruit PV1 & PV 2 facilities near Koppies, Free State	Sun Mechanics	Project Manager & EAP
Kakamas PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Kakamas II PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Machadodorp 1 PV SEF, Mpumalanga	Solar To Benefit Africa	Project Manager & EAP
PV site within the Northern Cape	iNca Energy	Project Manager & EAP
PV sites within 4 ACSA airports within South Africa, National	Airports Company South Africa (ACSA)	Project Manager & EAP
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo3 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo4 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
Sannaspos PV SEF Phase 2 near Bloemfontein, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Solar Park Expansion within the Rooiwal Power Station, Gauteng	AFRKO Energy	Project Manager & EAP
Steynsrus SEF, Free State	SunCorp	Project Manager & EAP

Project Name & Location	Client Name	Role
Sirius Solar PV Project Three and Sirius Solar PV Project Four (BA in terms of REDZ regulations), Northern Cape	SOLA Future Energy	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Allemans Fontein SEF near Noupoort, Northern Cape	Fusion Energy	Project Manager & EAP
Amandel SEF near Thabazimbi, Limpopo	iNca Energy	Project Manager & EAP
Arola/Doornplaat SEF near Ventersdorp, North West	FRV & iNca Energy	Project Manager & EAP
Bloemfontein Airport PV Installation, Free State	The Power Company	Project Manager & EAP
Brakspruit SEF near Klerksorp, North West	FRV & iNca Energy	Project Manager & EAP
Carolus Poort SEF near Noupoort, Northern Cape	Fusion Energy	Project Manager & EAP
Damfontein SEF near Noupoort, Northern Cape	Fusion Energy	Project Manager & EAP
Everest SEF near Welkom, Free State	FRV & iNca Energy	Project Manager & EAP
Gillmer SEF near Noupoort, Northern Cape	Fusion Energy	Project Manager & EAP
Grootkop SEF near Allansridge, Free State	FRV & iNca Energy	Project Manager & EAP
Heuningspruit PV1 & PV 2 near Koppies, Free State	Cronimat	Project Manager & EAP
Kimberley Airport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Kolonnade Mall Rooftop PV Installation in Tshwane, Gauteng	Momentous Energy	Project Manager & EAP
Loskop SEF near Groblersdal, Limpopo	S&P Power Unit	Project Manager & EAP
Marble SEF near Marble Hall, Limpopo	S&P Power Unit	Project Manager & EAP
Morgenson PV1 SEF South-West of Windsorton, Northern Cape	Solar Reserve South Africa	Project Manager & EAP
OR Tambo Airport PV Installation, Gauteng	The Power Company	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV & iNca Energy	Project Manager & EAP
Rhino SEF near Vaalwater, Limpopo	S&P Power Unit	Project Manager & EAP
Rustmo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
Spitskop SEF near Northam, Limpopo	FRV & iNca Energy	Project Manager & EAP
Steynsrus PV, Free State	Suncorp	Project Manager & EAP
Tabor SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
UpingtonAirport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Valeria SEF near Hartebeestpoort Dam, North West	Solar to Benefit Africa	Project Manager & EAP
Watershed SEF near Lichtenburg, North West	FRV & iNca Energy	Project Manager & EAP
Witkop SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
Woodmead Retail Park Rooftop PV Installation, Gauteng	Momentous Energy	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Adams Solar PV Project Two South of Hotazel, Northern Cape	Enel Green Power	Project Manager
ECO for the construction of the Kathu PV Facility, Northern Cape	REISA	Project Manager
ECO and bi-monthly auditing for the construction of the Pulida PV Facility, Free State	Enel Green Power	Project Manager
ECO for the construction of the RustMo1 SEF, North West	Momentous Energy	Project Manager
ECO for the construction of the Sishen SEF, Northern	Windfall 59 Properties	Project Manager

Project Name & Location	Client Name	Role
Cape		
ECO for the construction of the Upington Airport PV Facility, Northern Cape	Sublanary Trading	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Kathu PV facility, Northern Cape	REISA	Project Manager
ECO for the construction of the Konkoonsies II PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
ECO for the construction of the Aggeneys PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager

Compliance Advice and ESAP Reporting

Project Name & Location	Client Name	Role
Aggeneys Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Airies II PV Facility SW of Kenhardt, Northern Cape	BioTherm Energy	Environmental Advisor
Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Environmental Advisor
Kathu PV Facility, Northern Cape	Building Energy	Environmental Advisor
Kenhardt PV Facility, Northern Cape	BioTherm Energy	Environmental Advisor
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Environmental Advisor
Konkoonises II SEF near Pofadder, Northern Cape	BioTherm Energy	Environmental Advisor
Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Lephalale SEF, Limpopo	Exxaro	Environmental Advisor
Pixley ka Seme PV Park, South-East of De Aar, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Environmental Advisor
Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Environmental Advisor
Sirius PV Plants, Northern Cape	Aurora Power Solutions	Environmental Advisor
Upington Airport PV Power Project, Northern Cape	Sublunary Trading	Environmental Advisor
Upington SEF, Northern Cape	Abengoa Solar	Environmental Advisor
Ofir-ZX PV SEF near Keimoes, Northern Cape	Networx S28 Energy	Environmental Advisor
Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Environmental Advisor
Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
5 PV SEF projects in Lephalale, Limpopo	iNca Energy	Environmental Advisor
Prieska PV Plant, Northern Cape	SunEdison Energy India	Environmental Advisor
Sirius Phase One PV Facility near Upington, Northern Cape	Aurora Power Solutions	Environmental Advisor

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Biodiversity Permit & WULA for the Aggeneys SEF near Aggeneys, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permit for the Konkoonises II SEF near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permitting for the Lephalale SEF, Limpopo	Exxaro Resources	Project Manager & EAP

Project Name & Location	Client Name	Role
Environmental Permitting for the Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Project Manager & EAP
Environmental Permitting for the Upington SEF, Northern Cape	Abengoa Solar	Project Manager & EAP
Environmental Permitting for the Kathu PV Facility, Northern Cape	Building Energy	Project Manager & EAP
Environmental Permitting for the Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Project Manager & EAP
Environmental Permitting for the Lephalale SEF, Limpopo	Exxaro Resources	Project Manager & EAP
Environmental Permitting for the Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Project Manager & EAP
Environmental Permitting for the Sirius PV Plant, Northern Cape	Aurora Power Solutions	Project Manager & EAP
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Permits for the Kleinbegin and UAP PV Plants, Northern Cape	MedEnergy Global	Project Manager & EAP
S53 Application for Arriesfontein Solar Park Phase 1 – 3 near Danielskuil, Northern Cape	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for Hertzogville PV1 & PV 2 SEFs, Free State	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for the Bloemfontein Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
S53 Application for the Kimberley Airport PV Facility, Northern Cape	Sublunary Trading	Project Manager & EAP
S53 Application for the Project Blue SEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 Application for the Upington Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
WULA for the Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Project Manager & EAP
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Project Manager & EAP

RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Ilanga CSP 2, 3, 4, 5, 7 & 9 Facilities near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP
Ilanga CSP near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP
Ilanga Tower 1 Facility near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP

Project Name & Location	Client Name	Role
Karoshoek CPVPD 1-4 facilities on site 2 as part of the larger Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshoek CSP facilities on sites 1.4; 4 & 5 as part of the larger Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshoek Linear Fresnel 1 Facility on site 1.1 as part of the larger Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the !Khi CSP Facility, Northern Cape	Abengoa Solar	Project Manager
ECO for the construction of the Ilanga CSP 1 Facility near Upington, Northern Cape	Karoshoek Solar One	Project Manager
ECO for the construction of the folar Park, Northern Cape	Kathu Solar	Project Manager
ECO for the construction of the KaXu! CSP Facility, Northern Cape	Abengoa Solar	Project Manager
Internal audit of compliance with the conditions of the IWUL issued to the Karoshoek Solar One CSP Facility, Northern Cape	Karoshoek Solar One	Project Manager

Screening Studies

Project Name & Location	Client Name	Role
Upington CSP (Tower) Plant near Kanoneiland, Northern Cape	iNca Energy and FRV	Project Manager & EAP

Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Environmental Advisor
Ilangalethu CSP 2, Northern Cape	FG Emvelo	Environmental Advisor
Kathu CSP Facility, Northern Cape	GDF Suez	Environmental Advisor
Lephalale SEF, Limpopo	Cennergi	Environmental Advisor
Solis I CSP Facility, Northern Cape	Brightsource	Environmental Advisor

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting for the Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP
Environmental Permitting for the Kathu CSP, Northern Cape	GDF Suez	Project Manager & EAP
WULA for the Solis I CSP Facility, Northern Cape	Brightsource	Project Manager & EAP

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Sere WEF, Western Cape	Eskom Holdings SoC Limited	EAP

Project Name & Location	Client Name	Role
Aberdeen WEF, Eastern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Amakhala Emoyeni WEF, Eastern Cape	Windlab Developments	Project Manager & EAP
EXXARO West Coast WEF, Western Cape	EXXARO Resources	Project Manager & EAP
Goereesoe Wind Farm near Swellendam, Western Cape	iNca Energy	Project Manager & EAP
Hartneest WEF, Western Cape	Juwi Renewable Energies	Project Manager & EAP
Hopefield WEF, Western Cape	Umoya Energy	EAP
Kleinsee WEF, Northern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Klipheuwel/Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Moorreesburg WEF, Western Cape	iNca Energy	Project Manager & EAP
Oyster Bay WEF, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Project Blue WEF, Northern Cape	Windy World	Project Manager & EAP
Rheboksfontein WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Spitskop East WEF near Riebeeck East, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Suurplaat WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Swellendam WEF, Western Cape	IE Swellendam	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro	Project Manager & EAP
West Coast One WEF, Western Cape	Moyeng Energy	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Amakhala Emoyeni Wind Monitoring Masts, Eastern Cape	Windlab Developments	Project Manager & EAP
Beaufort West Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
Koekenaap Wind Monitoring Masts, Western Cape	EXXARO Resources	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Palm Tree Power	Project Manager & EAP
Laingsburg Area Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Overberg Area Wind Monitoring Masts, Western Cape	BioTherm Energy	Project Manager & EAP
Oyster Bay Wind Monitoring Masts, Eastern Cape	Renewable Energy Systems Southern Africa (RES)	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Albertinia WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Pal Tree Power	Project Manager & EAP
Napier Region WEF Developments, Western Cape	BioTherm Energy	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro Resources	Project Manager & EAP
Various WEFs within an identified area in the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Investec Bank Limited	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Eskom Holdings Limited	Project Manager & EAP

Project Name & Location	Client Name	Role
Various WEFs within the Western Cape	Western Cape Department of Environmental Affairs and Development Planning	Project Manager & EAP
Velddrift WEF, Western Cape	VentuSA Energy	Project Manager & EAP
Wind 1000 Project	Thabo Consulting on behalf of Eskom Holdings	Project Manager & EAP
Wittekleibosch, Snylip & Doriskraal WEFs, Eastern Cape	Exxarro Resources	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager
ECO for the construction of the Gouda WEF, Western Cape	Blue Falcon	Project Manager
EO for the Dassiesklip Wind Energy Facility, Western Cape	Group 5	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Gouda Wind Energy facility near Gouda, Western Cape	Blue Falcon	Project Manager
Annual auditing of compliance with all environmental licenses for the operation activities at the West Coast One Wind Energy facility near Vredenburg, Western Cape	Aurora Wind Power	Project Manager
External environmental and social audit for the Amakhala Wind Farm, Eastern Cape	Cennergi	Project Manager
External environmental and social audit for the Tsitsikamma Wind Farm, Eastern Cape	Cennergi	Project Manager
ECO for the construction of the Excelsior Wind Farm and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
External compliance audit of the Dassiesklip Wind Energy Facility, Western Cape	BioTherm Energy	Project Manager

Compliance Advice

Project Name & Location	Client Name	Role
Amakhala Phase 1 WEF, Eastern Cape	Cennergi	Environmental Advisor
Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Environmental Advisor
Excelsior Wind Farm, Western Cape	BioTherm Energy	Environmental Advisor
Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Hopefield Community WEF, Western Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Rheboksfontein WEF, Western Cape	Moyeng Energy	Environmental Advisor
Tiqua WEF, Western Cape	Cennergi	Environmental Advisor
Tsitsikamma WEF, Eastern Cape	Cennergi	Environmental Advisor
West Coast One WEF, Western Cape	Moyeng Energy	Environmental Advisor

Due Diligence Reporting

Project Name & Location	Client Name	Role
Witteberg WEF, Western Cape	EDPR Renewables	Environmental Advisor
IPD Vredenburg WEF within the Saldanha Bay area, Western Cape	IL&FS Energy Development Company	Environmental Advisor

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Biodiversity Permitting for the Power Line between the Tsitikamma Community WEF & the Diep River Substation, Eastern Cape	Cennergi	Project Manager & EAP
Biodiversity Permitting for the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager & EAP
Environmental Permitting for the Excelsior WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Plant Permits & WULA for the Tsitsikamma Community WEF, Eastern Cape	Cennergi	Project Manager & EAP
S24G and WULA for the Rectification for the commencement of unlawful activities on Ruimsig AH in Honeydew, Gauteng	Hossam Soror	Project Manager & EAP
S24G Application for the Rheboksfontein WEF, Western Cape	Ormonde - Theo Basson	Project Manager & EAP
S53 Application & WULA for Suurplaat and Gemini WEFs, Northern Cape	Engie	Project Manager & EAP
S53 Application for the Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
S53 Application for the Project Blue WEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 for the Oyster Bay WEF, Eastern Cape	RES	Project Manager & EAP
WULA for the Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP

CONVENTIONAL POWER GENERATION PROJECTS (COAL)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Mutsho Power Station near Makhado, Limpopo	Mutsho Consortium	Project Manager & EAP
Coal-fired Power Station near Ogies, Mpumalanga	Ruukki SA	Project Manager & EAP
Thabametsi IPP Coal-fired Power Station, near Lephalale, Limpopo	Axia	Project Manager & EAP
Transalloys Coal-fired Power Station, Mpumalanga	Transalloys	Project Manager & EAP
Tshivasho IPP Coal-fired Power Station (with WML), near Lephalale, Limpopo	Cennergi	Project Manager & EAP
Umbani Coal-fired Power Station, near Kriel, Mpumalanga	ISS Global Mining	Project Manager & EAP
Waterberg IPP Coal-Fired Power Station near Lephalale, Limpopo	Exxaro Resources	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Coal Stockyard on Medupi Ash Dump Site, Limpopo	Eskom Holdings	Project Manager & EAP

Project Name & Location	Client Name	Role
Biomass Co-Firing Demonstration Facility at Arnot Power Station East of Middleburg, Mpumlanaga	Eskom Holdings	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Baseload Power Station near Lephalale, Limpopo	Cennergi	Project Manager & EAP
Coal-Fired Power Plant near Delmas, Mpumalanga	Exxaro Resources	Project Manager & EAP
Makhado Power Station, Limpopo	Mutsho Consortium, Limpopo	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Camden Power Station, Mpumalanga	Eskom Holdings	Project Manager

Compliance Advice

Project Name & Location	Client Name	Role
Thabametsi IPP Coal-fired Power Station, near Lephalale, Limpopo	Axia	Environmental Advisor

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Permit application for the Thabametsi Bulk Water Pipeline, near Lephalale, Limpopo	Axia	Project Manager & EAP
S53 & WULA for the Waterberg IPP Coal-Fired Power Station near Lephalale, Limpopo	Exxaro Resources	Project Manager & EAP
S53 Application for the Tshivasho Coal-fired Power Station near Lephalale, Limpopo	Cennergi	Project Manager & EAP

CONVENTIONAL POWER GENERATION PROJECTS (GAS)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Ankerlig OCGT to CCGT Conversion project &400 kV transmission power line between Ankerlig and the Omega Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Gourikwa OCGT to CCGT Conversion project & 400 kV transmission power line between Gourikwa & Proteus Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Plant, KwaZulu-Natal	Richards Bay Gas	Project Manager & EAP
Decommissioning & Recommissioning of 3 Gas Turbine Units at Acacia Power Station & 1 Gas Turbine Unit at Port Rex Power Station to the existing Ankerlig Power Station in Atlantis Industria, Western Cape	Eskom Holdings	Project Manager & EAP
Two 132kV Chickadee Lines to the new Zonnebloem Switching Station, Mpumalanga	Eskom Holdings	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Fatal Flaw Analysis for 3 area identified for the establishment of a 500MW CCGT Power Station	Globeleq Advisors Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Aggeneis-Oranjemond Transmission Line & Substation Upgrade, Northern Cape	Eskom Transmission	Project Manager & EAP
Ankerlig-Omega Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Karoshoek Grid Integration project as part of the Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Koeberg-Omega Transmission Power Lines,, Western Cape	Eskom Transmission	Project Manager & EAP
Koeberg-Stikland Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Kyalami Strengthening Project, Gauteng	Eskom Transmission	Project Manager & EAP
Mokopane Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Saldanha Bay Strengthening Project, Western Cape	Eskom Transmission	Project Manager & EAP
Steelpoort Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Transmission Lines from the Koeberg-2 Nuclear Power Station site, Western Cape	Eskom Transmission	Project Manager & EAP
Tshwane Strengthening Project, Phase 1, Gauteng	Eskom Transmission	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Dassenberg-Koeberg Power Line Deviation from the Koeberg to the Ankerlig Power Station, Western Cape	Eskom Holdings	Project Manager & EAP
Golden Valley II WEF Power Line & Substation near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Golden Valley WEF Power Line near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Karoshoek Grid Integration project as part of the Karoshoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Konkoonsies II PV SEF Power Line to the Paulputs Substation near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Perdekraal West WEF Powerline to the Eskom Kappa Substation, Westnern Cape	BioTherm Energy	Project Manager & EAP
Rheboksfontein WEF Powerline to the Aurora Substation, Western Cape	Moyeng Energy	Project Manager & EAP
Soetwater Switching Station near Sutherland, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP

Solis Power I Power Line & Switchyard Station near Upington, Northern Cape	Brightsource	Project Manager & EAP
Stormwater Canal System for the Ilanga CSP near Upington, Northern Cape	Karoshoek Solar One	Project Manager & EAP
Tsitsikamma Community WEF Powerline to the Diep River Substation, Eastern Cape	Eskom Holdings	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Ferrum-Mookodi Transmission Line, Northern Cape and North West	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section A Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section B Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Hydra IPP Integration project, Northern Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Kappa-Sterrekus Section C Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Namaqualand Strengthening project in Port Nolloth, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
ECO for the construction of the Neptune Substation Soil Erosion Mitigation Project, Eastern Cape	Eskom	Project Manager
ECO for the construction of the Ilanga-Gordonia 132kV power line, Northern Cape	Karoshoek Solar One	Project Manager

