CONSTRUCTION OF THE SOLARRESERVE KOTULO TSATSI CONCENTRATED SOLAR PLANT 2, NORTHERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA REFERENCE: 14/12/16/3/3/2/694/2

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PROJECT DETAILS

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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.

Concentrated solar power: Solar generating facilities use the energy from the sun to generate electricity. Concentrated Solar Power facilities collect the incoming solar radiation and concentrate 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 544, 545 and 546 of June 2010. 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: An operational 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.

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 concentrated 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. Tower and molten salts technology is the proposed technology for the SolarReserve Kotulo Tsatsi CSP facility.

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste.

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INTRODUCTION CHAPTER 1

Kotulo Tsatsi Energy and SolarReserve propose the development, construction and operation of a commercial solar thermal electricity generating facility and associated infrastructure, approximately 70km west of Kenhardt in the Northern Cape Province. In order to generate electricity, the sun's rays are concentrated onto a central receiver via a heliostat field, allowing for the heating of molten salts, which in turn are used to superheat steam and drive a steam turbine generator.The project is known as the **SolarReserve Kotulo Tsatsi Concentrated Solar Plant 2** (to be referred to as CSP 2) with a contracted capacity of up to 200 megawatts (MW).

The proposed project site is situated on Portion 1 and Portion 2 of the Farm Styns Vley 280, which is situated within the Hantam Local Municipality and forms part of the Namakwa District Municipality, near to the boundary with the Kai !Garib Local Municipality of the ZF Mgcawu District Municipality.

PROJECT DETAILS *CHAPTER 2*

The proposed CSP 2 Project will consist of a solar tower and heliostats system with a generation capacity of ~200MW. Infrastructure associated with the CSP Plant includes:

- Solar Collector Field – consists of all systems and infrastructure related to the control and operation of the heliostats.
- Molten Salt Circuit – includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar-thermal tower receiver, pipelines and molten salt to steam heat exchangers.
- Power Block – consists of the steam turbine and generator, as well as the air-condenser and associated feedwater system.
- Auxiliary facilities – consists of the switch yard, step-up transformers, facility start-up generators (gas or diesel-fired – dependent on detailed design).
- 400kV or 132 kV on-site project substation.
- Eskom 400kV switching station.
- Up to 275kV power line up to 40km in length to connect to Eskom's existing Aries Substation and/or 400kV loop in – loop out to the existing Aries – Helios 400kV power line.
- Access roads (roads up to 6m wide)
- Water supply point located at the Kenhardt Water Reservoir and water supply pipeline situated within the servitude of existing roads (approximately 95km in length).
- Water storage reservoir and tanks
- Water treatment facility.
- Wastewater treatment facility.
- Plant assembly facility.
- Evaporation pond (approximately 8ha in extent).
- Workshop and office buildings.
- Man camp.

It is envisaged that the CSP 2 plant will be operated as a base load plant which feeds directly into Eskom's national power grid. The power plant utilises the molten salt central receiver tower technology, molten salt storage system, solar field and conventional steam generator system to generate power. The project will utilise the molten salt central receiver system to capture and focus the sun's thermal energy with thousands of heliostats (movable, flat reflective mirrors roughly 90m^2 – 140 m^2 which are oriented according to the sun's position in order to capture and reflect the solar radiation).

