PROPOSED ILANGA CSP 4 PROJECT, NORTHERN CAPE

ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA REFERENCE: 14/12/16/3/3/2/868

June 2016

Prepared for

Emvelo Holdings (Pty) Limited
22 Fredman Drive
Sandton
2010

Prepared by

Savannah Environmental (Pty) Ltd

1ST FLOOR, BLOCK 2
5 WOODLANDS DRIVE OFFICE PARK,
CORNER WOODLANDS DRIVE & WESTERN
SERVICE ROAD, WOODMEAD, GAUTENG
PO BOX 148, UNNINGHILL, 2157
TEL: +27 (0)11 656 3237
FAX: +27 (0)86 684 0547
E-MAIL: INFO@SAVANNAHSA.COM
WWW.SAVANNAHSA.COM

PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/868
Title	:	Proposed Ilanga CSP 4 Project, Northern Cape: Revised Draft Environmental Management Programme
Authors	:	Savannah Environmental (Pty) Ltd Jared Padavattan Tebogo Mapinga Jo-Anne Thomas
Specialists	:	Bird and Bat Unlimited Environmental Consultants HCAC Heritage Consultants Natura Viva cc Afzelia Environmental Consultants & Environmental Planning and Design Biodiversity Company
Client/Owner	:	Emvelo Holdings (Pty) Limited
Report Status	:	Environmental Management Programme: Revision 0

When used as a reference this report should be cited as: Savannah Environmental (2016) Proposed Ilanga CSP 4 Project: Environmental Management Programme.

DEFINITIONS AND TERMINOLOGY

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.

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.

Concentrating solar power: Solar generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power facilities collect the incoming solar radiation and concentrates it (by focusing or combining it) onto a single point, thereby increasing the potential electricity generation capacity.

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 Regulations GNR 983, 984 and 985 of December 2014. 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.

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

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

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.

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.

Parabolic trough: Consist of parabolic reflectors and cylindrical tubes (i.e. receivers) which run congruently. The reflectors are made of mirrored glass panels which are supported by a truss system that gives the solar collector assembly its structural strength. The support structure also allows the parabolic trough to track the sun thereby allowing for maximum generation capacity as the sun's trajectory changes on a daily and seasonal basis. The reflectors receive the incoming solar radiation and accurately concentrate it onto the receiver which is a highly efficient heat collection element which contains a heat transfer fluid (i.e. oil or water) which flows within a closed circuit to the power block of a solar facility.

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.

Solar thermal power: The generation of electricity can be easily explained as the conversion of energy from one form to another. Solar thermal facilities, like conventional coal-fired power plants operate by heating water for the purpose of steam generation. This steam is used to turn a generator which is a rotating machine that converts mechanical energy into electrical energy by creating relative motion between a magnetic field and a conductor. Where conventional power stations burn fossil fuels (i.e. coal or gas) to generate steam, their solar counterparts extract this energy from the sun. Two types of solar thermal technologies make use of reflectors / mirrors to concentrate the incoming solar radiation onto a focal point. These are referred to as line and point concentrating solar power (CSP) technologies. The point focus technologies include the tower and dish technologies, the line focus technologies include the parabolic trough and linear Fresnel technologies. The parabolic trough is the proposed technology for the Ilanga facility.

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*,

TABLE OF CONTENTS

APPENDICES

INTRODUCTION CHAPTER 1

This Construction and Operational Environmental Management Programme (CEMP and OEMP) has been compiled for the 50MW Ilanga CSP 4 Project being planned by Emvelo Holdings (Pty) Limited. The project involves the construction and operation of a concentrated solar thermal facility utilising parabolic trough technology as well as associated infrastructure. Emvelo Holdings (Pty) Limited is proposing the development of an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek Site 5 CSP/ Ilanga LFTT 2 (1 x 100 MW Parabolic Trough) Site 5, DEA Ref No.: 14/12/16/3/3/2/295 within the Karoshoek Solar Valley Development on Portion 2 of the Farm Matjiesrivier 41 located approximately approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape Province.. The Ilanga CSP 4 Project is proposed to generate up to 150MW (combined authorised facility and proposed facility) in capacity and will be constructed over an area of approximately 680ha in extent within the broader property.

The EMPr has been developed on the basis of the findings of the EIA, 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 Emvelo Holdings (Pty) Limited employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Ilanga CSP 4 Facility. The document must be adhered to, updated as relevant throughout the project life cycle. This document fulfils the requirement of the department and is a draft EMPr submitted with the draft EIA.

PROJECT DETAILS *CHAPTER 2*

Emvelo Holding (Pty) Ltd, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek Site 5 CSP/ Ilanga LFTT 2 (1 x 100 MW Parabolic Trough) Site 5, DEA Ref No.: 14/12/16/3/3/2/295) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape (refer to Figure 2.1). The proposed project is to be known as the **Ilanga CSP 4** Project. The **Ilanga CSP 4** Project is proposed to generate up to 50MW in capacity and will be constructed within an area of approximately 225ha in extent within the broader property.

A broader study area of approximately 6800ha is being considered, within which the development footprint for the proposed Project (Ilanga CSP 4) of approximately 225 ha in extent would be appropriately located (refer to Figure 2.2). The site can adequately accommodate the proposed larger 150MW CSP Project with a footprint of 684 ha (proposed facility and authorised facility). It is anticipated that the Project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (Refer to Figure 2.4). All identified sensitivities were excluded from the proposed development were feasible.

The purpose of the additional CSP facility to be investigated is to facilitate the increase in capacity of the authorised Karoshoek Site 5 CSP/ Ilanga LFTT 2 facility to 150MW in order to meet the generating capacity thresholds specified by the Department of Energy (DoE) in its Expedited Bid Window of the Renewable Energy Independent Power Producers Procurement (REIPPP) Programme (Tender No: DOE/003/13/14 – as amended from time to time).

Solar power generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power (CSP) collects the incoming solar radiation and concentrates it (focusing or combining it), on a single point, thereby increasing the potential electricity generation. The authorised CSP Site 5 (Karoshoek Site 5 CSP/ Ilanga LFTT 2) will consist of parabolic trough technology with a heat transfer fluid (HTF) with a generating capacity of 100MW consisting of the following infrastructure:

» Parabolic troughs utilising a heat transfer fluid (HTF).
» Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.

» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

The proposed Ilanga CSP 4 Project is proposed to include several parabolic troughs with a generating capacity of up to 50 MW and internal access roads and will be developed together with the authorised Karoshoek Site 5 CSP/ Ilanga LFTT 2.

2.1. Findings of the Environmental Impact Assessment

The preceding chapters of this report together with the specialist studies contained within **Appendices D - J** provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the Ilanga CSP Facility and the associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental team during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

The assessment of potential environmental impacts presented in this report is based on a preliminary layout of the troughs and associated infrastructure (for the 150MW facility) provided by Emvelo Holdings (Pty) Ltd. A broader study area of approximately 6800ha is being considered, within which the development footprint for the proposed Project (Ilanga CSP 4) of approximately 225 ha in extent would be appropriately located. The site can adequately accommodate the proposed larger 150MW CSP Project with a footprint of 680ha (proposed facility and authorised facility. It is anticipated that the Project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (Refer to Figure 9.1). All identified sensitivities were excluded from the proposed development were feasible.

No environmental fatal flaws were identified to be associated with the proposed facility. However the following potentially significant environmental impacts have been identified through the EIA Phase.

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impact on soil and agricultural potential.
» Impacts on avifauna.
» Impacts on water resources.
» Visual impacts.

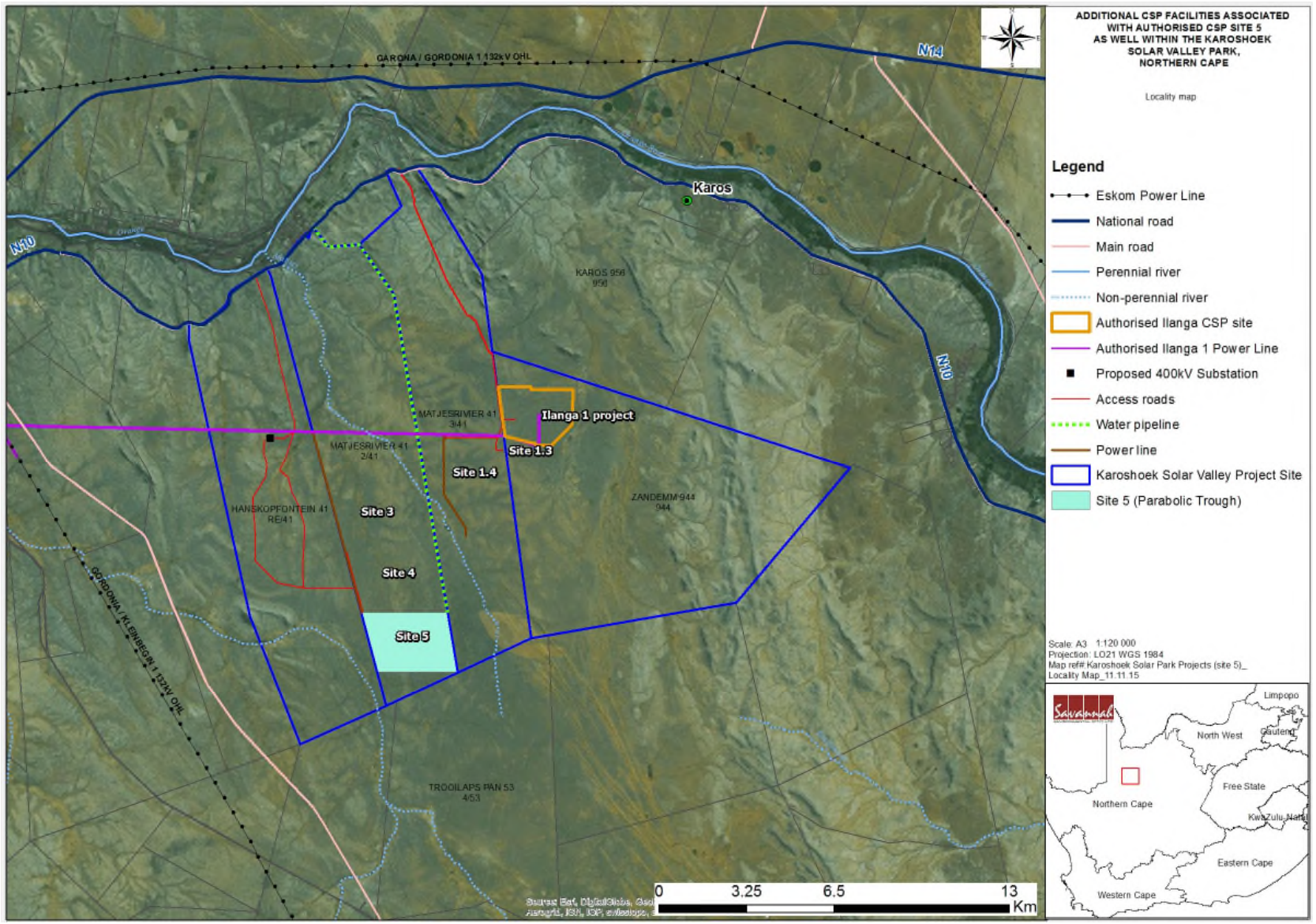


Figure 2.1: Locality map showing the proposed location of Ilanga CSP 4 Project (previously referred to as Site 5) within the extent of the farm Portion 2 of the Farm Matjiesrivier 41.

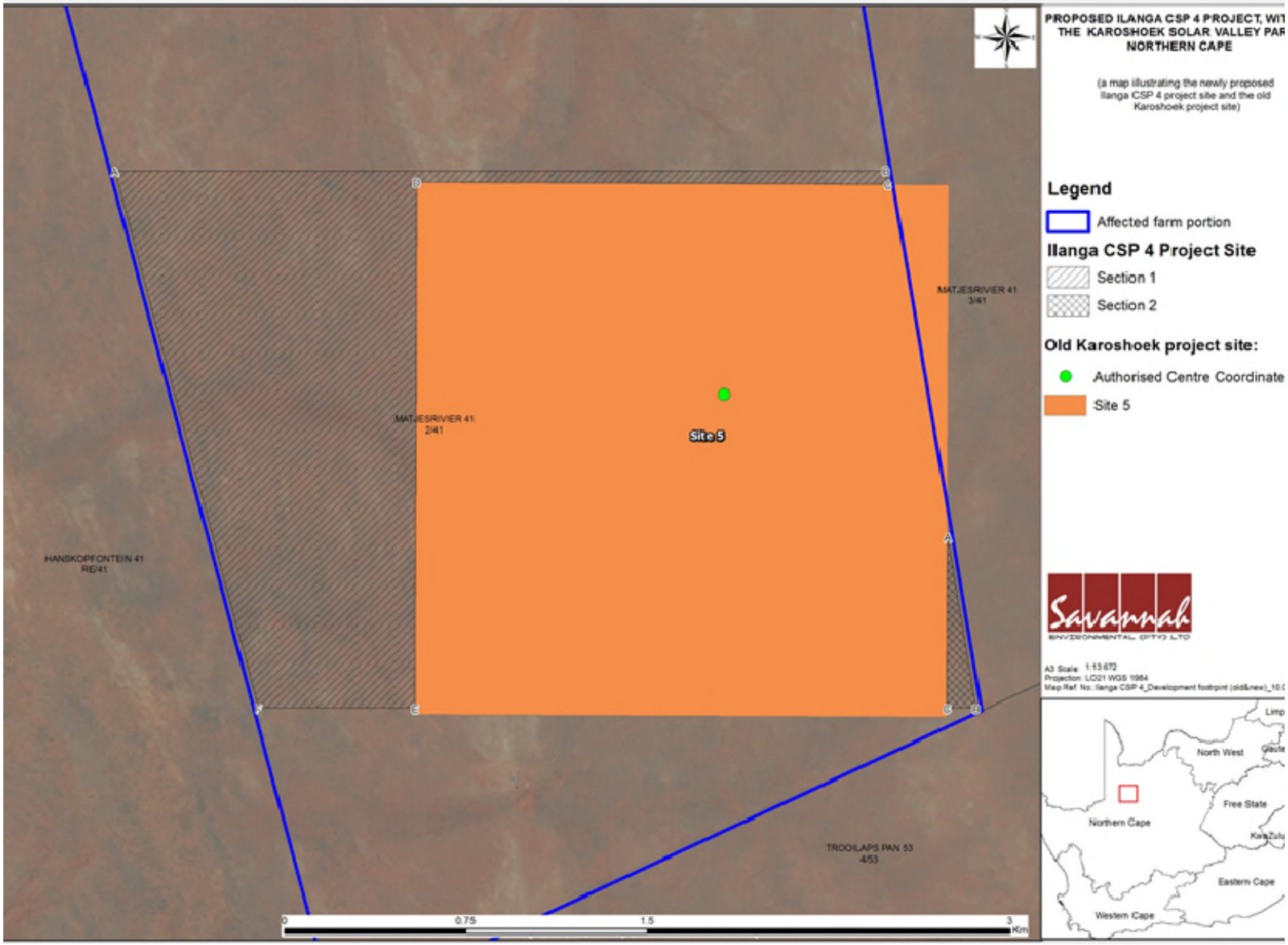


Figure 2.2: Layout plan indicating the area of expanded footprint (Ilanga CSP 4 Project Site) (Refer to **Appendix A** A3 Maps)

» Impacts on the social environment.
» Cumulative impacts.

2.1.1 Local site-specific impacts

The development of the proposed Ilanga CSP 4 project is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat due to hard infrastructure such as the reflector arrays, roads, operations buildings, etc. There are however no features at the site considered to be very high sensitivity or present a no go area and the abundance of species of concern within the development area is also low. The only feature of high sensitivity is a small pan. It is likely that the pan would be lost to the development as there is little scope for avoidance under CSP development. However, the loss of the pan would not significantly impact the availability of this habitat in the area as there are many larger pans in the broader area. Loss of this pan to the development is therefore considered to be acceptable.

Due to the large amount of development proposed in the area, the development of the site will contribute to cumulative impact. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss (ca. 680ha) resulting from the development would not significantly impact the remaining extent of this vegetation type, or the availability of this habitat in the broader area. While there are some protected species present, there are no species of high conservation concern present and no significant impacts can be expected on the local populations of the protected species present. Consequently the impact of the development on the future conservation potential of the area is considered low.

Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be low and faunal species of concern are not likely to be abundant at the site. The development will include some broad flat valley bottoms which receive and transmit drainage during large rainfall events. As the substrate of the bottomlands consists of coarse sands, runoff quickly infiltrates in these areas and there is seldom any flow through the bottomlands. However, the development will likely significantly increase runoff due to the increased extent of hardened surfaces such as roads associated with the development, which may have impacts on the receiving environment and hydrological processes at the site.

Overall and with the suggested mitigation measures implemented, the impacts of the development on ecology are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

2.1.2 Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include disturbance during construction and operation, loss of habitat and potential for collision with the troughs and associated infrastructure. From the monitoring undertaken on the site, seventy two (72) species, 13 collision-prone species and 6 threatened red-data species have been recorded over the total Karoshoek Solar Valley Development site. Species richness was much lower on the CSP 4 site itself, with the density of smaller species being higher in the wet season than in the dry season. Namaqua Sandgrouse were particularly numerous in the wet season. Only three collision-prone species were recorded on the CSP 4 site of which one was a red-data species (Ludwig's Bustard).

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of avifaunal impacts of the Ilanga CSP 4 Facility can be reduced to low, or avoided. The CSP 4 Facility can be developed and impacts on avifauna managed by taking the following into consideration:

» Well-structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme in conjunction with management interventions (as detailed in the tables above) will determine this and can provide appropriate mitigations.
» Little research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community. Therefore, a full 12-months of post-construction monitoring at this site by trained ornithologists (able to distinguish Ludwig's from Kori Bustards) is strongly recommended.
» It is recommend that all available precautions are taken to avoid threatened species and wetland birds being attracted to the troughs. If species are attracted and collide with the CSP troughs by mistaking them for open water then it is recommended that innovative bird deterrent techniques are used, such as the Torri lines mentioned in the avian EIA Report (Simmons and Martins 2015).
» If these recommendations can be followed and prove effective, it is expected that the Ilanga CSP 4 development can proceed with the least impact to the avifauna of the area.

2.1.3 Impacts on water resources

Impacts on water resources associated with the proposed facility relate largely to the abstraction of water from the Orange River System, as well as potential impacts on the water quality of the river due to sedimentation and/or contamination. However, the majority of impacts can be reduced to low significance with the implementation of appropriate mitigation measures, and the proposed development should, therefore, have limited impact on the overall status of the riparian systems within the region. Impacts

on the Orange River system due to water abstraction, and site-specific impacts on in-stream biota are difficult to quantify due to the highly regulated nature of the system.

The only significant risk to the project is the water use license not being granted by the Department of Water Affairs. Although dry cooling will be practiced which will reduce water requirements, the Orange River system is under pressure in terms of water requirements.

2.1.4 Impact of Soil and Agricultural Potential

The overall impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the climatic conditions and the low agricultural and grazing potential of the site. There have never been any substantial farming practices (agriculture or grazing) on the property because of the dominant climatic conditions and prevailing soil conditions. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The soil and rock type properties tend to be very homogenous in the area and the whole site can be better utilised for development (such as that for power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facilities.

There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

2.1.5 Visual impacts

Potential visual impacts on sensitive receptors that have been identified through scoping and the site visit include:

- The visibility of the facility to, and potential visual impact on homesteads that have been identified as potentially being impacted;
- The visibility of the facility to, and potential visual impact on users of roads in close proximity;
- The visibility of the facility to, and potential visual impact on sensitive receptors;
- Visual impacts associated with construction of the proposed project;
- Possible impact of glint and glare; and
- The possible impact of lighting associated with night time operation, and security lights.

The affected landscape has a degree of visual absorption capacity due to occasional head height shrubs particularly in valley lines as well as the minor ridgelines that bisect the valley floor. As a result, the project will almost always be viewed from a similar level as the development meaning that it will largely be seen in elevation. This will mean that overviews of the full extent of development will not be possible from public access areas. Mitigation should be focused on maintaining natural vegetation which will provide a degree of screening and ensuring that development levels are not elevated above the natural landform.

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of impacts of the project can be reduced to low to medium. The assessment indicates that the development of the additional area on Ilanga CSP 4 is likely to have minimal additional visual impact over and above that associated with the authorised site.

2.1.6 Impacts on the social environment

The proposed development site is located within a rural setting and is removed from settlements and homesteads. Impacts on the social environment are expected during both the construction phase and the operation phase of the CSP facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the CSP facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Positive impacts associated with the project are largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The proposed project could assist in alleviating poverty amongst some individuals in the study area through the provision of permanent employment opportunities. Should all proposed facilities within the Karoshoek Solar Valley Site be developed, the cumulative positive impacts would be of great value to the communities in the area.

The development of a renewable energy facility of this nature will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP).

Potential negative impacts which require mitigation relate to an influx of workers and jobseekers to an area (whether locals are employed or outsiders are employed) and an associated perceived risk of an increase in crime in the area, and traffic and intrusion influences during construction. As a limited number of workers are proposed to be housed on site, certain impacts could arise as a result of worker conduct at this site.

Stringent mitigation is required to be implemented to reduce these impacts to acceptable levels.

Impacts on farming activities may occur as a result of the proposed development. However, due to the limited agricultural potential of the proposed development site, and the low rainfall in the area, the impact on agricultural potential as a result of the loss of land associated with the development is not expected to be significant. In fact, the proposed development may present opportunities for additional agriculture on the site and surrounds in that the water supply infrastructure could be utilised to transport water to irrigate crops within these areas. This would be a positive impact.

2.2. Environmental Sensitivities

From the specialist investigations undertaken for the proposed CSP Facility, a number of sensitive areas were identified (refer to Figure 2.3 and the A3 map in **Appendix O**. The following sensitive areas/environmental features have been identified on the site:

» Ecology: The majority of the larger Ilanga CSP 4 site consists of open plains considered to be of medium-low sensitivity on account of the low abundance of species and habitats of conservation concern within these areas. There are some areas within the site considered to be of medium sensitivity - these are areas of deeper sands which are considered slightly higher sensitivity than the surrounding plains on account of the higher concentration of protected tree species within these areas. There is also a very small pan within the site, which is considered to be of high sensitivity. There is also an area of shallow soils with exposed quartz that is considered to be of medium-high sensitivity on account of the higher abundance of protected species within this habitat. There are no areas within the site that are considered very high sensitivity and only the pan is considered high sensitivity but it is very small and its potential loss to the development would not be likely to significantly impact the availability of this habitat in the wider area.
» Avifauna: The impact zone of the CSP trough CSP 4 lies on the interface of Nama Karoo and Kalahari Shrubland. Up-to-date (SABAP2) bird atlas data combined with our data indicates that habitat in the Karoshoek Solar Valley development footprint supports up to 114 bird species, including 14 species ranked in the top 100 collision-prone species. Six of these species are also red-listed: Black Harrier Circus maurus, Lanner Falcon Falco biarmicus, Kori Bustard Ardeotis kori, Ludwig's Bustard Neotis ludwigi, Verreaux's Eagle Aquila verreauxi and Secretarybird Saggitarius serpentarius. Given that harriers, eagle and bustards are highly collision-prone species, they may interact negatively with the CSP 4 CSP infrastructure. Similarly, the proximity to the Orange River may attract wetland species seeking other wetland areas, and cause mortality as birds attempt to land on the CSP mirrors. In addition, larks and sandgrouse will lose habitat totaling ~410 ha. Since the degree and significance of bird impacts will depend largely on the abundance and movements of key species, the specialist calculated bird densities in the site footprint and the

passage rate of the collision-prone through and over the site. The 1 km surveys revealed a higher species richness of smaller birds in the wet season (13.3 v 9.0 species km-1). The Passage rate of larger collision-prone birds was low at 0.29 birds per hour of observation and it differed little between the seasons. Five species of wetland birds that may be attracted to the mirrored surfaces, were recorded in the wet season as expected, and large numbers of sandgrouse (944 birds h-1) were recorded commuting to a flooded pan on the eastern edge in the wet season. Sociable Weavers were present in low numbers on the site.

The volume of water required for the generation of steam to drive the turbines at one CSP is about 100 000- 130 000m3 3 per year.

The Specialist quantified the impacts and found high levels of significance for the collision-prone red data bustard species on CSP 4that require mitigation. Overhead power lines pose a significant threat, particularly to the bustards, and this is assessed in a separate Basic Assessment process.

As is evident in Figure 2.3, some areas of moderate and high sensitivity will be impacted by the proposed layout. These areas are however limited and impacts on these areas are not expected to result in impacts at a broader scale which could compromise habitat availability or species abundance. The layout as proposed is therefore considered to be acceptable.