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting and WULA for the Rockdale B Substation & Loop in Power Lines,	Eskom Holdings	Project Manager & EAP
Environmental Permitting and WULA for the Steelpoort Integration project, Limpopo	Eskom Holdings	Project Manager & EAP
Environmental Permitting for Solis CSP near Upington, Northern Cape	Brightsource	Project Manager & EAP

MINING SECTOR PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Elitheni Coal Mine near Indwe, Eastern Cape	Elitheni Coal	Project Manager & EAP
Groot Letaba River Development Project Borrow Pits	liso	Project Manager & EAP
Grootegeluk Coal Mine for coal transportation infrastructure between the mine and Medupi Power Station (EMPr amendment) , Limpopo	Eskom Holdings	Project Manager & EAP
Waterberg Coal Mine (EMPr amendment), Limpopo	Seskoko Resources	Project Manager & EAP
Aluminium Plant WML & AEL, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP

Decommissioning and Demolition of Kilns 5 & 6 at the Slurry Plant, Kwa-Zulu Natal	PPC	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Duhva Mine Water Recovery Project, Mpumalanga	Eskom Holdings SoC Limited	Project Manager
External compliance audit of Palesa Coal Mine's Integrated Water Use License (IWUL), near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Palesa Coal Mine's Waste Management License (WML) and EMP, near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Mbali Coal Mine's Integrated Water Use License (IWUL), near Ogies, Mpumalanga	HCI Coal	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mining Operations (Brand se Baai), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mineral Separation Plant (MSP), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Smelter Operations (Saldanha), Western Cape	Tronox Namakwa Sands	Project Manager
Compliance Auditing of the Waste Management Licence for the PetroSA Landfill Site at the GTL Refinery, Western Cape	PetroSA	Project Manager

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Waste Licence Application for the Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP
WULA for the Expansion of the Landfill site at Exxaro's Namakwa Sands Mineral Separation Plant, Western Cape	Exxaro Resources	Project Manager & EAP
S24G & WML for an Aluminium Plant, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Bridge across the Ngotwane River, on the border of South Africa and Botswana	Eskom Holdings	Project Manager & EAP
Chemical Storage Tanks, Metallurgical Plant Upgrade & Backfill Plant upgrade at South Deep Gold Mine, near Westornaria, Gauteng	Goldfields	Project Manager & EAP
Expansion of the existing Welgedacht Water Care Works, Gauteng	ERWAT	Project Manager & EAP

Project Name & Location	Client Name	Role
Golden Valley WEF Access Road near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Great Fish River Wind Farm Access Roads and Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Ilanga CSP Facility Watercourse Crossings near Upington, Northern Cape	Karoshoek Solar one	Project Manager & EAP
Modification of the existing Hartebeestfontein Water Care Works, Gautng	ERWAT	Project Manager & EAP
N10 Road Realignment for the Ilanga CSP Facility, East of Upington, Northern Cape	SANRAL	Project Manager & EAP
Nxuba (Bedford) Wind Farm Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Pollution Control Dams at the Medupi Power Station Ash Dump & Coal Stockyard, Limpopo	Eskom	Project Manager & EAP
Qoboshane borrow pits (EMPr only), Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Tsitsikamma Community WEF Watercourse Crossings, Eastern Cape	Cennergi	Project Manager & EAP
Clayville Central Steam Plant, Gauteng	Bellmall Energy	Project Manager & EAP
Msenge Emoyeni Wind Farm Watercourse Crossings and Roads, Eastern Cape	Windlab	Project Manager & EAP

Basic Assessments

Project Name & Location	Client Name	Role
Harmony Gold WWTW at Doornkop Mine, Gauteng	Harmony Doornkop Plant	Project Manager & EAP
Ofir-ZX Watercourse Crossing for the Solar PV Facility, near Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Qoboshane bridge & access roads, Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Relocation of the Assay Laboratory near Carletonville, Gauteng	Sibanye Gold	Project Manager & EAP
Richards Bay Harbour Staging Area, KwaZulu-Natal	Eskom Holdings	Project Manager & EAP
S-Kol Watercourse Crossing for the Solar PV Facility, East of Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Sonnenberg Watercourse Crossing for the Solar PV Facility, West Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP
Masetjaba Water Reservoir, Pump Station and Bulk Supply Pipeline near Nigel, Gauteng	Naidu Consulting Engineers	Project Manager & EAP
Access Road for the Dwarsug Wind Farm, Northern Cape Province	South Africa Mainsteam Renewable Power	Project Manager & EAP
Upgrade of the Cooling Water Treatment Facility at the Kriel Power Station, Mpumalanga	Eskom	Project Manager & EAP

Screening Studies

Project Name & Location	Client Name	Role
Roodepoort Open Space Optimisation Programme (OSOP) Precinct, Gauteng	TIMAC Engineering Projects	Project Manager & EAP
Vegetable Oil Plant and Associated Pipeline, Kwa-Zulu Natal	Wilmar Oils and Fats Africa	Project Manager & EAP

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Olifants River Water Resources Development Project (ORWRDP) Phase 2A: De Hoop Dam, R555 realignment and housing infrastructure	Department of Water and Sanitation	Project Manager Auditor
ECO for the Rehabilitation of the Blaaupan & Storm Water Channel, Gauteng	Airports Company of South Africa (ACSA)	Project Manager
Due Diligence reporting for the Better Fuel Pyrolysis Facility, Gauteng	Better Fuels	Project Manager
ECO for the Construction of the Water Pipeline from Kendal Power Station to Kendal Pump Station, Mpumalanga	Transnet	Project Manager
ECO for the Replacement of Low-Level Bridge, Demolition and Removal of Artificial Pong, and Reinforcement the Banks of the Crocodile River at the Construction at Walter Sisulu National Botanical Gardens, Gauteng Province	South African National Biodiversity Institute (SANBI)	Project Manager
External Compliance Audit of the Air Emission Licence (AEL) for a depot in Bloemfontein, Free State Province and in Tzaneen, Mpumalanga Province	PetroSA	Project Manager

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
WULA for the Izubulo Private Nature Reserve, Limpopo	Kjell Bismeyer, Jann Bader, Laurence Saad	Project Manager & EAP
WULA for the Masodini Private Game Lode, Limpopo	Masodini Private Game Lodge	Environmental Advisor
WULA for the Ezulwini Private Nature Reserve, Limpopo	Ezulwini Investments	Project Manager & EAP
WULA for the Masodini Private Game Lode, Limpopo	Masodini Private Game Lodge	Project Manager & EAP
WULA for the N10 Realignment at the Ilanga SEF, Northern Cape	Karoshoek Solar One	Project Manager & EAP
WULA for the Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP
S24G and WULA for the Ilegal construction of structures within a watercourse on EFF 24 Ruimsig Agricultural Holdings, Gauteng	Sorror Language Services	Project Manager & EAP

HOUSING AND URBAN PROJECTS

Basic Assessments

Project Name & Location	Client Name	Role
Postmasburg Housing Development, Northern Cape	Transnet	Project Manager & EAP

Compliance Advice and reporting

Project Name & Location	Client Name	Role
Kampi ya Thude at the Olifants West Game Reserve, Limpopo	Nick Elliot	Environmental Advisor

Project Name & Location	Client Name	Role
External Compliance Audit of WUL for the Johannesburg Country Club, Gauteng	Johannesburg Country Club	Project Manager

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Due Diligence Audit for the Due Diligence Audit Report, Gauteng	Delta BEC (on behalf of Johannesburg Development Agency (JDA))	Project Manager

ENVIRONMENTAL MANAGEMENT TOOLS

Project Name & Location	Client Name	Role
Development of the 3rd Edition Environmental Implementation Plan (EIP)	Gauteng Department of Agriculture and Rural Development (GDARD)	Project Manager & EAP
Development of Provincial Guidelines on 4x4 routes, Western Cape	Western Cape Department of Environmental Affairs and Development Planning	EAP
Compilation of Construction and Operation EMP for the Braamhoek Transmission Integration Project, Kwazulu-Natal	Eskom Holdings	Project Manager & EAP
Compilation of EMP for the Wholesale Trade of Petroleum Products, Gauteng	Munaca Technologies	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for Medupi Power Station, Limpopo	Eskom Holdings	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Dube TradePort Site Wide Precinct	Dube TradePort Corporation	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Kusile Power Station, Mpumalanga	Eskom Holdings	Project Manager & EAP
Review of Basic Assessment Process for the Wittekleibosch Wind Monitoring Mast, Eastern Cape	Exxaro Resources	Project Manager & EAP
Revision of the EMPr for the Sirius Solar PV	Aurora Power Solutions	Project Manager & EAP
State of the Environment (SoE) for Emalahleni Local Municipality, Mpumalanga	Simo Consulting on behalf of Emalahleni Local Municipality	Project Manager & EAP
Aspects and Impacts Register for Salberg Concrete Products operations	Salberg Concrete Products	EAP
First State of Waste Report for South Africa	Golder on behalf of the Department of Environmental Affairs	Project Manager & EAP
Responsibilities Matrix and Gap Analysis for the Kruisvallei Hydroelectric Power Generation Scheme, Free State Province	Building Energy	Project Manager
Responsibilities Matrix and Gap Analysis for the Roggeveld Wind Farm, Northern & Western Cape Provinces	Building Energy	Project Manager

PROJECTS OUTSIDE OF SOUTH AFRICA

Project Name & Location	Client Name	Role
Advisory Services for the Zizabona Transmission Project, Zambia, Zimbabwe, Botswana & Namibia	PHD Capital	Advisor
EIA for the Semonkong WEF, Lesotho	MOSCET	Project Manager & EAP
EMP for the Kuvaninga Energia Gas Fired Power Project, Mozambique	ADC (Pty) Ltd	Project Manager & EAP
Environmental Screening Report for the SEF near Thabana Morena, Lesotho	Building Energy	EAP
EPBs for the Kawambwa, Mansa, Mwense and Nchelenge SEFs in Luapula Province, Zambia	Building Energy	Project Manager & EAP
ESG Due Diligence for the Hilton Garden Inn Development in Windhoek, Namibia	Vatange Capital	Project Manager
Mandahill Mall Rooftop PV SEF EPB, Lusaka, Zambia	Building Energy	Project Manager & EAP
Monthly ECO for the PV Power Plant for the Mocuba Power Station	Scatec	Project Manager

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CURRICULUM VITAE OF NICOLENE VENTER

Profession : Public Participation and Social Consultant

Specialisation: Public participation process; stakeholder engagement; facilitation (workshops, focus group and public meetings; public open days; steering committees); monitoring and evaluation of public participation and stakeholder engagement processes

Work Experience: 21 years' experience as a Public Participation Practitioner and Stakeholder Consultant

VOCATIONAL EXPERIENCE

Over the past 21 years Nicolene established herself as an experienced and well recognised public participation practitioner, facilitator and strategic reviewer of public participation processes. She has experience in managing public participation projects and awareness creation programmes. Her experience includes designing and managing countrywide public participation and awareness creation projects, managing multi-project schedules, budgets and achieving project goals. She has successfully undertaken several public participation processes for EIA, BA and WULA projects. The EIA and BA process include linear projects such as the NMPP, Eskom Transmission and Distribution power lines as well as site specific developments such as renewable energy projects i.e. solar, photo voltaic and wind farms. She also successfully managed stakeholder engagement projects which were required to be in line with the Equator Principles.

SKILLS BASE AND CORE COMPETENCIES

- Project Management
- Public Participation, Stakeholder Engagement and Awareness Creation
- Public Speaking and Presentation Skills
- Facilitation (workshops, focus group meetings, public meetings, public open days, working groups and committees)
- Social Assessments (Stakeholder Analysis / Stakeholder Mapping)
- Monitoring and Evaluation of Public Participation and Stakeholder Engagement Processes
- Community Liaison
- IFC Performance Standards
- Equator Principles
- Minute taking, issues mapping, report writing and quality control

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- Higher Secretarial Certificate, Pretoria Technicon (1970)

Short Courses:

- Techniques for Effective Public Participation, International Association for Public Participation, IAP2 (2008)
- Foundations of Public Participation (Planning and Communication for Effective Public Participation, IAP2 (2009)
- Certificate in Public Relations, Public Relation Institute of South Africa, Damelin Management School (1989)

Professional Society Affiliations:

- Board Member of International Association for Public Participation (IAP2): Southern Africa

EMPLOYMENT

Date	Company	Roles and Responsibilities
November 2018 – current	Savannah Environmental (Pty) Ltd	Public Participation and Social Consultant <u>*Tasks include:*</u> *Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.* *Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.*
2016 – October 2018	Imaginative Africa (Pty) Ltd *(company owned by Nicolene Venter)*	Independent Consultant *Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements:* <u>*Tasks include:*</u> *Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.* *Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project*

		affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved *<u>Clients</u>:* *SiVEST Environmental, Savannah Environmental, Baagi Environmental; Royal Haskoning DHV (previously SSI)*
2013 - 2016	Zitholele Consulting *Contact person: Dr Mathys Vosloo* *Contact number: 011 207 2060*	Senior Public Participation Practitioner and Project Manager <u>Tasks included:</u> *Project managed public participation process for EIA/BA/WULA/EAL projects. Manages two Public Participation Administrators. Public Participation tasks as outlined as above and including financial management of public participation processes.*
2011 - 2013	Imaginative Africa (Pty) Ltd *(company owned by Nicolene Venter)*	Independent Consultant Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements <u>Tasks included:</u> *Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.* *Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved* *<u>Clients</u>:* *Bohlweki Environmental, Bembani Sustainability (Pty) Ltd; Naledzi Environmental*
2007 – 2011	SiVEST SA (Pty) Ltd *Contact person: Andrea Gibb* *Contact number: 011 798 0600*	Unit Manager: Public Participation Practitioner *<u>Tasks included:</u>* *Project managed public participation process for EIA/BA projects. Manages two Junior Public Participation Practitioners. Public Participation*

		tasks as outlined as above and including financial management of public participation processes.
2005 – 2006	Imaginative Africa (Pty) Ltd *(company owned by Nicolene Venter)*	Independent Consultant Public Participation and Stakeholder Engagement Practitioner <u>Tasks included:</u> *Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.* *Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.* <u>Clients</u>: *Manyaka-Greyling-Meiring (previously Greyling Liaison and currently Golder Associates)*
1997 - 2004	Imaginative Africa (Pty) Ltd *(company owned by Nicolene Venter)*	Independent Consultant: Public Participation Practitioner. <u>Tasks included:</u> *Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, affected landowners, etc.* *Managing interaction between Stakeholders and Team Members, liaising with National, Provincial Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical*

		information communicated to and consultation with all level of stakeholders involved. *<u>Clients</u>:* *Greyling Liaison (currently Golder Associates); Bembani Sustainability (Pty) Ltd; Lidwala Environmental; Naledzi Environmental*

PROJECT EXPERIENCE

<u>RENEWABLE POWER GENERATION PROJECTS: PHOTOVOLTAIC SOLAR ENERGY FACILITIES</u>

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Lichtenburg PVs (3 PVs) & Power Lines (grid connection), Lichtenburg, North West Province	*Atlantic Energy Partners* *EAP: Savannah Environmental*	*Project Manage the Public Participation Process* *Facilitate all meetings* *Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders*
Allepad PVs 4 PVs) & Power Lines (grid connection), Upington, Northern Cape Province	*IL Energy* *EAP: Savannah Environmental*	
Hyperion Solar PV Developments (4 PVs) and Associated Infrastructures, Kathu, Northern Cape Province	*Building Energy* *EAP: Savannah Environmental*	
Aggeneys Solar PV Developments (2 PVs) and Associated Infrastructures, Aggeneys, Northern Cape Province	*Atlantic Energy Partners and ABO Wind* *EAP: Savannah Environmental*	

Project Name & Location	***Client Name***	***Role***
Tlisitseng PV, including Substations & Power Lines, Lichtenburg, North West Province	*BioTherm Energy* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*
Sendawo PVs, including Substations & Power Lines, Vryburg, North West Province		
Helena Solar 1, 2 and 3 PVs, Copperton, Northern Cape Province		
Farm Spes Bona 23552 Solar PV Plants, Bloemfontein, Free State Province	*Surya Power* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*
De Aar Solar Energy Facility, De Aar, Northern Cape Province	*South Africa Mainstream Renewable Power Developments* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*
Droogfontein Solar Energy Facility, Kimberley, Northern Cape Province		
Kaalspruit Solar Energy Facility, Loeriesfontein, Northern Cape Province		
Platsjambok East PV, Prieska, Northern Cape Province		
Renosterburg PV, De Aar, Northern Cape Province	*Renosterberg Wind Energy Company* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*

19MW Solar Power Plant on Farm 198 (Slypklip), Danielskuil, Northern Cape Province	*Solar Reserve South Africa* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*

Basic Assessments and Environmental Management Programmes – Located within the Renewable Energy Development Zones (REDZ)

Project Name & Location	***Client Name***	***Role***
Moeding Solar PV Solar Energy Facility, Vryburg, North West Province	*Kabi Solar* *EAP: Savannah Environmental*	*Project Manage the Public Participation Process* *Facilitate all meetings* *Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders*
Sirius Solar PV Solar Energy Facility, Upington, Northern Cape Province	*SOLA Future Energy* *EAP: Savannah Environmental*	

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Aletta Wind Farm, Copperton, Northern Cape Province	*BioTherm Energy* *EAP: SiVEST*	*Public Participation*
Eureka Wind Farm, Copperton, Northern Cape Province		
Loeriesfontein Wind Farm, Loeriesfontein, Northern Cape Province	*South Africa Mainstream Renewable Power Developments* *EAP: SiVEST*	*Public Participation*
Droogfontein Wind Farm, Loeriesfontein, Northern Cape Province		
Four Leeuwberg Wind Farms, Loeriesfontein, Northern Cape Province		
Noupoort Wind Farm, Noupoort, Northern Cape Province		
Mierdam PV & Wind Farm, Prieska, Northern Cape Province		
Platsjambok West Wind Farm & PV, Prieska, Northern Cape Province		

Basic Assessments and Environmental Management Programmes – Located within the Renewable Energy Development Zones (REDZ)

Project Name & Location	**Client Name**	**Role**
Nama Wind Energy Facility, Northern Cape Province	*Genesis ECO* *EAP: Savannah Environmental*	*Project Manage the Public Participation Process* *Facilitate all meetings* *Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders*
Zonnequa Wind Energy Facility, Northern Cape Province		

Environmental Authorisation Amendments

Project Name & Location	***Client Name***	***Role***

Beaufort West 280MW Wind Farm into two 140MW Trakas and Beaufort West Wind Farms, Western Cape	*South Africa Mainstream Renewable Power Developments* *EAP: SiVEST*	*Public Participation*

RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Upington Concentrating Solar Plant and associated Infrastructures, Northern Cape Provionce	*Eskom Holdings* *EAP: Bohlweki Environmental*	*Public Participation*