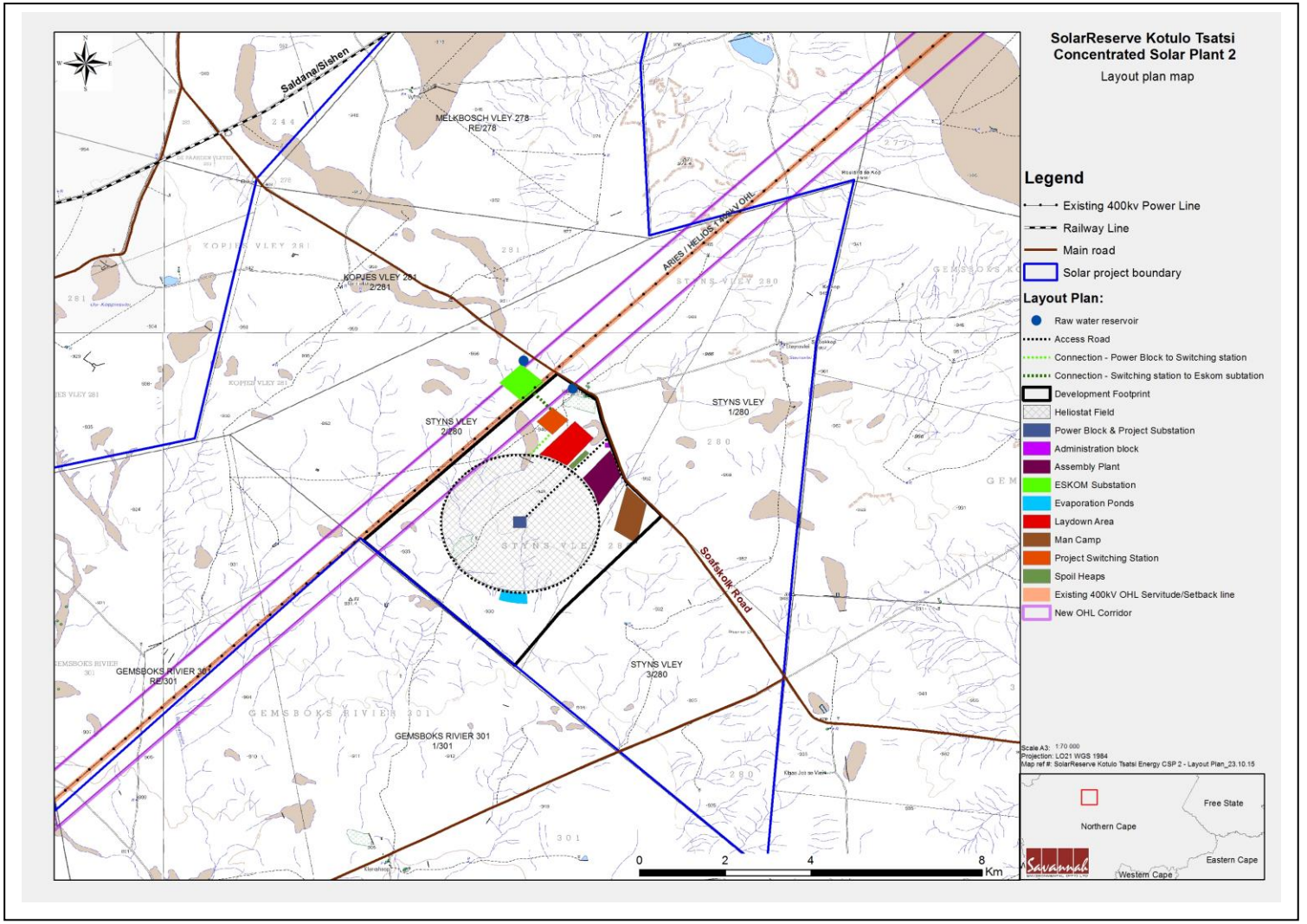

Figure 1: Layout plan for CSP 2 Plant within the larger solar project and the power line corridor over the existing Aries – Helios 400kV power line

2.1. Findings of the Environmental Impact Assessment

The area infrastructure (i.e. solar field, power block etc.) will be entirely contained within the identified site and will have a developmental footprint of approximately 1000 ha. The grid connection and water pipeline infrastructure will extend beyond this boundary and the boundaries of the larger solar park to the Eskom Aries Substation and Kenhardt water reservoir respectively.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated from the proposed project conclude that:

» There are **no environmental fatal flaws** that should prevent the proposed CSP project and associated infrastructure from proceeding on the identified site, provided that the recommended mitigation and management measures are implemented, and given due consideration during the process of finalising the facility layout.
» The proposed development on the site will create a highly localised reduction of indigenous trees and shrubs, geophytes and other species of conservation concern, but not to a degree that the current conservation status of such species will be negatively affected. Due to the areas of high ecological sensitivity being avoided by the design and layout of the CSP Plant, the **ecological impacts** of the CSP plant will be of a medium acceptable significance.
» The threat to **fauna and avifauna** communities would be from the loss of habitat, disturbance, collisions with the overhead power line and/or any interaction of fauna with the facility, and is not anticipated to have a significant negative impact on fauna or avifauna in the area.
» Very sparse **heritage resources** were found during the field survey undertaken for the site. From an archaeological perspective the observed heritage resources may be regarded as being of generally low significance. The fossil record from the geological deposits is very poor with respect to fossil finds.
» The cumulative significance of all the potential impacts on the **agricultural potential** is low due to the extent and limited agricultural potential of the project site.
» The anticipated **visual** impact is not considered to be a fatal flaw from a visual perspective, considering the low incidence of visual receptors occurring within the region.
» The development will only yield significant positive **economic** impacts.
» The development will have both positive and negative **social** impacts. It will create employment and business opportunities for locals during both the construction and operational phases and represent an investment in clean, renewable energy infrastructure.

The identified environmental sensitivities identified as occurring on the CSP 2 project site and the project layout plan have been overlaid onto a composite sensitivity map in Figure 2. The following is relevant in terms of the mapping:

Infrastructure siting

- The project development footprint is located adjacent to existing linear disturbances in the area, including the Aries–Helios 400kV power line and the Soafskolk Farm road.
- A 500m offset exists between the outer edge of the heliostat field and the existing Aries – Helios 400kV power line.
- An access road of ~2.5km in length branching off Soafskolk Road will be required to access the heliostat field after providing access to the man camp and project substation.
- The administration block, man camp, raw water reservoirs, project substation and project substation have been sited as close as possible to the existing Soafskolk farm road.
- The temporary laydown area (100ha), temporary assembly plant (100ha) and spoil area are situated north east of the heliostat field.
- The evaporation pond is required to be situated at the lowest point of the site in order to be gravity fed i.e. southern section of the site. The evaporation pond is situated more than 100m from the nearest drainage line in an area of low groundwater contamination risk.

Environmental sensitivity

- It is expected that the uppermost reaches of smaller fluvial systems of high ecological sensitivity will be affected within the CSP 2 project site. Siting of the CSP plant on these small areas of high ecological sensitivity is considered to be acceptable. It is expected that the impact can be further mitigated by moving the facility as far westwards towards the existing power line as possible.
- The confirmed/observed faunal migration corridor is situated to the south west and outside of the project footprint and is aligned primarily with drainage lines depicted as no-go features. This corridor supersedes that which is denoted as an Ecological Support Area (ESA) delineated in terms of the Namakwa Bioregional Plan.
- The recommended 3km avifauna buffer zone (red circle) around the martial eagle nest identified atop a tower structure has been mapped. This buffer zone does not overlap with the project development area and the martial eagle nest is situated approximately 4.5km from the power block (tower). Typically birds are at greater risk of succumbing to the effects of solar flux (singed feathers) within 100m from the tower. The evaporation pond (which could potentially be viewed by birds as an artificial waterbody thereby attracting them in the vicinity of power lines and the central receiver) has been sited appropriately in accordance with specialist recommendations to mitigate the potential for placing birds at risk from

collision with power lines and at risk from the effects of solar flux in proximity to the central receiver.

» Heritage find spots at CSP 2 consist of an old farm house and memorial to the south of the proposed administration block as well as two other find spots within the power line corridor. These sites will not be directly affected by the layout plan.

» No socially sensitive receptors developments are mapped within close proximity to the CSP 2 project site.