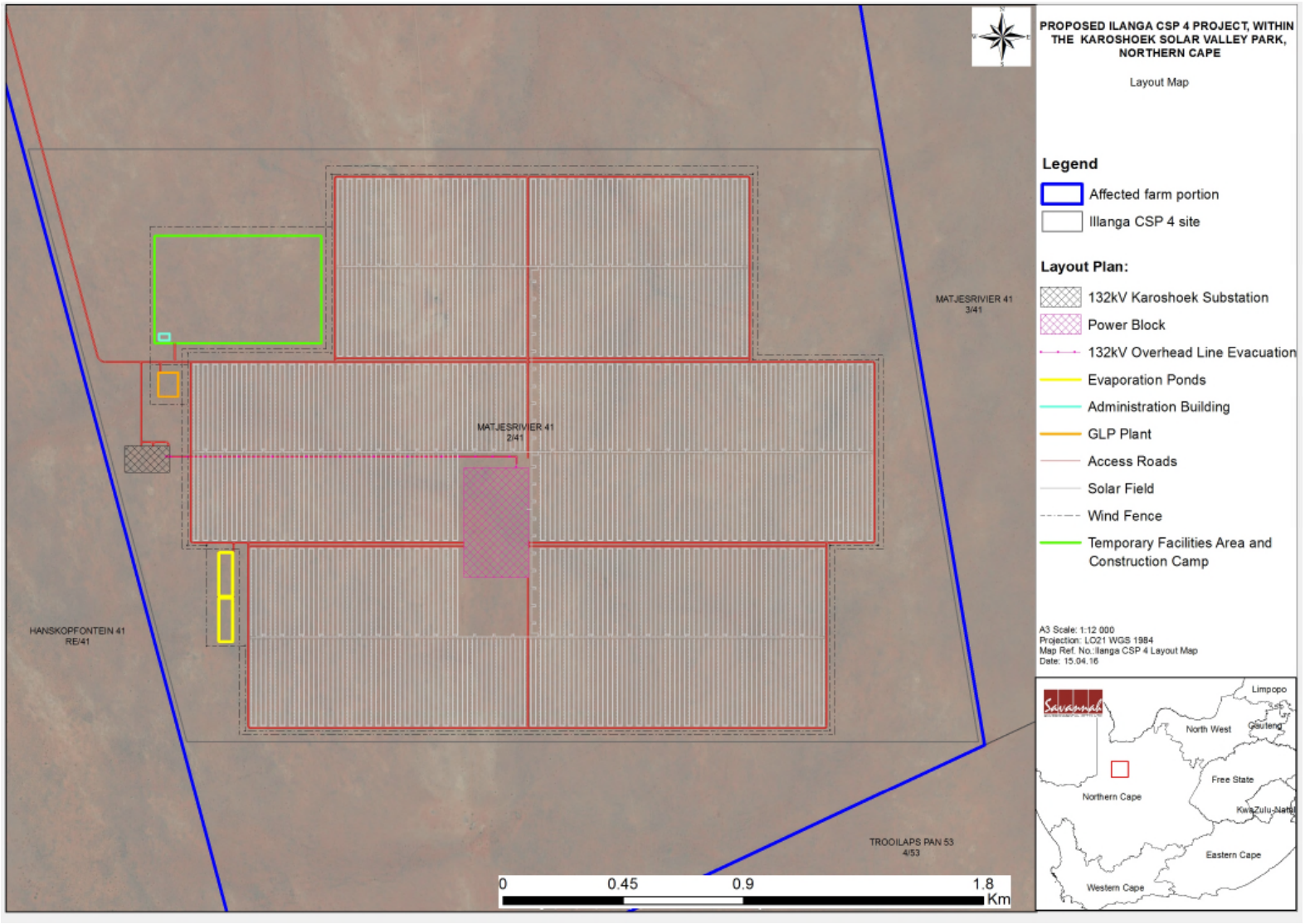


Figure 2.3: Preliminary Layout Map for the proposed Ilanga CSP 4 Project (Refer to **Appendix A** A3 Maps)

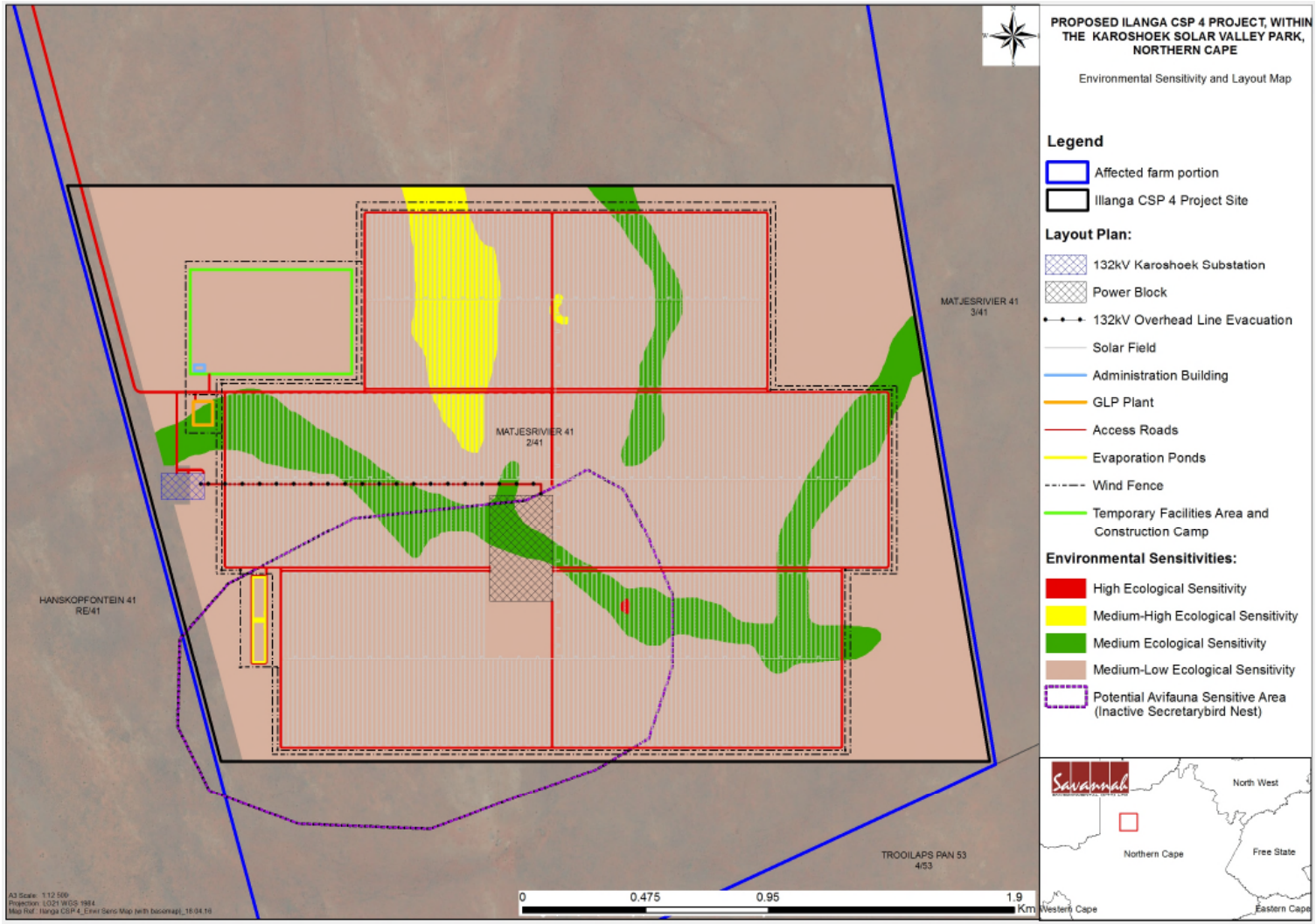


Figure 2.4: Combined Layout and Environmental Sensitivity Map for the Ilanga CSP 4 Facility and the authorised Karoshoek Site 5 CSP/ Ilanga LFTT 2 (full 150MW) showing areas of high sensitivity within the proposed layouts (A3 map included in **Appendix A)**

2.3. Activities and Components associated with the Solar Thermal Facility

The main activities/components associated with the proposed facility are detailed in the tables which follow.

Table 2.1: Activities to be undertaken during the pre-construction and construction phase of the Ilanga CSP 4 50MW facility

PRE-CONSTRUCTION AND CONSTRUCTION
» *Staff requirements* (full 150MW facility) – on average an estimated labour force of 250 to 350 will be used on-site during the construction phase. However during peak construction periods approximately 150 to 200 workers will be required on-site. These positions will be comprised of low skilled, semi-skilled, and skilled workers, the latter of which will most likely be sourced outside Upington (i.e. as these skills are unlikely to be available within the local community- 90% will be Sourh Africa, approximately 40% should be local depending on skills pool available). The specialists forming part of the construction team are likely to be sourced from outside the area and are likely to make use of the local establishments for accommodation facilities. The use of local contractors such as Small, Medium, and Micro Enterprises (SMMEs) operating in the area will be considered by the EPC partner, and will be driven largely by what skills and services could be sourced from local SMMEs (i.e. as part of a competitive tendering process). The EPC partner will determine the standards which all workers need to comply to and this will be in line with South African standards and laws applicable to the construction industry. The actual planning and recruitment phase is expected to start approximately 6 months to one year after financial close.
» *Construction materials and equipment requirements* **-** around 30 - 40% of the construction material and equipment may be sourced locally (i.e. within South Africa), depending on technical capabilities and prices of local industry. The materials and equipment will be transported to site by road, rail, and air if necessary.
» *Water requirements* - The proposed development will require approximately 240 000 m^3 per annum will be required over the 30-36 month construction phase.
» *Housing of the labour force* – although the majority of the low and semi-skilled work force will be sourced from the local area and will be housed off-site, it is possible that employeeswill be housed permanently on-site within the proposed location for the site village. The security team will operate on site in shifts over 24 hours.
» *Length of the construction phase* - commencement of the construction phase is dependent on the project being approved by DOE a generating license being issued by NERSA, and a Power Purchase Agreement being secured with Eskom/ Treasury or the designated buyer of renewable energy electricity and successfully reaching financial close.

Activity	***Detailed description***
Pre-construction surveys	Prior to initiating construction, a number of surveys will be required including, but not limited to: » Geotechnical survey - the geology and topography of the development footprint will be surveyed. The geotechnical study will focus on topographical constraints, foundation conditions, potential for excavations, and the availability of natural construction materials. The geotechnical examination will include surface and subsurface exploration, soil sampling and laboratory analysis. » Site survey - will be done for the finalisation of the design layout of the solar arrays, and the other associated infrastructure. The micro-siting footprint will consider any environmental sensitivity identified during the EIA Phase investigations and will need to be confirmed in line with the Environmental Authorisation issued for the Project.
Undertake site preparation	» Site preparation activities will include: * Clearance of vegetation within the development area. * Levelling of site (as necessary) * The development of stormwater control management systems which will include drainage channels which will collect all rain water and lead it to the natural stormwater drainage system. » These activities will require the stripping of topsoil which will need to be backfilled as construction progresses and stockpiled for future rehabilitation.
Establishment of access roads	» The study site is accessible via the N10 from Upington to Groblershoop. Access to the site will be off the N10 located to the north of the site. » Depending on the feasibility and on the environmental sensitivities there will be a 17 km internal tarred access road[1] of approximately 8 m wide which will lead directly to the power island. Between the heliostats there will be a stabilised gravel track that would be used for maintenance purposes during the operational phase. The final layout of the access roads will be determined following the identification of site related sensitivities.
Transport of components to site	» The components for the proposed Project will be transported to site in sections by road. Some of the Project components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of

[1] To be assessed through a separate BAR process

Activity	*Detailed description*
	1989)[2] by virtue of the dimensional limitations (i.e. length and weight). Components of various specialised construction and lifting equipment are required (e.g. for the power tower) and will need to be transported to site. In addition to the specialised lifting equipment/cranes, the 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 establishment of the substation and power line. » The equipment will be transported to the site using appropriate National, Provincial and local roads, and then the dedicated access/haul road to the site itself. In some instances, the dimensional requirements of the loads to be transported during the construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) as a result of abnormal loading.
Establishment of construction equipment camps, storage facilities and laydown areas	» Once the required equipment has been transported to site, dedicated construction equipment camp(s), storage facilities, and laydown area/s will need to be established. These areas serve to confine activities to a designated area to limit potential site disturbance. The laydown area will be used for the assembly of the parabolic troughs, as a logistical area for the contractors and as a prefabrication area. » The fuel required for on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction equipment camp to prevent leakages and soil contamination.
Establishment of electricity generation infrastructure	» Following the pre-construction surveys and clearing activities, the power block infrastructure (i.e. the steam turbine, generator, substation, and thermal storage units) will be constructed. Foundations will be established using concrete mixed at an off-site or on-site batching plant. » The parabolic troughs will be assembled in the parabola assembly building located in the solar field logistic area and transported around the site to the exact position where they will be erected and connected to its adjacent trough and the pipes conveying the heat transfer fluid. Approximately one loop which consists of 48 collectors will be constructed per day (i.e. one loop is approximately 300 metres in length).

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

Activity	***Detailed description***
Undertake site rehabilitation and establishment of the stormwater management plan	» Areas requiring rehabilitation will include those areas disturbed during the construction phase and are not required for operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. » Where relevant disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. » All temporary facilities, temporary equipment, and waste materials must be removed from site. » Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and drainage lines), to minimise loss of topsoil and control erosion. » Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

Table 2.2: Activities to be undertaken during the operation phase of the Ilanga CSP 4 50MW facility

OPERATION
» *Staff requirements* - approximately 100 staff members (for the full 50MW) are expected to be required on-site during the operational phase of the project. » *Length of the operation phase* – the facility is expected to be commissioned in 2019 and is expected to be operational for 20 - 25 years, where after it could be decommissioned or its lifespan extended depending on the power generation requirements at the time.

Activity	***Detailed description***
Sourcing, treatment and use of water	» Approximately 300 000 – 400 000 m^3 of water will need to be abstracted annually from the Leerkrans Abstraction Point on the Orange River to meet the proposed development requirements (i.e. 150 MW CSP facility). The water will be pumped to the de-gritting and filtration reservoir. The water will flow by gravity through the pipeline (as described above) to the storage reservoir at the power block area, where it will be treated according to the needs of the project. » Through a series of heat exchanges the water will be converted into steam to drive the turbine. The water cycle will be cooled through a process of dry cooling (i.e. air cooled condensers will be used instead of cooling towers). The HTF will be cooled in the boiler of the water steam cycle (i.e. main

Activity	***Detailed description***
	heat exchanger). No additional cooling of the HTF is foreseen, apart from minor fan coolers for certain equipment in the HTF system. » Once the water leaves the cycle, it will be released into the evaporation pond.
Treatment and disposal of waste water	» Water from the polishing plant will be collected in a neutralisation basin and then will be directed to the collecting pond while wastewater from the demineralisation plant will go directly to the collecting pond. » All surface water, stormwater, and drains, etc. will pass through an oil separator station and all chemical waste water will be pH adjusted before entering the collection pond. The water from the collecting pond is finally directed to the evaporation pond system. » Any water from ablution facilities will be collected in a septic tank.
Chemical dosing for the water-steam cycle	In order to maintain the required condensate quality of the water-steam cycle, ammonia is dosed in small quantities.
Inhibitor dosing for the closed cooling system	To minimise oxidation of the system a corrosion inhibitor (carbohydrazide) is dosed to the closed system.
Operation of the solar field	» The solar radiation will be concentrated by the mirrors onto the receiver which contains the heat transfer fluid. The heat transfer fluid is heated and circulated through the solar field back to the power block area where heat exchangers will transfer the collected solar thermal energy from the heat transfer system to the water steam cycle where superheated steam is generated. » The thermal energy in form of superheated steam is routed to the steam turbine generator in which the thermal energy is converted into electric power. » The solar collectors will track the sun during the progression of the day in order to maximise the solar energy yield.
Antifreeze heating	» Thermal oil in the HTF-system freezes at ambient conditions. Hence, the oil always has to be kept at a certain operation temperature, even if the plant is not in operation. For this purpose, antifreeze heaters will be installed, running on LPG. The installed boilers will comply with the relevant emission standards and regulation.
Operation of the electrical infrastructure	» The steam turbine generator will generate electricity at a voltage of approx. 16 kV and will be alternating current (AC). The electricity will be stepped up to a voltage of 132 kV and evacuated into the overhead distribution line and into the electricity grid.

Activity	*Detailed description*
Site operation and maintenance	» It is anticipated that a full-time security, maintenance, and control room staff will be required on site. » The facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.

Table 2.3: Activities to be undertaken during the decommissioning phase

DECOMMISSIONING	
» *Length of the decommissioning phase* – following the operational phase it could be decommissioned or its lifespan extended depending on the power generation requirements at the time. » *Activities during the decommissioning phase* - it is most likely that decommissioning would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.	
Activity	*Detailed description*
Site preparation	» Site preparation activities similar to those undertaken in the construction phase will be required during the decommissioning phase. This will include confirming the integrity of site access to the site in order to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and remove existing components	» The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 3

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided 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 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 (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This Construction and Operational Environmental Management Programme (CEMPr and OEMPr) has been compiled for the proposed Ilanga CSP 4 Project. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of December 2014. This document is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project and/or as the project develops. 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).

This EMPr has the following objectives:

» Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and

decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.

» Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
» Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
» Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
» Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The management and mitigation measures identified within the Environmental Impact Assessment (EIA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Emvelo Holdings (Pty) Limited 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 contract documentation. Since this EMPr is part of the EIA process for the proposed Ilanga CSP 4 Project, it is important that this document be read in conjunction with the Scoping and EIA Reports 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 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.

STRUCTURE OF THIS EMPR *CHAPTER 4*

The first three chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

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

These chapters set out the procedures necessary for Eskom as the project owner, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr 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, which is necessary to meet the overall goals; which take into account the findings of the EIA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving 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?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
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;
» 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.

The table below specifies plans required for the proposed project as specified by the DEA in the acceptance of the scoping report.

Table 4.1: Management plans for the proposed project

Plans required	Location in report
Layout and Sensitivity Map	Appendix A
Key Legislation Applicable to the Development	Appendix B
Grievance Mechanism for Public Complaints and Issues	Appendix C
Waste Management Plan	Appendix D
Alien Invasive Species and Open Management Plan	Appendix E
Re-Vegetation and Habitat Rehabilitation Plan	Appendix F
Plant Protection and Rescue Plan	Appendix G
Traffic Management Plan	Appendix H
Stormwater Management Plan	Appendix I
Erosion Management Plan	Appendix J

4.1 Project Team

This draft EMPr was compiled by:

	Name	Company
EMPr Compilers:	Jared Padavattan Tebogo Mapinga Jo-Anne Thomas	Savannah Environmental
Specialists:	Simon Todd	Simon Todd Consulting
	Candice Hunter	Savannah Environmental
	Rob Simmons	Bird and Bat Unlimited Environmental Consultants

	Name	Company
	Peter Kimberg	The Biodiversity Company
	Jaco van der Walt	Heritage Contracts
	John Marshall	Afzeilia Environmental Consultant & Environmental Planning and Design
	Garry Paterson	ARC-Institute for Soil, Climate and Water

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past years. They have managed and drafted EMPr for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

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

» Ensures that the design of the facility 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 identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» 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

No absolute *'no go'* areas were identified by the specialists during the EIA Phase. However, a number of potentially sensitive areas were identified to be associated with the proposed project, which included:

» *Areas of high ecological sensitivity* – several non-perennial drainage lines and pans.
» *Avifaunal* –area may be affected by the infrastructure of the CSP plant. However, the significance will be medium to low since few collision-prone species are expected to occur on the site.

In order to minimise impacts associated with the construction and operation of the facility, the following surveys are required to be undertaken during the final design phase:

» Detailed geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed (i.e. for the power block, and solar field), and the extent of earthworks and compaction required in the establishment of the internal access roads.

» Compilation of a detailed storm-water management plan – this will detail how storm-water runoff (i.e. over engineered hard surfaces) can be managed to reduce velocities and volumes of water that could lead to erosion and potential sedimentation of drainage systems. Stormwater drains should be correctly located and designed with appropriate erosion-control features to ensure local stormwater run-off over the flood embankments and natural riverbanks do not cause erosion and subsequent bank slumping.
» Water usage design - optimise the design or technology to reduce consumptive water requirements as far as possible.
» Heritage survey – a survey of the linear infrastructure will be undertaken prior to construction (i.e. the pipeline, access road, and the tower positions of the power line). If a heritage object of significance is found within the development footprint, appropriate specialists must be brought in to assess the site, notify the administering authority of the item/site, and undertake due/required processes.

Project Component/s	» Solar field and associated infrastructure. » Construction camps & other temporary infrastructure » Access roads.
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facility components (i.e. including the infrastructure within Site 4 and across the broader site to include the access road, pipeline, reservoirs and treatment facilities).
Mitigation: Target/Objective	» The design of the facility responds to the identified environmental constraints and opportunities. » 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/Owner EPC Contractor	Pre-construction
Undertake a heritage pre-construction survey.	Heritage specialist	Pre-construction
Preconstruction walk-through of facility footprint and support structure positions and use micro-siting to reduce local impact where possible.	Ecologist	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Geotechnical specialist	Pre-construction
Obtain any additional environmental permits required (e.g. water use license, protected tree and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Developer/Owner	Project planning
Agree on any requirements of an offset with DAFF prior to commencement of construction	Developer/Owner Specialist	Pre-construction
Affected individuals of protected species which cannot	Developer/Owner	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
be avoided should be translocated to a safe area on the site prior to construction. This does not include trees which cannot be translocated and where these are protected by DAFF and permit for their destruction would be required.	EPC Contractor/ Specialist	
No *Aloe dichotoma* trees may be removed as a result of the moratorium in place within the Province. The Ecological walkthrough that will be conducted must alos identify all *A. dichotoma* individuals within close proximity to the planned facilities.	Developer/Owner Specialist	Pre-construction
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the EIA Report and relevant appendices.	Engineering design consultant, solar component supplier, and Developer	Design review
External access point and internal access road to be carefully planned to maximise road user safety and limit any intrusion on the neighbouring property owners and road users.	Developer/Owner EPC Contractor	Design
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of stormwater within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the mirrors), as well as appropriate drainage around the site.	Developer/Owner EPC Contractor	Design
Plan and place light fixtures for the plant and the ancillary infrastructure in such a manner as to minimise glare and impacts on the surrounding area.	Developer/Owner EPC Contractor	Planning.
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer/Owner EPC Contractor	Planning
Plan new access roads according to contour lines to minimise cutting and filling operations.	Developer/Owner EPC Contractor	Design
Plan the placement of lay-down areas and construction equipment camps in order to minimise vegetation clearing.	Developer/Owner EPC Contractor	Planning
Develop a comprehensive rehabilitation plan for the site (refer to Appendix E).	Developer/Owner	Pre-construction
Submit a revised layout plan for the entire solar thermal power plant for approval to the department prior to commencement of construction.	Developer/Owner	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
The quantity of water needed for the duration of the construction phase is to be calculated and planned for in detail.	EPC Contractor	Pre-Construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer/Owner	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.	Developer/Owner	Pre-construction
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts	Developer/Owner EPC Contractor	Tender process
The procurement and design strategy of the project is required to implement technically feasible and cost-effective measures of reducing resource consumption and greenhouse gases, the measures of which should be communicated to all relevant staff members.	Developer/Owner EPC Contractor	Planning & Design phase Duration of project life cycle

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report. » Minimal impact on the riparian environment
Monitoring	» Review of the design by the Project Manager and the Environmental specialist prior to the commencement of construction.

OBJECTIVE 2: Minimise stormwater runoff and subsequent alteration of the local hydrological regime

Project Component/s	» Stormwater management components » All hard engineered surfaces
Potential Impact	» Poor stormwater management and alteration of the hydrological regime. » Risk of river system erosion and downstream sedimentation.
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces). » Construction of internal access roads.
Mitigation: Target/Objective	» Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Appropriately plan hard-engineered erosion protection structures.	Developer/Owner EPC Contractor	Planning and design
Design an appropriate stormwater management plan to ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities).	Developer/Owner EPC Contractor	Planning
Construction must include appropriate design measures that allow surface and sub-surface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater runoff.	Developer/Owner EPC Contractor	Planning and design

Performance Indicator	» Sound water quality and quantity management (i.e. as per the Water Use Licence Conditions).
Monitoring	» Surface water quality monitoring plan.

OBJECTIVE 3: To ensure effective communication mechanisms

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

Project component/s	» Solar energy facility
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with solar energy facility construction » Activities associated with solar energy facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » 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 (following the guidelines of the grievance mechanism in **Appendix C**) to be implemented during both the construction and operational phases of the	Developer/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
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.		
Develop and implement a grievance mechanism for the construction, operational 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/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer/Owner EPC 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), should be informed of the details of the contractors, size of the workforce and construction schedules.	Owner EPC Contractor	Pre-construction and construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMP.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

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

» Ensures that construction activities are properly 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, protected tree species, and habitats of ecological value (i.e. drainage lines).
» Minimises impacts on fauna using the site.
» Minimises the impact on heritage sites should they be uncovered.
» Establishes 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, Emvelo Holdings (Pty) Limited must ensure that the implementation of the facility 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. Emvelo Holdings (Pty) Limited will retain various key roles and responsibilities during the construction of the facility.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of environmental management programme during construction

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager; Site Manager; Safety, Health and Environment Representative; 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.

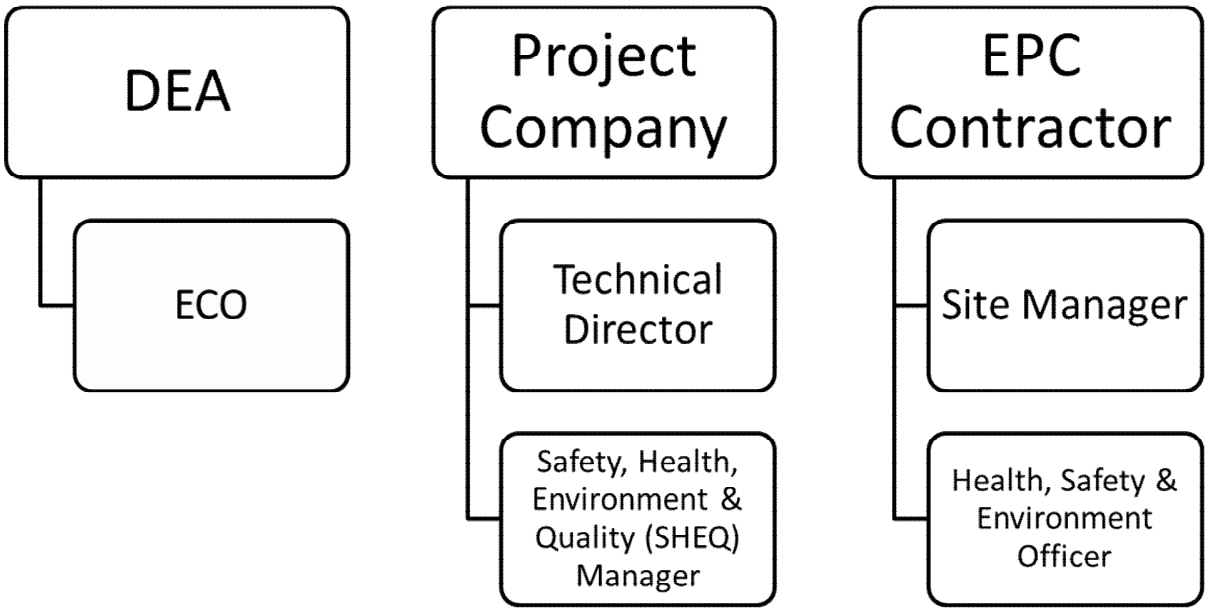


Figure 6.1: Organisational structure for the implementation of the EMP

Technical Director 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 Emvelo Holdings (Pty) Limited 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.
» Be fully conversant with the EIA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
» Be fully knowledgeable with the contents of all relevant licences and permits.