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Pluto-Mahikeng Main Transmission Substation and 400kV Power Line (Carletonville to Mahikeng), Gauteng and North West Provinces	*Eskom Holdings* *EAP: Baagi Environmental*	
Thyspunt Transmission Lines Integration Project, Eastern Cape Province	*Eskom Holdings* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*
Westrand Strengthening Project, Gauteng Province		*Public Participation,*
Mookodi Integration Project, North-West Province		
Transnet Coallink, Mpumalanga and KwaZulu-Natal Provinces		
Delarey-Kopela-Phahameng Distribution power line and newly proposed Substations, North-West Province		*Public Participation, Landowner and Community Consultation*
Invubu-Theta 400kV Eskom Transmission Power Line, KwaZulu-Natal Province	*Eskom Holding* *EAP: Bembani Environmental*	

Facilitation

Project Name & Location	***Client Name***	***Meeting Type***
Bloemfontein Strengthening Project, Free State Province	*Eskom Holdings* *EAP: Baagi Environmental*	*Public Meetings*
Mooidraai-Smitkloof 132kV Power Line and Substation, Northern Cape Province	*Eskom Holdings* *EAP: SSI*	*Focus Group Meetings*
Aggeneis-Oranjemond 400kV Eskom Transmission Power Line, Northern Cape Province	*Eskom Holdings* *EAP: Savannah Environmental*	*Focus Group Meetings & Public Meetings*
Ariadne-Eros 400kV/132kV Multi-Circuit Transmission Power Line (Public Meetings)	*Eskom Holdings* *EAP: ACER Africa*	*Public Meetings*
Majuba-Venus 765kV Transmission Power Lines, Mpumlanaga Province		*Public Meetings*

Basic Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***

Melkhout-Kudu-Grassridge 132kV Power Line Project (project not submitted to DEA), Eastern Cape Province	*Eskom Holdings* *EAP: SiVEST*	*Public Participation, Landowner and Community Consultation*
Tweespruit-Welroux-Driedorp-Wepener 132Kv Power Line, Free State Province		*Public Participation, Landowner and Community Consultation*
Kuruman 132Kv Power Line Upgrade, Northern Cape Province	*Eskom Holdings* *EAP: Zitholele*	*Public Participation, Landowner and Community Consultation*
Vaalbank 132Kv Power Line, Free State Province		*Public Participation, Landowner and Community Consultation*
Pongola-Candover-Golela 132kV Power Line (Impact Phase), KwaZulu-Natal Province		*Public Participation, Landowner and Community Consultation*
Ndumo-Geziza 132kV Power Line, KwaZulu-Natal Province		*Public Participation, Landowner and Community Consultation*

Screening Studies

Project Name & Location	***Client Name***	***Role***
Potential Power Line Alternatives from Humansdorp to Port Elizabeth, Eastern Cape Province	*Nelson Mandela Bay Municipality* *EAP: SiVEST*	*Social Assessment*

CONVENTIONAL POWER GENERATION PROJECTS (COAL, GAS AND ASSOCIATED INFRASTRUCTURE)

Stakeholder Engagement

Project Name & Location	***Client Name***	***Role***
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	*Department of Water and Sanitation* *Golder Associates*	*Secretarial Services*
Orange River Bulk Water Supply System		
Levuvu-Letaba Resources Quality Objectives		

Facilitation

Project Name & Location	***Client Name***	***Meeting Type***
Thabametsi IPP Power Station, Limpopo Province	*Thabametsi Power Company* *EAP: Savannah Environmental*	*Focus Group Meeting & Public Meeting*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Richards Bay Combined Cycle Power Plant, Richards Bay, Kwa-Zulu Natal Province (Impact Phase)	*Eskom Holdings* *EAP: Savannah Environmental*	*Public Participation*
Medupi Flue Gas Desulphurisation Project (up to completion of Scoping Phase), Limpopo Province	*Eskom Holdings SOC Ltd* *EAP: Zitholele Consulting*	*Public Participation, Landowner and Community Consultation*
Kendal 30-year Ash Disposal Facility, Mpumalanga Province		
Kusile 60-year Ash Disposal Facility, Mpumalanga Province		

Camden Power Station Ash Disposal Facility, Mpumalanga Province		
Tutuka Fabric Filter Retrofit and Dust Handling Plant Projects, Mpumalanga Province	*Eskom Holdings SOC Ltd* *EAP: Lidwala Environmental*	*Public Participation, Landowner and Community Consultation*
Eskom's Majuba and Tutuka Ash Dump Expansion, Mpumalanga Province		*Public Participation, Landowner and Community Consultation*
Hendrina Ash Dam Expansion, Mpumalanga Province		*Public Participation, Landowner and Community Consultation*

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, RAILWAY LINES, ROADS, WATER RESOURCES, STORAGE FACILITIES, ETC)

Facilitation

Project Name & Location	***Client Name***	***Meeting Type***
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	*Department of Water and Sanitation* *Golder Associates*	*Secretarial Services*
Orange River Bulk Water Supply System	*Department of Water and Sanitation* *Golder Associates*	*Secretarial Services*
Levuvu-Letaba Resources Quality Objectives	*Department of Water and Sanitation* *Golder Associates*	*Secretarial Services*
SmancorCR Chemical Plant (Public Meeting), Gauteng Province	*Samancor Chrome (Pty) Ltd* *EAP: Environment al Science Associates*	*Public Meeting*
SANRAL N4 Toll Highway Project (2nd Phase), Gauteng & North West Provinces	*Department of Transport* *EAP:*	*Public Meetings*

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Transnet's New Multi-Products Pipeline traversing Kwa-Zulu Natal, Free State and Gauteng Provinces	*Transnet* *EAP: Bohlweki Environmental*	*Public Participation*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Realignment of the Bulshoek Dam Weir near Klawer and the Doring River Weir near Clanwilliam, Western Cape Province	*Dept of Water and Sanitation* *EAP: Zitholele*	*Public Participation*

MINING SECTOR

Environmental Impact Assessment and Environmental Management Programme

Project Name & Location	**Client Name**	**Role**
Zero Waste Recovery Plant at highveld Steel, Mpumalanga Province	*Anglo African Metals* *EAP: Savannah Environmental*	*Public Participation*
Koffiefontein Slimes Dam, Free State Province	*Petra Diamond Mines* *EAP: Zitholele*	*Public Participation*

Baobab Project: Ethenol Plant, Chimbanje, Middle Sabie, Zimbabwe	*Applicant: Green Fuel* *EAP: SiVEST*	*Public Participation & Community Consultation*
BHP Billiton Energy Coal SA's Middelburg Water Treatment Plant, Mpumalanga	*BHP Billiton Group* *EAP: Jones & Wagener*	*Public Participation*

Short CV/Summary of Expertise – Simon Todd

ECOLOGICAL SPECIALIST SERVICES

Assessment/Management/Research

Simon Todd Pr.Sci.Nat

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60 Forrest Way
Glencairn
7975

Ecological Solutions for People & the Environment

Professional Profile

Simon Todd has extensive experience in biodiversity management and ecological assessment across South African ecosystems. This includes a variety of broad-scale strategic assessments and best-practice guidelines for a range of industries. In addition, Simon Todd has conducted a large amount of research on the impacts of land-use on biodiversity and has published numerous scientific papers in international peer-reviewed journals on this topic. Simon Todd is a recognised ecological expert and is a past chairman and current executive committee member of the Arid-Zone Ecology Forum and has over 20 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Recent notable projects include:

- First-author of a book chapter on the ecological impacts of Shale Gas development on the Karroo of South Africa. (2017)
- Co-author on the Biodiversity chapter of the Shale Gas SEA being conducted by CSIR. (2016)
- Co-author on the Eskom Grid Infrastructure SEA, managed by CSIR. (2016)
- Co-author on the Wind and Solar SEA, managed by CSIR. (2015)

Abbreviated CV

- Profession: Independent Ecological Consultant - Pr.Sci.Nat 400425/11
- Specialisation: Plant & Animal Ecology
- Years of Experience: 20 Years

Skills & Primary Competencies

- Research & description of ecological patterns & processes in Thicket, Savannah Nama Karoo, Succulent Karoo, Arid Grassland and Fynbos Ecosystems.
- Ecological Impacts of land use on biodiversity and provision of associated management advice.

- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

Tertiary Education:

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

Employment History

- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute
- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2007-Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.
- 2010-Present – Self-employed as consultant and sole proprietor of Simon Todd Consulting, which has conducted more than 150 specialist assessments.

General Experience & Expertise

- Lead ecologist on several SEA chapters, including Eskom Grid Infrastructure, Wind and Solar SEA and Shale Gas SEA.
- Conducted a large number of fauna and flora specialist assessments distributed widely across South Africa. Projects have ranged in extent from <50 ha to more than 50 000 ha.
- Widely-recognized ecology specialist. Published numerous peer-reviewed scientific publications based on various ecological studies across the country. Past chairman of the Arid Zone Ecology Forum and current executive committee member.
- Extensive field and personal experience across a broad range of South African ecosystems, with particular focus on the Western, Northern and Eastern Cape.
- Strong research background which has proved invaluable when working on ecologically sensitive and endangered ecosystems, habitats and species.
- Published numerous research reports as well as two book chapters and a large number of papers in leading scientific journals dealing primarily with human impacts on the vegetation and ecology of South African ecosystems.
- Maintain several long-term vegetation monitoring projects which have led to several publications.
- Guest lecturer at two universities and have also served as an external examiner.
- Reviewed papers for more than 12 international ecological journals.
- SACNASP registered as a Professional Natural Scientist, (Ecology) No. 400425/11.

Current Committees

- SANBI Vegmap Committee – 2015 – present
- CSIR Wind and Solar SEA Phase II advisory committee – 2016-present
- AZEF deputy chair – 2012-present
- SANBI Karoo Biogaps Taxon leads' committee and executive committee member.

Recent & Relevant Outputs & Publications

Strategic Environmental Assessments

Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.

Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.

Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.

Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.

Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

Specialist Fauna and Flora Assessments:

Specialist Ecological studies for many different developments distributed across the country including:

- Over 30 Wind Energy projects
- More than 60 Solar Energy developments
- More than 30 different housing, roads, mining and other infrastructure development projects.
- More than 20 electricity transmission infrastructure projects.

A full list of projects is available on request.

SHORT CV/SUMMARY OF EXPERTISE

Simon Todd Pr.Sci.Nat
Director & Principle Scientist
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7975

Ecological Solutions for People & the Environment

Eric Herrmann

Eric Herrmann is an avifaunal specialist with over 15 years of experience in biodiversity research and conservation in the Northern Cape. He completed a B.Tech Degree in Nature Conservation (1997) at the Cape Technikon, followed by a Masters in Conservation Ecology at the University of Stellenbosch (2004). He has worked as a research assistant for the Endangered Wildlife Trust (1999-2001) in the Kgalagadi Transfrontier Park, and then for the Percy FitzPatrick Institute of African Ornithology (University of Cape Town) as project manager of a field research centre near Kimberley (2003 to 2006). In 2006 he joined the provincial Department of Environment and Nature Conservation (DENC) in Kimberley as a faunal scientist until 2012. Since 2016 he has been working independently as an avifaunal specialist largely on wind and solar energy projects in the Western and Northern Cape.

Tertiary Education:

- 1994 - 1997 – National Diploma: Nature Conservation (cum laude), Cape Technikon
- 1998 - 1999 – B.Tech Degree: Nature Conservation (cum laude), Cape Technikon
- 2000 - 2004 – MFor: Conservation Ecology (cum Laude), University of Stellenbosch

Employment History

- 2016 - Present – Independent contractor, avifaunal specialist for renewable energy projects.
- 2006 - 2012 – Senior Conservation Scientist, Department of Environment and Nature Conservation, Kimberley.
- 2003 - 2006 – Research Assistant and Field Projects Manager, Percy Fitzpatrick Institute of African Ornithology, Cape Town
- 2001 - 2002 – Field Researcher, Deciduous Fruit Producers Trust, Stellenbosch.
- 1999 - 2001 – Research Assistant, Endangered Wildlife Trust, Johannesburg.

Recent Specialist Avifaunal Studies include the following:

- Dassieklip Wind Facility. Avifaunal post-construction monitoring. BTE Wind Pty (Ltd). 2018/19.
- Excelsior Wind Facility. Avifaunal pre-construction monitoring. BTE Wind Pty (Ltd). 2018/19.
- Kathu Hyperion Solar PV Facility, Kathu. Fauna and Flora EIA Process. Cape EAPrac 2018.
- Gaetsewe Solar PV Facility, Kathu. Avifaunal Scoping Report. Cape EAPrac 2018.
- Mogara Solar PV Facility, Kathu. Avifaunal Scoping Report. Cape EAPrac 2018.

- Mamre Wind Facility. Avifaunal pre-construction monitoring. Mulilo Renewable Project Developments. 2017.
- Soventix Solar PV Facility (De Aar). Avifaunal Specialist Scoping and EIA Reports. Ecoleges. 2017.
- Olifantshoek-Emil 132kV power line, Olifantshoek. Fauna and Flora BA process. Savannah Environmental 2017.
- Klondike (Vryburg) Solar PV Facility. Ecological Specialist Report for EIA. Cape EAPrac 2016.

savannah environmental

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CURRICULUM VITAE OF SHAUN TAYLOR

Profession : Environmental and Permitting Lead Consultant

Specialisation: Environmental Impact Assessments; Strategic Environmental Assessments; Environmental permitting compliance, advice & assurance; Water Use Licenses; Project Management; Wetland Assessments.

Work Experience: Eleven (11) years' experience in the environmental field

OCATIONAL EXPERIENCE

Shaun's highest qualification is a Master of Science Degree in Aquatic Health. Shaun has an in-depth understanding of environmental and water related South African legislation. Applicable legislation includes the National Environmental Management Act, 1998 (Act No. 107 of 1998), the Environmental Impact Assessment (EIA) Regulations (2006, 2010 and 2014, as amended) and the National Water Act, 1998 (Act No. 36 of 1998). Over and above a number of other projects, Shaun has successfully conducted and obtained environmental approvals for numerous renewable energy (wind and solar) developments as well as for infrastructure (roads, water pipeline and power line) related projects. Shaun has excellent experience in dealing with the entire environmental authorization (EA) process from beginning to end i.e. submission of applications, undertaking Environmental Impact Assessments and Basic Assessments (BAs), conducting EA amendments, extension applications and compiling Draft and Final Environmental Management Programmes (EMPrs). Shaun is well acquainted and experienced in dealing with the key provincial and national environmental authorities, other organs of state as well as any other key stakeholders.

Within the water field, Shaun has completed numerous water use license applications (WULAs), General Authorisations (GAs), Risk Assessments and WULA compliance monitoring for various developments. Shaun is also specialised in wetland ecology and operates as a wetland specialist. Shaun has undertaken and completed numerous wetland and riparian assessments for renewable energy, linear projects as well as site specific projects. Shaun has also undertaken a wetland offset plan and several wetland rehabilitation plans for various developments.

SKILLS BASE AND CORE COMPETENCIES

- Environmental Project Management
- Environmental Impact Assessments and Basic Assessments
- Environmental Management Programmes
- Environmental Compliance Monitoring
- Environmental Amendments
- Strategic Environmental Assessments
- Environmental Management
- Public and Stakeholder Engagement
- Water Use License Applications
- General Authorisations

- Risk Assessment Matrix
- Wetland Delineation, Functional and Impact Assessments
- Geographic Information Systems (GIS)

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- M.Sc. Aquatic Health, University of Johannesburg, Johannesburg (2011)
- B.Sc (Hons) Geography and Environmental Studies, University of Witwatersrand, Johannesburg (2010)
- B.A Geography and Environmental Science, Monash University, Johannesburg (2008)

Short Courses:

- National Training and Development Buffer Zone Workshop, Eco-pulse (2015)
- Integrated Water Resources Management (IWRM), the National Water Act (NWA), and Water Use Authorisations, focusing on Water Use License Applications – Procedures, Guidelines, Integrated Water and Waste Management Plan (IWWMP), Carin Bosman Sustainable Solutions (2014)
- Grass identification short course, Bushveld Eco Services (2010)
- Wildflower identification short course, Bushveld Eco Services (2010)
- Veld management short course, Bushveld Eco Services (2010)
- Short course and certification in Wetland Delineation and Rehabilitation Training Course from the School of Continuing Education, University of Pretoria (2008)

Professional Society Affiliations:

- Member of the South African Wetland Society (SAWS) (Current)
- Registration pending with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Scientist (Current)

Other Relevant Skills:

- Project Management Course, SiVEST (2017)

EMPLOYMENT

Date	Company	Roles and Responsibilities
June 2018 - Current:	Savannah Environmental (Pty) Ltd	Environmental and Permitting Lead Consultant *Tasks include: undertaking strategic environmental assessments, environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, environmental screening and due diligence assessments, water use license applications, wetland assessments and rehabilitation plans. Ensuring environmental compliance on permitting processes. Client liaison and relationship management.*
November 2010 – May 2018	SiVEST South Africa (Pty) Ltd	Environmental Scientist *Tasks included: conducting environmental impact assessments, basic assessments and water use license application processes, undertaking amendment and exemption*

Date	Company	Roles and Responsibilities
		applications, general project management, report writing, marketing and proposal writing, client liaison and relationship management, invoicing, conducting specialist riparian/wetland delineation and functional assessments, environmental and water related compliance monitoring and auditing.
October 2009 – March 2010	*Envirokey cc*	Junior Environmental Consultant and GIS support *Tasks included: being responsible for managing basic assessments, report writing, conducting specialist wetland assessments, auditing procedures and GIS mapping.*
August 2007 – September 2009	Holgate Meyer and Associates Environmental Management Services	Junior Environmental Consultant *Tasks included: being responsible for managing basic assessments, report writing, conducting specialist wetland assessments, environmental auditing procedures and GIS mapping.*

PROJECT EXPERIENCE

Project experience includes environmental approvals for numerous renewable energy (wind and solar) developments as well as for infrastructure (roads, water pipeline and power line) related projects. Within the water field, project experience includes numerous water use license applications, general authorisations, risk assessments and compliance monitoring for various developments. In terms of wetland assessments, project experience includes numerous wetland and riparian delineation, functional and impact assessments for renewable energy, linear projects and site-specific projects. The wetland experience also includes a wetland offset plan and several wetland rehabilitation plans (various types of developments).

RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Loeriesfontein Photovoltaic (PV) Plant, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*
Renosterberg PV Plant near De Aar, Northern Cape Province	*Renosterberg Wind Energy Corporation (RWEC) & Industrial Development Corporation (IDC) of South Africa*	*Environmental consultant, public participation, wetland specialist*
Droogfontein II - 70MW Solar Photovoltaic Power Plant near Kimberley, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*
Construction of a Concentrated PV/ PV Plant in De Aar, Northern Cape	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Proposed development of a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, public participation, wetland specialist*
Proposed development of a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, public participation, wetland specialist*
Loeriesfontein 70MW PV Plant, Northern Cape Province	*Biotherm Energy*	*Environmental consultant*
Droogfontein II - 70MW Solar Photovoltaic Power Plant near Kimberley, Northern Cape Province	*SunEdison*	*Project leader, environmental consultant*

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Integrated Water Use License Application for the Construction of a Concentrated PV/ PV Plant in De Aar, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*
Proposed Construction of the De Wildt Solar Photovoltaic Power Plant, General Authorisation and Risk Assessment, Gauteng Province	*SunEdison*	*Project leader, environmental consultant, wetland specialist*
Loeriesfontein Photovoltaic (PV) Plant Vegetation Permits, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant*
Droogfontein II 70MW Solar Photovoltaic Power Plant near Kimberley Vegetation Permits, Northern Cape Province	*SunEdison*	*Environmental consultant*

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Noupoort Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant & public participation*
Loeriesfontein Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*
Khobab Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*
Renosterberg Wind Farm near De Aar, Northern Cape Province	*Renosterberg Wind Energy Corporation (RWEC) & Industrial Development Corporation (IDC) of South Africa*	*Environmental consultant, public participation, wetland specialist*
Ithemba Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*
Harte Beeste Leegte Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*

Gras Koppies Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*
Xha! Boom Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, public participation, wetland specialist*

Screening Studies

Project Name & Location	***Client Name***	***Role***
Environmental Constraints Analysis Report for the establishment of four Wind Farms in the Northern and Eastern Cape Provinces	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*

Compliance Advice and ESAP reporting

Project Name & Location	***Client Name***	***Role***
Noupoort Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental advisor*

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Water Use License for the Dwarsrug Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*
Water Use License for the Victoria West Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*
Khobab Wind Farm Vegetation Permits, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant*
Loeriesfontein Wind Farm Vegetation Permits, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Environmental consultant*

RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Integrated Water Use License Application for the Construction of a CPV/ PV Plant in De Aar, Northern Cape Province of South Africa	*Mainstream Renewable Power South Africa*	*Environmental consultant, wetland specialist*
Water Use License for the Rooipunt Concentrated Solar Power Project, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, wetland specialist*
Water Use License for the Limestone Concentrated Solar Power Project, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, wetland specialist*

CONVENTIONAL POWER GENERATION PROJECTS (COAL)

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Proposed Installation of a 500m³ Bulk Storage Fuel Oil Tank at Grootvlei Power Station, Mpumalanga Province	*Eskom Generation*	*Environmental consultant, wetland specialist*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Water Use License Compliance Auditing for Grootvlei Power Station, Mpumalanga Province, South Africa	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*
Kusile Power Station Armcor Water Use License Compliance Audit, Mpumalanga Province	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*
Kusile Power Station Ash Dump Water Use License Compliance Audit, Mpumalanga Province	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*
Kusile Power Station Pollution Dams Water Use License Compliance Audit, Mpumalanga Province	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*
Kusile Power Station Stream Diversion and Water Pipeline Crossings Water Use License Compliance Audit, Mpumalanga Province	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*
Kusile Power Station Geotechnical Water Use License Compliance Audit, Mpumalanga Province	*Eskom Generation*	*Project leader, environmental auditor, wetland specialist*

GRID INFRASTRUCTURE PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Mookodi Integration Project Environmental Impact Assessment, North West Province	*Eskom Distribution*	*Environmental consultant, wetland specialist*
Eskom Thyspunt Nuclear Integration Project – Transmission and Substation Infrastructure (Northern and Southern Corridor), Eastern Cape Province	*Eskom Transmission*	*Environmental consultant, wetland specialist*

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Frankfort Strengthening Project: 88kV Power Line from Heilbron (via Frankfort) to Villiers, Free State Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*
Wilger 132kV Overhead Distribution Power Line, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Project leader, environmental consultant, wetland specialist*
Limestone 1 – 132kV Overhead Distribution Power Line, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, wetland specialist*
Limestone 2 – 132kV Overhead Distribution Power Line, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Environmental consultant, wetland specialist*
Proposed Tweespruit to Welroux Power Line and Substations, Free State Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*
Proposed Construction of a 132kV Power Line and Associated Infrastructure for the evacuation of power from the proposed 200MW Concentrated	*SolarReserve South Africa (Pty) Ltd*	*Project leader, environmental consultant, wetland specialist*

Solar Power (CSP) Plant on the Farm Rooipunt Number 617 near Upington, Northern Cape Province		
Loeriesfontein 132kV Power Line, Northern Cape Province	*Biotherm Energy*	*Project leader, environmental consultant, wetland specialist*
Proposed Construction of a 132kV Power Line and Associated Infrastructure for the evacuation of power from the Kalkaar Concentrating Solar Thermal Power Project on the Remainder of Portion 1 of the Farm Kalkaar 389 near Jacobsdal, Free State and Northern Cape Provinces	*SolarReserve South Africa (Pty) Ltd*	*Project leader, environmental consultant, wetland specialist*
Droogfontein II – 132kV power line and substation near Kimberley, Northern Cape Province	*SunEdison*	*Project leader, environmental consultant*
Mookodi Integration Project II – 132kV Power Line, Havelock Loop-in/Loop-out, Ganyesa Substation, North West Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Environmental Compliance Auditing for the Nigel Substation to Jameson Park (Inland Terminal 2) 88kV power lines	*Eskom Distribution*	*Environmental auditor*
Ga-rankuwa 11kV Underground Power Cable Water Use License Compliance Audit, Gauteng Province	*Eskom Distribution*	*Project leader, environmental auditor*

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Water Use License / General Authorisation for Ga-rankuwa Substation, Gauteng Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*
Water Use License / General Authorisation for Klevebank to Dalkieth 88kV Power Line, Gauteng Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*
Water Use License Application for the Frankfort Strengthening Project: 88kV Power Line from Heilbron (via Frankfort) to Villiers, Free State Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*
Water Use License / General Authorisation Proposed Tweespruit to Welroux Power Line and Substations, Free State Province	*Eskom Distribution*	*Project leader, environmental consultant, wetland specialist*

<u>MINING SECTOR PROJECTS</u>

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	***Client Name***	***Role***
Karowe Diamond Mine Environmental Management Plan Review and Update, Boteti District, Botswana	*Karowe Diamond Mine*	*Environmental consultant*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Post-rehabilitation Assessment of Three Wetland Crossing Sites for the Re-working of a Tailings Dam Project near Stilfontein, North West Province	*Chemwes (Pty) Ltd*	*Environmental auditor*

TRANSPORT SECTOR PROJECTS

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Polokwane Integrated Rapid Public Transport Network, Limpopo Province	*City of Polokwane*	*Environmental consultant, wetland specialist*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Transnet Rail Water Use License Compliance Audit, Northern Cape Province	*Hatch-Goba / Transnet*	*Environmental auditor*

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Water Use Licensing for the Polokwane Integrated Rapid Public Transport Network, Limpopo Province	*City of Polokwane*	*Environmental consultant, wetland specialist*
General Authorisation for the proposed eThekwini Integrated Rapid Public Transport Network (IRPTN) - BRT Phase 1: Route C1A, General Authorisation and Risk Assessment, Kwa-Zulu Natal Province	*Nako Iliso*	*Environmental consultant, wetland specialist*

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)

Basic Assessments

Project Name & Location	***Client Name***	***Role***
Sir Lowry's Pass River Flood Alleviation Project, Western Cape Province	*City of Cape Town*	*Environmental consultant*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Wetland Post-rehabilitation Assessment of the Inland New Multi-Purpose Pipeline in the Mpumalanga and Gauteng Provinces	*Transnet SOC Ltd*	*Wetland specialist*

HOUSING AND URBAN PROJECTS

Screening Studies

Project Name & Location	***Client Name***	***Role***
Social Housing Projects in Sasolburg and Secunda, Gauteng Province	*Provincial Department of Human Settlements*	*Environmental consultant, wetland specialist*

INDUSTRIAL PROJECTS

Basic Assessments

Project Name & Location	***Client Name***	***Role***
SPAR Distribution Centre, Port Elizabeth, Eastern Cape Province	*SPAR Group Ltd*	*Project leader, environmental consultant, wetland specialist*

Environmental Compliance, Auditing and ECO

Project Name & Location	***Client Name***	***Role***
Environmental Compliance Auditing for the Meadow Feeds Standerton Broiler Feed Mill, Mpumalanga Province	*Meadow Feeds*	*Environmental consultant, wetland specialist*

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	***Client Name***	***Role***
Water Use License for the SPAR Distribution Centre, Port Elizabeth, Eastern Cape Province	*SPAR Group Ltd*	*Project leader, environmental consultant, wetland specialist*
Water Use License for the Proposed Tissue Manufacturing Capacity at the Kliprivier Operations Base, General Authorisation and Risk Assessment, Gauteng Province	*Twinsaver Group*	*Project leader, environmental consultant, wetland specialist*

ENVIRONMENTAL MANAGEMENT TOOLS

Strategic Environmental Assessments

Project Name & Location	***Client Name***	***Role***
Molemole Local Municipality Strategic Environmental Assessment, Limpopo Province	*Capricorn District Municipality*	*Environmental consultant, wetland specialist*
Blouberg Local Municipality Strategic Environmental Assessment, Limpopo Province	*Capricorn District Municipality*	*Environmental consultant, wetland specialist*

SPECIALIST STUDIES

Wetland and Riparian Delineation, Functional and Impact Assessments

Project Name & Location	***Client Name***	***Role***
Surface Water Assessment for the Construction of a Wind Farm in Prieska, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Construction of a Wind Farm in Loeriesfontein, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Construction of a 132KV Distribution Line from the Kudu Substation to Dorstfontein Substation in Mpumalanga Province	*Eskom Distribution*	*Wetland specialist*
EIA for the Thyspunt Transmission Lines Integration Project: Surface Water Impact Assessment Report – EIA – Northern Corridor: Eastern Cape Province	*Eskom Transmission*	*Wetland specialist*
EIA for the Thyspunt Transmission Lines Integration Project: Surface Water Impact Assessment Report – EIA – Southern Corridor: Eastern Cape Province	*Eskom Transmission*	*Wetland specialist*

Surface Water Assessment for the Construction of a CSP and a CPV/ PV Plant in De Aar, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Environmental Management Framework for the Mogale City Local Municipality Surface Water Report – Desired State Report: Gauteng Province	*Mogale City*	*Wetland specialist*
Surface Water Assessment for the Proposed Township Development on the Remainder of Portion 27 of the Farm Middelburg and Townsland 287 JS, Mpumalanga Province	*Steve Tshwete Local Municipality*	*Wetland specialist*
Surface Water Assessment for the Construction of a CSP and a CPV/ PV Plant in De Aar, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Construction of a CSP and a CPV/ PV Plant in Kimberley, Northern Cape Province, South Africa	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Westrand Strengthening Project from Westgate Substation to Hera Substation and Westgate Substation Extension, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Mookodi Integration Project 2 Basic Assessment Surface Water Impact Assessment, North West Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Construction of a Gabion Structure at Waterval Substation in the Midrand Area, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Single 400kV Power Line from Borutho to Nzhlele, North West Province	*Eskom Transmission*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of an 88kv Power Line at Palmridge in the Ekurhuleni Metropolitan Municipality, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province	*SolarReserve South Africa (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Rebuilding of an 88kV Power Line from Henneman Substation to Serfontein Substation near Kroonstad, Free State Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Deconstruction and Construction of an 11kV Power Line near Delmas, Mpumalanga Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Solar Photovoltaic Power Plant near De Aar, Northern Cape Province, South Africa	*Renosterberg Wind Energy Corporation (RWEC) & Industrial Development Corporation (IDC) of South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Wind Farm near De Aar, Northern Cape Province	*Renosterberg Wind Energy Corporation (RWEC) & Industrial Development*	*Wetland specialist*

	Corporation (IDC) of South Africa	
Surface Water Assessment for the Proposed Construction of a Low-Cost Housing Development in the Soutpan area of Tshwane, Gauteng Province	*Makole Property Development*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 132kV Power Line near Kimberley, Northern Cape Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Extension of Delmas Substation and Associated Power Lines, Mpumalanga Province, South Africa	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Substation in the Midrand area of Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Construction of an 88kV Power Line at Lochvaal Kudu in the Emfuleni Municipality, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed construction of an 88kV Power Line from Klevebank Substation to Dalkeith Substation, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of an 88kV Power Line from Heilbron Substation to Villiers Substation, Free State Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 132kV Power Line, Substation and the Extension of Homestead Substation Associated with the 75MW Concentrating Photovoltaic (CPV) / Photovoltaic (PV) Plant (PV 3) on the Farm Droogfontein in Kimberley, Northern Cape Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Moddershaft Underground to Overhead Cable Replacement of an 11kV Power Line from Moddershaft Substation to a Minisub near Anzac, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of an 11kV Underground Power Cable from Civic Centre to Zola Substation, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Substation on Portion 265 Randjesfontein 405-JR, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Mathibestad Danhauser 33kV Power Line Network, North West Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Mathibestad-Danhauser Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Mothutlung North Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Mothutlung South Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*

Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Nonyane Madidi North Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Nonyane Swartdam Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Rebuild of a Section of the Existing 33kV Pelly Klipdrift Network, Gauteng and North West Provinces	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Zonderwater Kraal Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Hammanskraal Lusthof Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of a Section of the Existing 33kV Klipgat Circle Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Re-build of Sections of the Existing 33kV Erasmus Aviva Power Line Network, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of an 11kV Underground Power Cable at the Ga-Rankuwa Substation, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Mamatwan Manganese Mine, Northern Cape Province	*Groundwater Consulting Services (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Dwarsrug Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Manzimtoti Sewer Line Project, Kwa-Zulu Natal Province	*Environmental Planning and Design cc*	*Wetland specialist*
Surface Water Assessment for the Compensation Flats Development, Kwa-Zulu Natal Province	*Tongaat Hulett*	*Wetland specialist*
Surface Water Assessment for the Tinley Manor South Road Development, Kwa-Zulu Natal Province	*Tongaat Hulett*	*Wetland specialist*
Surface Water Assessment for the Ntuzuma Sewer Line Project, Kwa-Zulu Natal Province	*Environmental Planning and Design cc*	*Wetland specialist*
Surface Water Assessment for the Esphiva Sewer Line Project, Kwa-Zulu Natal Province	*Environmental Planning and Design cc*	*Wetland specialist*
Frankfort 132kV Power Line Wetland Walk-down Assessment, Free State Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Esphiva Water Pipeline near Ulundi, KwaZulu-Natal Province	*Environmental Planning and Design cc*	*Wetland specialist*
Surface Water Assessment for the Grootvlei Power Station, Mpumalanga Province	*Eskom Generation*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Embangweni and Bhekabantu Irrigation Schemes, KwaZulu-Natal Province	*Nzingwe Consultancy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Nondabuya and Khwehle	*Nzingwe Consultancy*	*Wetland specialist*

Primary Agriculture Schemes, KwaZulu-Natal Province		
Surface Water Assessment for the Proposed Expansion of the Makhathini Irrigation Scheme, KwaZulu-Natal Province	*Nzingwe Consultancy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Mbaliyezwe Irrigation Schemes, KwaZulu-Natal Province	*Nzingwe Consultancy*	*Wetland specialist*
Surface Water Assessment for the Proposed Mixed Use Development on the Remainder of Portion 27 of the Farm Middelburg Town and Townlands 287 JS, Steve Tshwete Local Municipality in the Mpumalanga Province	*Steve Tshwete Local Municipality*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of Two Power Lines and Two Substations for the Mainstream Wind Facilities near Beaufort West, Western Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed eThekwini Integrated Rapid Transport Network (IRPTN) – Bus Rapid Transport (BRT) Phase 1: Route C1A, KwaZulu-Natal Province	*Nako Iliso*	*Wetland specialist*
Surface Water Assessment for the Proposed Coal Railway Siding at the Welbedacht Marshalling Yard and associated Milder Road Upgrade near Springs, Gauteng Province	*Canyon Coal*	*Wetland specialist*
Surface Water Assessment for the Proposed Development of a 22kV Medium Voltage Power Line in Mofofutso, North West Province	*Eskom Distribution*	*Wetland specialist*
Wetland Walk-down Assessment for the Mookodi Integration Power Line Project, North West Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Coal Loading Facility within the existing Bronkhorstspruit Railway Siding near Bronkhorstspruit, Gauteng Province	*Canyon Coal*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Two 75MW Tlisitseng Solar Photovoltaic Energy Facilities near Lichtenburg, North West Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Two 75MW Sendawo Solar Photovoltaic Energy Facilities near Lichtenburg, North West Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Sendawo Solar Substation and associated 400kV Power Line near Lichtenburg, North West Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Helena 1, 2 & 3 Photovoltaic Energy Facilities near Copperton, Northern Cape Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 70MW Photovoltaic Facility and	*Mainstream Renewable Power South Africa*	*Wetland specialist*

132kV Power Line near Loeriesfontein, Northern Cape Province		
Surface Water Assessment for the Proposed Expansion of the Tissue Manufacturing Capacity at the Kliprivier Operations Base, Gauteng Province	*Twinsaver Group*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Eureka West 140MW Wind Farm near Copperton, Northern Cape Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Eureka East 140MW Wind Farm near Copperton, Northern Cape Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Eureka 132kV Power Line near Copperton, Northern Cape Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Aletta 140MW Wind Farm near Copperton, Northern Cape Province	*Biotherm Energy*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Ithemba Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Harte Beeste Leegte Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Gras Koppies Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Xha! Boom Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Expansion of the Mountain Valley "A" Grade Chicken Abattoir on the Remainder of Subdivision of Portion 17 (of 16) of the Farm Leeuw Poort 1120 FT, KwaZulu-Natal Province	*Shangoni Management Services (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a Linking Station, Power Lines and Substations for the Mainstream Wind Energy Facilities near Beaufort West, Western Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction 132kV Power Lines and a Substation for Tsakane Ext 10 and 22, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Harte Beeste Leegte Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Ithemba Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Gras Koppies Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*

Surface Water Assessment for the Proposed Construction of the Xha! Boom Wind Farm, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the SPAR Distribution Centre, Port Elizabeth, Eastern Cape Province	*SPAR Group Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 140MW Wind Farm and Associated Infrastructure near Hutchison, Northern Cape Province	*Mainstream Renewable Power South Africa*	*Wetland specialist*
Surface Water Assessment for the Proposed Maintenance of the Water Pipeline in Parys, Ngwathe Local Municipality, Free State Province	*Gedezar Consulting*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the Rietkuil Coal Railway Siding near Bronkhorstspruit, Gauteng Province	*Canyon Coal*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 75MW Solar Photovoltaic Power Plant near Dennilton, Limpopo Province	*Nokukhanya Energy (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of a 9.9 MW Solar Photovoltaic (PV) Energy Facility on the Farm Wildebeestkuil near Leeudoringstad, North West Province	*Leeudoringstad Solar Plant (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of up to a 5MW Solar Photovoltaic (PV) Energy Facility on Portion 37 of the Farm Leeuwbosch No. 44 near Leeudoringstad, North West Province	*Leeudoringstad Solar Plant (Pty) Ltd*	*Wetland specialist*
Surface Water Assessment for the Proposed Construction of the De Wildt Solar Photovoltaic Power Plant, Gauteng Province	*SunEdison*	*Wetland specialist*

Wetland and Riparian Rehabilitation Plans

Project Name & Location	***Client Name***	***Role***
Wetland and River Rehabilitation Plan for the Fourways 22kV Feeder Cable, Gauteng Province	*Eskom Distribution*	*Wetland specialist*
Wetland and Riparian Rehabilitation Plan for the Proposed eThekwini Integrated Rapid Transport Network (IRPTN) – Bus Rapid Transport (BRT) Phase 1: Route C1A, KwaZulu-Natal Province	*eThekwini Metropolitan Municipality*	*Wetland specialist*
Wetland Rehabilitation Plan for the Delmas Pedestrian Bridge, Mpumalanga Province	*Canyon Coal*	*Wetland specialist*
Wetland Remediation Plan for the Graspan Colliery Extension on the Remaining Extent of Portion 31 on the Farm Elandspruit 291 JS, Mpumalanga Province	*GiBB*	*Wetland specialist*

Wetland Offset Plans

Project Name & Location	***Client Name***	***Role***

Wetland Offset Plan for the Proposed Construction of the SPAR Distribution Centre, Port Elizabeth, Eastern Cape Province	*SPAR Group Ltd*	*Wetland specialist*

savannah environmental

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CURRICULUM VITAE OF GIDEON RAATH

Profession : Environmental and Permitting Consultant

Specialisation: Environmental Impact Assessments, Water Use Licencing, Waste Licencing, Environmental Compliance Officer, Ecological Specialist, Wetland Specialist, GIS, MPRDA permitting

Work Experience: 4.5 years' experience in environmental management, National Water Act, Mineral and Petroleum Resources Development Act, ECO and compliance auditing, wetland and ecological specialist reporting

VOCATIONAL EXPERIENCE

Gideon holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). His MSc thesis focused on the hydrological impact on the spatial distribution of invasive Eucalyptus trees along the Breede River, while his honours thesis evaluated ethnobotanical relationships around the Rio Tinto copper mine in Phalaborwa. Most recently he has worked as an Environmental Consultant at EOH Coastal and Environmental Services (EOH CES), conducting environmental authorisations applications (NWA, NEMA, MPRDA), Public Participation Processes, GIS specialisation as well as Ecological and Wetland specialist studies. Previously, Gideon worked as the Monitoring & Evaluation Project Manager for the City of Cape Town's invasive species unit (Environmental Resources Management Department).