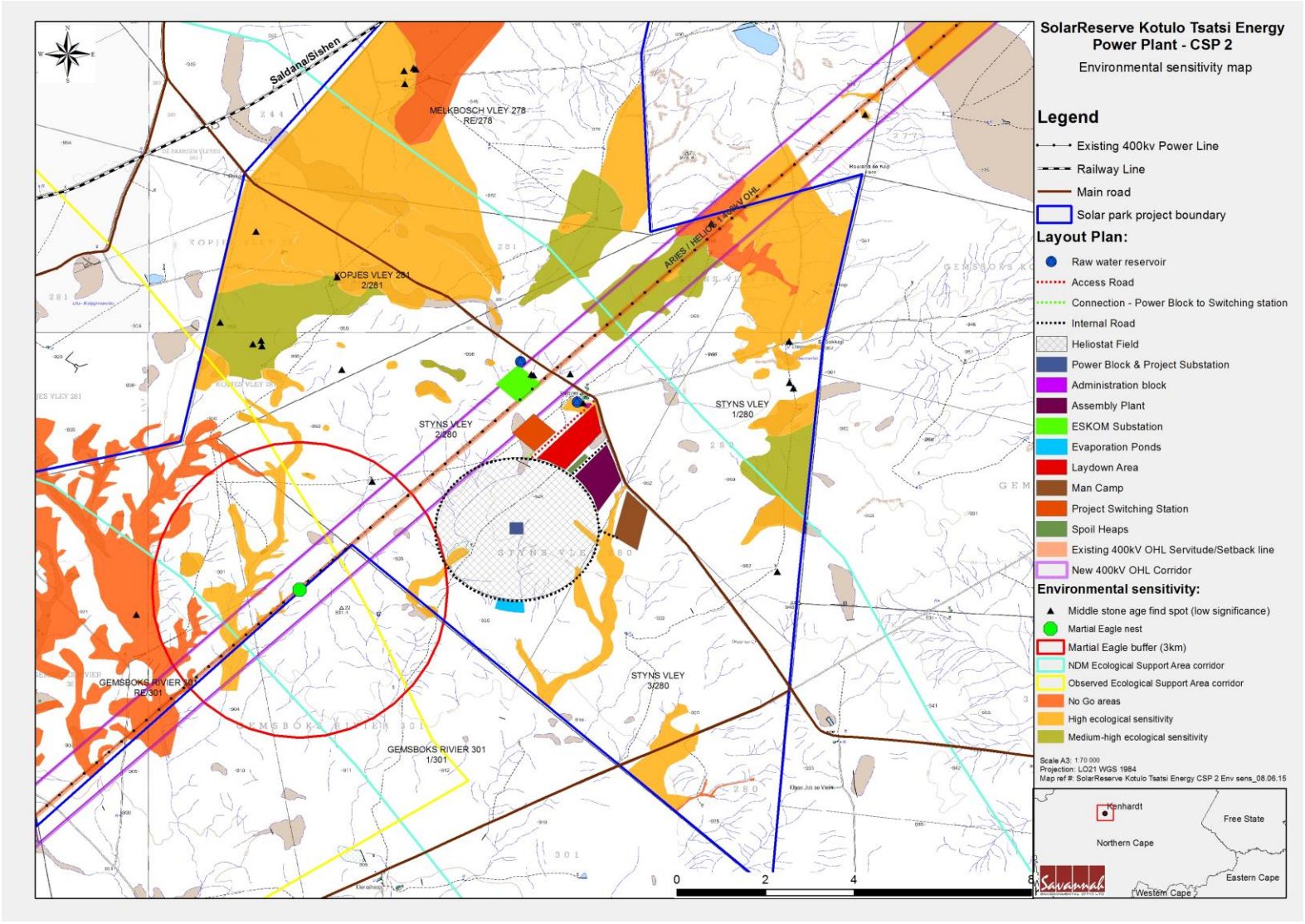

Figure 2: Final layout overlain on the environmental sensitivity map

2.2. Components and activities associated with the Solar Thermal Facility

The main components associated with the proposed CSP 2 facility are detailed in Table 2.1 below.