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

» Be fully knowledgeable with the contents of the EIA and risk management
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued)
» 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, 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 **Environmental Control Officer (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 EPC Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

» Be fully knowledgeable with the contents with the EIA.
» Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents with the EMPr.
» Be fully knowledgeable of all the licences and permits issued to the site.
» Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
» Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» 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.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Ensure that the compilation of progress reports for submission to the Technical Director, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.

» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Submit independent reports to the DEA and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and 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. However, in the absence of the ECO there should be a designated environmental officer 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.

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 EMP. 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 contractor's obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» A copy of the EMPr must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
» Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Staff will be informed of environmental issues as deemed necessary by the 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
» Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr
» 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 that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations)

Contractor's Safety, Health and Environment Representative: 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.

The Contractor's Safety, Health and Environment Representative should:
» Be well versed in environmental matters.
» Understand the relevant environmental legislation and processes.
» 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 EMP-related activities on site.

6.2 Objectives

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

OBJECTIVE 1: Minimise impacts related to inappropriate site establishment

Project Component/s	» Area infrastructure (i.e. troughs, power block, etc.). » Linear infrastructure (i.e. pipeline, access road).
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species and protected tree species.
Activities/Risk Sources	» Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
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.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the Site Manager.	EPC Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	EPC Contractor	Site establishment, and duration of construction
The developer and engineering, procurement and construction (EPC) contractors must ensure that there is a dedicated access and an access control point at the entrance gate off the N10.	EPC Contractor	Site establishment, and duration of construction
Develop an efficient access control system which allows for the identification of all people on site	EPC Contractor	Site establishment and duration of contract
The contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.		Duration of contract
Establish impermeable bunded areas for storage of hazardous materials as per the relevant SANS codes. Ensure that a detailed method statement is provided for bund management (i.e. removal of oily water and spills within the bund).	EPC Contractor	Site establishment
Minimise vegetation clearance or removal associated with site establishment activities, trim trees under supervision. Compile a method statement specific to vegetation clearance.	EPC Contractor	Site establishment
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 30 workers) at appropriate locations on site.	EPC Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands.	EPC 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 shadecloth) at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	EPC Contractor	Site establishment, and duration of construction

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.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr. » 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.

OBJECTIVE 2: Appropriate management of the construction site and construction workers

Some construction workers such as security personnel may be accommodated on site, while the rest (i.e. those who will commute from their residences) are expected to be accommodated at existing accommodation facilities in the study area. Construction equipment will need to be stored at appropriate locations on site.

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 EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project Component/s	» Area and linear infrastructure.
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. » Accommodation facilities. » Contractors not aware of the requirements of the EMP, 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
The siting of the construction camp/s must take cognisance of any sensitive areas identified by the EIA studies and reflected on the site layout plan included within this EMPr. The ECO should be consulted with regards to the location of the construction camp/s.	EPC Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	EPC Contractor	Site establishment, and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan to be developed with emergency procedures in the event of a fire.	EPC Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	EPC Contractor	Duration of Contract
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Solid waste (general waste) to be disposed of at the nearest appropriately permitted waste disposal facility. Proof of disposal to be retained as proof of responsible disposal	EPC 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	EPC Contractor	Maintenance: duration of contract within a particular area
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.	EPC Contractor O&M Contractor Owner	During and post construction.
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor O&M contractor Owner	During and post construction.
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 (refer to Section 7.4 of this EMPr). Records of all training undertaken must be kept.	EPC Contractor	Duration of construction
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	EPC Contractor and sub-contractor/s	Duration of contract
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall	EPC Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
be provided per 15 persons at each working area such as the Contractor's camp		
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.	EPC Contractor	Site establishment, and duration of construction
Cooking/meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	EPC Contractor and sub-contractor/s	Duration of contract
No open fires are permitted on site and construction personnel must be made aware of the consequences of starting a fire on site to avoid damage to neighbouring farms.	EPC Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	EPC 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.	EPC Contractor and sub-contractor/s	Duration of contract
Ensure waste containers are maintained and emptied as and when required.	EPC Contractor	Site establishment, and duration of construction
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area.	EPC Contractor	Construction
No one may disturb flora or fauna outside of the demarcated construction area/s.	EPC Contractor and sub-contractor/s	Duration of contract
Contractors appointed by the Contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent properties.	EPC Contractor and sub-contractor/s	Construction
Provide opportunities for workers to go home over weekends where required and practically possible.	EPC Contractor and sub-contractor/s	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	EPC Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction camps 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 reported. » 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 construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the Contractor's SHE Officer and the ECO. » Proof of disposal of sewage at an appropriate waste water treatment works. » Observation and supervision of Contractor practices throughout construction phase by the Contractor's SHE Officer and the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 3: Maximise local employment and business opportunities associated with the construction phase

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. 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 facility, including the associated infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business.
Activities/Risk Sources	» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Mitigation: Target/Objective	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

Mitigation: Action/Control	Responsibility	Timeframe
Employment of local community members (i.e. source labour from within the municipal area focused on the communities in closest proximity to the site e.g. Karos, Leerkrans, and Ntsikelelo) should be undertaken where possible.	EPC Contractor Owner	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and owner in identifying people whose skills may correspond with the required job specifications.	Owner EPC Contractor	Pre-construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	EPC Contractor Owner	Duration of construction
Remuneration packages should be market related and should take note of the sensitivities at hand.	EPC Contractor	Pre-construction and construction
Create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the construction process.	EPC Contractor Owner	Pre-construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	EPC Contractor	Pre-construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	Owner EPC Contractor	Pre-construction
Skills training and capacity building should be embarked upon from the onset of the construction phase and even prior to the construction phase if possible.	EPC Contractor	Pre-construction and construction
Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations.	Owner EPC Contractor	Pre-construction and Construction

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. » SMMEs are awarded contracts, where possible, during the construction phase. » 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.
Monitoring	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE 4: Maximise socio economic development, capacity building and skills training, and address economic inequities within the study area

The education levels among the population of the //Khara Hais Municipality are low. Furthermore, the majority of the people within the study area (local communities) are employed within the agricultural sector.

As the construction phase would involve unskilled, semi-skilled, and skilled workers it is likely that locals could be sourced for the unskilled and semi-skilled positions, thereby there should be sufficient numbers of individuals to choose from. Due to the high unemployed figures, it is also clear that there would be various unemployed persons in search of employment, even if they can only secure temporary positions. For the lower level skilled positions, outsiders would thus definitely not have to be externally sourced. Even though all that would be employed might not have the necessary applicable skills, this issue could be addressed through proper focussed skills training and capacity building initiatives after locals have been sourced, but prior to construction activities starting.

Project Component/s	» Availability of required skills in the local communities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business could be maximised.
Activities/Risk Sources	» Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Locals are unavailable to assist farmers during pruning and harvesting seasons. » Higher skilled positions might be sourced internationally.
Mitigation: Target/Objective	» 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
The developer/owner, in discussions with the Local Municipality, should aim to employ a maximum number of the low-skilled and/or semi-skilled workers from the	Developer/Owner, EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
local area where possible.		
A broad-based approach should be followed to identify and involve relevant organisations in identifying people whose skills may correspond with the job specifications.	Developer/Owner, EPC Contractor	Pre-construction
In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	Owner, EPC Contractor	Duration of construction
A proactive consultative skills-audit should be undertaken in the local communities where job creation is currently a significant need.	EPC Contractor	Pre-construction, and construction
An in-depth community needs assessment (CNA) will need to be carried out to make sure that the real needs of communities are addressed (in line with the local government) and the correct representatives of the community are appointed to run the community trust	EPC Contractor	Pre-construction, and construction
Appropriate training should be provided as per a skills development plan to narrow the gap between skills and demand. It is preferable that training be of such a nature that the skills thereby acquired are transferable and of real benefit in other employment contexts.	EPC Contractor	Pre-construction, and construction

Performance Indicator	» A skills development plan is developed. » Job opportunities, especially of lower skilled positions, are primarily awarded to members of local communities. » Skills training and capacity building initiatives are developed and implemented. » Local SMMEs and/or entrepreneurs awarded the opportunity to become involved in the tender process.
Monitoring	» Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 5: Minimise impacts related to traffic management and transportation of equipment and materials to site

Increased traffic would include heavy and light vehicles transporting goods and building materials (i.e. from Upington). At this stage it is not clear how many vehicles would make use of this road on a daily basis but it is expected that it would increase the traffic volume on the meandering N10 national road. An increased risk of accidents is a concern, especially if vehicles overtake on the sections of the road where passing is not

allowed. Additional pressure on the capacity and road surface of the N10 is also foreseen.

Project Component/s	» Delivery of any component required within the construction phase.
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 cement from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Substation construction activities.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the facility on local traffic volume, 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 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 (refer to Appendix G).	Developer/Owner EPC Contractor	Pre-construction
Appropriate dust suppression must be implemented on gravel roads to limit dust creation.	Developer/Owner EPC Contractor	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Transport Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Transport Contractor	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	EPC Contractor (or appointed transportation	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
	contractor)	
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	EPC Contractor	Duration of contract
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.	EPC Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	EPC Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	EPC Contractor	Duration of contract
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 for the duration of the construction period.	EPC Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	EPC Contractor	Duration of contract
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.	EPC Contractor	Duration of contract
To minimise impacts on local communities, consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.	EPC Contractor	Duration of contract
Source general construction material and goods locally where available to limit transportation over long distances.	EPC 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	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 6: Minimise the potential impact on health, safety and security

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities. The actual safety of construction workers is also of concern. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction areas, the usage of large equipment on site, the risks associated with the storage of equipment and material on site, as well as the increased risk of accidents due to the increased movement of construction vehicles on the local roads.

Other concerns relate to littering, unwanted behaviour of construction workers, transmission of Sexually Transmitted Diseases (STDs), environmental pollution, an increase risk in fires and so forth. Although such perceptions cannot be substantiated or be changed it should be sensitively dealt with. It is thus clear that even though the construction phase when these impacts could occur is only of a short duration, the effects of the impacts could remain in the medium term.

Project Component/s	» Inflow of workers could result in increased safety and security risks.
Potential Impact	» Outside workers are involved in criminal activities and/or fires occur.
Activities/Risk Sources	» Safety of individuals and animals are at risk. » Theft of livestock. » Theft of construction material. » On-site accidents. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/Control	Responsibility	Timeframe
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	EPC Contractor	Pre-construction
On-site security should be active prior to the construction phase.	EPC Contractor	Pre- construction
Screening of applicants could lessen perceived negative perceptions about the outside workforce.	EPC Contractor	Cconstruction

Mitigation: Action/Control	Responsibility	Timeframe
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	EPC Contractor	Construction
All staff should undergo a general H&S induction and simplified environmental awareness training session	EPC Contractor (and sub-contractor/s)	Duration of contract
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	Owner and EPC Contractor	Construction
Property owners, their workers, and local communities should be motivated to be involved in crime prevention and by reporting crimes.	Developer/Owner and Local communities	All phases of project
The construction site should be fenced and access to the area controlled.	EPC Contractor	All phases of project
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	EPC Contractor	Construction
Security personnel should be aware of the possibility of animal theft and poaching and should be able to identify possible criminal elements and/or criminal activities in this regard.	EPC Contractor	Construction
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and the Local Municipality	Owner, Local Municipality, and local communities	Pre- construction and when required
Contact details of emergency services should be prominently displayed on site.	EPC Contractor	Construction
Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires	EPC Contractor	Construction
The construction site and accommodation facility should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	EPC Contractor	Construction
Construction activities should not interfere with the farming activities on surrounding properties.	EPC Contractor	Construction

Performance Indicator	» No criminal activities and theft of livestock attributable to the construction workforce are reported.' » Limited intrusions on surrounding property owners. » No reports from property owners regarding problems with construction activities and workforce. » No fires or on-site accidents occur.
Monitoring	» The Owner, and appointed ECO must monitor indicators listed above

	to ensure that they have been implemented.

OBJECTIVE 7: 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	» Construction activities associated with the area and linear infrastructure.
Potential Impact	» Dust 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
Activities/Risk Sources	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access 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

Mitigation: Action/Control	Responsibility	Timeframe
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.	EPC Contractor	Duration of contract
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 Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	EPC Contractor	Site establishment and construction

Mitigation: Action/Control	Responsibility	Timeframe
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	EPC Contractor	Duration of contract
Height of spoil/subsoil/overburden (not topsoil) stockpiles to be limited to 5m. Spoil and subsoil to be compacted and watered down as necessary	EPC 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.	EPC Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the H&S Officer.	EPC 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.	EPC Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	EPC Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	EPC Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	EPC 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.	EPC Contractor	Duration of contract
The batching plant must be enclosed with shade cloth to reduce the amount of cement particulates/ particles released into the environment.	EPC Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » 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 commences. » 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.

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 reporting system must be used to record non-conformances to the EMP.

OBJECTIVE 8: Minimisation of development footprint and disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks. » Trenching activities for water supply pipeline. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. compaction). » Foundations or plant equipment installation. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	EPC Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	EPC Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated	EPC Contractor	Site

Mitigation: Action/Control	Responsibility	Timeframe
areas so that impact on flora and fauna is restricted.		establishment & duration of contract
All fill material must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	EPC Contractor	Duration of contract
Topsoil must be stockpiled and managed in terms of the soil management plan (refer to Appendix J).	EPC Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months.	EPC Contractor	Site establishment & duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	EPC Contractor	Site establishment Maintenance: for duration of contract
The maximum topsoil stockpile height must not exceed 2m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	EPC Contractor	Duration of contract
Topsoil recovered from site, must not be used for any construction related activities, including that of bedding for underground cabling.	EPC Contractor	Duration of contract

Performance Indicator	» Zero disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by Contractor's SHE Officer and the ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 9: Minimise the impacts on and loss of indigenous vegetation

The density and diversity of protected species at the site is low. The only species observed within the site were *Boscia albitrunca* and *Hoodia gordonii* which both occurred at low density. Other protected species observed in the area which may be present but were not observed within the development area include *Acacia erioloba*, *Aloe clavifora* and *Boscia foetida*. As the site is large, some individuals of these species may be

present but at a low density or as small plants, as they were not observed during the site visit even though the site is flat and open.

Listed species that are known to occur in the area, but which were not observed include *Brachystelma huttonii* (Rare) and *Pelargonium reniforme* subsp. *reniforme* (Data Deficient Data).

Table 7.1. Listed species which may occur within the CSP 4 site, including their IUCN status and the likelihood that they occur at the site.

Family	Species	IUCN Status	Likelihood
ASPHODELACEAE	*Aloe dichotoma*	VU	Low
MESEMBRYANTHEMACEAE	*Dinteranthus wilmotianus*	NT	Low
AMARYLLIDACEAE	*Crinum bulbispermum*	Declining	Low
FABACEAE	*Acacia erioloba*	Declining	Confirmed
APOCYNACEAE	*Hoodia gordonii*	DDD	Confirmed
GERANIACEAE	*Pelargonium reniforme subsp. reniforme*	DDD	Low
ASTERACEAE	*Gymnostephium ciliare*	DDT	Low
ASTERACEAE	*Senecio monticola*	DDT	Low

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Construction of access roads. » Construction/placement of water pipeline, storage/treatment reservoirs, and water abstraction infrastructure » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Retain natural vegetation in the highly sensitive areas of the site. » Minimise footprints of disturbance of vegetation/habitats on-site. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
All development footprints within areas of natural vegetation should be surveyed and protected species identified and marked.	EPC Contractor	Duration of construction
Search and Rescue (S&R) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. The necessary permits must be in place » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately as soon as possible. Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment		
It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas.	EPC Contractor	Duration of construction
Minimise large-scale clearance of natural vegetation and disturbance to the proposed site.	EPC Contractor	Duration of construction
Limit impacts on riparian vegetation at the water abstraction point.	EPC Contractor	Duration of contract
A site rehabilitation programme must be implemented (refer to Appendix E).	EPC Contractor in consultation with Specialist	Duration of contract
All protected tree and herbaceous species that may be present near construction activities must be demarcated with highly visible barriers, in order to prevent accidental damage or removal by subcontractors	EPC Contractor	Construction
Monitor and control declared weeds and invader species. » Continually monitor the re-emergence of these species and manage according to the invasive species management plan	EPC Contractor	Duration of construction

Performance Indicator	» Zero disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances

	to the EMP.

OBJECTIVE 10: Minimise the establishment and spread of alien invasive plants

The disturbance created during the construction phase of the project would leave the site highly vulnerable to invasion by alien plant species, which would impact diversity and ecological processes within the area. Alien species that were observed and which might increase in response to the disturbance include *Prosopis glandulosa*, *Salsola kali* and *Flaveria bidentis*.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within project control area during the construction and operation phases.

Mitigation: Action/Control	Responsibility	Timeframe
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.	EPC Contractor Owner	Construction and operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act) (refer to Appendix D).	EPC Contractor Owner	Construction and operation
Immediately control any alien plants that become established using registered control methods.	EPC Contractor Owner	Construction and 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.	EPC Contractor	Construction and rehabilitation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
Monitoring	» Ongoing monitoring of area by Contractor's SHE Officer and the ECO during construction. » Ongoing monitoring of area by environmental manager during operation. » Annual audit of project area 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 project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 11: Minimise the impacts on fauna

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance.	EPC Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	EPC Contractor	Site establishment & duration of contract
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas	Suitably qualified person	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
before the start of site clearing/construction and relocated to safe areas.		
Ensure storage water reservoirs and the evaporation ponds could be covered with an appropriate material (e.g. by a mesh) to avoid fauna from drowning or drinking dorm the evaporation ponds.	EPC Contractor	Construction
A site rehabilitation programme should be implemented (refer to Appendix E).	EPC Contractor in consultation with Specialist	Duration of contract
Implement a faunal removal plan/ rescue plan with designated/ trained personnel and contact numbers.	EPC Contractor	Duration of contract
All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity. » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed by a suitably qualified person in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again	EPC Contractor	Duration of construction
Place notice boards around site indicating protected and dangerous species for the protection of fauna and workers.	EPC Contractor	Duration of contract
The fence surrounding the evaporation pond/s must be constructed in such a way to prevent fauna from accessing the ponds. The fences to be constructed around the development footprint must be erected in such a manner to ease the free movement of wildlife.	EPC Contractor	Construction

Performance Indicator	» Zero disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks » Recording faunal fatalities to monitor success of relocation efforts » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 12: Minimise the impacts on avifauna

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Decrease in avifaunal populations. » Decrease in avifaunal species diversity. » Loss of specially protected species.
Activity/Risk Source	» Clearance of vegetation with established nests. » Erection of powerlines and stringing of earth wires.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor avifaunal species » To minimise injury and death to avifaunal species. » To minimise loss of avifaunal populations. » To minimise loss of species diversity.

Mitigation: Action/Control	Responsibility	Timeframe
Placement of infrastructure away from highly sensitive bird areas, especially feeding/ nesting areas or roosts.	EPC Contractor	Construction
Install bird diverters to deter birds mistaking the reflection of the mirrored troughs for open water.	EPC Contractor	Construction
Ensure storage water reservoirs and the evaporation ponds could be covered with an appropriate material (e.g. by a mesh) to avoid birds nesting on the ponds, or bird deterrent measures are used.	EPC Contractor	Construction
Implement an avifaunal removal plan/ rescue plan with designated/ trained personnel and contact numbers.	EPC Contractor	Duration of contract
Established Sociable Weaver nests requires a permit from NC DENC prior to removal	EPC Contractor/ Owner	Duration of contract

Performance Indicator	» Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on avifaunal species (i.e. noted/recorded fatalities)
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 13: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of the river.
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
Potential Impact	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity. » Establishment or extension of the water abstraction facilities etc on the banks and floodplains of the Orange River.
Mitigation: Target/Objective	» Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. » Minimise deposition of soil into drainage lines. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas.	EPC Contractor	Before and during construction
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	EPC Contractor	Construction
Access roads to be carefully constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	EPC Contractor	Construction
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Minimise removal of vegetation which adds stability to soil.	EPC Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase must be protected from erosion	EPC Contractor	Construction
Implement erosion control measures denuded areas as required.	EPC Contractor	Construction
Control depth of excavations and stability of cut faces/sidewalls.	EPC Contractor	Construction
Salvaging topsoil: » Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material. o Topsoil stripping removes up to 30 cm or less of the upper soils. » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area. * This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. * Different types of topsoil – rocky soils and sands or loams must be stored separately » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year.	EPC Contractor	Pre-construction/ Construction
Storing topsoil: » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: * At least 50 m from any wetland or watering point * Ideally a disturbed but weed-free area » Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the	Contractor	Pre-construction/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches * In such case, use one side of the linear development for machinery and access only * Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) * If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: * Preventing ponding on or between heaps of topsoil * Or covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring establishment of all invasive vegetation and removing such if it appears * Keeping heights of topsoil at 2m to prevent wind erosion * Keeping slopes of topsoil at a maximal 2:1 ratio * Monitoring and mitigating erosion where it appears * Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered		
Reapplying topsoil:	EPC Contractor	Construction and

Mitigation: Action/Control	Responsibility	Timeframe
» Spoil materials and subsoil must be back-filled first, then covered with topsoil » Generally, topsoil should be re-applied to a depth equal to slightly greater than the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked to out to optimise re-vegetation efforts with the topsoil available » Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts. » To stabilise reapplied topsoil and minimise raindrop impact and erosion: o Use organic material from cleared and shredded woody vegetation where possible o Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation		rehabilitation
Re-applied topsoil needs to be re-vegetated as soon as possible, following the specifications of the re-vegetation and rehabilitation plan.	EPC Contractor	Construction monitored during operation phase
General Erosion control measures: » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas o Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion	EPC Contractor	Construction monitored during operational phase

Mitigation: Action/Control	Responsibility	Timeframe
potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water		

Performance Indicator	» No activity outside demarcated disturbance areas. » Limited level of activity within disturbance areas. » Limited level of soil erosion around site due to construction activities. » Limited level of increased siltation in drainage lines. » Acceptable state of excavations. » No activity in restricted areas.
Monitoring	» Monthly inspections of sediment control devices. » Monthly inspections of surroundings, including drainage lines. » Immediate reporting of ineffective sediment control systems.

	» An incident reporting system will record non-conformances.

OBJECTIVE 14: Protection of heritage resources

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

Archaeological or other heritage materials occurring in the path of any surface or sub-surface disturbances associated with any aspect of the development are highly likely to be subject to destruction, damage, excavation, alteration, or removal. The objective should be to limit such impacts to the primary activities associated with the development and hence to limit secondary impacts during the medium and longer term working life of the facility.

From these studies widely dispersed individual scatters of stone tools are known to occur in the larger study area. Artefact density at these scatters are so low that they do not represent individual sites but rather background scatter or find spots. However several Stone Age sites do occur in the larger area. The sites consist of a LSA artefact scatter around depressions that contain seasonal water and stream bed margins that was utilised in the past.

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
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 » Pipeline construction activities.
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
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary	EPC Contractor in consultation with	Site establishment

Mitigation: Action/control	Responsibility	Timeframe
disturbance of adjacent areas.	Specialist	
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	EPC Contractor in consultation with Specialist	Pre-construction
Project employees and any contract staff must maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Owner / EPC Contractor	Duration of contract
If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Itumeleng Masiteng/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required.	EPC Contractor in consultation with Specialist	Duration of contract
Shallow pans and depressions that contain seasonal water could be archaeologically significant and should be avoided as far as possible.	EPC Contractor in consultation with Specialist	Duration of contract
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	EPC Contractor in consultation with Specialist	Pre-construction

Performance Indicator	» Zero disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	» Observation of excavation activities by Contractor's SHE Officer 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 » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 15: Minimisation of visual impacts associated with construction

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

Project Component/s	» Construction site and construction accommodation.
Potential Impact	» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.
Activity/Risk Source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas.

Mitigation: Action/Control	Responsibility	Timeframe
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	EPC Contractor	Construction
Ensure that rubble, litter, and disused construction materials are managed and removed regularly.	EPC Contractor	Construction
Ensure a designated area is selected for waste management and that the area is maintained daily.	EPC Contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat a manner.	EPC Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	EPC Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	EPC Contractor	Construction
Rehabilitate all disturbed areas, construction areas, roads, and servitudes to acceptable visual standards.	EPC Contractor	Construction

Performance Indicator	» Vegetation cover on and near the site is intact with no evidence of degradation or erosion. » Construction site is kept in a neat and tidy state.