Gideon's GIS background includes the management of the City of Cape Town invasive species GIS database, involving the storage, management, recall and quality control off all sightings, clearance visits and known infestations. Further experience include mapping for various consulting projects, boundary verification through ground-truthing and the spatial mapping and delineation component of this MSc research. Gideon has further attended public participation workshops, and has been involved with IAP identification, translation, public meetings and engagement for a variety of projects, mainly within the Afrikaans speaking Northern Cape. Gideon is interested in invasion ecology, treatment of groundwater pollution through phytoremediation, botanical and wetland specialist studies, GIS application for ecology and environmental management, and the EIA processes in general.

SKILLS BASE AND CORE COMPETENCIES

- Environmental Management
- GIS data manipulation, storage, management and mapping
- EIA Impact Assessments and Basic Assessment
- Environmental Management Programmes
- Environmental Compliance Monitoring
- Mining Rights, Mining Permits, Prospecting Rights (and renewal) applications (MPRDA & NEMA)
- Public and Stakeholder Engagement (NEMA)
- Ecological/Botanical Specialist Studies

- Wetland Delineation, Functional and Impact Assessment studies
- Water Use Licence Applications (NWA)
- General Authorisations (NWA)

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- M.Sc. Geography and Environmental Science (2014), Stellenbosch University (2014)
- B.Sc. (Hons) Ecology, Environment and Conservation (Cum Laude), University of the Witwatersrand (2011)
- B.Sc. Life and Environmental Sciences, University of Johannesburg (2010)

Short Courses:

- GroundTruth SASS5 competency course, GroundTruth Aquatic Consulting (2017)
- DWS 21C&I GA training workshop, Department of Water and Sanitation (2016)
- IAIAsa Public Participation Process Workshop, IAIA South Africa (2016)
- EIA Theory and application, EOH Coastal and Environmental Services (2015)
- Water Safety Training, City of Cape Town Environmental Resources Department (2014)
- Herbicide safety and application for weed control, City of Cape Town Environmental Resources Department (2014)
- Snake awareness training, City of Cape Town Environmental Resources Department (2014)
- Habitable Planet Workshop, Applied Centre for Climate & Earth Systems Science, Cape Town (2011)

Professional Society Affiliations:

- Golden Key International Honour Society – University of the Witwatersrand Chapter
- South African Council for Scientific Natural Professionals (SACNASP): Certified Natural Scientist – Pr.Sci.Nat. (Membership No.: 117178)
- IAIAsa (Membership No.: 3619)

Other Relevant Skills:

- GPS use, spatial data capturing and ground truthing

EMPLOYMENT

Date	Company	Roles and Responsibilities
October 2018 - Current:	Savannah Environmental (Pty) Ltd	Environmental and Permitting Consultant <u>Tasks include</u>: Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, wetland assessments, botanical/ecological assessments, mining rights and permit applications, prospecting rights applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management.

Date	Company	Roles and Responsibilities
February 2015 – September 2018	EOH Coastal and Environmental Services (Pty) Ltd	Senior Environmental Consultant Tasks included: Undertaking environmental impact assessments, basic assessments, environmental management programmes (EMPrs), environmental amendments, water use license applications, general authorisations, wetland assessments, botanical/ecological assessments, mining rights and permit applications, prospecting rights applications, environmental compliance officer audits and reporting, Ensuring environmental compliance on permitting processes, client liaison and relationship management, public participation processes for environmental authorisations.
March 2014 – February 2015	Invasive Species Unit (ISU), Environmental Resources Management Department (ERMD), City of Cape Town	Professional Officer Tasks included: Managed the Monitoring & Evaluation project portfolio, entailing the establishment of an invasive species monitoring & evaluation system for the ISU, as well as GIS database management, quality assurance and reporting thereof. Position required managing a small staff compliment (dealing directly with GIS database management), managing time and budgets for the monitoring division, conducting monitoring trials and research, writing species management plans as well as handling the GIS database, quality control, verification and integrity for the ISU.
January 2012 – March 2014	University of Stellenbosch	Departmental Assistant Tasks included: Technical editing of academic reports. Formatting of PhD and MSc reports on a weekly basis, with short turnaround time and good quality feedback.
January 2011 – January 2012	University of the Witwatersrand	Departmental Assistant Tasks included: Responsible for practical tutorials and marking of 1st year medical students. Included zoology and botany.
January 2006 – November 2010 (part time)	Codeon Networking CC	Co-founder and web developer Tasks included: Small business owner, responsible for all facets of the business. Self-taught HTML, CSS, PHP and MySQL. Won and produced two medium enterprise websites serving the gaming community. Websites required user profiles & permissions, CMS system and automated payment options as functionality. Development

Date	Company	Roles and Responsibilities
		and maintenance of a user database and account management system.

PROJECT EXPERIENCE

Project experience includes project management, EIA, BA and EMPr documentation development, integrated water use license applications, general authorisations, specialist botanical and ecological impact assessments, specialist wetland delineation and impact assessments, GIS applications and mapping, compliance auditing and monitoring, vegetation rehabilitation and monitoring plans, integrated waste management plans and waste licencing, mining right & permits, as well as prospecting rights applications.

Industry experience includes the waste sector (IWMP's and waste licencing), road and rail infrastructure (BAR, S&EIR, WUL/GA, Waste Licence), ports and harbours (management plans), private sector clients across varying industries (various permits), mining sector (BAR, S&EIR, mining permits and rights, prospecting rights), conservation sector (biodiversity plans), renewable energy industry (BAR, S&EIR) as well as the gas and oil industry (biodiversity reports).

RENEWABLE POWER GENERATION PROJECTS: SOLAR ENERGY FACILITIES

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Enel Paleisheuwel Solar compliance auditing, Paleisheuwel, Northern Cape	Enel Green Power RSA (EGP RSA)	Environmental consultant

RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
G7 Brandvalley S&EIR, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Environmental consultant
G7 Rietkloof S&EIR, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Environmental consultant

Basic Assessments

Project Name & Location	Client Name	Role
G7 Renewable Energy 132kV BAR & EMPr, Matjiesfontein, Northern Cape	G7 Renewable Energy (Pty) Ltd	Project Manager, Environmental consultant, Public Participation

Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Biotherm Energy Golden Valley Wind Energy Facility ESAP, Bedford, Eastern Cape	Biotherm Energy Pty Ltd	Environmental consultant

Amendments

Project Name & Location	Client Name	Role

Mosselbay Energy EA Amendment, Mosselbay, Western Cape	Mosselbay Energy IPP (Pty) Ltd	Environmental consultant

GAS PROJECTS

Screening Studies

Project Name & Location	Client Name	Role
iGas integrated biodiversity screening, Saldanha, Western Cape	Central Energy Fund - iGas (subsidiary)	Environmental consultant, Faunal specialist (assistant)

MINING SECTOR PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Triton Minerals Limited Ancuabe and Nicanda Hills EPDA, Ancuabe, Cabo Del Gado Province, Mozambique	Triton Minerals Ltd	Environmental consultant
Ancuabe graphite mine Environmental and Social Impact Assessment (ESIA), Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Environmental consultant

Basic Assessments

Project Name & Location	Client Name	Role
SANRAL material sourcing BAR (DMR), Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, Environmental consultant, Public Participation
SANRAL Bierspruit R510 Borrow Pit authorisation, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Almenar tin prospecting BAR, Carnarvon, Northern Cape	Almenar Property Investments (Pty) Ltd	Environmental consultant

Rehabilitation Studies

Project Name & Location	Client Name	Role
Ancuabe baseline vegetation monitoring assessment and programme, Ancuabe, Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Botanical specialist
Prospecting pit rehabilitation programme, Ancuabe, Cabo Del Gado Province, Mozambique	Grafex Limitada Mozambique	Botanical specialist, Environmental consultant
Mayfield Quarry rehabilitation plan, Grahamstown, Eastern Cape	Mayfield Quarry	Environmental consultant

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Construction monitoring and DMR environmental authorisation, Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, ECO,
SANRAL Caledon N2 Section 3 road upgrade ECO Audits and Reporting, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, ECO

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
VMC Mining permit renewal application, Rust De Winter, Gauteng	Vergenoeg Mining Company (Pty) Ltd	Environmental consultant
Zirco Resources Kamiesberg heavy mineral sand mine water use licence, Kamiesberg, Northern Cape	Zirco Roode Heuwel (Pty) Ltd	Environmental consultant

INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
S&EIR authorisation for the SANRAL Zandkraal-Windburg N1 road upgrade, Windburg, Free State Province	SANRAL SOC Ltd & SMEC Consulting Engineers	Project Manager, Environmental consultant, Public Participation
Thabazimbi Local Municipality Integrated Waste Management Plan, Thabazimbi, Limpopo Province	Thabazimbi Local Municipality & Anglo American Plc	Environmental consultant, Public Participation

Basic Assessments

Project Name & Location	Client Name	Role
SANRAL Masekwaspoort N1 Road Upgrade BA, Louis Trichardt, Limpopo Province	SANRAL SOC Ltd & Knight Piésold Consulting	Project Manager, Environmental consultant, Public Participation
SANRAL Polokwane N1 Ring Road Upgrade Basic Assessment, Polokwane, Limpopo Province	SANRAL SOC Ltd & KBK Engineers	Environmental consultant
Boshoek Loop Rail Upgrade BAR, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Wetland specialist, Public Participation
Heysterkrand Loop Rail Upgrade BAR, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Public Participation
SANRAL Bierspruit R510 road upgrade Basic Assessment, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Barberton IAPS Waste Water Treatment Works development BAR, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Project Manager, Environmental consultant, Public Participation
SANRAL Caledon N2 Section 3 road upgrade project Basic Assessment, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, Environmental consultant, Ecological specialist, ECO

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Construction Monitoring and DMR environmental authorisation, Hendrina, Mpumalanga Province	SANRAL SOC Ltd & Leo consulting engineers	Project Manager, Environmental consultant, ECO

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Water use licence for the SANRAL Zandkraal-Windburg N1 road upgrade and quarrying, Windburg, Free State Province	SANRAL SOC Ltd & SMEC Consulting Engineers	Project Manager, Environmental consultant, Public Participation
SANRAL Masekwaspoort N1 road upgrade water use licence application, Louis Trichardt, Limpopo Province	SANRAL SOC Ltd & Knight Piésold Consulting	Project Manager, Environmental consultant, Public Participation
Boshoek Loop Rail Upgrade water use licence application, Rustenburg, North-West Province	Transnet SOC Ltd	Project Manager, Environmental consultant, Wetland specialist, Public Participation
SANRAL Bierspruit R510 road water use licence, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Project Manager, Environmental consultant, Ecological specialist, Public Participation
Barberton IAPS Waste Water Treatment Works water use licence and SASS 5 assessment, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Project Manager, Environmental consultant, Aquatic specialist, Public Participation
SANRAL Caledon N2 Section 3 road upgrade water use licence and specialist reports, Caledon, Western Cape Province	JG Afrika Engineering	Project Manager, Environmental consultant, Ecological specialist, Public Participation

HOUSING AND URBAN PROJECTS

Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Scoping and EIR authorisation, Water Use Licence, for the Ganspan tourism facility development, Jan Kempdorp, Northern Cape	Frances Baard Local Municipality	Project Manager, Environmental consultant, Public Participation

Basic Assessments

Project Name & Location	Client Name	Role
Basic Assessment for the office complex development within the Pretoria National Botanical Gardens, Pretoria, Gauteng	South African National Biodiversity Institute (SANBI)	Project Manager, Environmental consultant, Public Participation, ECO
Corner Berg and Drooge Street township development BAR, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant, Public Participation
Corner Kort and Bree Street township development BAR, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant, Public Participation
Hope Village township development BAR, Johannesburg, Gauteng	Door of Hope Charity Organisation	Project Manager, Environmental consultant, Public Participation
ACSA Jones Road Filling Station Basic Assessment, Johannesburg, Gauteng	Airports Company South Africa SOC Ltd	Project Manager, Environmental consultant, Public Participation

Screening Studies

Project Name & Location	Client Name	Role
Kibler Park Church Development ecological assessment, Johannesburg, Gauteng	Riverside Community Church	Project Manager, Ecological specialist
DEA Quoin Point dune specialist assessments, Gansbaai, Western Cape	Department of Environmental Affairs (national)	Project Manager, Environmental consultant

Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
Transnet Depot and Siding compliance auditing programme, Johannesburg, Gauteng & Rustenburg, North-West Province	Transnet SOC Ltd	ECO
Environmental compliance monitoring for the office complex development within the Pretoria National Botanical Gardens, Pretoria, Gauteng	South African National Biodiversity Institute (SANBI)	Project Manager, Environmental consultant, Public Participation, ECO

Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Atmospheric Emissions Licence, Section 24G for the ER Galvanizing plant and operations, Johannesburg, Gauteng	ER Galvanizers Pty Ltd	Project Manager, Environmental consultant, Public Participation
City of Johannesburg nature reserve proclamation (Phase II), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Project Manager, Environmental consultant, Public Participation, Botanical specialist
Hope Village township development water use licence, Johannesburg, Gauteng	Door of Hope Charity Organisation	Project Manager, Environmental consultant, Public Participation
Diamond Park Township Development Section 24G, Kimberley, Northern Cape	Sol Plaatje Local Municipality	Project Manager, Environmental consultant, Public Participation
Boschendal Wine Estate hydro-electric power station Water Use Licence and S24G application, Stellenbosch, Western Cape	Boschendal Wine Estate	Environmental consultant
City of Johannesburg nature reserve proclamation boundary verification (Phase I), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Environmental consultant
PRDW Cape Town harbour breakwater rehabilitation EMPr, Cape Town, Western Cape	PRDW Engineering	Project Manager, Environmental consultant
PRDW Bushman's Estuary dune encroachment project management, Kenton-on-sea, Eastern Cape	PRDW Engineering	Environmental consultant
Corner Berg and Drooge Street township development water use licence application, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant
Corner Kort and Bree Street township development water use licence, Zeerust, North-West Province	Ramotshere Moiloa Local Municipality	Project Manager, Environmental consultant
Bloekombos (Kraaifontein) hospital water use licence application, Cape Town, Western Cape	Western Cape Provincial Government (PGWC)	Project Manager, Environmental consultant, Botanical specialist, Wetland specialist

SPECIALIST STUDIES

Project Name & Location	Client Name	Role
Boshoek Loop Rail Upgrade BAR and Water Use Licence, Rustenburg, North-West Province	Transnet SOC Ltd	Wetland specialist
City of Johannesburg nature reserve proclamation (Phase II), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	Botanical specialist
SANRAL Bierspruit R510 road upgrade Water Use Licence, Basic Assessment, Thabazimbi, Limpopo Province	SANRAL SOC Ltd & Royal HaskoningDHV South Africa	Ecological specialist
Kibler Park Church Development Ecological Assessment, Johannesburg, Gauteng	Riverside Community Church	Ecological specialist
Barberton IAPS Waste Water Treatment Works development BAR, water use licence and SASS 5 assessment, Barberton, Mpumalanga Province	Umjindi Local Municipality and Rhodes University	Aquatic specialist
Wijnberg Trust Dam 2 expansion Aquatic Impact Assessment	Wijnberg Trust	Aquatic specialist
SANRAL Caledon N2 Section 3 road upgrade project Basic Assessment, Water Use Licence and Specialist reports, Caledon, Western Cape Province	JG Afrika Engineering	Ecological specialist
City of Johannesburg nature reserve proclamation boundary verification (Phase I), Johannesburg, Gauteng	City of Johannesburg SOC Ltd	GIS specialist
iGas integrated biodiversity screening, Saldanha, Western Cape	Central Energy Fund - iGas (subsidiary)	Faunal specialist (assistant)
Bloekombos (Kraaifontein) botanical baseline and impact assessment, Cape Town, Western Cape	Western Cape Provincial Government (PGWC)	Wetland specialist Botanical specialist

CURRICULUM VITAE: D G Paterson

SURNAME: PATERSON
FIRST NAME(S): David Garry
KNOWN AS: Garry
DATE OF BIRTH: 25-08-1959 in Bellshill, Scotland
NATIONALITY: South African
I.D. No.: 5908255258088
LANGUAGE PROFICIENCY: English, Afrikaans (both fluent), French (poor)
MARITAL STATUS: Married, one son

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E-MAIL ADDRESS: garry@arc.agric.za