Monitoring	» Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE 16: Appropriate handling and management of waste

The construction of the CSP facility 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 of the solar energy facility will include:

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

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
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.	EPC Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	EPC Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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.		
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.).	EPC Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	EPC Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	EPC 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.	EPC Contractor	Duration of contract
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.	EPC Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	EPC Contractor	Duration of contract
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage.	EPC Contractor	Duration of contract
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	EPC 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 must be compiled and appropriate measures implemented to ensure compliance with legislative requirements.	EPC Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
reduction, recycling, re-use and disposal where appropriate.		
Septic tanks and portable toilets must be monitored and maintained daily.	EPC Contractor	Duration of construction
Discharge of sewage into the environment must be prevented and if leaks occur from sewage systems, then this must be fixed and the contaminated vegetation/ soil must be removed immediately and treated as hazardous waste.	EPC Contractor	Duration of construction
Ensure the above ground septic tank is in an impermeable bund that can contain at least 110% of the tanks contents.	EPC Contractor	Duration of construction
Ensure that the below ground storage of any septic tanks 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.	EPC Contractor	Duration of construction
Daily inspection of all portable toilets and septic tanks must be performed by SHE/ environmental representatives on site.	EPC Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	EPC Contractor	Duration of Construction
All waste facilities and waste transportation contractors must be licensed and registered where necessary.	EPC 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 material re-used for an appropriate purpose.	EPC Contractor	Completion 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. » 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 17: Appropriate handling and storage of chemicals, hazardous substances

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. Chemical storage is likely to occur within the power block site.

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
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.

Mitigation: Action/Control	Responsibility	Timeframe
Implement the emergency preparedness plan during the construction phase.	EPC Contractor	Pre-construction and implement for duration of Contract
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation.	EPC Contractor	Construction phase
Establish an appropriate Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not limited to: » Designated area; » All applicable safety signage; » Fire fighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents.	EPC Contractor	Pre-construction and implement for duration of Contract
Spilled cement must be cleaned up as soon as possible	EPC Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
and disposed of at a suitably licensed waste disposal site.		contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	EPC 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.	EPC Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.	EPC Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	EPC Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	EPC Contractor	Duration of contract
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands or a drainage line.	EPC Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	EPC 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 and applicable regulations and safety instructions.	EPC 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.	EPC Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	EPC 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.	EPC Contractor	Duration of contract
Evaporation dams must be appropriately lined, as required by the NEM: Waste Act and associated Regulations, and in line with the water use license issued for the site (once issued).	EPC Contractor	Construction
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.	EPC Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
stormwater system.		
Upon the completion of construction, the area must be cleared of potentially polluting materials.	EPC Contractor	Completion of construction
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.	EPC 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. Where required, a NEMA section 30 report must be submitted to DEA within 14 days of the incident.	EPC Contractor	Duration of contract

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by 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 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.

OBJECTIVE 18: Effective management of concrete batching plants

A considerable amount of concrete is required during the construction of the solar energy 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 stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant and associated activities
Potential Impact	» Dust emissions » Release of contaminated water

	» Change in surrounding waterbodies' pH and resultant impacts. » 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	EPC Contractor	Construction phase
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	EPC 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	EPC Contractor	Construction phase
Good maintenance practices must be implemented, including regular sweeping to prevent dust build-up	EPC 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.	EPC 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	EPC Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include covering the conveyor with a roof, installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	EPC Contractor	Construction phase
Process wastewater and contaminated stormwater 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.	EPC Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	EPC Contractor	Construction phase

Performance Indicator	» No complaints on 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. » 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. » 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: 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:

» Details of the 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)
» Stipulate the stormwater management procedures recommended in the stormwater management method statement.
» Stormwater and water crossings 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:
    * The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
    * Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.
» Dust and noise pollution
    * Describe 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, borrow pits 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 (ie 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 protocol on 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 reviewed by 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. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

6.4 Awareness and Competence: Construction Phase of the Solar Energy Facility

OBJECTIVE 1: 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 Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. 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 is to have copies of the relevant Method Statements and be aware of the content thereof.
- Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff is 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 Training

Environmental Awareness Training must be undertaken by the EPC Contractor and must take the form of an on-site talk and demonstration by the 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 ECO on site.

6.4.2 Induction Training

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 SHE Officer and should include discussing the developer'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 SHE Officer on site.

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least once a week) 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 the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Monitoring Programme: Construction Phase of the Solar Energy Facility

OBJECTIVE 1: 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, Ilanga CSP 4 Facility will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely 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 communication and feedback to authorities and stakeholders

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident 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. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

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 EPC 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

An environmental internal audit must be conducted every 3 months and an external audit must be conducted once a year in order to confirm compliance with the requirements of all environmental permits (including the Environmental Authorisation) for the project, this EMPr, and all relevant legislation. The results of the audit reports must be made available to the DEA and relevant competent authority on request, and must be part of monitoring and audit reports. An annual audit report must be compiled and submitted to DEA until the completion of the construction and rehabilitation. This audit report must assess the effectiveness of the mitigation measures and recommendations for amongst others the following: grievance incidents, waste management, alien and open space management, re-vegetation and rehabilitation, plant rescue and protection and traffic and transportation plan. This report must indicate the date of the audit, the name of the auditor and the outcome of the each 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 external auditor and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and 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.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

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	» Area and linear infrastructure.
Potential Impact	» Environmental integrity of 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. » Pipeline servitude » 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 revegetation and rehabilitation plan (refer to **Appendix F**).	EPC Contractor	Following execution of the works
Rehabilitation must be undertaken as soon as possible after completion of construction activities to reduce the area of habitat converted at any one time	EPC Contractor	Following execution of the works

Mitigation: Action/Control	Responsibility	Timeframe
and to speed up recovery of natural habitats.		
All temporary facilities, equipment, and waste materials must be removed from site.	EPC Contractor	Following execution of the works
All rehabilitated areas must be demarcated and movement in this area minimised, in order to prevent damage by construction vehicles and activities. Demarcation must remain in place until acceptable rehabilitation has been achieved.	EPC Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	EPC Contractor	Following completion of construction activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	EPC Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	EPC Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	EPC 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.	EPC Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	EPC Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Owner in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines is necessary.	Owner in consultation with rehabilitation specialist	Post-rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Owner in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	» All portions of 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	» 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.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Overall Goal: To ensure that the operation of the solar energy facility 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 solar energy facility in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts
» Enables the solar energy facility 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
» Minimises impacts on fauna using the site
» Establishes an environmental baseline for solar energy facility sites in South Africa

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operational EMPr.

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 environmental management programme 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 **Operations Manager** will:
» Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMP.
» 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 wind energy 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 CSP 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.

The Technical/SHEQ Manager must provide fourteen (14) days written notification the DEA that the activity operational phase will commence.

OBJECTIVE 2: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

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	» Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitation at its completion
Potential Impact	» Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	» Movement of employee vehicles within and around site.
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
Vehicle movements must be restricted to designated roadways.	Owner O&M Operator	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Owner O&M Operator	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Owner O&M Operator	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Owner in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Employ an EO for the duration of the operational phase of the plant to ensure compliance of all environmental related legislation and best practice.	Owner O&M Operator	Operation
Monitor avifaunal movement along the power line and solar field, to assess the integrity of mitigation measures in place. Further mitigation measures must be implemented if carcases and/ or injuries are being recorded. A faunal/ avifauna incident register must be maintained on site.	Owner O&M Operator	Operation
To reduce the risk of mortality, the following must be implemented: » The cooling system used must be based on an Air Cooled Condenser, which is a widely used technology for all kind of power plants. The steam is a completely closed system. » Other structures with high temperatures must be appropriately thermally isolated. Any openings to the pipe extractions are to be closed with a grid to prevent birds entering these areas. » The heliostats must be tilted when being cleaned or when not in use to reduce collision-risk for low-flying birds.	Owner O&M Operator	Operation
Implement an animal removal plan to ensure safety of workers and fauna.	Owner O&M Operator	Operation

Performance Indicator	» No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts.
Monitoring	» Observation of vegetation on-site by STPP Manager and

	environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE 3: Minimisation of visual impacts

The primary visual impact of the facility and its ancillary infrastructure, including the power line, is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
Potential Impact	» Visual impact of facility degradation and vegetation rehabilitation failure. » Lighting influences from the facility on surrounding areas.
Activity/Risk Source	» The proposed facility. » Reservoirs.
Mitigation: Target/Objective	» To minimise potential for visual impact. » To ensure a well maintained and neat facility.

Mitigation: Action/Control	Responsibility	Timeframe
Maintain the general appearance of the facility in an aesthetically pleasing way.	Owner O&M Operator	Operation.
Monitor rehabilitated areas, and implement remedial action as and when required.	Owner O&M Operator	Operation.
Use of light fixtures and the fitment of covers and shields will be designed to contain rather than spread light.	Owner O&M Operator	Operation and maintenance

Performance Indicator	» Well maintained and neat facility with intact vegetation on and near the facility. » Lighting impact and visual intrusion is minimal and no complaints received from settlements or homesteads.
Monitoring	» Monitoring of rehabilitated areas.

OBJECTIVE 4: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems or the river (in the case of the abstraction point).
» Degradation of the natural soil profile due to pollution.

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Owner O&M Operator	Operation
Ensure dust control on site: wetting of denuded areas or the use of an appropriate dust suppression measure.	Owner O&M Operator	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, and shade nets).	Owner O&M Operator	Operation
Control depth of excavations and stability of cut faces/sidewalls.	Owner O&M Operator	Operation
Maintain pump inlets and their supporting infrastructure so to prevent the potential for scour / erosion and downstream sedimentation of the Orange River.	Owner O&M Operator	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis.

	» Water management plan

OBJECTIVE 5: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. According to National Environmental Management: Air Quality Act, an air emissions license is not required for power generation facilities with a capacity of less than 50 MW. Out of a maximum generating capacity of 50 MW, the expected air emissions for Ilanga CSP 4 Project will be approximately 9 MW (i.e. 20% of the maximum) and therefore no license will be required, if supplementary firing is used.

Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	» Hard engineered surfaces » On-site vehicles
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 and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction 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.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	Owner EPC Contractor	Site establishment and construction
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	Owner EPC Contractor	Duration of contract
Speed of vehicles must be restricted, as defined by the Health and Safety Manager.	Owner EPC Contractor	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Owner EPC Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for 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 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 reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 6: Ensure the implementation of an appropriate fire management plan during the operation phase

The vegetation in the study area may be at risk of fire, particularly the parabolic troughs which are situated closer to the ground. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Operation and maintenance of the CSP 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 solar energy 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 fire fighting equipment on site and establish a fire fighting management plan during operation (refer to Appendix K).	Owner O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Owner O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Owner O&M Operator	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.).	Owner O&M Operator	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.	Owner O&M Operator	Operation
Contact details of emergency services should be	Owner	Operation

Mitigation: Action/Control	Responsibility	Timeframe
prominently displayed on site.	O&M Operator	

Performance Indicator	» Fire fighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring	» The project developer must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 7: Maximise local employment and business opportunities

The proposed facility is expected to require approximately 25 permanent employees including security personnel who would be on site on a permanent basis.

Therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited opportunities should still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the proposed facility could include maintenance of the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment

Project Component/s	» Operation and maintenance of the facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Locals are not employed where the skills exist. » Local procurement is not undertaken if possible. » Local businesses are not supported.
Mitigation: Target/Objective	» Maximise the appointment of local employees.

Mitigation: Action/Control	Responsibility	Timeframe
A skills development plan should be developed which should concentrate on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere.	Owner O&M Operator	Operation
The Owner should capacitate locals where practical.	Owner	Operation

Mitigation: Action/Control	Responsibility	Timeframe
	O&M Operator	
The Owner should consider training and capacity building programmes to lessen the skills disparity.	Owner O&M Operator	Operation
The skill requirements should be communicated to the local community leaders and community based organisations.	Owner	Operation
Make use of local recruitment agencies or other relevant community based organisations to obtain a list of jobseekers.	Owner	Operation
An equitable process whereby minorities and previously disadvantaged individuals (including women) are taken into account should be implemented.	Owner	Operation
Local sourcing of materials, general services to assist in providing economic, and employment opportunities for the local people.	Owner	Operation

Performance Indicator	» An employee list drawn up indicating the percentage of locals employed. » Local procurement is undertaken.
Monitoring	» The project developer should be able to demonstrate that the above indicators are implemented.

OBJECTIVE 8: Assist with social development and enhance capacity building and skills development within the local communities

An important positive role that the developer could fulfil as part of their social responsibility towards the local communities is to assist in addressing community development needs during the operational phase.

The project applicant is therefore accountable to optimise the productive potential of those employed at the proposed facility's operation through capacity building and skills training, whether these individuals are temporary or permanent employees.

One of the aims of the project could be to revitalise the area in terms of job creation and infrastructure development, in other words it would focus on broad based empowerment.

Project Component/s	» Capacity building and skills training undertaken during the operational phase.
Potential Impact	» Positive contribution to the capacity of individuals involved with the project, and equipping them with transferable skills.

	» Contribution towards local development initiatives.
Activities/Risk Sources	» No social responsibility from developer. » No contribution towards local development initiatives. » Inefficient training or lack of capacity building and skills training.
Mitigation: Target/Objective	» Capacity building and skills training continuously undertaken during the operational phase of the project. » Positive social responsibility initiatives.

Mitigation: Action/Control	Responsibility	Timeframe
Involvement in upliftment programmes could be done according to the needs identified as part of the IDP of the //Khara Hais Municipality.	Owner Local Municipality	Operation
Capacity building and skills training should form part of the social development support provided to local communities.	Owner Local Municipality	Operation
In cases for the middle to lower skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	Owner Local Municipality	Operation
The project applicant should create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the operational phase for rendering ancillary services to the proposed facility.	Owner	Operation

Performance Indicator	» The skills development plan concentrates on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere. » Local development initiatives should be supported
Monitoring	» The Owner should be able to demonstrate that the above indicators are implemented.

OBJECTIVE 9: Minimise the potential impact on farming activities and on the surrounding landowners

Once operational, the impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). The number of workers on site on a daily basis is anticipated to have minimal negative social impacts in this regard.

Individuals leaving their existing full time employment positions at farms in the area to obtain work at the facility could result in possible negative impacts on the farming

community. Employing outsiders on the other hand and accommodating them at the planned accommodation facility on site could also affect the community's social dealings with each other as well as the traditional character of the area. In worst cases it could result in social conflict between the various groupings. The recruitment and employment process would thus have to be sensitively dealt with to limit any possible negative impacts on the daily living patterns of the existing farming community and other community members.

The operations at the facility, however is not anticipated to have severe negative impacts on the neighbouring farmers' living and movement patterns, apart from a limited increase in the movement of people to and from the site, as well as the presence of these employees on-site on a permanent basis. Concerns about rental agreements should be considered.

Vehicle movement to and from the site (e.g. transportation of workers and goods) could influence road users' daily movement patterns, although it is anticipated that this impact would only materialise intermittently.

Project Component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	» Possible limited intrusion impact on surrounding land owners. » Possible phasing out of cattle farming.
Activities/Risk Sources	» Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.
Mitigation: Target/Objective	» Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Owner O&M Operator	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Owner Employees	Operation
Limit the development of new access roads on site as far as possible.	Owner Contractors	Operation

Performance Indicator	» No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities.
Monitoring	» The Owner should be able to demonstrate that facility is well managed

	without environmental pollution and that the above requirements have been met.

OBJECTIVE 10: Appropriate handling and management of hazardous substances and waste

The operation of the solar energy 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 liquid waste.

Project Component/s	» Parabolic troughs (i.e. heat transfer fluid). » Substation. » 15% of back up fuel will be sourced from LPG or biofuel. » Water treatment works. » Operation and maintenance staff. » Workshop.
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	» Transformers and switchgear – substation. » Parabolic troughs. » Water storage and treatment reservoirs. » Fuel, oil, HTF, and LNG storage. » Maintenance building.
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
Hazardous substances (such as used/new transformer oils, HTF, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Owner O&M Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Owner O&M Operator	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste	Owner O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
disposal site or sold to a recycling merchant for recycling.		
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.	Owner O&M Operator	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Owner O&M Operator	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Owner/ waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Owner/ waste management contractor	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	Owner	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Owner	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Owner	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Owner	Operation
On-site hazardous chemicals and hazardous waste storage facilities must not exceed the design limits for liquid waste containment as stipulated in the relevant regulations and SANS codes.	Owner	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. » All appropriate waste disposal certificates with the monthly reports.

8.2. Monitoring Programme: Operation Phase of the Solar Energy Facility

OBJECTIVE 1: 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. An internal environmental audit must be conducted every 6 months and an external audit must be conducted once a year in order to confirm compliance with the requirements of all environmental permits (including the Environmental Authorisation) for the project, this EMPr, and all relevant legislation. The results of the audit reports must be made available to the DEA and relevant competent authority on request, and must be part of monitoring and audit reports. An annual audit report must be compiled and submitted to DEA. The aim of the auditing process would be to routinely 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 communication and feedback to authorities and stakeholders

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of 20 - 30 years and eventual extensions (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

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

» ***Site Preparation***
Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

» ***Disassemble and Remove Infrastructure***
Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

9.1. Objectives

In decommissioning the facility, Emvelo Holdings (Pty) Limited must ensure that:

» All sites not already vegetated are vegetated as soon as possible after operation ceases with species appropriate to the area.
» Any fauna encountered during decommissioning should be removed to safety by a suitably qualified person,
» All structures, foundations and sealed areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site or as requirement by the relevant legislation.
» All access/service roads not required to be retained by landowners are closed and fully rehabilitated.
» All vehicles to adhere to low speed limits (i.e. 30km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust.
» All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
» All rehabilitated areas are monitored for erosion.
» Components of the facility are removed from the site and disposed of appropriately.
» Retrenchments should comply with South African Labour legislation of the day.

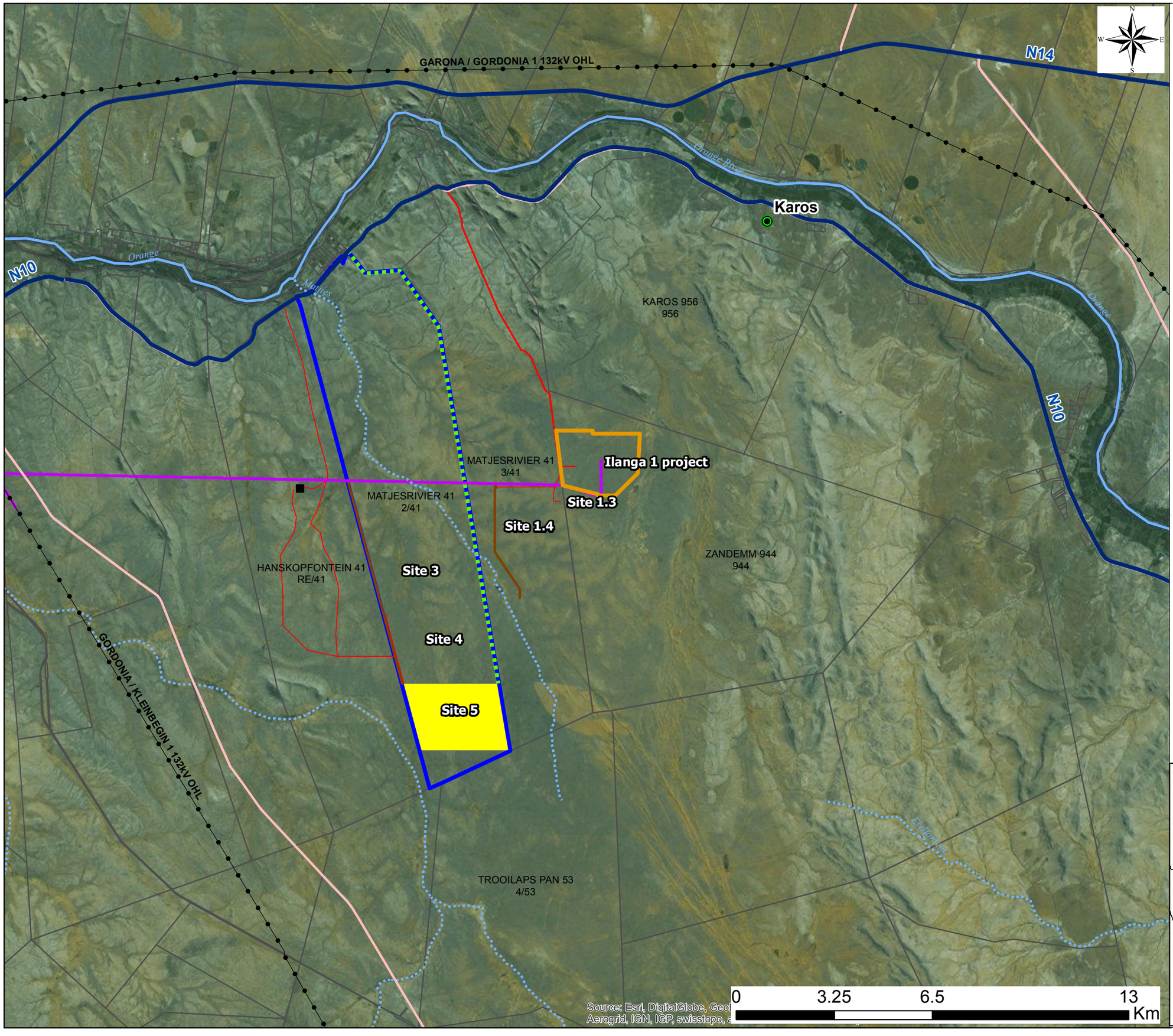
The general specifications of Chapter 7 (Construction) and Chapter 8 (Rehabilitation 8) are also relevant to the proposed project and must be adhered to.

Appendix A:

Facility Layout and Sensitivity Maps

PROPOSED ILANGA CSP 4 PROJECT, WITHIN THE KAROSHOEK SOLAR VALLEY PARK, NORTHERN CAPE

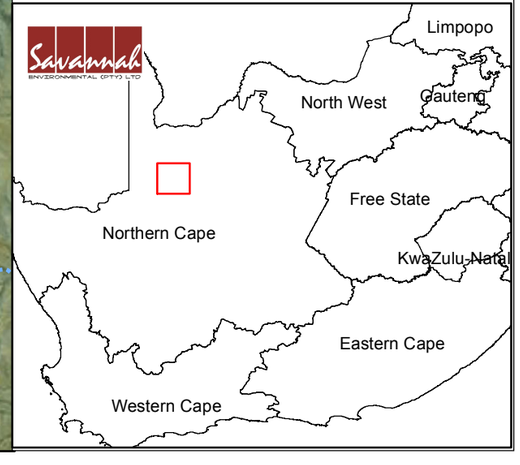
Locality map



Legend

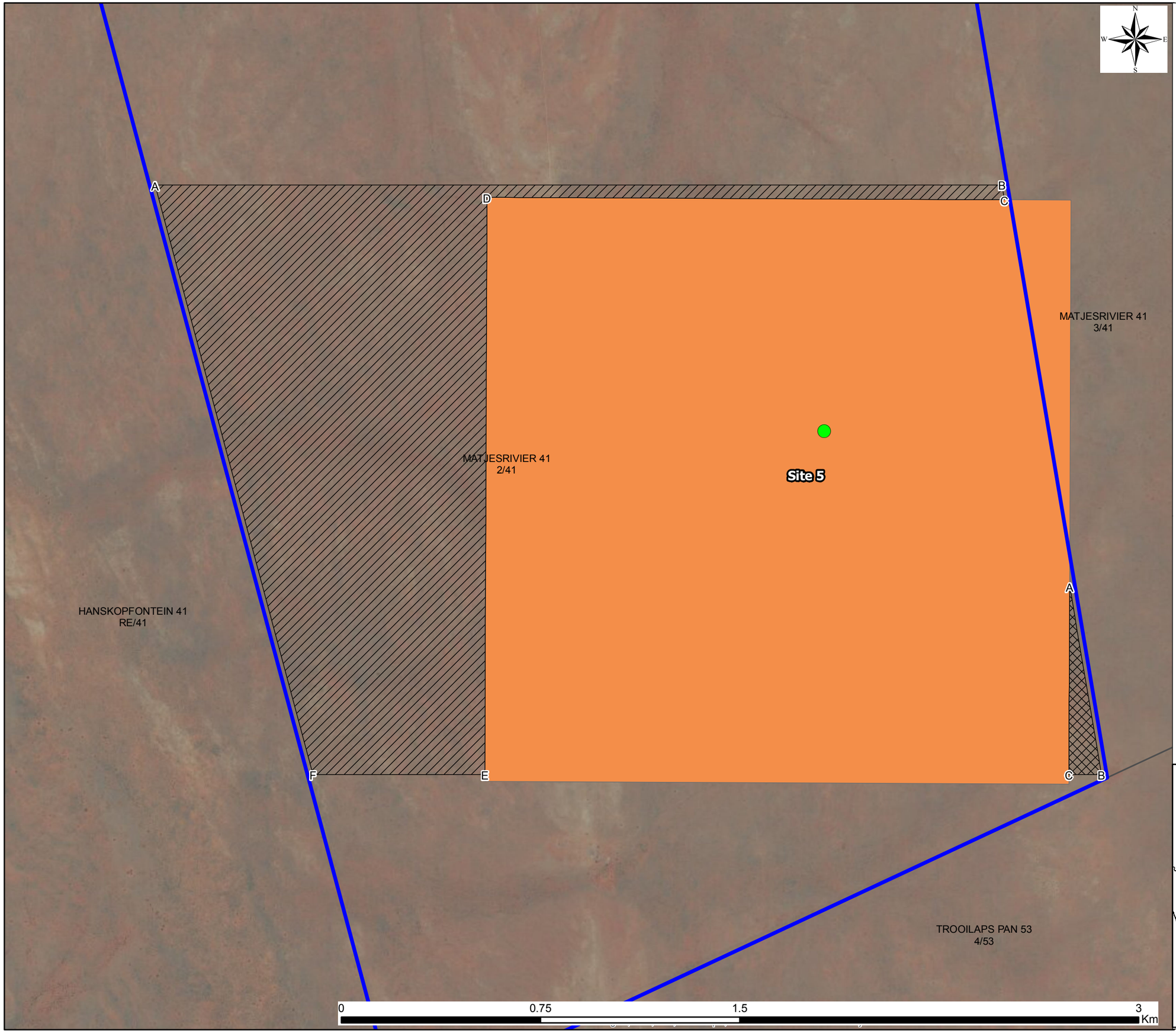
- Eskom Power Line
- National road
- Main road
- Perennial river
- Non-perennial river
- Authorised Ilanga CSP site
- Authorised Ilanga 1 Power Line
- Proposed 400kV Substation
- Access roads
- Water pipeline
- Power line
- Affected farm portion
- Illanga CSP 4 site

Scale: A3 1:120 000
Projection: LO21 WGS 1984
Map ref#:ILANGA CSP 4_Locality Map_11.11.15



PROPOSED ILANGA CSP 4 PROJECT, WITHIN THE KAROSHOEK SOLAR VALLEY PARK, NORTHERN CAPE

(a map illustrating the newly proposed Ilanga CSP 4 project site and the old Karoshoek project site)



Legend

- Affected farm portion

Ilanga CSP 4 Project Site

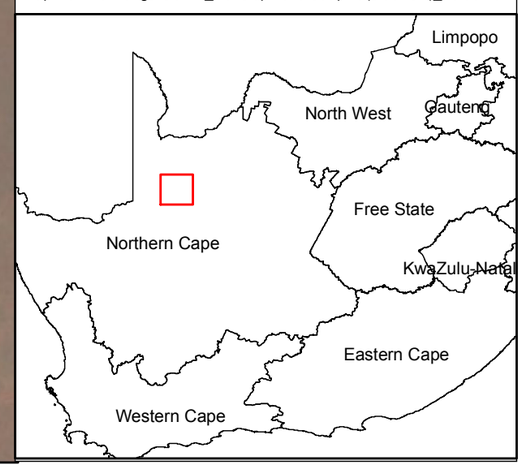
- Section 1
- Section 2

Old Karoshoek project site:

- Authorised Centre Coordinate
- Site 5

Savannah ENVIRONMENTAL (PTY) LTD

A3 Scale: 1:13 672
Projection: LO21 WGS 1984
Map Ref. No.:Ilanga CSP 4_Development footrpint (old&new)_10.06.16



PROPOSED ILANGA CSP 4 PROJECT, WITHIN THE KAROSHOEK SOLAR VALLEY PARK, NORTHERN CAPE

Layout Map

MATJESRIVIER 41
3/41

MATJESRIVIER 41
2/41

HANSKOPFONTEIN 41
RE/41

TROOILAPS PAN 53
4/53

0 0.45 0.9 1.8 Km

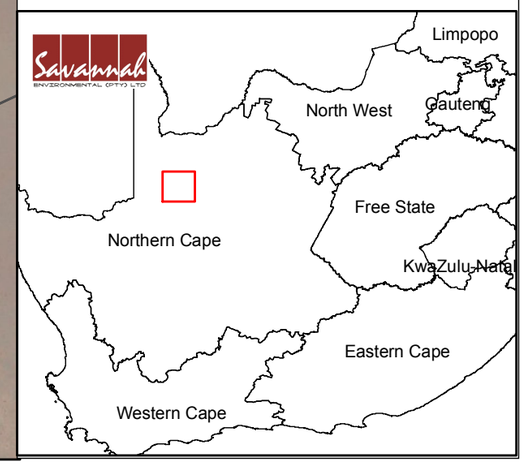
Legend

- Affected farm portion
- Illanga CSP 4 site

Layout Plan:

- 132kV Karoshoek Substation
- Power Block
- 132kV Overhead Line Evacuation
- Evaporation Ponds
- Administration Building
- GLP Plant
- Access Roads
- Solar Field
- Wind Fence
- Temporary Facilities Area and Construction Camp

A3 Scale: 1:12 000
Projection: LO21 WGS 1984
Map Ref. No.:Ilanga CSP 4 Layout Map
Date: 15.04.16



PROPOSED ILANGA CSP 4 PROJECT, WITHIN THE KAROSHOEK SOLAR VALLEY PARK, NORTHERN CAPE

Environmental Sensitivity and Layout Map

MATJESRIVIER 41
3/41

MATJESRIVIER 41
2/41

HANSKOPFONTEIN 41
RE/41

TROOILAPS PAN 53
4/53

Legend

- Affected farm portion
- Illanga CSP 4 Project Site

Layout Plan:

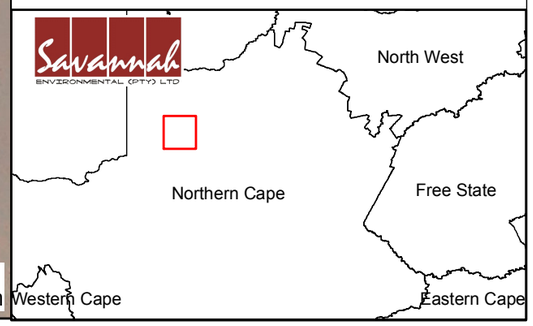
- 132kV Karoshoek Substation
- Power Block
- 132kV Overhead Line Evacuation
- Solar Field
- Administration Building
- GLP Plant
- Access Roads
- Evaporation Ponds
- Wind Fence
- Temporary Facilities Area and Construction Camp

Environmental Sensitivities:

- High Ecological Sensitivity
- Medium-High Ecological Sensitivity
- Medium Ecological Sensitivity
- Medium-Low Ecological Sensitivity
- Potential Avifauna Sensitive Area (Inactive Secretarybird Nest)

0 0.475 0.95 1.9 Km

A3 Scale: 1:12 500
Projection: LO21 WGS 1984
Map Ref.: Ilanga CSP 4_Envir Sens Map (with basemap)_18.04.16



Appendix B:

Key Legislation Applicable to the Development

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

The following legislation and guidelines have informed the scope and content of this EMP Report:

» National Environmental Management Act (Act No 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GNR 982, appendix 4 in Government Gazette 38282 of 4 December 2014)
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
» Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014
» Public Participation in the EIA Process (DEA, 2014)
» Integrated Environmental Management Information Series (published by DEA)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the table that follows.

Table 1.1: Relevant legislative and permitting requirements applicable to the establishment of Ilanga CSP 4 Project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	» EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. » In terms of GNR 387 of 21 April 2006, a scoping and EIA process is required to be undertaken for the proposed project	» National Department of Environmental Affairs – lead authority » NC DENC - commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	» In terms of the Duty of Care provision in S28(1) 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, stopped or minimised. » In terms of NEMA, it has become the legal	Department of Environmental Affairs (as regulator of NEMA)	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.		
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » NC DENC » Local Authorities	There is no requirement for a noise permit in terms of the legislation. Noise impacts may result from specific activities carried out during the construction phase of the project and could present an intrusion impact to the local community.
National Water Act (Act No 36 of 1998)	» Water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.	» Department of Water Affairs	» The abstraction of water and storage of water are regarded as a water uses (as defined in terms of S21 of the NWA). » A water use license (WUL) is required to be obtained if wetlands/pans or drainage lines are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest). » A water use license (WUL) is required to be obtained for the handling and storage of wastewater associated with the

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			project. » A water use license application will be applied for in line with the DWS requirements, once the project has obtained preferred bidder status.
National Water Act (Act No 36 of 1998)	» In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	» Department of Water Affairs (as regulator of NWA)	This section will apply throughout the life cycle of the project.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.	» Department of Minerals and Energy	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» S21 – Listed activities requiring an Air Emissions License. » Minimum emission standards are set for Listed Activities. » Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013. » Measures to control noise (S34) - no regulations promulgated yet. » The Act provides that an air quality officer	» National Department of Environmental Affairs » District Municipality	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project. » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.		person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » 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 (S44).	South African Heritage Resources Agency and the Provincial Heritage Resources Agency	An HIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix G). Should a heritage resource be impacted upon, a permit may be required from SAHRA.
National Environmental Management: Biodiversity	» Provides for the MEC/Minister to identify any process or activity in such a listed	» Department of Environmental Affairs	Under this Act, a permit would be required for any activity which is of a

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Act (Act No 10 of 2004)	ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), 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 summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and	» DENC	nature that may negatively impact on the survival of a listed protected species. An ecological study has been undertaken as part of the EIA Phase. As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix D.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	» Department of Agriculture	While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. 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 protected tree, except under a licence granted by the Minister'.	Department of Agriculture, Forestry and Fisheries (DAFF)	A licence is required for any removal of protected trees (*Brachystelma huttonii* (Rare) and *Pelargonium reniforme* subsp. *Reniforme (*Listed species that are known to occur in the area, but which were not observed on site)).
National Veld and Forest	In terms of S12 the landowner must ensure	Department of Agriculture,	While no permitting or licensing

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Fire Act (Act 101 of 1998)	that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Forestry and Fisheries (DAFF)	requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death by reason of 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,	» Department of Health	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » 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.		
National Road Traffic Act (Act No 93 of 1996)	» 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. » The general conditions, limitations, and escort requirements for abnormally	Provincial Department of Transport (provincial roads) » South African National Roads Agency Limited (national roads)	» 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 power station components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	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.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» 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— *(a)* adding other waste management activities to the list; *(b)* removing waste management activities from the list; or *(c)* making other changes to the particulars on the list. » A Basic Assessment or Environmental Impact Assessment 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	National Department of Water and Environmental Affairs (hazardous waste and effluent) Provincial Department of Environmental Affairs (general waste)	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMPr.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	(a) 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; *(b)* adequate measures are taken to prevent accidental spillage or leaking; *(c)* the waste cannot be blown away; *(d)* nuisances such as odour, visual impacts and breeding of vectors do not arise; and *(e)* pollution of the environment and harm to health are prevented		
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	» In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. In this regard, all land within a 3 kilometres radius of the centre of the Southern African large Telescope dome falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope.	Department of Science and Technology	Approval from SKA required.
Provincial Legislation			

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
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	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant species found on site. .

Table 3.2: Standards applicable to the Ilanga CSP 4 project

Theme	Standard	Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants
Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments	General procedure used to determine the noise impact
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication	Provides noise impact criteria
	National Noise Control Regulations	Provides noise impact criteria
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels
Waste	DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste	DWAF Minimum Requirements
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) – National norms and standard for the storage of waste.	» Provides uniform national approach relating the management of waste facilities » Ensure best practice in management of waste storage » Provides minimum standards for the design and operation of new and existing waste storage
Water	Best Practise Guideline (G1) Stormwater Management DWS2006	Provides guidelines to the management of stormwater
	South African Water Quality Guidelines	Provides water quality guidelines

Appendix C:

Grievance Mechanism for Public Complaints and Issues

GRIEVANCE MECHANISM / PROCESS

PURPOSE

This Grievance Mechanism has been developed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The aim of the grievance mechanism is to ensure that grievances or concerns raised by local landowners and or communities are addressed in a manner that:

» Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting.
» Builds 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 address grievances in a manner that does not require a potentially costly and time consuming legal process.

PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

» Local landowners, communities and authorities must be informed in writing by the Proponent of the grievance mechanism and the process by which grievances can be brought to the attention of the Proponent through its designated representative.
» A company representative must be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person must be provided to local landowners, communities and authorities.
» Project related grievances relating to the construction, operational and or decommissioning phase 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.
» 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 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).
» 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. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

» The meeting should be chaired by the Proponent's representative appointed to address grievances. The Proponent must provide a person to take minutes of and record the meeting/s. Any costs associated with hiring venues must be covered by the Proponent.
» Draft copies of the minutes must be made available to the Complainant and the Proponent within 4 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 4 working days of receipt of the draft minutes.
» In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must 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 Proponent 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 Proponent 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 Proponent, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Proponent. The Proponent must provide a person to take minutes of 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 Proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 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 can be or needs to be taken. Closure status will be classified 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 and the case has been authorised for close out by the Appeals Committee.
» 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 Proponent, either party may be of the opinion that legal action may be the most appropriate option.

Appendix D:

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 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 that is generated from the project activities on site.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and includes waste stream information available at the time of compilation. Construction practices and operations must be measured and analysed 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 further updated should further detail regarding waste quantities and categorisation become available, during the construction and/or operational stages.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Ilanga CSP 4 Facility will generate construction solid waste, general waste, contaminated water and soil.

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

- Concrete waste generated from removal foundations, spoil and excess concrete.
- Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- Hazardous waste from vehicle, equipment and machinery parts (oil cans, filters, rags etc), and servicing.
- Hazardous waste from, flouresent tubes, HTF, used hydrocarbon containers, and waste ink carteridges.
- Recycable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- Organic waste from food waste and alien and endemic vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from spoil material from site clearence and trenching works.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by means of a number of pieces of legislation, 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)
» Air Quality Act (Act 39 of 2004)

Storage of waste must be undertaken in accordance with the National Norms and Standards for the Storage of Waste published in GN926.

4. WASTE MANAGEMENT PRINCIPLES

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

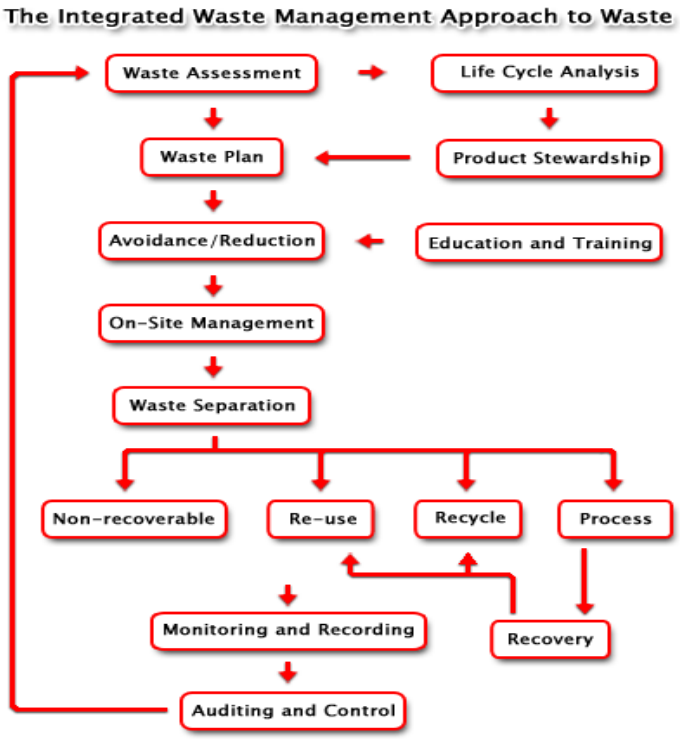


Figure 1: Integrated Waste Management Flow Diagram
(Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496)

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 a 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 as possible.

4.1. Construction phase

A plan for the management of waste during construction waste is detailed below. As previously stated, construction practices must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

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 method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
» Once a waste inventory has been established, targets for 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.
» Waste manifests and waste acceptance approvals from designated waste facilities must be kept on hand in order to prove compliance.
» Septic tanks and portable toilets must be monitored and maintained daily. 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 driving around the area.
» Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at various areas around 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. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
» 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.
» Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
» If possible a dedicated waste management team must be appointed by the principal contractors' EO, whom 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 EO.

» All waste removed from site must be done so by a registered/ licensed subcontractor, whom 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.

4.1.3. Management of waste storage areas

» The position of all waste storage areas must be located at least 32m away from water courses and ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
» Collection bins placed around 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.
» 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, not allowing access to vermin or other rodents. A Tarp or Shade cloth should ideally be used to ensure avifauna does not have access to waste.
» Waste must be stored in designated containers and not on the ground.
» Inspections and maintenance of bunds must be undertaken daily. 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 removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

4.1.4. Disposal

» Waste generated on site must be removed on a regular basis, as determined by the EO and ECO. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
» Waste must be removed by a suitably qualified contractor and disposed 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 Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, 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.

5. Operational phase

It is expected that the operational 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. Limited amounts of hazardous wastes (grease, oils) may 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.

The following waste management principles apply during the operational 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 construction 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 operational phase.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

6. 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 E:

Alien Invasive Plant and Open Space Management Plan

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

1. PURPOSE

Invasive alien species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Ilanga CSP 4 Facility. The broad objectives of the plan includes the following:

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

2. RELEVANT ASPECTS OF THE SITE

Alien plants are likely to invade the site as a result of the large amounts of disturbance created during operation. Current levels of plant invasion at the site is low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali* and *Flaveria bidentis*

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 aliens 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 NEMBA. 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 Cat 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 Cat 3 plants to exist in riparian zones.

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

It is important to note that alien 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 shortly after they arrive in the project area. 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 new 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 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 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 & Guiding Principles

Alien control programs are long-term management projects and should include 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 aliens are easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. <u>Clearing Methods</u>

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. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

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

» **<u>Mechanical control</u>**

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 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 invasion and may also be ineffective for many woody species which resprout. 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 in 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.

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 in 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 plants 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 ongoing monitoring programme for construction phase to detect and quantify any alien species that may become established and identify the problem species.
- Alien vegetation regrowth on areas disturbed by construction must be immediately controlled once recorded throughout the entire site during construction and operation.
- 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 are such that 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 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 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 aliens identified should be cleared using appropriate means.

4.5. Monitoring

In order to monitor 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 and assessment of the magnitude of alien invasion on site as well as an assessment of the success 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.

<u>Construction Phase</u>

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Preconstruction & monthly thereafter
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

Operation Phase

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

Appendix F:

Re-Vegetation and Habitat Rehabilitation Plan

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the Ilanga CSP 4 Facility are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation plan for the site can be summarised as follows:

» Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
» Re-vegetate all disturbed areas with suitable local plant species.
» Minimise visual impact of disturbed areas.
» Ensure that disturbed areas are safe for future uses.

This Revegetation and Rehabilitation Plan should be closely aligned with other site-specific plans, including the Erosion Management Plan, Soil Management Plan, Alien Plant Management Plan, and Plant Rescue and Protection Plan. Prior to commencement of construction, a detailed Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a Rehabilitation Specialist.

2. RELEVANT ASPECTS OF THE SITE

Within the site, the Bushmanland Arid Grassland typically consists of extensive open plains dominated by various bushman-grasses with greater or lesser amounts of scattered taller woody species and trees present. Typically, this vegetation within the study area is dominated by grasses such as *Stipagrostis ciliata*, *S.uniplumis*, *S.amabilis* and *Schmidtia kalahariensis*. Trees and shrubs of the open plains included *Boscia foetida*, *Boscia albitrunca*, *Parkinsonia africana*, *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Aptosimum albomarginatum*. There were also occasional stony areas within these areas that contained a greater amount of woody shrubs and grass species not present on the sandy soils. These areas were dominated by species such as *Aptosimum spinescens*, *Barleria rigida*, *Leucosphaera bainesii*, *Zygophyllum dregeanum* and grasses such as *Enneapogon scaber*, *Stipagrostis obtusa* and *Oropetium capense*. Overall, the affected area is considered relatively low sensitivity, as there are few sensitive features present. Protected species observed include *Hoodia gordonii* which occurs scattered at a low density and *Boscia albitrunca* which is a nationally protected tree which occurs also at low density across the site.

Photograph 1: Vegetation within the Ilanga CSP 4 Project area consists of an open grassland with scattered shrubs and trees such as *Boscia albitrunca*.

Photograph 2: Some parts of the site are encroached by Rhigozum trichotomum and have a higher density of this and other shrub species such as Phaeoptilum spinosum. These areas are not considered sensitive as there are very few species or features of concern within these areas.

3. REHABILITATION METHODS

» Immediately after replacing topsoils in disturbed areas, the soil surface must be revegetated with a suitable plant cover.
» It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover. However, simply applying this topsoil to a well prepared rehabilitation site does not result in the same species richness and diversity as the surrounding areas. In some areas the natural regeneration of the vegetation may be poor and the application relevant of seed to enhance vegetation recovery may be required.
» Where possible, seed should be collected from plants present at the site during plant rescue oprerations. Indigenous seeds may also be harvested for purposes of re-vegetation in areas that are free of alien or invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
» Seed collection should be undertaken by a suitably qualified specialist who is familiar with the various seed types associated with the plant species and rehabilitation in the area.
» Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. The collection of unripe seeds will reduce the percentage germination thereby reducing the effectiveness of the rehabilitation efforts. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.
» Seed can be sown onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch. Additional organic material may be added to the soil mix, if required, to assist with water retention during the early stages of seedling establishment.
» It should be ensured that the seed mix is as diverse as possible in the first season. After the first season, when pioneer plant communities have successfully established, attempts should be made to re-sow and replant the area with more perennial and woody species. It is a process that will require several follow-ups.
» Planting is dependent on species involved. Planting of species recommended for rehabilitation should be carried out as far as is practicable to coincide with the onset of the first significant rains. In general however, planting should commence as soon as possible after construction is completed in order to minimise the potential for erosion.
» The final vegetation cover should resemble the original (non-encroached and indigenous) vegetation composition and structure as far as practicably possible.
» Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed.
» Once revegetated, areas should be protected to prevent trampling and erosion.

» No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
» Where rehabilitation sites are located within actively grazed areas, they should be fenced, this must be undertaken in consultation with the landowner.
» Fencing should be removed once a sound vegetative cover has been achieved.
» Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

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 Proponent 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:

» Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state.
» Associated nature and stability of surface soils
» Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately.

The initial revegetation period post construction is estimated to be over a period of 6 months (minimum) to 12 months (maximum), or a time period specified by the rehabilitation specialist, particularly if planting of trees and shrubs occurs. The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

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

» Re-vegetated areas should be monitored every 4 months for the first 12 months following construction.
» Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;

» Any areas showing erosion, should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until an acceptable plant cover is achieved (excluding alien plant species or weeds). Additional seeding or planting may be necessary to achieve acceptable plant cover. Hand seeding may have to be considered as an option in this case.

Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging alien plant species should continue for as long as considered necessary.

Appendix G:

Plant Rescue and Protection Plan

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the 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 Ilanga CSP 4 Facility on listed and protected plant species and their habitats and to provide guidance on search and rescue of species of conservation concern.

2. RELEVANT ASPECTS OF THE SITE

The density and diversity of protected species at the site is low. The only species observed within the site were *Boscia albitrunca* and *Hoodia gordonii* which both occurred at low density. Other protected species observed in the area which may be present but were not observed within the development area include *Acacia erioloba*, *Aloe claviforа* and *Boscia foetida*. As the site is large, some individuals of these species may be present but at a low density or as small plants, as they were not observed during the site visit even though the site is flat and open.
Listed species that are known to occur in the area, but which were not observed include *Brachystelma huttonii* (Rare) and *Pelargonium reniforme* subsp. *reniforme* (Data Deficient Data).

Table 1. Listed species which may occur within the Ilanga CSP 4 Project site, including their IUCN status and the likelihood that they occur at the site.

Family	Species	IUCN Status	Likelihood
ASPHODELACEAE	*Aloe dichotoma*	VU	Low
MESEMBRYANTHEMACEAE	*Dinteranthus wilmotianus*	NT	Low
AMARYLLIDACEAE	*Crinum bulbispermum*	Declining	Low
FABACEAE	*Acacia erioloba*	Declining	Confirmed
APOCYNACEAE	*Hoodia gordonii*	DDD	Confirmed
GERANIACEAE	*Pelargonium reniforme subsp. reniforme*	DDD	Low
ASTERACEAE	*Gymnostephium ciliare*	DDT	Low
ASTERACEAE	*Senecio monticola*	DDT	Low

3. PRINCIPLES FOR SEARCH AND RESCUE

Successful plant rescue can only be achieved if:

» Species can be removed from their original habitat with minimal damage to the plant, especially the roots.

» All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
» They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
» Timing of planting activities is planned with the onset of the growing season.
» Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

The following principles apply in terms of plant rescue and protection:

» A permit is required from the Northern Cape Department of Environment and Nature Conservation to translocate or destroy any listed and protected species identified by the ecological walkthrough survey undertaken for the optimised final Ilanga CSP 4 Facility layout, even if they do not leave the property. This permit should be obtained prior to any search and rescue operations being undertaken.
» Where suitable species are identified, a search and rescue operation of these species should be undertaken within the development footprint, where these species would be affected, and prior to the commencement of construction.
» As far as possible, timing of search and rescue activities should be planned with the onset of the growing season.
» Affected individuals should be translocated to a similar habitat outside of the development footprint and marked and recorded for monitoring purposes. For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device.
» The rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.
» Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. Re-planting into the wild must cause as little disturbance as possible to existing natural ecosystems. The position of the rescued individual/s must be recorded to aid in future monitoring of that plant as noted earlier.
» During construction, the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO)/ Environmental Representative must monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO/ SHE Representative) and any listed species present which are able to survive translocation should be translocated to a safe site.
» Any listed species suitable for translocation observed within the development footprint, and that would be affected, that were not previously observed be translocated to a safe site.

» The collecting of plants of their parts should be strictly forbidden. Staff should be informed of the legal and conservation aspects of harvesting plants from the wild as part of the environmental induction training.
» Sensitive habitats and area outside project development should be clearly demarcated as no go areas during the construction and operational phase to avoid accidental impacts.

Appendix H:

Traffic and Transportation 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 and the construction of temporary and long-term access within the vicinity of the Ilanga CSP 4 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.

2. RELEVANT ASPECTS OF THE PROJECT

The main access to the site will be directly from the N10 which runs North of the praised development. Internal access roads of up to 5 m wide will also be required.

Methodology
Three possible access routes were identified at the N10 where safe access intersections that would allow for traffic to flow and not result in any hazards were identified. These access routes identified were; Option 1, Option 2 and Option 3 as shown in figure 1 below.