ACADEMIC QUALIFICATIONS:

- Matriculated: 1976, Dalziel High School, Motherwell, Scotland
- BSc (Hons) Geography, 1980, University of Strathclyde, Glasgow, Scotland
- MSc (Soil Science) *cum laude*, 1998, University of Pretoria
- PhD (Soil Science), 2014, University of Pretoria

PROFESSIONAL CAREER:

- 1981-1987: Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1987-1992: Senior Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1992-present: Senior Soil Scientist: ARC-Institute for Soil, Climate & Water

FIELDS OF SPECIALITY AND COMPETENCE:

- Soil classification and mapping
- Soil interpretations
- Soil survey project management
- Environmental assessment
- Soil survey and land capability course presentation
- Ground penetrating radar

PUBLICATIONS (see attached list):

- Three refereed articles (S.A. Journal of Plant and Soil)
- Nine Congress papers/posters
- S.A. Soil Classification (1991) (Member of working group)
- Seven 1:250 000 Land Type Maps
- Three Land Type Memoirs
- More than 200 soil survey reports and/or maps

COURSES COMPLETED:

- Course in Project Management (University of Stellenbosch)
- Course in Junior Personnel Management (Dept of Agriculture)
- Course in Handling of Grievances and Complaints (Dept of Agriculture)
- Course in Marketing (ARC-ISCW)
- Course in National Qualifications Framework Assessment, ARC-CO
- Training Course in Ground Penetrating Radar (GSSI, USA)
- Introduction to ArcGIS 8, GIMS, 2004

PROFESSIONAL STATUS:

- Registered Natural Scientist: Soil Science (SA National Council for Natural Scientific Professions) – registration number 400463/04
- Member of South African Soil Classification Working Group, 1990-present
- Convenor of South African Soil Classification Working Group, 2013-
- Member of Soil Science Society of South Africa (1982-present)
- President of Soil Science Society of South Africa (2005-2007)
- Member of South African Soil Survey Organisation (2000-present)
- Council Member of South African Soil Survey Organisation (2002-2003)
- Member of International Erosion Control Association
- Scientific Referee, S.A. Journal for Plant and Soil
- External Examiner, University of Pretoria, University of Witwatersrand, University of Venda

AWARDS:

Best article on Soil Science, South African Journal for Plant and Soil, 2011

MISCELLANEOUS:

- Editor, Soil Science Society newsletter, 1993-present
- Member, Clapham High School (Pretoria) Governing Body 1998-2002
- Member, Northern Gauteng Football Referee's Association
- Committee Member, Rosslyn Golf Club (Club Champion 2002 and 2007)

INTERESTS:

Sport, especially golf and soccer; wildlife; reading; music

REFEREES:

Mr T.E. Dohse, ARC-Institute for Soil, Climate and Water.
Tel: 082 324 5389

Prof Robin Barnard, ARC-Institute for Soil, Climate and Water
Tel: 012 310 2549

Prof M.C. Laker (retired), (012) 361-2900; 082 785 5295

PUBLICATIONS LIST:

Refereed Articles:

BüHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E., 1993. Pedogenic differences between two adjacent basalt-derived profiles. 1. Textural and chemical characteristics. *S. Afr. J. Plant & Soil*, 10: 155-161

BüHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E., 1994. Pedogenic differences between two adjacent basalt-derived profiles. 2. Mineralogical characteristics. *S. Afr. J. Plant & Soil*, 11: 5-11

PATERSON, D.G. & LAKER, M.C., 1999. Using ground penetrating radar to investigate spoil layers in rehabilitated mine soils. *S. Afr. J. Plant & Soil*, 16:131-134.

PATERSON, D.G., BüHMANN, C., PIENAAR, G.M.E. & BARNARD, R.O., 2011. Beneficial effect of palm geotextiles on inter-rill erosion in South African soils and mine dam tailings: a rainfall simulator study. *S. Afr. J. Plant & Soil*, 28: 181-189.

PATERSON, D.G. & BARNARD, R.O., 2011. Beneficial effect of palm geotextiles on inter-rill erosion in South African soils . *S. Afr. J. Plant & Soil*, 28: 190-197.

BHATTACHARRYA, R., FULLEN, M.A., BOOTH, C.A., KERTESZ, A., TOTH, A., SZALAI, Z., JAKAB, G., KOZMA, K., JANKAUSKAS, B., JANKAUSKIENE, G., BÜHMANN, C., PATERSON, D.G., MULIBANA, N.E., NELL, J.P., VAN DER MERWE, G.M.E., GUERRA, A.J.T., MENDONCA, J.K.S., GUERRA, T.T., SATHLER, R., BEZERRA, J.F.R., PERES, S.M., ZHENG YI, LI YONGMEI, TANG LI, PANOMTARANICHAGUL, M., PEUKRAI, S., THU, D.C., CUONG, T.H., TOAN, T.T., 2011. Effectiveness of biological geotextiles for soil and water conservation in different agro-environments. *Land Degradation and Development*, 22: 495-504.

FULLEN, M.A., SUBEDI, M., BOOTH, C.A., SARSBY, R.W., DAVIES, K., BHATTACHARRYA, R., KUGAN, R., LUCKHURST, D.A., CHAN, K., BLACK, A.W., TOWNROW, D., JAMES, T., POESEN, J., SMETS, T., KERTESZ, A., TOTH, A., SZALAI, Z., JAKAB, G., JANKAUSKAS, B., JANKAUSKIENE, G., BÜHMANN, C., PATERSON, D.G., MULIBANA, N.E., NELL, J.P., VAN DER MERWE, G.M.E., GUERRA, A.J.T., MENDONCA, J.K.S., GUERRA, T.T., SATHLER, R., BEZERRA, J.F.R., PERES, S.M., ZHENG YI, LI YONGMEI, TANG LI, PANOMTARANICHAGUL, M., PEUKRAI, S., THU, D.C., CUONG, T.H., TOAN, T.T., JONSYN-ELLIS, F., SYLVA, J.T., COLE, A., MULHOLLAND, B., DERALOVE, M., CORKILL, C. & TOMLINSON, P., 2011. Utilising biological geotextiles: introduction to the Borassus Project and global perspectives. *Land Degradation and Development*, 22: 453-462.

SMETS, T., POESEN, J., BHATTACHARRYA, R., FULLEN, M.A., SUBEDI, M., BOOTH, C.A., KERTESZ, A., SZALAI, Z., TOTH, A., JANKAUSKAS, B., JANKAUSKIENE, G., GUERRA, A.J.T., BEZERRA, J.F.R., ZHENG YI, PANOMTARANICHAGUL, M., BÜHMANN, C. & PATERSON, D.G., 2011. Evaluation of biological geotextiles for reducing runoff and soil loss under various environmental conditions using laboratory and field data. *Land Degradation and Development*, 22: 480-494.

NETHONONDA. L.O., ODHIAMBO, J.J.O. & PATERSON, D.G., 2012. Indigenous knowledge of climatic conditions for sustainable crop production under resource-poor farming conditions using participatory techniques. *Sustainable Agriculture Research,* 2 (1), 26-31.

NETHONONDA, L.O., ODHIAMBO, J.J.O. & PATERSON, D.G., 2012. Assessment of spatial

variability of selected soil chemical properties in a communal irrigation scheme under resource-poor farming conditions in Vhembe District of Limpopo Province, South Africa. *African J. Agric. Res.* 7 (39), 5445-5492.

PATERSON, D.G., SMITH. H.J. & VAN GREUNEN, A., 2013. Evaluation of soil conservation measures on a highly erodible soil in the Free State province, South Africa. *S. Afr. J. Plant & Soil*, 30: 213-217.

PATERSON, D.G., TURNER, D.P., WIESE, L.D., VAN ZIJL, G.M., CLARKE, C.E. & VAN TOL, J., 2014. Spatial soil information in South Africa – situational analysis, limitations and challenges. *S. Afr. J. Science* (in press).

Books:

PATERSON, D.G. & MUSHIA, N.M., 2012. Chapter 32. Soil databases in Africa. *In: Handbook of Soil Science: Resource Management and Environmental Impacts (2nd Edn). Eds. P.M. Huang, Y Li & M.E. Sumner.* CRC Press, Boca Raton FL.

SOIL CLASSIFICATION WORKING GROUP*, 1991. Soil classification. A taxonomic system for South Africa. Institute for Soil, Climate & Water, Pretoria.

* Co-author as member of Working Group

Theses:

PATERSON, D.G., 1998. The use of ground penetrating radar to investigate subsurface features in selected South African soils. Unpublished MSc Thesis, University of Pretoria.

PATERSON, D.G., 2014. The use of palm leaf mats in soil erosion control. Unpublished PhD Thesis, University of Pretoria.

Congress Papers:

PATERSON, D.G., 1987. The relationship between geology and soil type in the northern Kruger National Park. 14th Congress of the Soil Science Society of S.A. Nelspruit, 14-17 July 1987.

PATERSON, D.G., 1990. A study of black and red clay soils on basalt in the northern Kruger National Park. 16th Congress of the Soil Science Society of S.A. Pretoria, 9-12 July 1990.

PATERSON, D.G., 1992. The potential of ground penetrating radar as an aid to soil investigation. 17th Congress of the Soil Science Society of S.A. Stellenbosch, 28-30 Jan.1992.

PATERSON, D.G., 1995. The complex soil mantle of South Africa. ARC Wise Land Use Symposium, Pretoria, 26-27 Oct. 1995

PATERSON, D.G. & LAKER, M.C., 1998. Locating subsoil features with ground penetrating radar. 21st Congress of the Soil Science Society of S.A. Alpine Heath, 20-22 Jan. 1998.

PATERSON, D.G., 2000. Mapping rehabilitated coal mine soils in South Africa using ground penetrating radar. Eighth International Conference on Ground Penetrating Radar, Gold Coast, Australia, 23-26 May 2000.

PATERSON, D.G. & VAN DER WALT, M., 2003. The soils of South Africa from the Land Type Survey. 24th Congress of the Soil Science Society of S.A., Stellenbosch, 20-24 Jan. 2003.

Land Type Maps:

PATERSON, D.G., 1990. 1:250 000 scale land type map 2230 Messina. Dept. Agriculture, Pretoria.

PATERSON, D.G. & HAARHOFF, D., 1989. 1:250 000 scale land type map 2326 Ellisras. Dept. Agriculture, Pretoria.

PATERSON, D.G., PLATH, B.L. & SMITH, H.W., 1987. 1:250 000 scale land type map 2428 Nylstroom. Dept. Agriculture, Pretoria.

PATERSON, D.G. & ROSS, P.G., 1989. 1:250 000 scale land type map 2330 Tzaneen. Dept. Agriculture, Pretoria.

PLATH, B.L. & PATERSON, D.G., 1987. 1:250 000 scale land type map 2426 Thabazimbi. Dept. Agriculture, Pretoria.

Land Type Memoirs:

PATERSON, D.G., PLATH, B.L. & SMITH, H.W., 1988. Field Investigation. In: *Land types of the maps 2426 Thabazimbi & 2428 Nylstroom. Mem. Agric. Nat. Res. S. Afr.* No. 10. Dept. Agriculture, Pretoria.

PATERSON, D.G., SCHOEMAN, J.L., TURNER, D.P., GEERS, B.C. & ROSS, P.G., 1989. Field Investigation. In: *Land types of the maps 2330 Tzaneen & 2430 Pilgrim's Rest. Mem. Agric. Nat. Res. S. Afr.* No. 12. Dept. Agriculture, Pretoria.

PATERSON, D.G., 1999. 1:250 000 land type survey of the former Ciskei (Unpublished). ISCW Report GW/A/99/24.

Also:

PATERSON, D.G., 1992. Ground penetrating radar applications in USA and South Africa. Report on an official study tour to USA, 13-29 July, 1991. ISCW Report GW/A/92/8.

PATERSON, D.G., 2000. Report on official overseas visit to GPR2000 Conference, Broadbeach, Australia, 23-26 May, 2000. ISCW Report GW/A/2000/40.

Plus ARC-ISCW Reports on:

- Ground penetrating radar investigations in: Kruger National Park; Enseleni, Natal; Weatherly, Maclear; Kleinkopje Mine

- Soil survey investigations at: Roodeplaat, Kathu, Steelpoort River, Palala River, Zeekoegat (Roodeplaat), Limpopo River, Lydenburg, Kendal, Clewer Sand (Witbank), Botha Sand (Witbank), Balmoral Colliery, Bafokeng (Rustenburg), Towoomba (Warmbaths), Hoeveld Stene (Middelburg), Quality Bricks (Witbank), Visagie Sand (Middelburg), Rosslyn, Coalbrook (Sasolburg), Stewart Coal (Delmas), Forzando Coal (Hendrina), Vaalgro (Vereeniging), Ratanda (Heidelberg), Elspark (Boksburg), Thorncliffe Mine (Steelpoort), Jan Smuts Quarry (Boksburg), Ennerdale (Phase I & II), Thokoza, North Riding, Natalspruit (Alberton), Arnot, Kroondal (Phase I & II), Ga-Rankuwa, Hartebeespoort Dam,

Kosmos, Assen, Grasmere, Magalies Moot (Pretoria), Valpre (Paulpietersburg), Cargo Carriers (Sasolburg), Waterval (Rustenburg), Rayton, Bronkhorstspruit, Zwavelpoort (Pretoria), Pietersburg, Trojan Mine (Steelpoort), Platinum Highway (Rustenburg), Moutse, Centurion, Salique (Klaserie), Northam, Greenside Colliery (Witbank), South Deep Mine (Westonaria), Bank Colliery, Steelpoort Platinum, Gautrain Route (Pta/Jbg), Rietspruit Mine (Ogies), Potgietersrus Platinum, Atok Mine (Lebowa), Blue Ridge Mine (Groblersdal), Ngodwana, Estancia (Breyton), Twickenham Mine (Steelpoort), Marikana.

ENVIRONMENTAL PLANNING AND DESIGN

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.

Qualifications

Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979)
	Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (South Africa)
	Chartered Member of the Landscape Institute (UK)
	Certified Environmental Assessment Practitioner of South Africa.
	Member of the International Association of Impact Assessment, South Africa

Languages	English	- Speaking	-	Excellent
		- Reading	-	Excellent
		- Writing	-	Excellent

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Key Experience

Jon qualified as a Landscape Architect at Cheltenham (UK) in 1979. He has been a Chartered Member of the Landscape Institute (UK) since 1986. He is also a registered Landscape Architect and Environmental Assessment Practitioner of South Africa.

During the early part of his career (1981 – 1990) he worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He worked in the United Kingdom (1990 – 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiry for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Bill.

His more recent VIA work in Africa (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations, a number of commercial and residential developments as well as numerous renewable energy projects.

VIA work undertaken during the last twelve months includes assessments for several proposed Eskom power lines / substations and numerous solar and wind energy projects.

Relevant Landscape & Visual Impact Assessment (LVIA) Projects

1. **Paulputs CSP Power Tower project** – LVIA for a 200MW CSP power tower facility near Pofadder in the Northern Cape.
2. **Karoshoek Solar Valley** – LVIA for nine CSP projects including power tower and parabolic trough projects in the Karoshoek Solar Valley near Upington in the Northern Cape.
3. **Noupoort CSP** – LVIA for two CSP parabolic trough facilities close to Noupoort in the Northern Cape.
4. **Sol Invictus Solar** – LVIA for four 150MW photovoltaic solar arrays near Aggeneys in the Northern Cape for a private client
5. **Tshivhaso Power Station** – LVIA for a proposed new 600MW power station including associated infrastructure and dumps near Lephalale in the Limpopo Province for a private client.
6. **Woodhouse Solar** – LVIA for two 100MW photovoltaic solar arrays near Vryburg in the North West Province for a private client.
7. **Saldanha Eskom Network Strengthening Project** – LVIA for major improvements to Eskom's electrical infrastructure between Langebaan and Saldanha in the Western Cape for Eskom.
8. **Albany Solar Array** – LVIA for two 75MW photovoltaic solar arrays near Upington in the Northern Cape.
9. **Mpophomeni Shopping Centre** – LVIA for a proposed new shopping center to the south of Midmar Dam in KwaZulu Natal for a private client.
10. **Gunstfontein Wind Farm** – LVIA for a 200MWnd farm near Sutherland in the Northern Cape for a orivate client.
11. **Hennenman Solar Array** – LVIA for a proposed solar array in the Free State for a private client.
12. **Moorreesburg Wind Farm** – LVIA for a proposed wind energy project in the Western Cape for a private client.
13. **Lethabo Solar Array** – LVIA for a proposed solar array at the Lethabo Power Station in the Free State for Eskom.
14. **Tutuka Solar Array** – LVIA for a proposed solar array at the Tutuka Power Station in Mpumalanga for Eskom.
15. **Majuba Solar Array** – LVIA for a proposed solar array at the Majuba Power Station in Mpumalanga for Eskom.
16. **Isundu 765 / 400Kv Sub Station** - LVIA for a proposed major substation in KwaZulu Natal for Eskom.
17. **Bhangazi Lake Tourism Development** – Visual impact assessment for a proposed lodge development within the Isimangaliso Wetland Park World Heritage Site. This work is ongoing.
18. **Quarry Development for the Upgrade of Sani Pass –** Visual Impact Assessments for two proposed quarry developments on the edge of the uKhalamba-Drakensburg World Heritage Site.
19. **Mtubatuba to St Lucia Overhead Power Line** – Visual Impact Assessment for a proposed power line bordering on the Isimangaliiso Wetland Park World Heritage Site for

Eskom.

20. **St Faiths 400/132 kV Sub-Station and Associated Power Lines** - Visual Impact Assessment for a proposed new major sub-station and approximately 15km of overhead power line for Eskom.
21. **Clocolan to Ficksburg Overhead Power Line** – Visual Impact Assessment for a proposed power line for Eskom.
22. **Solar Plant Projects including Photovoltaic and Concentrating Solar Power Plants** – Numerous projects for Eskom and private clients in the Northern Cape, Limpopo, Mpumalanga and the Free State.
23. **Moorreesburg Wind Farm.** Visual impact assessment for a proposed new wind farm in the Western Cape.
24. **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
25. **Camperdown Industrial Development** - Visual Impact Assessment for proposed new light industrial area to the north o Camperdown for a private client.
26. **Wild Coast N2 Toll Highway** – Peer review of VIA undertaken by another consultant.
27. **Gamma to Grass Ridge 765kv transmission line** – Peer review of LVIA undertaken by another consultant.
28. **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
29. **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
30. **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
31. **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal
32. **Dube Trade Port, Durban International Airport** – Visual Impact Assessment for a new international airport.
33. **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
34. **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
35. **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
36. **Diamond Mine at Rooipoort Nature Reserve near Kimberley** – Visual impact assessment for a proposed diamond mine within an existing nature reserve for De Beers.
37. **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
38. **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
39. **Estuaries of KwaZulu Natal Phase 1 and Phase 2 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight

estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.

40. **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
41. **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
42. **Zeekoegatt, Durban** - Computer aided visual impact assessment. Acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
43. **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
44. **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
45. **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
46. **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
47. **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
48. **Sainsbury's Bryn Rhos (UK)** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
49. **Ynyston Farm Access (UK)** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development in Cardiff for the Land Authority for Wales.
50. **Cardiff Bay Barrage (UK)** - Concept Design, Detail Design, Documentation, and Visual Input to Environmental Statement for consideration by Parliament in the debate prior to the passing of the Cardiff Bay Barrage Bill. The work was undertaken for Cardiff Bay Development Corporation.
51. **A470, Cefn Coed to Pentrebach (UK)** - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
52. **Sparkford to Illchester Bye Pass (UK)** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
53. **Green Island Reclamation Study (Hong Kong)** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
54. **Route 3 (Hong Kong)** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
55. **China Border Link (Hong Kong)** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
56. **Route 81, Aberdeen Tunnel to Stanley (Hong Kong)** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address:	6A Scarborough Road, Muizenberg, 7945
Telephone:	(021) 788 8425
Cell Phone:	083 272 3225
Email:	jayson@asha-consulting.co.za

Birth date and place:	22 June 1976, Cape Town, South Africa
Citizenship:	South African
ID no:	760622 522 4085
Driver's License:	Code 08
Marital Status:	Married to Carol Orton
Languages spoken:	English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP)

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 –
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

<u>Phase 1 surveys and impact assessments:</u>

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies including Phase 1 test excavations (historic & prehistoric sites)
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

<u>Phase 2 mitigation and research excavations:</u>

- ESA open sites
  - Duinefontein, Gouda
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Curriculum Vitae

JOHN E. ALMOND Ph.D. (Cantab)

***Natura Viva* cc, PO Box 12410 Mill Street, CAPE TOWN 8010, RSA**
tel: (021) 462 3622 e-mail: naturaviva@universe.co.za

- **Honours Degree in Natural Sciences (Zoology)**, University of Cambridge, UK (1980).
- **PhD in Earth Sciences (Palaeontology)**, University of Cambridge, UK (1986).
- **Post-doctoral Research Fellowships** at University of Cambridge, UK and Tübingen University, Germany (Humboldt Research Fellow).
- **Visiting Scientist** at various research institutions in Europe, North America, South Africa and fieldwork experience in all these areas, as well as in North Africa.
- **Scientific Officer, Council for Geoscience, RSA** (1990-1998) – palaeontological research and fieldwork – especially in western RSA and Namibia.
- **Managing Member, *Natura Viva* cc** – a Cape Town-based company specialising in broad-based natural history education, tourism and research – especially in the Arid West of Southern Africa (2000 onwards). *Natura Viva* cc produces **technical reports** on palaeontology, geology, botany and other aspects of natural history for public and private nature reserves.
- **Current palaeontological research** focuses on fossil record of the Precambrian / Cambrian boundary (especially trace fossils), and the Cape Supergroup of South Africa.
- **Registered Field Guide** for **South Africa** and **Namibia**
- **Member of the A-team, Botanical Society of SA** (Kirstenbosch Branch) – involved in teaching and training leaders for botanical excursions. Invited leader of annual Botanical Society excursions (Kirstenbosch Branch) to Little Karoo, Cederberg, Namaqualand and other areas since 2005.
- **Professional training of Western and Eastern Cape Field Guides** (FGASA Level 1 & 2, in conjunction with *The Gloriosa Nature Company*) and of Tourist Guides in various aspects of natural history.
- Involved in **extra-mural teaching in natural history** since the early 1980s. Extensive experience in **public lecturing**, running **intensive courses** and leading **field excursions for professional academics as well as enthusiastic amateurs** (*e.g.* Geological Society / Archaeological Society / Friends of the SA Museum / Cape Natural History Club / Mineral Club / Botanical Society of South Africa / SA Museum Summer & Winter School Programmes / UCT Summer School)
- **Development of palaeontological teaching materials** (textbooks, teachers guides, palaeontological displays) and **teacher training** for the new school science curriculum (GET, FET).
- Former long-standing member of **Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC)**. Advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA (including APM Permit Committee at HWC). Compilation of **technical reports on provincial palaeontological heritage of Western, Northern and Eastern Cape** for SAHRA and HWC. Accredited member of PSSA and APHP (Association of Professional Heritage Practitioners, Western Cape).
- **Palaeontological impact assessments for developments in the Western Cape, Eastern Cape, Northern Cape, Free State, Northwest Province, Mpumulanga, Gauteng.**

- Several hundred **palaeontological heritage desktop studies and field assessments** completed over the past few years. Examples of recent larger projects include:

  (1) Several major alternative energy projects (wind / solar) in the Prieska, De Aar, Sutherland and Cookhouse / Middleton areas (N. Cape, E. Cape)

  (2) Palaeontological heritage survey of the Coega IDZ (E. Cape)

  (3) On-going survey of borrow pits in the Western Cape

  (4) Palaeontological heritage assessments for the Transnet 16 mtpa railway development, Hotazel to Coega IDZ (N. Cape, E. Cape)

  (5) Eskom transmission line developments such as Gamma-Omega and Gamma Perseus projects (N. Cape, W. Cape, Free State)

  (6) Mining exploration studies on the Great Karoo

  (7) Strategic Environmental Assessment Specialist Report – Heritage (palaeontological component) For National Wind and Solar PV, Shale Gas in the Karoo, Square Kilometre Array

- **Reviews of fossil heritage** related to new 1: 250 000 geological maps published by the Council for Geoscience (Geological Survey of SA) – *e.g.* Clanwilliam, Loeriesfontein, Alexander Bay sheets.

Dr Neville Bews & Associates
SOCIAL IMPACT ASSESSORS

Curriculum Vitae Neville Bews

Dr. Neville Bews & Associates – Johannesburg, South Africa

EDUCATION

- *B.A. (Soc), University of South Africa, 1980*
- *B.A. (Soc) (Hons), University of South Africa, 1984*
- *The Henley Post Graduate Certificate in Management, Henley Management College, United Kingdom*
- *M.A. (Cum Laude), Rand Afrikaans University, 1999*
- *D. Litt. et Phil., Rand Afrikaans University, 2000*

Dr Neville Bews is a senior social scientist and human resource professional with 36 years' experience. He consults in the fields of Social Impact Assessments and research, and human resource management. He has worked on a number of large infrastructure, mining and water resource projects. He at times lectures at both the Universities of Pretoria and Johannesburg and is a Senior Fellow in the Centre for Sociological Research, Department of Sociology, University of Johannesburg.

EMPLOYMENT HISTORY

Dr Neville Bews & Associates, Johannesburg, South Africa
Social Impact Assessment consultant and part-time lecturer, 2001 – date.
Leads social impact assessments, provides strategic social management advice to clients, acts as reviewer and mentor to young social scientists.

S A Eagle Company Ltd, Johannesburg, South Africa
Employee Relations Manager, 1992 - 2001
Human Resource management and administration; industrial relations; human resource related research projects; designing and leading implementation of research strategies; disciplinary and grievance hearings; negotiating with unions; corporate social responsibility.

Status Management Services
Human Resources Consultant, 1986 – 1992
Management training; employee assistance programmes; industrial relations; recruitment; disciplinary and grievance hearings; negotiating with unions; job evaluation.

City of Johannesburg
Professional Officer - Human Resources, 1977 - 1986
Industrial relations; disciplinary and grievance hearings; negotiating with unions; recruitment, selection and placement; management training; job evaluation.

EXPERIENCE – EXAMPLES

Water resources and regional planning Social Impact Assessments

Department of Water Affairs and Forestry **South Africa**
Social impact assessment for the Mokolo and Crocodile River (West) Water Augmentation Project for increased and assurance of water supply. Research socio-economic circumstances, data analysis, assessment, authored report.

The Aveng (Africa) Group Limited (Grinaker LTA) **South Africa**
Assisting the construction company with the social management of the Mokolo and Crocodile River (West) Water Augmentation Project. Consult and mediate between contractors and affected parties advise on strategies to reduce tensions between contractors and the public.

Department of Water Affairs and Forestry **South Africa**
Ncwabeni Off-Channel Storage Dam for security of water supply in Umzumbe, KwaZulu-Natal. Research socio-economic circumstances, data analysis, assessment, authored report.

Sedibeng District Municipality **South Africa**
Social impact assessment for the Environmental Management Plan for the Sedibeng District, on behalf of Felehetsa Environmental (Pty) Ltd. Research socio-economic circumstances, data analysis, assessment, authored report.

Felehetsa Environmental (Pty) Ltd **South Africa**
Social Impact Assessment for Waterfall Wedge housing and business development situated in Midrand Gauteng. Research socio-economic circumstances, data analysis, assessment, authored report.

NEMAI Consulting Environmental & Social Consultants **South Africa**
Ncwabeni: Off-Channel Storage Dam, KwaZulu-Natal. Research socio-economic circumstances, data analysis, assessment, authored report.

Department of Water and Sanitation **South Africa**
Mzimvubu Water Project Eastern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Social Assessments for mining clients

Vale **Mozambique**
Socio-economic impact assessment of proposed Moatize power plant, Tete. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social impact assessment for the social and labour plan for Leeuwpan Coal Mine, Delmas. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social impact assessment for the social and labour plan for Glen Douglas Dolomite Mine, Henley-on-Klip. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social impact assessment for the social and labour plan for Grootegeluk Open Cast Coal Mine, Lephalale. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social and labour plan for the Paardekraal Project, Belfast. Research socio-economic circumstances, data analysis, assessment, authored report.

Exxaro Resources Limited **South Africa**
Social impact assessment for the Paardekraal Belfast Project Belfast. Research socio-economic circumstances, data analysis, assessment, authored report.

Kumba Resources Ltd **South Africa**
Social Impact Assessments for the Sishen Iron Ore Mine in Kathu Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Kumba Resources Ltd **South Africa**
Social Impact Assessments for the Sishen South Project in Postmasburg, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Kumba Resources Ltd **South Africa**
Social Impact Assessments for the Dingleton resettlement project at Sishen Iron Ore Mine Kathu, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Gold Fields **South Africa**
Social Impact Assessment for the Gold Fields West Wits Project. Research socio-economic circumstances, data analysis, assessment, authored report.

Anglo Coal **South Africa**
Review of social impact assessment for the proposed Waterberg Gas 37-spot coalbed methane (CBM) bulk yield test project.

Sekoko Mining **South Africa**

Sekoko Wayland Iron Ore, Molemole Local Municipalities in Limpopo Province. Research socio-economic circumstances, data analysis, assessment, authored report.

Memor Mining (Pty) Ltd **South Africa**

Langpan Chrome Mine, Thabazimbi, Limpopo. Research socio-economic circumstances, data analysis, assessment, authored report.

Prescali Environmental Consultants (Pty) Ltd **South Africa**

Vlakpoort Open Cast Mine – Thabazimbi, Limpopo. Research socio-economic circumstances, data analysis, assessment, authored report.

Afrimat Ltd **South Africa**

1. Marble Hall Lime Burning Project: Social Impact Assessment – Limpopo.
2. Glen Douglas Lime Burning Project: Social Impact Assessment - Henley-on Klip, Midvaal

Social assessments for regional and linear projects

Gautrans **South Africa**

Social impact for the Gautrain Rapid Rail Link, Pretoria to Johannesburg and Kempton Park. Managed a team of 10 field workers, research socio-economic circumstances, data analysis, assessment, and co-authored report.

South African National Road Agency Limited **South Africa**

Social Impact of tolling the Gauteng Freeway Improvement Project. Research socio-economic circumstances, data analysis, assessment, authored report.

South African National Road Agency Limited **South Africa**

Social Impact of the N2 Wild Coast Toll Highway. Managed a team of three specialists. Research socio-economic circumstances, data analysis, assessment, co-authored report.

South African National Road Agency Limited **South Africa**

SIA for the N3 Keeversfontein to Warden (De Beers Pass Section). Research socio-economic circumstances, data analysis, assessment, authored report.

Transnet **South Africa**

Social impact assessment for the Transnet New Multi-Product Pipeline Project (555 km) (Commercial Farmers). Research socio-economic circumstances, data analysis, assessment, authored report.

Eskom Holdings Limited **South Africa**

Social Impact Assessment for the Ubertas 88/11kV Substation in Sandton, Johannesburg. Research socio-economic circumstances, data analysis, assessment, authored report.

Eskom Holdings Limited **South Africa**

Nuclear 1 Power Plant. Assisted with the social impact assessment consulting to Arcus GIBB Engineering & Science. Peer review and adjusted the report and assisted at the public participation feedback meetings.

Eskom Holdings Limited, Transmission Division **South Africa**
Social impact assessment for Eskom Holdings Limited, Transmission Division's Neptune-Poseidon 400kV Power Line in the Eastern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

Eskom Holdings Limited, Transmission Division **South Africa**
Social Impact assessment for Eskom Holdings Limited, Transmission Division, Forskor-Mernsky 275kV±130km Powerline and Associated Substation Works in Limpopo Province. Research socio-economic circumstances, data analysis, assessment, authored report.

MGTD Environmental **South Africa**
Social impact assessment for a 150MW Photovoltaic Power Plant and Associated Infrastructure in Mpumalanga. Research socio-economic circumstances, data analysis, assessment, authored report.

MGTD Environmental **South Africa**
10MWp Photovoltaic Power Plant & Associated Infrastructure, North West Province. Research socio-economic circumstances, data analysis, assessment, authored report.

eThekwini Municipality **South Africa**
Social impact assessment for the proposed infilling of the Model Yacht Pond at Blue Lagoon, Stiebel Place, Durban. Research socio-economic circumstances, data analysis, assessment, authored report.

MGTD Environmental **South Africa**
ABC Prieska Solar Project; Proposed 75 MWp Photovoltaic Power Plant and its associated infrastructure on a portion of the remaining extent of ERF 1 Prieska, Northern Cape. Research socio-economic circumstances, data analysis, assessment, authored report.

MGTD Environmental **South Africa**
ABC Prieska Solar Project; Proposed 75 MWp Photovoltaic Power Plant and its associated infrastructure on a portion of the remaining extent of ERF 1 Prieska, Northern Cape;

Assessments for social projects and social research

Australia – Africa 2006 Sport Development Program **South Africa**
To establish and assess the impact of the Active Community Clubs Initiative on the communities of NU2 (in the township of Mdantsane)*and Tshabo (a rural village). Lead researcher social, data collection and analysis, assessment.

United Nations Office on Drugs and Crime **South Africa**

Evaluation of a Centre for Violence Against Women in Upington. Research socio-economic circumstances, data analysis, assessment, co-authored report.

University of Johannesburg **South Africa**
Research into research outputs of academics working in the various departments of the university. Research socio-economic circumstances, data analysis, assessment, authored report.

Human Resource and management training

Various national companied **South Africa**
Developed and run various management courses such as, recruitment selection & placement; industrial relations / disciplinary hearings; team building workshops; multiculturalism workshop.
1986-2007

University of South Africa, Department of Industrial Psychology **South Africa**
Developed the performance development study guide for industrial psychology 3. 2000

Authored Chapters in HR books **South Africa**
In Slabbert J.A. de Villiers, A.S. & Parker A (eds.). Managing employment relations in South Africa.
Teamwork within the world-class organisation. 2005
In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. Personnel Psychology 3rd Edition
Chapter 9 – Human resource planning.
Chapter 10 – The changing nature of work. 2005.
In Rossouw, G. J. and van Vuuren, L. Business Ethics - Made in Africa 4th Edition.
Chapter 11 – Building Trust with Ethics.

South African Management Development Institute (SAMDI) **Democratic Republic of the Congo**
Developed a course on Strategic Human Resource Planning for SAMDI and the Democratic Republic of the Congo as well as trainer's manuals for this course. 2006.

Competition Tribunal **South Africa**
Developed a Performance Management System and Policy for the Competition Tribunal South Africa.
2006

PUBLICATIONS

Bews, N. & Martins, N. 2002. An evaluation of the facilitators of trustworthiness. SA Journal of Industrial Psychology. 28(4), 14-19.

Bews, N. Martins, N. & von der Ohe, H. 2002. Editorial. SA Journal of Industrial Psychology. 28(4), 1.

Bews, N. & Rossouw, D. 2002. Contemporary organisational change and the importance of trust. SA Journal of Industrial Psychology. 28(4), 2-6.

Bews, N. & Uys, T. 2002. The impact of organisational restructuring on perceptions of trustworthiness. SA Journal of Industrial Psychology. 28(4), 21-28.

Bews, N & Rossouw, D. 2002. A role for business ethics in facilitating trustworthiness. Journal of Business Ethics. 39: 377-390.

Bews, N. 2009. A matter of trust – Gaining the confidence of the public and client. IAIA Newsletter Forthcoming (Spring 2009).

Bews, N. 2009. Does he who pays the bill call the shots? Sitting astride client and public interest – the dilemma of maintaining credibility in impact assessments. IAIA Newsletter Winter – 2009.

Bews, N. 2002. Reducing your company's risk of sexual harassment claims. HR Future. (2) 2 10-11.

Bews, N. & Martins, N. von der Ohe, H. 2002. Organisational change and trust: Experiences here and abroad. Management Today, (18) 8 34-35.

Martins, N. Bews, N. & von der Ohe, H. 2002. Organisational change and trust. Lessons from Europe and South African organisations. HR Future, (2)9 46-47.

Rossouw, D. & Bews, N. 2002. The importance of trust within a changing business environment. Management Today. 18(2) 26-27.

Bews, N. 2001. You can put a value to trust in the new economy. HR Future, (1)1 48-49.

Bews, N. 2001. Maintaining trust during organisational change. Management Today, (17) 2 36-39.

Bews, N. 2001. Business ethics, trust and leadership: how does Africa fare? Management Today, (17) 7 14-15.

Rossouw, D & Bews, N. 2001. Trust is on the decline in the workplace, yet it's vital for modern organisational success. People Dynamics. (18) 6 28-30.

Bews, N. & Uys, T. 2001. The effects of restructuring on organisational trust. HR Future, (1)8 50-52.

Rossouw, G. J. & Bews. N. F. 2010. Building Trust with Ethics. In Rossouw, G. J. and van Vuuren, L. Business Ethics - Made in Africa 4th Edition. Cape Town: Oxford University Press.

Bews N. 2005. Teamwork within the world-class organisation. In Slabbert J.A. de Villiers, A.S. & Parker A (eds.). Managing employment relations in South Africa. Durban : Butterworths.

Bews, N. F. 2005. Human resource planning. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F. 2005. The changing nature of work. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F. 2005. Chapter 9 & 13. In Muchinsky, P. M. Kriek, H. J. & Schreuder, A. M. G. 2005. Instructor's Manual. Personnel Psychology 3rd Edition. Cape Town; Oxford University Press.