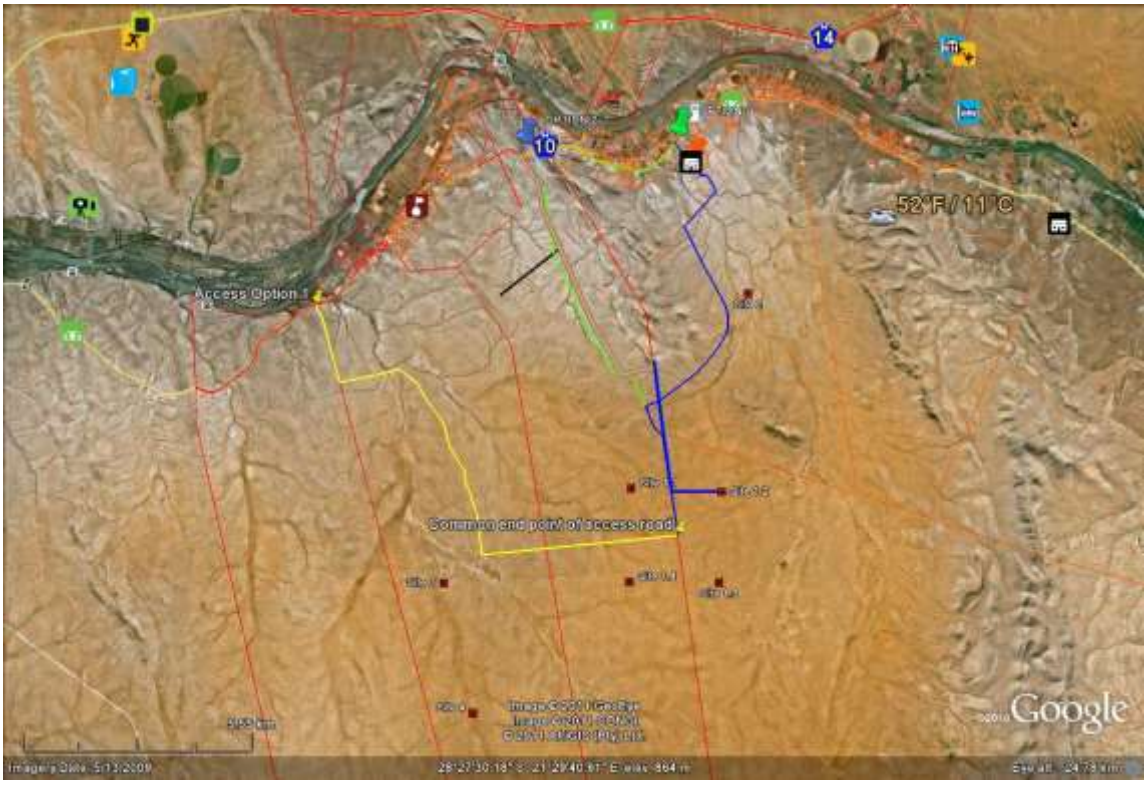


Figure 1: N10 access options for the Karoshoek Solar Valley Site

A site visit inspection with three representatives from SANRAL was organised by Worley Parsons as part of study that included a cost benefit analysis, road traffic flow improvement that benefits road users, the nearby communities and reduces the number of accidents and traffic hazards in the area. Option 2 despite being the most expensive option was selected as the option that will ensure there will be no hazards as a result of increased trucks and it will prevent as well as reduce the number of accidents at section 11 at kilometre chainage 87.2 as shown in figure 2 below.

Figure 2: N10, kilometre chainage 87.2

Road Traffic Plan

SANRAL advised that the Option 2 intersection would only be approved if the re-alignment of the N10 at km chainage 87.2 will adhere to a design speed of 100km/hour as this will allow for traffic to flow without resulting in congestion at the chosen intersection. The current speed limit at the proposed intersection is 60km/hour, because of the fact that the road is not aligned as indicated in figure 2.
To meet the requirements of SANRAL, a detailed survey and design was conducted by Worley Parsons. The design makes provision for traffic from the N10 to enter the Karoshoek Solar Valley site without causing any congestion as extra lanes will be developed to accommodate the traffic at the N10 and from the Karoshoek Solar Valley site.

The traffic crossing the N10 from the north to the south will be accommodated by a proposed sub – level bridge and no crossing with the N10 will be done. This has been designed so for traffic safety reasons. The intersection will be used to transport staff on a daily basis to and from the site as well as material and people during construction. Traffic within the Karoshoek Solar Valley will be accommodated by internal access routes that will be designed according to the normal safe horizontal and vertical specifications for the South African Standards and storm water structures will be designed to accommodate effluent crossing the roads.

SANRAL Approval

SANRAL has approved the road design for the intersection at km chainage 87.2, Drawing No's 26537KPO/LS/1 and 26537KPO/LS/2 showing the detailed design was approved by SANRAL as shown in the 8 June correspondence letter NC11/2/3-10/11-9 from SANRAL.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

» Prior to the commencement of construction the contractor must develop their own detailed Transport Management Plan (TMP) based on the requirements laid out in this plan.
» 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 program (e.g. toolbox talks) by the Environmental Officer (EO). Through this program, 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 I:

Stormwater Management Plan

STORMWATER MANAGEMENT PLAN

1. PURPOSE

It is widely recognised that developments could impact negatively on drainage systems. By taking greater cognisance of natural hydrological patterns and processes it is possible to develop stormwater management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate stormwater management are increased erosion risk and risks associated with flooding. Therefore, this Stormwater Management Plan and the Erosion Management Plan are closely linked to one another and should be managed together.

This Stormwater Management Plan addresses the management of stormwater runoff from the development site and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of storm water management measures and infrastructure are:

» Topography and slope gradients;
» Placing of infrastructure and infrastructure design;
» Annual average rainfall;and
» Rainfall intensities.

The objective of the plan is therefore to provide measures to address runoff from disturbed portions of the site, such that they:

» do not result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
» do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the development if not necessary.
» do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This Storm Water Management 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 proposed development is situated to the south of the Orange River with a proposed abstraction point that is situated on the Orange River approximately 25 km upstream of Upington. The project area is situated in the Lower Orange Water Management Area (WMA).

The main drainage line associated with the Karoshoek CSP facility is the Orange River which is situated to the north of the project area. The Matjies River, a 1st order tributary of the Orange River flows in a northerly direction down the centre of the proposed site whilst an unnamed tributary of the Orange River flows through the south western portion of the site. The Donkerhoekspruit, another 1nd order tributary of the Orange River, is situated to the west of the project area and is unlikely to be impacted upon by the project.
Of all these rivers only the Orange River is perennial and the smaller tributaries are likely only to flow for brief periods after rainfall events.

3. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various stormwater management principles should be considered including:

» Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
» Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
» Minimse the area of exposure of bare soils to minimse the erosive forces of wind, water and all forms of traffic.
» Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
» Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
» Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.
» Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
» Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
» Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the, natural drainage lines and to assist with any sheet flow on the site.

» Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.
» Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
» Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system.
» Preferably all drainage channels on site and contained within the larger area of the property (i.e. including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

3.1. Engineering Specifications

A detailed engineering specifications Stormwater 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 this Storm-water Management Plan. 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 stormwater control measures (post construction).
» All temporary and permanent water management structures or stabilisation methods must be indicated within the Final/Updated Stormwater Management Plan.
» The drainage system for the site should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying storm waters around and away from infrastructure.
» Procedures for storm water flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
» An onsite Engineer or Environmental Officer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
» The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Stormwater 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 the Stormwater Management Plan are met before, during and after construction. The designated responsible person on site, must be indicated in the Stormwater Control

Method Statement and shall ensure that no construction work takes place before the relevant stormwater control measures are in place.

An operational phase Stormwater 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.

Appendix J:

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 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.

2. RELEVANT ASPECTS OF THE SITE

The generalised soil patterns for the area are Sandy AR2 soils and LP2 soils that have limited pedological development. The dominant soil pattern is however CM which are deeper red soils with a high base status. AR2 soil patterns may be described as red and yellow, sandy well drained soils with high base status. The other soil pattern, LP2, is soil with minimal development, usually shallow on hard or weathering rock, with or without intermittent diverse soils. Calcrete and lime is generally found in large parts or in most of the surrounding landscape.

Soil classes provided by the source indicate that lithosols occur on between 30%-60% of the site. Lithosols are shallow soils on hard or weathering rock. They may receive water runoff from associated rock and are not generally deep because of their association with depth limiting rock layers such as the metamorphic gneiss. Soil horizons associated with the lithic group are lithocutanic B and hard rock, which occur in Glenrosa, Mispah and Cartef soil forms. Freely drained, structureless soils with restricted soil depth, excessive drainage, high erodibility and low natural fertility are common.

Oxidic soils have a B horizon that has a colour directly related to the mineralogy of the area. Freely drained, unstructured soils occur on between 30%-60% of the site. Soil horizons associated of the group are Longlands, Clovelly and Hutton (Fey, 2010).

There are a variety of land types in the broader study area, i.e. Ic, Ae, Af, and Ag land types. The most common land types in the study area are Ae and Af (Land Type Survey Staff, 1987 (Refer to Figure 1)).

Land type Ag5 covers the largest area of the project site. Red and yellow well-drained sandy soil with high base status may occur in places. Deeper Hutton soil forms occur which are clearly distinct from Mispah.

Land type Af25 is found east of the site. This land type is very similar to **Ag5** with the only real difference being that it has a larger percentage of deeper soils when compared to **Ag5**.

Red and yellow well-drained sandy soils with a high base status dominate the area. The main soil form present is Hutton. An Orthic A horizon rarely deeper than 200mm is found directly on top of a Red Apedal B.

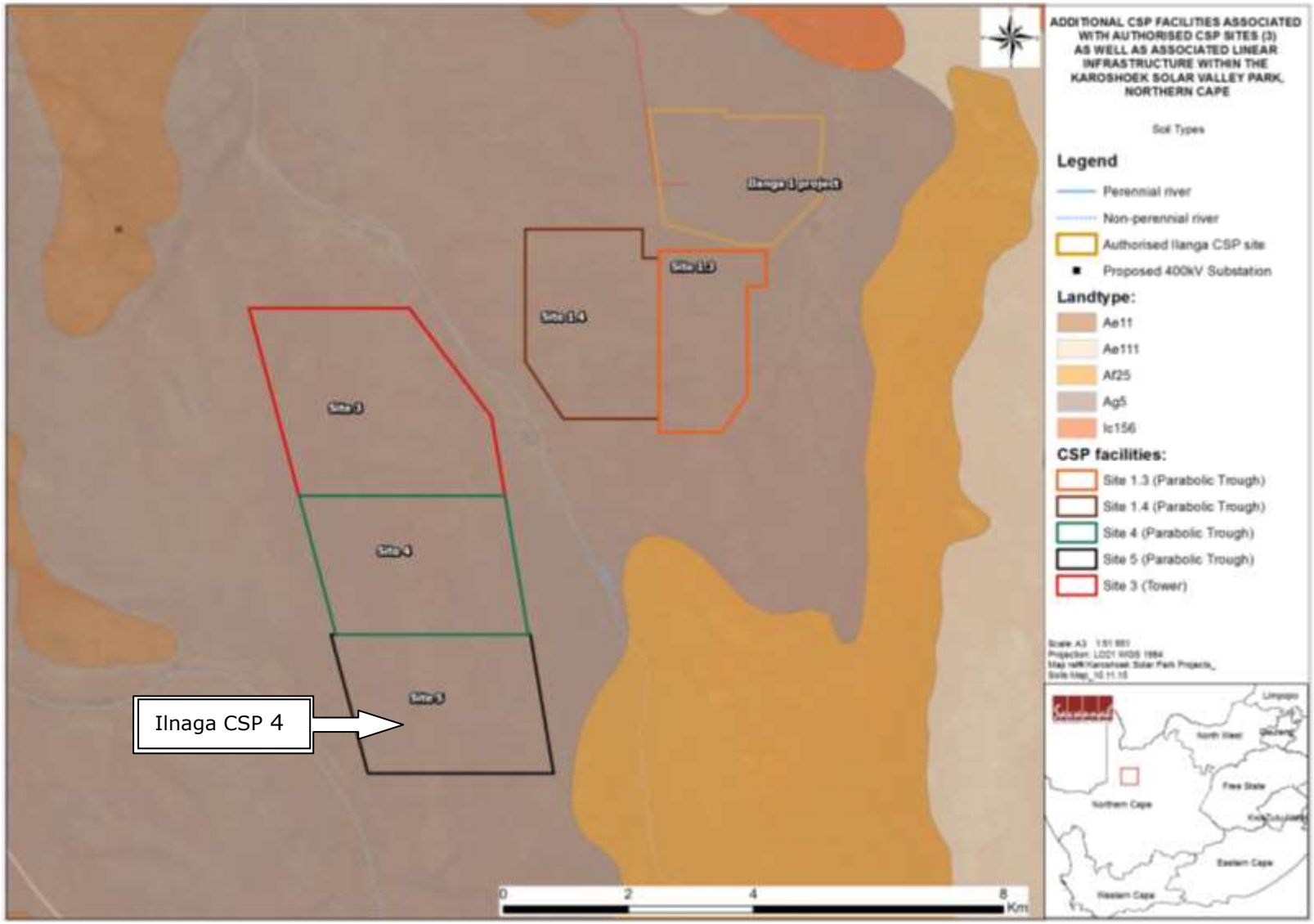


Figure 1: Land types identified within the Karoshoek Solar Development study area

The soils contained within land types Ae, Af and Ag can be soils of **high agricultural potential** if irrigation water is available. The low rainfall in the study area, however, inhibits dry-land crop production.

The soils in the study area are somewhat susceptible to wind erosion and are largely classified under category 2a where sands are strongly dominant. The measure as to how easy soil may erode by means of wind transportation is given below:

» Fine silt and clay (<0.01 mm) offer strong resistance to movement.
» Coarse silt and very fine sand (0.01-0.1 mm) are lost in suspension.
» Very fine to medium sand (0.1-0.5 mm) is subjected to saltation.
» Coarse sand (0.5-1.0 mm) moves as surface creep

Soils on the site generally have below 10% dominant clay in the top soils. The soils are moderately susceptibility to water erosion which varies across the site. The general assumption is that the erosion susceptibility increases with an increase in the slope angle and/if the slope length is constant.

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.
» Soils 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 present with energy dissipation features present to slow and disperse the water into the receiving area.
» Roads 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.
» 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 should 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.
» 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 (ongoing) 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 H** 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 stormwater control measures (post construction).
» All temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
» An onsite 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 to 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 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 the 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).

5. REFERENCES

Department of Environmental Affairs. (1983). *Conservation of Agricultural Resources Act 43 of 1983.* Pretoria: Department of Environmental Affairs.

Coetzee, K. (2005). *Caring for Natural Rangelands.* Scottsville: University of KwaZulu-Natal Press.

Commission, F. R. (2009, March 10). *Forestry Commission*. Retrieved August Tuesday, 2012, from Forestry Commission: Forest Research : www.forestry.gov.uk

Tongway, D. J., & Ludwig, J. A. (2004). *Heterogeneity in arid and semi arid lands.* Queensland: Sustainable Ecosystems.

van der Linde, M., & Feris, L. (2010). *Compendium of South African Legislation.* Pretoria: Pretoria University Press.

Appendix K:

Emergency Preparedness and Response Plan

EMERGENCY PREPAREDNESS AND RESPONSE 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 response 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 response 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 construction 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 PS1 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

Emvelo Eco Projects (Pty) Ltd proposes to construct and operate a 50 MW Concentrated Solar Plant, using parabolic trough technology, known as the Ilanga CSP 4 Project, on Portion 2 of the Farm Matjiesrivier 41 located approximately approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape Province. Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operational phases:

» Fires;
» Leakage of hazardous substances;
» Storage of flammable materials and substances;
» Flood events and overflow of wastewater retention dam;
» 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 the 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; for a gas fire it is usually appropriate to isolate the fuel and let it burn itself out but keep everything around the fire cold.

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 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 50m of drainage lines or 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 spill to limit entering water bodies and surrounding areas.
5. Identify substance spilled.
6. Quantify spill (under or over guideline/threshold levels).
7. Notify Site Manager and emergency response crew and authorities (in event of major spill).
8. Inform users (and downstream users) of potential risk.
9. Clean up of spill using spill kit or by HazMat team.
10. Record of 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. 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 trench required. Spilled substances can then be recovered using a pump or sorbent materials.

Containment of Spills on Water

Spills in water can negatively impact water quality and aquatic life. All measures need to be undertaken to contain spills on open water. The following methods could be used:

» *Weirs*
Weirs can be used to contain spills in streams and to prevent further migration downstream. Plywood or other materials found on site can be placed into and across the width of the stream, such that water can still flow under the weir. Weirs are however only effective for spilled substances which float on the water surface.

» *Barriers*
In some situations barriers made of netting or fence material can be installed across a stream, and sorbent materials placed at the base to absorb spilled substance. Sorbents will need to be replaced as soon as they are saturated. Water will be allowed to flow through.

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 fire using appropriate equipment
4. If not safe to extinguish, contain fire
5. Notify Site Manager and emergency response crew and authorities
6. Inform users (and downstream users) of potential risk of fire
7. Record of incident on company database

ii. Procedures

Because large scale fires may spread very fast in the environment 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 in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguisher, hose reels, 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 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

» 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.

3.1.3. Scenario: Flood events and overflow of wastewater retention dam

i. Action Plan

The following action plan is proposed in the event of a flood of overflow of wastewater retention dam:

1. Identify flood state or overflow
2. Assess personal safety, safety of others and environment
3. Identify source
4. Stop the source of water(waste) causing overflow if safely possible
5. Contain overflow water to limit it entering surrounding water bodies
6. Quantify overflow
7. Notify Site Manager and emergency response crew and authorities
8. Inform users (and downstream users) of potential risk
9. Record of incident on company database

ii. Flood/overflow Effect Prevention Measures

Preventing flood/ overflowing of wastewater retention dam must be a top priority. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Manager. All parties are expected to:

» Always conduct proper maintenance and inspections on the area and machinery/vehicles.
» Never allow for the risk of over flowing, especially in or near sensitive areas.
» Know the limits of the wastewater dam/s.
» Store all materials in protected areas.

Restrictions must be placed on amounts of wastewater to be pumped into the dam. All technical detail as to capacity and limitations of the facility must be made extremely clear to reduce the potential of contamination.

iii. Procedures

Although attempts can be made to minimise the effects of flooding, it is impossible to prevent floods altogether. Being prepared for flooding and having emergency plans must therefore be a priority.

a) Procedures for initial actions

» Ensure safety of all personnel.
» Assess hazards and risks.
» Stop the flood/overflow if safely and physically possible, e.g. shut off pump.

» No matter what the volume is, notify site manager.
» Contain the wastewater.

b) Reporting procedures

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

c) Procedures for containing and controlling overflow of wastewater retention dam

Measures can be taken to prepare for quick and effective containment of any potential overflow.

» Initiate overflow containment by first determining what will be affected by the incident.
» Assess speed and direction of overflow and cause of movement (water, wind and slope).
» Determine best location for containing wastewater, avoiding any water bodies.
» Have a contingency plan ready in case event worsens beyond control or if the weather or topography impedes containment.

d) Procedures for transferring, storing, and management.

Following clean up, any tools or equipment used will be properly washed and decontaminated, or replaced if this is not possible. All materials used for containment of spilled wastewater must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

SUMMARY: RESPONSE PROCEDURE

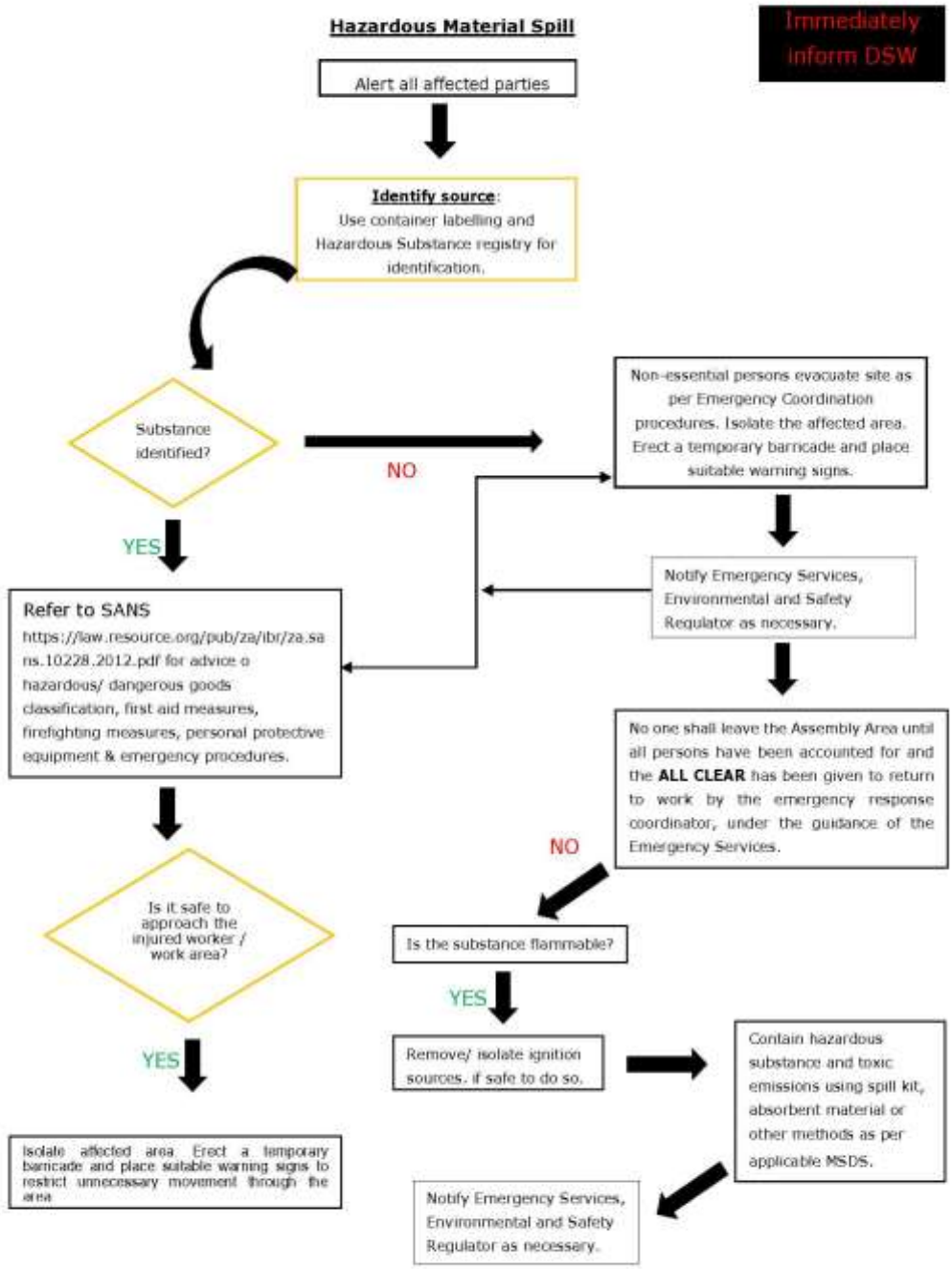


Figure 1: Hazardous Material Spill

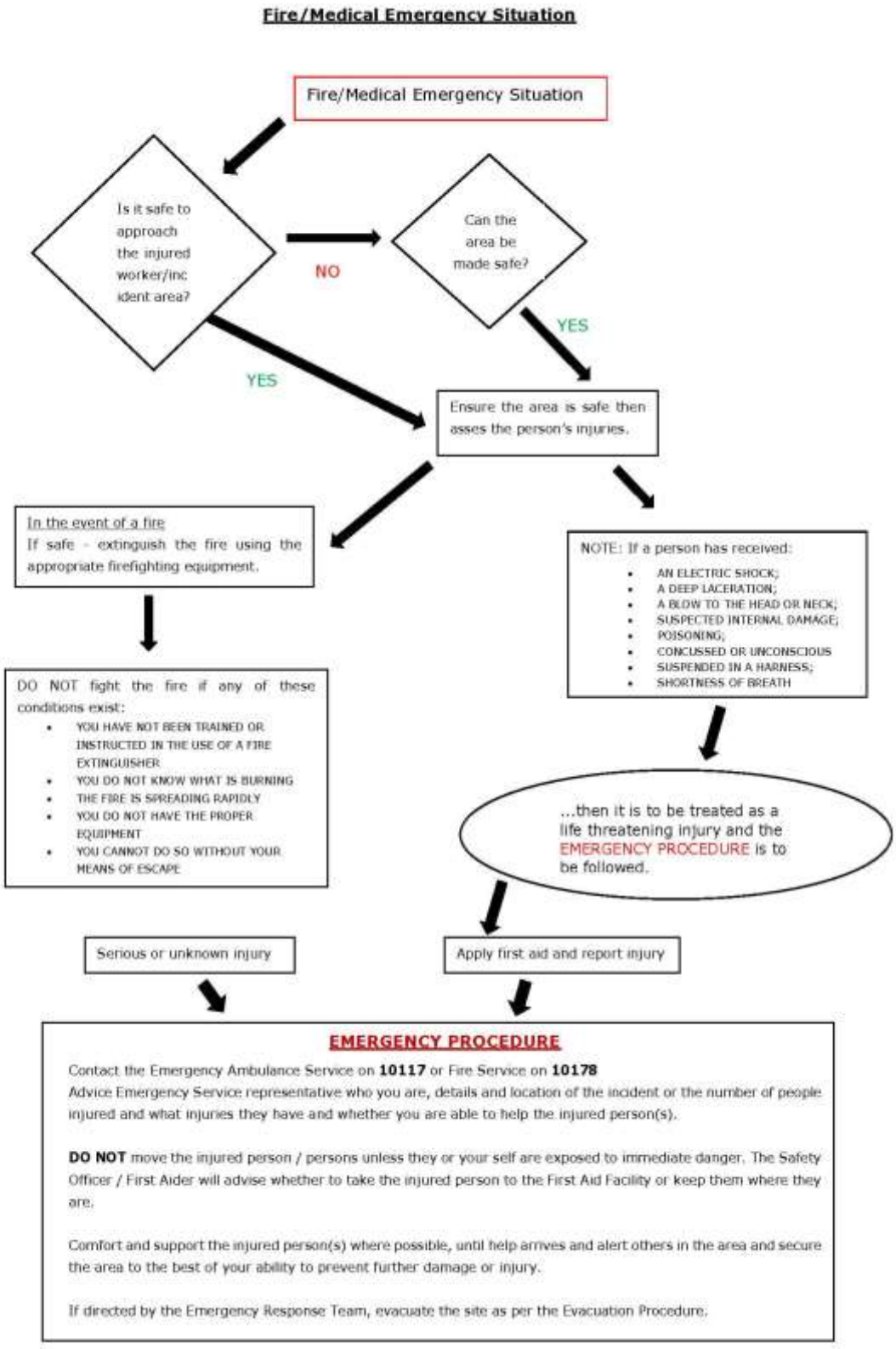


Figure 2: Emergency Fire/Medical

Appendix L:

Curriculum Vitae of the Project Team

CURRICULUM VITAE
JO-ANNE THOMAS

Profession	:	Environmental Consultant
Specialisation	:	Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology
Years experience	:	Seventeen (17) years in the environmental field

KEY RESPONSIBILITIES

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, 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; 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

Courses:

Environmental Impact Assessment, *Potchefstroom University,* 1998
Environmental Law, *Morgan University*, 2001

Professional Society Affiliations:

Professional Natural Scientist (Registration No 400024/00).

EMPLOYMENT

2006 - Current: Director of Savannah Environmental (Pty) Ltd. Independent specialist environmental consultant

October 1997-November 2005: Bohlweki Environmental (Pty) Ltd: Senior Environmental Scientist; Environmental Management and Project Management

January to July 1997: Junior Science Teacher, Sutherland High School, Pretoria

---

PROJECT EXPERIENCE

Current projects include:

Wind Energy Projects

- Project manager for the EIA undertaken for the Kleinsee wind energy facility and associated infrastructure, Northern Cape (for Eskom)
- Project manager for the EIA undertaken for the Aberdeen wind energy facility and associated infrastructure, Eastern Cape (for Eskom)
- Project manager for the EIA undertaken for the Project Blue wind energy facility and associated infrastructure, Northern Cape (for Diamond Wind)
- Project manager for the EIA undertaken for the Swellendam wind energy facility and associated infrastructure, Western Cape (for IE Swellendam)
- Project manager for the EIA undertaken for the Moorreesburg wind energy facility and associated infrastructure, Western Cape (for IE Moorreesburg)
- Project manager for the EIA undertaken for the proposed Spitskop East wind energy facility, Eastern Cape Province (for Renewable Energy Resources Southern Africa)
- Project manager for the EIA undertaken for the proposed EXXARO West Coast wind energy facility and associated infrastructure at a site within the Western Cape (for EXXARO Resources)
- Project manager for the EIA undertaken for the proposed Oyster Bay wind energy facility, Eastern Cape Province (for Renewable Energy Resources Southern Africa)
- EIA and EMP for the proposed wind energy facility and associated infrastructure at a site within the Western Cape (for Eskom Generation)
- EIA and EMP for the proposed wind energy facility and associated infrastructure at a site near Hopefield, Western Cape Province (for Umoya Energy)
- Project manager for the proposed Klipheuwel/Dassiesfontein wind energy facility and associated infrastructure at a site within the Overberg area of the Western Cape (for BioTherm Energy)

- Project manager for the proposed Suurplaat wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)
- Project manager for the proposed West Coast One wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)
- Project manager for the proposed Rheboksfontein wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)

Solar Energy Projects

- Project manager for the EIA and EMP for two PV sites within the Western and Northern Cape Provinces (for INCA Energy)
- Project manager for the Basic Assessment and EMP for PV site within the Northern Cape Province (for INCA Energy)
- Project manager for the Basic Assessment and EMP for a PV site near Rustenburg, North-West Province (for Momentous Energy)Project manager for the EIA and EMP for the proposed Project Ilanga (125MW CSP facility) near Upington, Northern Cape Province (for Ilangethu Energy)
- Project manager for the EIA and EMP for two PV sites within the Northern Cape Province (for MedEnergy Global)
- Project manager for the Basic Assessment and EMP for PV sites within 4 ACSA airports within South Africa (for ACSA PV)
- Project manager for the EIA and EMP for the proposed Waterberg PV plant, Limpopo Province (for Thupela Energy)

Coal-fired Power Station Projects

- Project manager for the EIA undertaken for the proposed Independent power Producer (IPP) Coal-fired Power Station and associated infrastructure near Lephalale within the Waterberg District Municipality of the Limpopo Province
- Project manager for the EIA undertaken for the proposed Umbani Coal-fired Power Station and associated infrastructure near Kriel, Mpumalanga Province
- Project manager for the EIA undertaken for the proposed Ruukki Coal-fired Power Station and associated infrastructure near Ogies, Mpumalanga Province

Gas-fired Power Station Projects

- Project manager for the EIA and EMP for the proposed conversion of the existing Open Cycle Gas Turbine (OCGT) Ankerlig Power Station (located in Atlantis Industria) to a Combined Cycle Gas Turbine (CCGT) power station, and the associated 400 kV transmission power line between Ankerlig Power Station and the Omega Substation (for Eskom Generation)
- Project manager for the EIA and EMP for the proposed conversion of the existing Open Cycle Gas Turbine (OCGT) Gourikwa Power Station (located near Mossel Bay) to a Combined Cycle Gas Turbine (CCGT) power station, and the associated 400 kV transmission power line between Gourikwa Power Station and the Proteus Substation (for Eskom Generation)

Power lines

- Project manager for the EIA and EMP for the proposed Mokopane Integration Project, Limpopo Province (for Eskom Transmission)
- Project manager for the proposed transmission lines from the Koeberg-2 Nuclear Power Station site, Western Cape Province (for Eskom Transmission)
- Project manager for the proposed Tshwane strengthening project, Phase 1, Gauteng Province (for Eskom Transmission)
- Project manager for the EIA and EMP for the proposed Kyalami Strengthening Project, Gauteng Province (for Eskom Transmission)
- Project manager for the EIA and EMP for the proposed Steelpoort Integration Project, Limpopo Province (for Eskom Transmission)

Compliance Advice and Due Diligence

- First annual Environmental and Social Monitoring Report for the Upington Airport 10MW PV Plant, Northern Cape Province
- Compliance advice for Financial Close of the Ilanga CSP Facility, Northern Cape Province
- Compliance advice for Financial Close of West Coast One Wind Energy Facility, Western Cape Province
- Compliance advice for Financial Close of Tsitsikamma Wind Energy Facility, Eastern Cape Province
- Compliance advice for Financial Close of Upington Solar Facility, Northern Cape Province
- Environmental Due Diligence of a wind energy facility in the Western Cape on behalf of EDPR Renewables
- Environmental Due Diligence of a wind energy facility on the West Coast of the Western Cape on behalf of ILF&S

CURRICULUM VITAE
TEBOGO MAPINGA

Profession	:	Senior Environmental Consultant for Savannah Environmental Consultants
Specialisation	:	Environmental Management
Years of experience	:	8 years

KEY RESPONSIBILITIES

- Project Management and client liaison;
- Report writing and review;
- Compliance monitoring and audit reporting;
- Development of Proposals; and
- Staff monitoring.

SKILLS BASE AND CORE COMPETENCIES

- Report Writing, drafting proposals and tenders;
- Negotiating skill;
- Problem solving;
- Financial management and marketing;
- Understanding of all Environmental Legislation (NEMA, NEM:BA, NEM:WA, NEM:AQA, NEM:PAA, etc) and all other relevant legislation;
- Ability to work independently and in a team;
- Verbal, written and good presentation skills;
- Time management and workload management;
- Facilitation skills; and
- Organizational, planning and analytic skills.

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- *Bsc Degree: The University of Limpopo, 2006; and*
- *Honours in Environmental Management: University of South Africa (in progress).*

Courses:

- Computer Literacy Course: University of Limpopo, 2005; and
- Environmental Impact Assessment Training: University of Pretoria, 2012.

Professional Society Affiliations:

- ***N/A***

EMPLOYMENT HISTORY

Environmental Practitioner/ Project Manager: Phaki Phakanani Environmental Consultants (January 2007 - March 2008) Tasks include:

- Training of junior staff;
- Client Liaison;

- Project co-ordination and facilitation;
- Managing specialists;
- Report writing and presentations;
- Compiling Environmental Impact Assessment Reports (Basic and Scoping/EIA Report); and
- Facilitating the Public Participation Process.

Environmental Manager: SEF (1 April 2008 – 30 February 2009) Tasks include:

- Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessments, Basic Assessments and Environmental management plans;
- Co-ordination of the public participation process;
- Project management, including specialists and other team members;
- Development of terms of reference, project proposals and tenders; and
- Client liaison.

Environmental Project Manager: SEF (1 March 2009 until 31 April 2010) Tasks include:

- Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessments, Basic Assessments and Environmental management plans;
- Co-ordination of the public participation process;
- Project management, including specialists and other team members;
- Development of terms of reference, project proposals and tenders;
- Client liaison;
- Marketing; and
- Financial Management of projects.

Environmental Officer Specialist production: Department of Environmental Affairs (1 April 2010 until 1 June 2013) Tasks include:

- Process EIA applications submitted to DEA within the stipulated legislated time frames;
- Implement the SID and ERP EIA guideline;
- Provide technical input into Appeal Response Report's (ARR's);
- Support Regulatory Services with compliance monitoring and enforcement;
- Implement DEA and Public Entity EIA forums; and
- Provide technical input into CD: IEA correspondence.

Environmental Scientist: GIBB Engineering and Science (Mega Projects) (1June 2013- 31 March 2014) Tasks include:

- Re-writing the Revised Draft EIR Version 2 Eskom Nuclear-1 EIA; and
- Liaison with the client and specialists.

PROJECT EXPERIENCE

ENVIRONMENTAL IMPACT ASSESSMENTS AND PUBLIC PARTICIPATION

- Wesley Peddie Power Line Basic Assessment (2015)
- Pofadder Wind and Solar Energy Facilities (2014-2015);
- Pofadder Power Line Basic Assessment Application (2014-2015)
- Castle Wind Energy Facility (2014-2015)
- Spitskop Wind Energy Facility (2014-2015);
- Bobididi Solar Facility-Environmental Screening (2014);
- Son Sitrus Solar Energy Facility (2014);
- Nuclear- 1 EIA (2013);
- Langkuil Industrial Development, 2008 (Environmental Manager and Project Manager);
- Township Development in Reitfontein, 2008/2009;
- Upgrading of the BP Golf Course, 2008;
- Construction of the BP Soshanguve VV Filling Station, 2008;
- Construction of the BP Soshanguve ZZ Filling Station, 2008;
- Shell Filling Stations(Project Manager and Client Liaison), 2008/ 2009:
- Watloo Filling Station
- Chantelle Filling Station
- M2 East Filling Station
- Orlando Filling Station
- Equestria Willowglen Filling Station
- President Park Filling Station
- Capital Park;
- Eskom- Komati Water Augmentation, 2008;
- Rainbow Junction Residential Development, 2008/ 2009;
- Township Development in Delmore Park Extension 7, 2008/ 2009;
- West Rand District Municipality- Bulk Water Supply 2009;
- West Rand District Municipality Air Quality Assessment;
- Lonmin K4 Shaft Mine Upgrading;
- Westlake Residential Development;
- Air Quality Management Plan;
- Montana Spruit Upgrading;
- Palm Ridge Township Development;
- HM Pitjie Roads;
- Vlaakplat S24G Application (Mokgale City Local Municipality);
- Rangeview Ext 2 S24G Application (Mogale City Local Municipality);
- Construction of Khetho Bridge, Greater Giyani Local Municipality, 2007;
- Demolition and Relocation of Malamulele High School, 2007;
- Construction of Malamulele Shopping Complex, 2007;
- The Subdivision of land in Ellisrus, 2007;
- Construction of the Senwabarwane Filling Station, 2007;

- Residential Development in Tlapeng Village, 2007;
- Township Development in Maphosa Village, 2007;
- Establishment of a Piggery in Mogalakwena Local Municipality, 2007;
- Establishment of two Piggeries in Elias Motsoaledi Local Municipality, 2007;
- Establishment of a Piggery in Modimolle Local Municipality, 2007;
- Township Development in Rietfontein, 2007;
- Public Participation and Section 24G Application for the National Taxi Scrapping Project, 2007;
- Construction of a Shopping Complex in Zebediela, 2007;
- Establishment of a Guest House (ECA application), 2008;
- Establishment of a Waste Management Depot in Rustenburg, 2008; and
- Establishment of a Waste Management Depot in Tzaneen and Nkowa-Nkowa, 2008.

CURRICULUM VITAE
Jared Padavattan

Profession	:	Environmental Assessment Practitioner
Specialisation	:	Compliance Monitoring (including Construction Health and Safety Management) and Environmental Assessment Practitioner
Years of experience	:	3 Years

KEY RESPONSIBILITIES AS ENVIRONMENTAL CONTROL OFFICER (ECO)

Specific responsibilities as an Environmental Control Officer include; the independent monitoring of construction activities, reporting of environmental incidences and non-compliances to the responsible contractor and the Department of Environmental Affairs, ensuring the projects' Environmental Management Programme (EMP) and Environmental Authorisation (EA) conditions and objectives are being met. ECO also ensures compliance is being met with regards to permits and licenses under DAFF and DWS.

KEY RESPONSIBILITIES AS EAP

- Client and Authority liaison.
- Prepare terms of reference and appoint technical specialists.
- Compilation of environmental technical reports such as environmental management Programmes and environmental impact assessment.
- Water Use Licence applications.
- Compilation of Integrated Water Use License Applications and Integrated Waste Water Management Plans.

SKILLS BASE AND CORE COMPETENCIES

- Environmental Audits and Compliance Monitoring.
- Environmental Audit reports.
- Environmental reporting to LTA, developer and Owners' Engineering team.
- Overseeing and providing input on rehabilitation activities.
- Identification of protected and specially protected species.
- Facilitation (Contractors meetings)
- Reviewing and Assessment (Contractors environmental method statements, project documentation, MSDS etc.)
- Environmental Awareness Training.
- Client and authority liaison.
- Water Use License compliance monitoring.
- Ensuring conditions stated in permits and licenses related to the project are adhered too (SAHRA, DWS, DAFF and local environmental departments).
- Reviewing of specialist reports for input on site activities.
- Construction Health and Safety Management

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. Hons. Environmental Management: UNISA, (2010-2011)
- B.Sc. Marine Biology: University of Kwa-Zulu Natal, (2007 – 2009)

Courses:

- SAMTRAC (*Cum Laude*), NOSA (2015)
- 2014 Construction Regulations (2015)
- ASHEPP (Applying Safety, Health and Environmental Principles and Procedures), NOSA (2013)
- Introduction to SAMTRAC and Hazard Identification and Risk Assessment, NOSA (2013)

Professional affiliation:

- SACPCMP Construction Health and Safety Manager: Registration currently under review

EMPLOYMENT

- *July 2014 – Current:* Savannah Environmental (Pty) Ltd: Environmental Control Officer and Environmental Assessment Practitioner
- *January 2014 – July 2014:* GCS (Pty) Ltd, Kloof, Durban, Kwa-Zulu Natal: Environmental Assessment Practitioner

PROJECT EXPERIENCE

ENVIRONMENTAL CONTROL OFFICER:

- Khi Solar One: Concentrated Solar Thermal Tower Plant – ECO (Abengoa Solar).
- Xina Solar One: Concentrated Solar Thermal Plant – ECO (Abengoa Solar).

ENVIRONMENTAL ASSESSMENT PRACTITIONER:

ENVIRONMENTAL IMPACT ASSESSMENTS

- Proposed Rohill business Estate, Durban North, Kwa-Zulu Natal (2014): EIA
- Zululand Anthracite Colliery (Pty) Ltd, Northern Kwa-Zulu Natal (2014): S24G application
- Bondit Right Trading (Pty) Ltd, Marianhill, Kwa-Zulu Natal (2014): Milkyway Shopping centre, Basic assessment project initiation
- Kangra Coal (Pty) Ltd, Near eMkhondo, Mpumalanga (2014): Extension of existing Maquasa East Discard Dump, EIA for DEA and DMR
- Eskom Holding SOC Ltd: Proposed Majuba PV Solar Energy Facility near Amersfoort, Mpumalanga (2015)
- FG Emvelo (Pty) Ltd (2015): Proposed construction of the Additional Karoshoek CSP Facilities, Northern Cape

WATER USE LICENCES:

- Zululand Anthracite Colliery (Pty) Ltd, Northern Kwa-Zulu Natal (2014): IWULA.
- Airports Company South Africa (Pty) Ltd, La Mercy (2014): King Shaka International Airport, IWULA.
- Barberry Group cc, Northen Kwa-Zulu Natal (2014): Talana loop railway siding, IWWMP.
- Zinoju Coal (Pty) Ltd/ Forbes Coal (Pty) Ltd, near Dundee, Kwa-Zulu Natal (2014): Amendment to IWWMP for Magdelena Colliery.
- Kangra Coal (Pty) Ltd, near eMkhondo, Mpumalanga (2014): Kangra Longridge mine closure, assisting with wetland health and delineation.
- Moyeng Energy (Pty) Ltd (2015): Gemini wind farm.

ENVIRONMENTAL MANAGEMENT PLAN:

- Kotulo Tsatsi Energy and SolarReserve (2015): Construction of the SolarReserve Kotulo Tsatsi Concentrated Solar Plant 2, Northern Cape.

ENVIRONMENTAL AUDITING:

- Macambini Water Pipeline audit, Northern Kwa-Zulu Natal (2014).

Kimberg, Peter - Curriculum Vitae

330 Percheron Road, Beaulieu Estate, Midrand | +27 (82) 417 9191

peter@thebiodiversitycompany.com

Personal Information

Date of birth: 1975/11/06

Languages: Fluent in English & Afrikaans

Marital status: Married

ID Number: 7511065211087

Career Objectives

Ensuring development of earth's resources whilst adhering to a policy of no net-loss of biodiversity

Work Experience

March 2015 – current | 50% Shareholder in The Biodiversity Company | Independent Biodiversity Consultancy

- Providing specialist biodiversity consulting services to the private sector.

January 2014 – February 2015 | Self-employed as Hydrocynus Consulting | Independent Aquatic and Biodiversity Consultant

- Providing specialist aquatic and biodiversity consulting services to the private sector.

August 2013 – December 2013 | Golder Associates Africa | Discipline Lead Ecological Services

In addition to specialist responsibilities (below):

- Leading innovation and business development within division;
- Providing in-house advisory services to project opportunities in Africa including resource allocation, project complexity, location and project risks.

March 2009 – September 2013 | Golder Associates Africa | Divisional Leader Ecology

- Management of all aspects pertaining to running of division including financial performance, strategic planning, human resource management and health & safety management;
- Quality control & review of ecology division deliverables;
- Project management and client interaction;
- Compilation of integrated biodiversity reports from various specialist ecological disciplines;
- Specialist studies of aquatic ecosystems including high level/risk baseline and impact assessments and compilation of complex management plans.

July 2007 – February 2009 | Golder Associates Africa | Group Leader Aquatics

- Management of aquatics group including group coordination and scheduling;
- Project management and client interaction;

- Specialist studies of aquatic ecosystems including baseline and impact assessments and compilation of management plans.

February 2004 – June 2007 | Ecosun cc. | Senior Aquatic Consultant

- Specialist assessments of aquatic ecosystems.

January 2003 – December 2003 | Incomati Tigerfish Action Group (iTag) | Field Researcher

- Assessment of migratory movements and habitat use of Tigerfish (*Hydrocynus vittatus*) using radio telemetry in the Crocodile and Komati Rivers, Kruger National Park.

January 1997 – December 1998 | Legacy Hotel Group | Field guide

- Leading guided game drives and bush walks in the Pilanesberg National Park, NW Province.

Education

M.Sc. | Ongoing to be completed 2016 | Rhodes University

Assessment of the impact of the alien invasive fish species *Micropterus salmoides* (Largemouth Bass) on indigenous fish communities in the Groot Marico River catchment, North-West Province, South Africa.

B.Sc. Honours | 2002 | University of Johannesburg (UJ)

Aquatic Health: Baseline assessment of aquatic ecosystems in the Mankwe River, Pilanesberg National Park, North-West Province.

B.Sc. | 1999 - 2001 | University of Johannesburg (UJ)

Majors: Zoology & Botany

Skills & Abilities

Specialist Skills

- Extensive experience as aquatic specialist with high competency in the following:
  - Baseline assessments of aquatic ecosystems including:
    - Detailed characterization of aquatic habitats;
    - Collection of water & sediment samples and interpretation of laboratory results;
    - Sampling of aquatic biota including periphyton, diatoms, zooplankton & phytoplankton, benthic macroinvertebrates & fish;
    - Identification of African fish species;
    - Compilation of critical habitat reports;
  - Compilation of impact assessment reports in line with IFC Performance Standard 6;
  - Compilation of biodiversity reports;
  - Compilation of alien invasive species management plans;
  - Ecological risk assessment.
- Worked in a wide variety of environments in 15 African countries including South Africa, Namibia, Angola, Botswana, Mozambique, Madagascar, Lesotho, Zambia, Democratic Republic of Congo, Central African Republic, Tanzania, Togo, Guinea, Liberia & Mali.
-

Management

- Financial management & planning;
- Strategic planning including compiling business plans;
- Human resource management;
- Health & safety management.

Communication

- Presentation skills - ability to confidently explain complex scientific principles to a wide variety of audiences.

Recent Project Experience (full list available on request)

- **Société des Mines de Fer de Guinée (SMFG), Mt. Nimba; Guinea** : Aquatic baseline, critical habitat and impact assessment of aquatic ecosystems associated with the proposed iron ore mine at Nimba World Heritage Site, Guinea;
- **New Liberty Gold Mine, Liberia**: Aquatic baseline and impact assessment report for input into project ESIA report;
- **Scantogo Cement Project ,Togo**: Ecological specialist assessment report for inclusion into project ESIA report;
- **Riversdale Benga, Tete, Mozambique**: Scoping, baseline and impact assessment of aquatic ecosystems in the Zambezi and Revúboè Rivers associated with proposed coal mining activities;
- **Hillside Aluminum, Richards Bay, South Africa**: Receptor characterization component of Source, Pathway, Receptor (SPR) report;
- **Royal Vopak, Heidelberg, South Africa**: Sensitive biodiversity and ecosystem assessment; and
- **Exxaro, Belfast, South Africa**: Update of Belfast Wetland offset and compilation of additional impact assessment reports.

Training & Workshops

Banks and Biodiversity Training Course: Equator Principles Association, Citibank, WWF and BBOP, (2013);

Workshop to discuss the mainstreaming of biodiversity considerations into the strategic development of the Waterberg Coal Corridor: National Biodiversity and Business Network, (2013);

Ecological Risk Assessment Workshop: presented by W. Landis (Washington University) at North-West University, (2013);

Introduction to the Upstream Petroleum Industry – Oil and Gas School: Golder Associates 3 day training seminar, (2011);

Manager Excellence: Golder Associates Africa 4 day training course, (2010)***;***

S21(c) and (i) Water Uses – Comprehensive Training: Directorate Water Abstraction and Instream Use, (2009); and

Monitoring contaminant levels in freshwater fish for bioaccumulation surveys and human consumption: University of Johannesburg & Water Resource Commission (WRC), (2005).

Publications

Kimberg PK, DJ Woodford, H Roux & OLF Weyl (2014). Species-specific impact of introduced largemouth bass *Micropterus salmoides* in the Groot Marico Freshwater Ecosystem Priority Area, South Africa. African Journal of Aquatic Science, DOI: 10.2989/16085914.2014.976169

PK Kimberg, DJ Woodford, OLF Weyl, C Hui, DM Richardson, TP Msezane, KA van der Walt, ER Swartz, CT Chimimba, T Zengeya & BR Ellender (2014). Understanding the unintended spread and impact of alien and invasive fish species – development of management guidelines for South African inland waters. Report to the Water Research Commission. WRC Report No. 2039/1/14.

References

Gabriel Canahai | Associate, Environmental Technology Business Unit Leader | **Golder Associates Africa (Pty) Ltd.** | **T:** [+27] (11) 254 4800 | **C:** [+27] 82 779 3290 | **E:** gcanahai@golder.co.za |

Warren Aken | Aquatic Biologist | Divisional Leader: Ecology | **Golder Associates Africa (Pty) Ltd.** | **T:** [+27] (11) 254 4869 | **C:** [+27] 78 3060 866 | **E:** waken@golder.co.za |

Danie Otto | Biophysical Lead | **Digby Wells Consulting (Pty) Ltd.** | **C:** [+27] (82) 399 9315 | **E:** danie.otto@digbywells.com |

Chris Fell | Environmental & Social Management Plan Team | **Mozambique LNG Project** | **C:** [+27] 72 3476050 | **E:** cfell@rsrisksolutions.com |

CV for ENVIRONMENTAL ASSESSMENTS

Dr Rob Simmons

Synopsis: 57 year-old ecologist and ornithologist, with 30 year's research experience in Namibia and South Africa. Permanent Resident in South Africa. Currently I am Research Associate within the FitzPatrick Institute's Centre of Excellence, UCT.
Formerly employed in the Namibian Ministry of Environment and Tourism (MET) as the country's ornithologist, specializing in biodiversity issues. Schooled in England (Honours: Astrophysics), Canada (MSc: Biology) and South Africa (PhD: Zoology).

I have worked in all parts of Namibia, first as Wetlands Biologist, then Ornithologist, specialising on raptorial birds, shorebirds, flamingos, terns, endemic species and inventories of Namibia's wetlands. Endemic species have been intensively studied in the escarpment and specialized collaborative studies have been undertaken with Cambridge, Oxford, Uppsala, Stanford, Edinburgh and Sheffield Universities. I have authored and co-authored 100 papers and 60 popular articles, contributed to 9 books or proceedings, and written an Oxford–published book on raptors in 2000. I have recently (2015) finished Namibia's first Red Data book on birds to be published in May.
I live and work in South Africa and have undertaken over 20 impact assessments in the last 20 years. I was part of the advisory board team for BAWESG of EWT and Birdlife SA Birds.

1. SPECIFIC EXPERIENCE :

(i) **Ecological study of the Cunene River mouth** – As wetlands biologist, I headed a 1991 survey team comprising MET staff, that assessed the avifauna of the river's lagoon over 3 months during peak (March - May) and low flow (November) periods. We concurrently recorded all other fauna in the area and undertook simple mapping and river sampling. Results published *Madoqua* 18:163-180 (1993)

(ii) **National surveys of Namibian wetland birds** - Coordinated avifaunal assessments of about 80 wetlands throughout Namibia twice a year, as part of an Africa-wide programme (1990-2003).