Bews, N. F., Schreuder, A. M. G. & Vosloo, S. E. 2000. Performance Development. Study guide for Industrial Psychology 3. Pretoria: University of South Africa.

Uys, T. and Bews, N. 2003. ''Not in my Backyard'': Challenges in the Social Impact Assessment of the Gautrain. Department of Sociology Seminar, RAU. 23 May 2003.

Bews, N. 2002. The value of trust in the new economy. Industrial Relations Association of South Africa (Irasa). Morning seminar 21 August 2002.

Bews. N, 2002. The issue of trust considered. Knowledge Recourses seminar on Absenteeism. The Gordon Institute of Business. 27 August 2002.

Bews, N. & Uys, T. 2001. The impact of organisational trust on perceptions of trustworthiness. South African Sociological Association Conference. Pretoria.

Bews, N. 2001. Business Trust, Ethics & Leadership:- Made in Africa. International Management Today/Productivity Development Conference. Hosted by Productivity Development (Pty) Ltd & Management Today. Best Knowledge in Leadership Practice Conference 23-24 July 2001.

Bews, N. 2001. Charting new directions in leading organisational culture and climate change. Workplace Transformation and Organisational Renewal. Hosted by The Renaissance Network. November 2001.

Bews, N. 2000. Towards a model for trust. South African Sociological Association Conference. Saldanha.

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MEMBERSHIP OF PROFESSIONAL BODIES

Member of South African Affiliate of the International Association for Impact Assessment (IAIAsa).
Membership Number: 2399
Registered on database for scientific peer review of iSimangaliso GEF project outputs

SPECIALIST EXPERTISE

ANDREW CLEGHORN

Profession:	Civil Engineer
Position in Firm:	Regional Head – Western Cape, Shareholder, Principal Civil Engineer
Qualifications:	PrEng 20030171, MEng (Civil)
Years of Experience:	17 years

Summary of Experience: Andrew Cleghorn has more than 17 years engineering experience. Andrew obtained his Master of Engineering degree in 2016 from the University of Stellenbosch. Andrew was recently promoted to the position of Regional Head of the Western Cape Transport and Infrastructure branch. Andrew has technical and professional skills in pavement engineering, non-motorised transport planning, design and development of transport systems, project planning and management and construction monitoring.

Specialist Experience:

2017- Current	**Project:**	**N2 Wildcoast Highway, Section 20 from Miskaba River Bridge to the Mtentu River Bridge**
	Position:	Project Leader, Lead Designer
	Description:	Design and Construction supervision of 18km of Greenfields portion of the N2
	Activities Performed:	Project Leader and Design Specialist
	Project Value:	R 1 bn
2011-2016	**Project:**	**N2 Upgrades Myddleton near Caledon**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements
	Activities Performed:	Project Management and Lead Designer, Pavement Engineering
	Project Value:	R 40 000 000.00 (Construction)
2011-2016	**Project:**	**Cape Town Northern Areas Road Rehabilitation**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements
	Activities Performed:	Project Management and Lead Designer, Pavement Engineering
	Project Value:	R 110 000 000.00 (Construction cost)
2011-2012	**Project:**	**Phillipi Plaza Shopping Complex**
	Position:	Project Leader and Lead Designer
	Description:	Parking and roads to new shopping complex
	Project Value:	R 12 000 000.00 (Construction)

2008-2011	**Project:**	**Bredasdorp Main Road Rehabilitation**
	Position:	Project Leader and Lead Designer
	Description:	Road Rehabilitation and Improvements
	Activities Performed:	Project Management and Lead Designer, Pavement Engineering

2007-2018	**Project:**	**Muizenberg Main Road Phase 1 2 3**
	Position:	Lead Designer
	Description:	Road Rehabilitation and Civil Engineering Services
	Activities Performed:	Lead Designer
	Project Value:	R 600 000 000.00 (Construction)

CURRICULUM VITAE

Name	Stephen Burton
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Scientist: Environmental Division
Years with Firm	11 Years
Date of Birth	12 January 1979
ID Number	7901125138083
Nationality	South African

Education

Matric Exemption (Natal Education Department)
Maritzburg College, PMB, KZN (1991 – 1996)

Professional Qualifications

B.Sc. (Zoology 2002), University of Natal PMB, KZN
B.Sc. Honours (Zoology 2003), University of Natal PMB, KZN
M.Sc. (Zoology 2006), University of KwaZulu-Natal PMB, KZN
Pr.Sci.Nat. Registration No. 117474

Years of Experience

12 Years

Membership to Professional Societies

International Association for Impact Assessment South Africa (IAIAsa)
South African Council for Natural Scientific Professions (SACNASP) Pr. Sci. Nat. Reg No. 117474

Employment Record

April 2008 – present	SiVEST SA (Pty) Ltd: Environmental Division - Environmental Scientist
May 2007 – March 2008	UDIDI Project Development Company: Environmental Planner

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Good	Good	Good

Key Experience

Field of Specialisation in Environmental Science, Zoology (specifically Ornithology and Mammology), Entomology and Wetland Ecology. Stephen is skilled in the following fields:-

- Evaluation of Biodiversity

- Management Recommendations
- Scoping Reports and Environmental Impact Assessments
- Bird Identification
- Grass Identification
- Tree Identification
- Mammal Identification
- Wetland Ecology
- Wetland Delineation
- Wetland Functionality Assessments
- Wetland Rehabilitation Plans
- GIS Package Skills, particularly ESRI products
- Statistical Package Skills, particularly STATISTICA, PDAP and R-Statistics.

Stephen has completed a Bachelor of Science Degree with a Zoology Major (University of Natal, PMB), as well as a Bachelor of Science (Honours) in Zoology (University of Natal, PMB). Stephen has also completed a Master of Science Degree in Zoology (University of KwaZulu-Natal, PMB). This post-graduate degree was fieldwork and lab based and provided practical experience in conceptualising, planning, modelling and executing of a project.

Stephen has been involved in consulting since May 2007, which included scoping reports, environmental management plans, integrated management plans, rezoning applications, development facilitation act applications, basic assessment reports, environmental impact reports and strategic environmental assessments. He has been involved in a number of faunal assessments for developments ranging from power lines and water pipelines, to housing developments and light industrial developments. In addition, Stephen has undertaken a number of wetland assessments, and wetland rehabilitation plans, for developments ranging from pipelines through housing and industrial developments.

Since Joining SiVEST Environmental Division in April 2008, Stephen has been involved in a number of projects ranging from Environmental Management Planning for Eskom Power lines to the writing up of scoping reports and environmental impact reports for various projects, and the auditing of Eskom Power lines, district roads and Umgeni Water pipelines and dams. In addition, he has developed specialist skills in faunal and wetland assessments for a range of development types.

Projects Experience

April 2008 – present

POWERLINE/ROADS PROJECTS

- D1562 Road Upgrade
- Franklin Overhead Power Line
- Eskom Grassridge Melkhout Power Line Rebuild
- Bulwer-Lamington Power Line
- Lukhanyeni and Maduna Access Roads, Umzimkhulu, Basic Assessment Class Application
- D1131 and D1137 Roads in Msunduzi
- Harvard-Soutdrift Power Line (Solar Reserve South Africa)
- Lengau Sub-Station & Switching Yard (Solar Reserve South Africa)
- Eskom Corinth-Mzongwana
- Eskom Ndwedwe to Appelsbosch
- Eskom Empangeni-Mandeni / Fairbreeze
- Spoornet Coal Link Upgrade
- Eskom Eros to Port Edward 132kV distribution lines
- Eskom Royal Substation
- Eskom Corinth-Lamington

DEVELOPMENT PROJECTS

- Shemula Water Treatment Works Expansion
- Mooi River Industrial Park Development, EIA
- MiddelFontein Housing Development, Kokstad, EIA
- Thanda Integrated Management Plan Development
- Ladysmith Extension 15 Development EIA
- Ladysmith Shopping Mall EIA
- Ladysmith Pedestrian Bridges BA
- Peacetown Taxi Rank BA
- Crookes Brothers EMF – Analysis Report

WATER PROJECTS

- Swayimane Community Water Supply Scheme
- Mooi-Mgeni Water Transfer System – Phase 2 (Trans-Caledon Tunnel Authority)
- Middeldrift Phase 2 Community Water Supply Scheme
- Shemula Water Treatment Works Expansion and Rising Main
- Richmond Pipeline, Umgeni Water
- Imvutshane Dam, Umgeni Water
- Shemula Water Treatment Works Expansion
- Bulwer Dam EIA
- Hazelmere Pipeline, Umgeni Water
- Sundumbilli Community Water Supply Scheme
- Bulwer Farm Community Water Supply Scheme
- Umhlumayo Phase 4 (Fitty Park) Water Supply Scheme
- Raisethorpe Canal

ENVIRONMENTAL AUDITING / ENVIRONMENTAL CONTROL OFFICER (ECO)

- Mooi-Mgeni Water Transfer System – Phase 2 (Trans-Caledon Tunnel Authority)
- Zimbali Golf Course Estate Development
- Middeldrift Phase 2 Community Water Supply Scheme
- Shemula Water Treatment Works Expansion and Rising Main
- Zwelethu - Port Edward Power Line
- Richmond Pipeline, Umgeni Water
- Imvutshane Dam, Umgeni Water
- Hazelmere Pipeline, Umgeni Water
- Mpumulanga Town Centre Precinct, Shopping Centre Development
- Lukhanyeni and Maduna Access Roads, Umzimkhulu Environmental Auditing
- Rainbow Farms Broiler Houses (B17/B18)
- Ludeke-Zwelethu Power Lines, Port Edward
- Sundumbilli Community Water Supply Scheme
- Eros to Kokstad Power Line
- Roads in the Msunduzi Municipality
- Raisethorpe Canal
- Eskom Empangeni-Mandeni / Fairbreeze(Obanjeni) Power Line
- Eskom Mandeni-Dlangezwa Power Line
- Brewitt Park Housing Development, Escourt

GIS INPUT MAPPING

- Arcelor-Mittal Newcastle Vegetation Assessment – Mapping & Desktop Assessment
- Normandien Farms – Mapping & Desktop Assessment

- Zimbali Lakes and Golf Course Estate - Mapping
- Cornubia Industrial Development Zone - Mapping
- Mshwathi Pipeline - Mapping
- Porritt Access Road Dispute, Snowdon Farm Trust - Mapping
- SNA Roads - Mapping & Desktop Assessment
- Ballito Flats - Mapping & Desktop Assessment
- DOW Veterinary Quarantine - Mapping & Desktop Assessment
- Farm Isonti - Mapping
- Hawaan CT - Mapping
- Izinga Phase 3 EIA - Mapping
- Ellingham Estate - Mapping
- Motala Housing - Mapping
- Ndundula Road - Mapping & Desktop Assessment
- Okhahlamba Landfill and Cemetery Project - Mapping & Desktop Assessment
- SNA Roads - Mapping & Desktop Assessment
- Woodridge Estate - Mapping
- Umgeni Water Ngcebo Biodiversity - Mapping
- Alton Warehouse - Mapping & Desktop Assessment
- Shell Hans Dettman - Mapping & Desktop Assessment
- Lower Tugela Bulk Water Supply Scheme Extension - Mapping & Desktop Assessment

WETLAND ASSESSMENTS AND REHABILITATION PLANS

- Rockdale Wetland Assessment
- Tooverberg Wind Energy Farm
- Sibaya Node 5 Development
- Transnet Wetland Functionality and Biodiversity Assessment for Port of Richards Bay
- Cornubia Rem 68 Development
- Dube Tradeport State of the Environment Report
- Eshowe SSA1 Bulk Water Supply Scheme
- Umgeni Water Waste Water Treatment Plant Offsets
- Osizweni Industrial Development
- Bishopstowe Strategic Environmental Assessment
- Ezaheni D Housing Development
- Izinga Phase 3 Residential Development Amendment
- Dannhauser Bulk Water Supply
- Transnet Richards Bay Port Wetland Assessment
- Raisethorpe Canal Phase 2
- Mimosadale Bulk Water Supply
- Greater Edendale EMF
- Shemula Phases 2-6 Pipeline
- Sumitomo New Rubber Plant
- Riverside Cemetery Development
- DTP Support Zone 2 Development
- Wosiyane/Swayimane Pipeline
- IRPTN Corridor 4 Development
- Sibaya Development
- Cornubia North Development
- Tinley Manor North Development
- Izinga Phase 3 Development
- Nonoti-Zinkwazi Development
- Zimbali Estate Properties
- Mthandeni Irrigation Scheme

- Strode Property Development
- Ethekwini Integrated Rapid Public Transport Network Corridor 9
- D1562 Road Upgrade
- Cornubia Phase 2 Development
- Compensation Flats Development
- Zimbali Estate Development
- Mandeni Cemetery
- Fairmont Hotel
- Tinley Manor South Development
- Maidstone Mill Development
- Mnambithi Substation and Powerline
- Nquthu Town Erf 16 & 17 Development
- Goswell Platform Development - Cato Ridge
- Driefontein Pipeline Route - Ladysmith
- Blaaubosch Housing Development - Newcastle
- Madadeni Housing Development - Newcastle
- Hyde Park Country Estate
- Newcastle Municipality New Cemetery Sites

FAUNAL ASSESSMENTS

- Umlaas Gate Faunal Assessment
- Ntunjambili Bulk Water Supply Scheme
- In-depth specialist studies (including faunal) for Port of Richards Bay
- Kassier Road North Mixed Use Development
- Transnet Richards Bay Port Faunal Assessment
- Greater Edendale EMF
- Shemula Phase 2-6 Pipeline
- Milky Way Shopping Centre Development
- Dudley Pringle Development
- Lindokuhle Housing Development
- Shongweni Bulk Water Pipeline
- Ethekwini Integrated Rapid Public Transport Network Corridor 1
- Ethekwini Integrated Rapid Public Transport Network Corridor 3
- Ethekwini Integrated Rapid Public Transport Network Corridor 9
- Newcastle Municipality New Cemetery Sites
- Shongweni Mixed-Use Development
- Nonoti Beach Tourism Development
- Proposed Shoprite & Checkers Distribution Centre Development, Marianhill
- Proposed Cornubia Development, Umhlanga
- Lower Tugela Bulk Water Supply Scheme Extension
- Proposed Redcliffe Housing Development in Ethekwini Municipality

AVI- FAUNAL ASSESSMENTS

- Proposed High Voltage Powerline to Cygnus Substation, Empangeni
- Proposed High Voltage Powerline between Corinth and Lamington Substations, Underberg
- Proposed High Voltage Powerline between Corinth and Mzongwana Substations

APPENDIX L:
Key Legislation

APPLICABLE LEGISLATION

Table 1: Applicable Legislation, Policies and/or Guidelines associated with the development of Aggeneys 2

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* * *Prevent pollution and ecological degradation,* * *Promote conservation, and* * *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.	DEA – Competent Authority Northern Cape DENC – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The final BA Report will be submitted to the competent and commenting authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	In terms of the Listing Notices (GNR 327, GNR 325 and GNR 324), a full Scoping and EIA Process is required to be undertaken for the proposed project.		
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DEA Northern Cape DENC	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application during the BA process through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof	DEA Northern Cape DENC Khâi-Ma LM	Noise impacts are expected to be associated with the construction phase of the project. Provided that appropriate mitigation measures are implemented, construction noise is likely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	(Regulation 04).		
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)), and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).	Regional DWS	Ephemeral watercourses traverse the project site for Aggeneys 2. In the event that development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the DWS.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	DMR	Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA is not required to be obtained.
	Section 53 of the MPRDA states that any person who		In terms of Section 53 of the MPRDA approval

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.		is required from the Minister of Mineral Resources to ensure that the proposed development does not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme. Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.	Northern Cape DENC / Namakwa DM	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However granted that appropriate mitigation measures are implemented, the proposed project is not anticipated to result in significant dust generation.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not	SAHRA Ngwao Boswa Kapa Bokone (NBKB)	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to **Appendix F** of the BA Report). No significant heritage resources were found within the development area. However, the rocky hill to the north of the project site is a no-go area, and should be avoided. Should a heritage resource be impacted

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.		upon, a permit may be required from SAHRA or Ngwao Boswa Kapa Bokone (NBKB) in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GNR 668). This will be determined once the final location of the project and its associated infrastructure within the project site has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and	DEA Northern Cape DENC	Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. The *Lithops julii subsp fuller* was observed on the gravel plains near to the Loop 10 gravel road. This area is demarcated as a no-go area for the development and the current layout avoids this area entirely.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).		
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).	DEA Northern Cape DENC	Restricted Activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GNR 1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	DAFF	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of DAFF will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. However this is not anticipated to be required for the project. In terms of Regulation 15E (GNR 1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods:

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			» Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation (4). » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any	DAFF	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present on the project site for the submission of relevant permits to authorities prior to the disturbance of these individuals. The ecological specialist study undertaken as

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	protected tree, except under a licence granted by the Minister".		part of the BA process included a site visit which allowed for the identification of any protected tree species which may require a license in terms of the NFA within the project site (refer to **Appendix D** of the BA Report). No protected tree species were found within the project site for Aggeneys 2.
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the project, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list.	DEA – hazardous waste Northern Cape DENC – general waste	No listed activities are triggered by the project and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.	SANRAL – national roads Northern Cape DoT	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the substation components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Provincial Policies / Legislation			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; The Act provides lists of protected species for the Province.	Northern Cape Department of Environment and Nature Conservation (DENC).	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site. The Ecological Impact Assessment (**Appendix D** of the BA Report) identified the *Lithops julii* subsp. *fuller* which was observed on the gravel plains near the Loop 10 gravel road. This area falls outside the development area for the solar PV facility.

APPENDIX M
Chance Find Procedure

CHANCE FIND PROCEDURE

<table>
<tr><td colspan="3">Chance Fossil Finds Procedure: Aggeneys 2 near Aggeneys, Northern Cape Province.</td></tr>
<tr><td>Province & Region:</td><td colspan="2">Northern Cape
Namakwa District Municipality</td></tr>
<tr><td>Responsible Heritage Authority</td><td colspan="2">South African Heritage Resources Agency (SAHRA)
111 Harrington Street
PO Box 4637
Cape Town
8001
Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock Unit(S)</td><td colspan="2">Late Caenozoic superficial deposits esp. aeolian sands, surface gravels & alluvium. Possible calcretised ancient alluvial gravels.</td></tr>
<tr><td>Potential Fossils</td><td colspan="2">Bones, teeth & horncores of mammals, reptiles & fish, terrestrial gastropods, calcretised burrows</td></tr>
<tr><td rowspan="3">ECO Protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
» Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
» Context – describe position of fossils within stratigraphy (rock layering), depth below surface
» Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
» Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
» Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
» Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
» Photograph fossils against a plain, level background, with scale
» Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
» Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist</td></tr>
</table>

		» Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.	
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority	
Specialist Palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.	