(iii) **Sandwich Harbour avifauna** - A project begun 25 years ago by ministry staff, and continuing to this day, assessing natural changes in geomorphology and wetland area (using Global Positioning System technology) and the resultant changes in wetland avifauna. Random survey plots used to count birds.

Major nationwide monitoring projects:
Population monitoring of Namibian endemics - In conjunction with Edinburgh University initiated a project to determine densities and thus overall population numbers of all 16 Namibian endemic birds. Populations are now the best known for any species in Namibia. Published *Biological Conservation* 1996 and incorporated into the new Namibian Red Data book (Simmons et al. 2015).
Damara Tern status –In 1992 I devised a stratified random survey of the entire 1450 km-long coast of Namibia, revolutionised our estimates of the species' status. Published *Ibis* 1998. Current publication with students on effects of protection on population size and success.
Black Harrier status – From 2000 - present monitoring threatened Black Harriers throughout South Africa, using satellite tags to follow migration and research with MSc and PhD students.

Impact Assessments undertaken

My consultancy work experience covers 20 years in Namibia and South Africa.

- birds impacted by a proposed Haib copper mine near the Orange River (1994)

- siting of proposed Lüderitz wind farm prior to formal assessments for NamPower (1997);
- coastal birds impacted by new "pocket-beach" diamond mines within the Diamond Area of the Sperrgebeit for Namdeb (Enviro-science (2002);
- impacts to birds along powerlines across the Namib Desert (Windhoek-Walvis Bay) for Nampower (2000).
- assessment of water abstraction scheme from Karst System on wetlands and birds near Tsumeb (2003) (Jessica Hughes).
- impacts to birds from proposed powerlines between Windhoek-Rehoboth (2005) for NamPower
- bird impacts on a proposed powerline south-east of the Waterberg Plateau Park (assisted Chris van Rooyen with specialist knowledge -2006)
- impact of uranium mine at Valencia, Khan River, Namibia (Aug 2007, Feb 2008)
- Impact on birds of proposed shooting range at Faure Police site, Western Cape (2009)
- Impact on birds of new airport in Caledon, Western Cape (2009)
- Wind farm (x5) bird assessments (with Andrew Jenkins) in Western Cape (2010-2011)
- Power lines-bird interactions Redlinghuys, West Cape (ERM- 2009)
- Coastal birds impacted by re-mining diamonds at E-Bay, Sperrgebeit, Namibia (Pisces-2010)
- Impact of golf course development at the River Club, Observatory (2010)
- Wind farm assessments at Gansbaai/Walker Bay (Savannah-2011)
- Wind farm assessments on the west coast at Kleinsee and Koingnaas (Savannah – 2011)
- EIA report for Kleinsee 300 and Kleinsee Blue projects (Savannah-2011)
- EIA report and pre-construction monitoring of birds in Namaqualand and Springbok (Mulilo – 2012)
- EIA report and pre-construction for birds on a wind farm at Konstabel (Mainstream 2011).
- Pre-construction monitoring of birds at the Witteberg (Karoo) wind farm site – (Anchor Environmental 2011-2012)
- Pre-construction monitoring of birds at a Richtersveld wind farm site (EnBW -2012-2013)
- Pre-construction monitoring of birds at Happy Valley (E Cape) wind farm site (EDP Renewables -2013-2014).

Recent papers and academic background can be found at:
http://www.fitzpatrick.uct.ac.za/docs/whatsnew.html

Red data book and conservation work at:
www.nnf.org.na/RAPTORS/raptors_pges/conservation.htm

Papua New Guinea work at:
http://www.natural-research.org/news/PNG_harrier.htm

BIRDS UNLIMITED
Environmental Consultants
Dr Rob Simmons & Marlei Martins
+ 27 (0) 827 800 133
+ 27 (0) 827 656 850
rob.simmons@uct.ac.za
marlei.bushbaby@gmail.com

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

ADDRESS: Institute for Soil, Climate and Water
Private Bag X79
Pretoria 0001
Republic of South Africa

TEL.: (012) 310 2601
083 556 2458

FAX: (012) 323 1157

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 effects 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., 2015. Spatial soil information in South Africa – situational analysis, limitations and challenges. *S. Afr. J. Science* 111 (5/6). Art. #2014-0178, 7 pages. http://dx.doi.org/10.17159/sajs.2015/20140178

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.

CV Jaco van der Walt

PERSONAL PARTICULARS:

NAME:	Jaco van der Walt
MARITAL STATUS:	Married with two dependants
DATE OF BIRTH :	1977-11-04
Work Address	37 Olienhout Street, Modimolle, 0510
E-MAIL:	jaco.heritage@gmail.com
MOBILE:	+27 82 373 8491
FAX:	+27 86 691 6461

SYNOPSIS

Jaco has been actively involved as a professional archaeologist within the heritage management field in southern Africa for the past 15 years. Jaco acted as council member for the Association of Southern African Professional Archaeologist (ASAPA Member #159) in the Cultural Resource Management (CRM) portfolio for two years (2011 – 2012). Jaco was also a Research Associate with the University of Johannesburg from 2011 – 2013. He is well respected in his field and published in peer reviewed journals and presented his findings on various national and international conferences.

ACADEMIC QUALIFICATIONS:

Date of matriculation:		1995
Particulars of degrees/diplomas and/or other qualifications:		
Name of University or Institution:		University of Pretoria
Degree obtained	**:**	BA
Major subjects	**:**	Archaeology Cultural Heritage Tourism
Year of graduation	**:**	2001
Name of University or Institution:		University of the Witwatersrand
Degree obtained	**:**	BA [Honours]
Major subjects	**:**	Archaeology
Year of graduation	**:**	2002
Name of University or Institution	**:**	University of the Witwatersrand
Degree Obtained		**:**BA [Masters]
Major subject		**:**Archaeology
Year of Graduation		:2012

EMPLOYMENT HISTORY:

2011 – Present: **Owner - Heritage Contracts and Archaeological Consulting CC**.
2007 – 2010 : **CRM Archaeologist,** Managed the Heritage Contracts Unit at the University of the Witwatersrand.
2005 - 2007: **CRM Archaeologist**, Director of Matakoma Heritage Consultants
2004: **Technical Assistant**, Department of Anatomy University of Pretoria
2003: **Archaeologist**, Mapungubwe World Heritage Site
2001 - 2002: **CRM Archaeologists,** For R & R Cultural Resource Consultants, Polokwane
2000: **Museum Assistant**, Fort Klapperkop.

Countries of work experience include:
Republic of South Africa, Botswana, Zimbabwe, Mozambique, Tanzania, The Democratic Republic of the Congo, Lesotho and Zambia.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:

- Association of Southern African Association Professional Archaeologists. Member number 159
- Association of Southern African Association Professional Archaeologists Cultural Resource Management Section
  Accreditation: Field Director Iron Age Archaeology
  Field Supervisor – Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation
- Accredited CRM Archaeologist with SAHRA
- Accredited CRM Archaeologist with AMAFA
- Co-opted council member for the CRM Section of the Association of Southern African Association Professional Archaeologists (2011 – 2012)

REFERENCES:

1. Prof Marlize Lombard — Senior Lecturer, University of Johannesburg, South Africa
   E-mail: mlombard@uj.ac.za
2. Prof TN Huffman
   Department of Archaeology Tel: (011) 717 6040
   University of the Witwatersrand

Alex Schoeman — University of the Witwatersrand E-mail: Alex.Schoeman@wits.ac.za

CV Jaco van der Walt

PERSONAL PARTICULARS:

NAME:	Jaco van der Walt
MARITAL STATUS:	Married with two dependants
DATE OF BIRTH :	1977-11-04
Work Address	37 Olienhout Street, Modimolle, 0510
E-MAIL:	jaco.heritage@gmail.com
MOBILE:	+27 82 373 8491
FAX:	+27 86 691 6461

SYNOPSIS

Jaco has been actively involved as a professional archaeologist within the heritage management field in southern Africa for the past 15 years. Jaco acted as council member for the Association of Southern African Professional Archaeologist (ASAPA Member #159) in the Cultural Resource Management (CRM) portfolio for two years (2011 – 2012). Jaco was also a Research Associate with the University of Johannesburg from 2011 – 2013. He is well respected in his field and published in peer reviewed journals and presented his findings on various national and international conferences.

ACADEMIC QUALIFICATIONS:

Date of matriculation:		1995
Particulars of degrees/diplomas and/or other qualifications:		
Name of University or Institution:		University of Pretoria
Degree obtained	**:**	BA
Major subjects	**:**	Archaeology Cultural Heritage Tourism
Year of graduation	**:**	2001
Name of University or Institution:		University of the Witwatersrand
Degree obtained	**:**	BA [Honours]
Major subjects	**:**	Archaeology
Year of graduation	**:**	2002
Name of University or Institution	**:**	University of the Witwatersrand
Degree Obtained		**:**BA [Masters]
Major subject		**:**Archaeology
Year of Graduation		:2012

EMPLOYMENT HISTORY:

2011 – Present: **Owner - Heritage Contracts and Archaeological Consulting CC**.
2007 – 2010 : **CRM Archaeologist,** Managed the Heritage Contracts Unit at the University of the Witwatersrand.
2005 - 2007: **CRM Archaeologist**, Director of Matakoma Heritage Consultants
2004: **Technical Assistant**, Department of Anatomy University of Pretoria
2003: **Archaeologist**, Mapungubwe World Heritage Site
2001 - 2002: **CRM Archaeologists,** For R & R Cultural Resource Consultants, Polokwane
2000: **Museum Assistant**, Fort Klapperkop.

Countries of work experience include:
Republic of South Africa, Botswana, Zimbabwe, Mozambique, Tanzania, The Democratic Republic of the Congo, Lesotho and Zambia.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:

- Association of Southern African Association Professional Archaeologists. Member number 159
- Association of Southern African Association Professional Archaeologists Cultural Resource Management Section
  Accreditation: Field Director Iron Age Archaeology
  Field Supervisor – Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation
- Accredited CRM Archaeologist with SAHRA
- Accredited CRM Archaeologist with AMAFA
- Co-opted council member for the CRM Section of the Association of Southern African Association Professional Archaeologists (2011 – 2012)

REFERENCES:

1. Prof Marlize Lombard — Senior Lecturer, University of Johannesburg, South Africa
   E-mail: mlombard@uj.ac.za
2. Prof TN Huffman
   Department of Archaeology Tel: (011) 717 6040
   University of the Witwatersrand

Alex Schoeman — University of the Witwatersrand E-mail: Alex.Schoeman@wits.ac.za

Simon Todd Consulting

P.O.Box 71
Nieuwoudtville
8180
Simon.Todd@uct.ac.za
Grazing.Guidelines@gmail.com

H: 027 218 1276
C: 082 3326 502

SUMMARY OF EXPERTISE:
SIMON TODD

- Profession: Ecological Consultant
- Specialisation: Plant & Animal Ecology
- Years of Experience: 15 Years

Skills & Primary Competencies

- Research & description of ecological patterns & processes in Fynbos, Succulent Karoo, Nama Karoo, Thicket, Arid Grassland and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- 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.

Experience Specific to the Current Proposal

- Conducted a large number of specialist assessments of wind energy facilities, distributed widely across South Africa and including sites in similar environments to the current study including several sites along the Mossel Bay – Gouritz coastline.
- Provided more than 10 full EIA assessments of wind energy facilities ranging from small developments of less than 20 turbines to very large projects in excess of 500 turbines and 50 000 ha.
- Worked on several wind energy facilities in areas with highly endangered species such as Riverine Rabbits and van Zyl's Golden Mole, which have required specific and specialized attention.
- Extensive experience in renosterveld vegetation types, as occur at the site. Currently supervising a UCT PhD student working on Renosterveld management in the Overberg region.

General Experience & Expertise

- Conducted a large number of fauna and flora specialist assessments distributed widely across South Africa.
- Extensive experience in the field and exceptional level of technical expertise, particularly with regards to GIS capabilities which is essential with regards to producing high-quality sensitivity maps for use in the design of final project layouts.
- Strong research background which has proved invaluable when working on several ecologically sensitive and potentially controversial sites containing some of the most threatened fauna in South Africa.
- 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 Africa.
- Maintain several long-term vegetation monitoring projects distributed across Namaqualand and the karoo.
- Guest lecturer at two universities and have also served as an external examiner.
- Reviewed papers for more than 10 international ecological journals.
- Past chairman and current committee member of the Arid Zone Ecological Forum.
- SACNASP registered as a Professional Natural Scientist, (Ecology) No. 400425/11.

A selection of recent work is as follows:

Specialist Assessments:

Bitterfontein Solar Plant - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Beaufort West Solar Facility, Erf 7388 - Fauna & Flora Specialist Assessment. Specialist Report for Cape EAPrac. 2012.

Plant Sweeps on Portion 2 of the Farm Demaneng 546, Kuruman District, Northern Cape Province for SA Manganese. 2011.

Proposed Olyven Kolk Solar Power Plant, Northern Cape: Botanical and Faunal Specialist Assessment. Specialist Report for Environmental Resources Management (ERM). 2011.

Klawer Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Witberg Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Lambert's Bay Wind Farm: Ecological and Biodiversity Assessment: Terrestrial Vertebrate Fauna & Botanical Specialist Study. Specialist Report for Environmental Resources Management. 2011.

Environmental Impact Assessment: Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy Facility near Sutherland, Western and Northern Cape Provinces. Specialist Report for Environmental Resources Management. 2011.

Ecological Scoping & Baseline Study. Vleesbaai Wind Park Development. Vleesbaai Independent Power Producers, ERM 2011.

Environmental Impact Assessment: Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy Facility near Beaufort West, Western Cape Province. Specialist Report for Environmental Resources Management. 2010.

Environmental Impact Assessment: Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy at Konstabel, Western Cape Province. Specialist Report for Environmental Resources Management. 2010.

Environmental Impact Assessment: Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy Facility at Perdekraal, Western Cape Province. Specialist Report for Environmental Resources Management. 2010.

Environmental Impact Assessment: Terrestrial Ecology Specialist Study for the Proposed Establishment of a Renewable Energy Facility near Victoria West, Western and Northern Cape Provinces. Specialist Report for Environmental Resources Management. 2010.

Research Reports & Peer Reviewed Publications:

Todd, S.W. 2010. Vegetation and Plant Communities Associated with the Tillite and Dolerite Renosterveld Types of the Avontuur Conservation Area, Nieuwoudtville, South Africa. DRYNET.

Todd, S.W., Milton, S.J., Dean, W.R.J. Carrick, P.J. & Meyer, A. 2009. Ecological best Practice Guidelines for the Namakwa District. The Botanical Society of South Africa.

Todd, S.W. 2009. Field-Based Assessment of Degradation in the Namakwa District. Final Report. Mapping Degradation in the Arid Subregions of the BIOTA South Transect. SANBI.

Todd, S.W. 2009. A fence-line in time demonstrates grazing-induced vegetation shifts and dynamics in the semi-arid Succulent Karoo. *Ecological Applications*, 19: 1897–1908.

Todd, S.W. 2007. Characterisation of Riparian Ecosystems. D14 of The WADE Project. Floodwater Recharge of Alluvial Aquifers in Dryland Environments. *GOCE-CT-2003-506680- WADE.* Sixth Framework Programme Priority 1.1.6.3 Global Change and Ecosystems.

Todd, S.W. 2006. Gradients in vegetation cover, structure and species richness of Nama-Karoo shrublands in relation to distance from livestock watering points. *Journal of Applied Ecology* 43: 293-304.

Benito, G., Rohde, R., Seely, M., Külls, C., Dahan, O., Enzel, Y., **Todd, S**. Botero, B., Morin, E., Grodek, T., Roberts, C. 2010. Management of Alluvial Aquifers in Two Southern African Ephemeral Rivers: Implications for IWRM. *Water Resources Management*, 24:641–667.

Hahn, B.D., Richardson, F.D., Hoffman, M.T., Roberts, R., **Todd, S.W.** and Carrick, P.J. 2005. A simulation model of long-term climate, livestock and vegetation interactions on communal rangelands in the semi-arid Succulent Karoo, Namaqualand, South Africa*. Ecological Modelling* 183, 211–230.

Malgas, R.R., Potts, A.J., Oettlé, N.M., Koelle, B., **Todd, S.W.**, Verboom G.A. & Hoffman M.T.. 2010. Distribution, quantitative morphological variation and preliminary molecular analysis of different growth forms of wild rooibos (*Aspalathus linearis*) in the northern Cederberg and on the Bokkeveld Plateau. *South African Journal of Botany*, 76, 72-81.

Mills, A., Fey, M., Donaldson, J.D., **Todd, S.W**. & Theron, L.J. 2009. Soil infiltrability as a driver of plant cover and species richness in the semi-arid Karoo, South Africa. *Plant and Soil* 320: 321–332.

Rahlao, J.S., Hoffman M.T., **Todd, S.W**. & McGrath, K. 2008. Long-term vegetation change in the Succulent Karoo, South Africa following 67 years of rest from grazing. *Journal of Arid Environments*, 72, 808-819.

Hoffman, M.T. & **Todd, S.W.** 2010. Using Fixed-Point Photography, Field Surveys, And Gis To Monitor Environmental Change: An Example From Riemvasmaak, South Africa. Chapter In *Repeat Photography: Methods And Applications In The Natural Sciences.* R.H. Webb, Editor. Island Press. In Press.

CURRICULUM VITAE
CANDICE HUNTER

Profession	:	Social Consultant
Specialisation	:	Social Impact Assessments (SIA)
Years' experience	:	1 year and 9 month

KEY RESPONSIBILITIES

Specific responsibilities as a Social Consultant involve conducting field research; socio-economic surveys; the management and analysis of data; undertaking stakeholder engagement and communication processes; socio-economic baseline data analyses and conducting general social research for a variety of projects. This includes managing and coordinating the Social Impact Assessment (SIA) processes and compiling SIA reports in line with the countries guidelines and legislation.

SKILLS BASE AND CORE COMPETENCIES

- Social Impact Assessments (SIA)
- EIA Legislation
- Data gathering and analysis
- Qualitative and quantitative social research
- Field research and socio-economic surveys
- Baseline socio-economic data analyses
- Stakeholder engagement
- Public participation process
- Communication and community facilitation
- Report writing and review
- Project administration

EDUCATION AND PROFESSIONAL STATUS

Degrees:

» M. A. Environmental Management: University of Johannesburg (2013)
» B.A. Honours Tourism Development (Cum Laude): University of Johannesburg (2010)

Courses:

» Advanced Certificate in Social Impact Assessment (SIA) (Cum Laude): University of Johannesburg (2013)
» Certificate in Global Reporting Initiative (GRI), Sustainability Reporting Process: Environmental & Sustainable Solutions CC (2012)

Publications:

» Hunter, C. & Mearns, K. (2015). Assessing the sustainability reporting of selected tourism companies listed on the Johannesburg Stock Exchange (JSE). *African Journal of Hospitality, Tourism and Leisure, 4(1): 1-18.* Publication URL: http://www.ajhtl.com/uploads/7/1/6/3/7163688/article_51_vol.4__1__2015.pdf

EMPLOYMENT

January 2014 – Current:
Savannah Environmental (Pty) Ltd: Social Consultant

February 2011 – January 2013:

University of Johannesburg: Department of Geography, Environmental and Energy Studies & School of Tourism and Hospitality (STH): Student and Research Assistant.

PROJECT EXPERIENCE

Social Impact Assessment Reports:

» January 2014: Specialist SIA study for the proposed Gihon Solar Energy Facility & Associated Infrastructure Located near Bela-Bela, Limpopo Province (for Networx SA)

» March 2014: Specialist social scoping study for the proposed Exheredo Photovoltaic (PV) Solar Energy Facility and associated infrastructure located near Kenhardt, Northern Cape Province (for Kotulo Tsatsi Energy (Pty) Ltd)

» May 2014: Specialist social scoping study for the proposed Wolmaransstad Municipality Solar Energy Facility and associated infrastructure near Wolmaransstad, North West Province (for Bluewave Capital (Pty) Ltd)

» July 2014: Specialist SIA study for the proposed Newcastle Solar Energy Facility near Newcastle, KwaZulu Natal (for Building Energy SpA)

» July 2014: Specialist SIA study for the proposed Pongola Solar Energy Facility near Pongola, KwaZulu Natal (for Building Energy SpA)

» July 2014: Specialist SIA study for the proposed Senekal 1 Solar Energy Facility near Mkuze, KwaZulu Natal (for Building Energy SpA)

» July 2014: Specialist SIA study for the proposed Senekal 2 Solar Energy Facility near Mkuze, KwaZulu Natal (for Building Energy SpA)

» October 2014: Specialist SIA study for the proposed Kotulo Tsatsi Energy Concentrated Solar Power (CSP) Tower Plant 3 facility and associated infrastructure located near Kenhardt, Northern Cape Province (for Kotulo Tsatsi Energy (Pty) Ltd)

» November 2014: Specialist social scoping study for the proposed Lethabo Solar Energy Facility and associated infrastructure near Sasolburg, Free State Province (for Eskom Holdings (SOC) Limited)

» November 2014: Specialist social scoping study for the proposed Majuba Solar Energy Facility and associated infrastructure near Amesforort, Mpumalanga Province (for Eskom Holdings (SOC) Limited)

Social Impact Assessment Reports:

» November 2014: Specialist social scoping study for the proposed Tutuka Solar Energy Facility and associated infrastructure near Standerton, Mpumalanga Province (for Eskom Holdings (SOC) Limited)

» December 2014: Specialist social scoping study for the proposed 120MW CPV Facility and associated infrastructure near Upington, Northern Cape Province (for Lambrius Energy (Pty) Ltd)

» February 2015: Specialist SIA study for the proposed realignment of the N10 to facilitate access to the Ilanga CSP Facility site, east of Upington, Northern Cape Province (for SANRL)

» March 2015: Specialist social scoping study for the proposed Beaufort West Solar Power Plant 1 near Beaufort West, Western Cape Province (for Beaufort West Solar Company 1 (Pty) Ltd)

» March 2015: Specialist social scoping study for the proposed Beaufort West Solar Power Plant 2 near Beaufort West, Western Cape Province (for Beaufort West Solar Company 2 (Pty) Ltd)

» March 2015: Specialist social scoping study for the proposed Beaufort West Solar Power Plant 3 near Beaufort West, Western Cape Province (for Beaufort West Solar Company 3 (Pty) Ltd)

» June 2015: Specialist social scoping report for the proposed Buffels Solar 1 and Solar 2 Solar Energy Facilities, near Orkney, North West Province (for Kabi Solar (Pty) Ltd)

» July 2015: Specialist SIA study for the proposed Lethabo Solar Energy Facility and associated infrastructure near Sasolburg, Free State Province (for Eskom Holdings (SOC) Limited)

» July 2015: Specialist SIA study for the proposed Majuba Solar Energy Facility and associated infrastructure near Amesforort, Mpumalanga Province (for Eskom Holdings (SOC) Limited)

» July 2015: Specialist SIA study for the proposed Tutuka Solar Energy Facility and associated infrastructure near Standerton, Mpumalanga Province (for Eskom Holdings (SOC) Limited)

» August 2015: Specialist social scoping report for the proposed Paulputs CSP Tower Facility and associated infrastructure, near Pofadder, Northern Cape Province (for Abengoa Solar Power South Africa (Pty) Ltd)

» September 2015: Specialist SIA study for the proposed AEP Bloemsmond Solar 1 and Solar 2 PV Facilities, near Upington, Northern Cape Province (for AEP Bloemsmond Solar 1 (Pty) Ltd)

Other Projects:

» June 2014: Screening and pre-feasibility report- Site assessment for the proposed Wind Energy Facility near Van Reenen, KwaZulu Natal and Free State Provinces (for 4Green Development SA)

Jonathan Marshall

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 Short Course, University of KZN (1997)

Professional
Chartered Member of the Landscape Institute (UK)
Member of the International Association of Impact Assessment, South Africa
Certified Environmental Assessment Practitioner of South Africa.

Languages

English	-	Speaking	-	Excellent
	-	Reading	-	Excellent
	-	Writing	-	Excellent

Contact Details

Post: PO Box 2122
Westville
3630
Republic of South Africa

Phone: +27 31 2668241, Cell: +27 83 7032995

Key Experience

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Certified Environmental Assessment Practitioner of South Africa (2009).

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 (VIA) 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 has worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries 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 (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 in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last eighteen months includes assessments for proposed new mine developments in Ghana and Guinea as well as a proposed extension to the Gateway Shopping Centre in Umhlanga.

Visual Impact Assessment Experience

- 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.
- Gateway Shopping Centre Extension (Durban) – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
- Kouroussa Gold Mine (Guinea) – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
- Mampon Gold Mine (Ghana) - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
- Telkom Towers – Visual impact assessments for numerous Telkom masts in KwaZulu Natal
- Dube Trade Port, Durban International Airport – Visual Impact Assessment
- Sibaya Precinct Plan – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- Umdloti Housing – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- Tata Steel Ferrochrome Smelter - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- 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.
- Hillside Aluminium Smelter, Richards Bay - Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- Estuaries of KwaZulu Natal Phase 1 – 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.
- Signage Assessments – Numerous impact assessments for proposed signage developments for Blast Media.
- Signage Strategy – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- Zeekoegatt, Durban - Computer aided visual impact assessment. EDP 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.
- 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.
- 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.
- 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.
- 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.
- Southgate Industrial Park, Durban - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
- Sainsbury's Bryn Rhos - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- Ynyston Farm Access - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- Cardiff Bay Barrage - Concept Design, Detail Design, Documentation, and Visual Input to Environmental Statement for Cardiff Bay Development Corporation.
- A470, Cefn Coed to Pentrebach - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- Sparkford to Illchester Bye Pass - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- Green Island Reclamation Study - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- Route 3 - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- China Border Link - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- Route 81, Aberdeen Tunnel to Stanley - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.