Table 2.1: Dimensions of the main infrastructural components for the proposed 200MW CSP 2 Project

Infrastructure	Footprint / dimensions
Receiver Tower	Accommodated in power block. Up to 250m in height
Heliostat field	Up to 800 ha (3 192m in diameter). Between 12 m and 15 m in height
Power block including steam turbine and generator	~ 242m in diameter ~ 5 ha circle
Molten salt storage tanks	2 tanks (cold and hot tank)
Water storage reservoir and tanks	Holding reservoir of 20 000m^3 and project tank of 5 000m^3.
Project substation	200m x 200m
400kV Substation (Eskom)	600m x 600m
Masts and telecommunications	Up to 32m in height
Power line (up to 275kV)	Up to 50m servitude, ~ 40km in length
400 kV power line (loop in – loop out)	55m servitude approximately 1.4km in length.
Lined evaporation pond	8 ha
Assembly facility	100 ha
Internal access roads	8m wide
Water supply point	Existing Kenhardt Reservoir
Water supply pipeline between Kenhardt and project reservoir	~95 km in length
Temporary laydown area and construction camp	100 ha
Man camp	Up to 50 ha

A detailed description of the life cycles phases of the proposed CSP 2 plant are included in the EIA Report but have been summarised below for the pre-construction, construction and operational phases of the project.

Pre-construction and construction phase: Activities and/or facilities relevant to this phase include:

- Access Control
- Conduct Surveys

- Establishment of Access Roads to the Site
- Undertake Site Preparation
- Transport of Components and Equipment to Site
- Refuelling
- Bulk material laydown
- Construct Power Block and Substation
- Establishment of Ancillary Infrastructure
- Auxiliary Power Supply
- Water Supply
- Man camp and staff facilities
- Ablution facilities
- Management and administration
- Waste Management
- Fire Protection
- Connect Substation to Power Grid
- Undertake Site Remediation

Operational phase: will involve the generation of power using the CSP technology and electrical systems, as well as the day-to-day management and maintenance of associated support services and infrastructure. In this regard, the activities and/or facilities relevant to the operational phase include:

- Access and security services
- Generation of electricity using CSP technology
- Start-up and operational power supply and use
- Water supply and use
- Procurement, storage and use of consumables
- Maintenance and repair to operational equipment
- Waste management
- Emissions management
- Stormwater management infrastructure
- Management and administration facilities (including visitor and training facilities)
- Management of man camp and staff facilities
- Fire protection
- Rehabilitation management

Decommissioning and closure: This phase is expected to take place after a period of 20 to 60 years subsequent to its commissioning (depending on whether the plant is refitted). A detailed plan for the decommissioning and closure of the facility will be drawn up before operations are ceased and submitted to the relevant competent authority for authorisation and ultimate implementation.

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 3

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 R545, GNR 546 in Government Gazette 33306 of 18 June 2010)
- 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 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA Process (DEA, 2010)
- International Standards - Equator Principles

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 3.1: Relevant legislative permitting requirements applicable to the SolarReserve Kotulo Tstatsi CSP 2 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 duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	» 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
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 - commenting authority » Local Authorities » District & Local Municipality	» 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. Any such specific activities should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.
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 and Sanitation	» The abstraction of water, the disposal of water containing waste and the alteration of the bed, banks, characteristics or course of a watercourse is regarded as a water use (as defined in terms of S21 of the NWA). » A water use license (WUL) is required to be obtained if pans or drainage lines are impacted on

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			» A water use license application will be applied for in line with the DWAS and DoE requirements, once the project has obtained proffered 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 and Sanitation (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. » Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.	» Department of Minerals and Energy	» As no borrow pits are expected to be required for the construction of the facility (material to be imported), 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 may require any person to submit an atmospheric	» 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 person has failed to comply with

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	impact report if there is reasonable suspicion that the person has failed to comply with the Act.		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 and PIA has been undertaken as part of the EIA Process to identify heritage and palaeontological sites. Should a heritage resource be impacted upon, a permit may be required from SAHRA.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed 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.	Department of Environmental Affairs	Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	» 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 in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader 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.
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	» 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

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	measures for alien and invasive plant species (Regulation 15E of GN R1048).		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'.	National Department of Forestry	A licence is required for the removal of protected trees.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the applicant must ensure 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.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation	» Any structure exceeding 45 m above ground level or structures where the top of the structure exceeds 150 m above the mean ground level, the mean ground level considered	» Civil Aviation Authority (CAA)	» While no permitting of licence requirements arise from the legislation, this act will find application during the operational

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Regulations (CARS) 1997	the lowest point in a 3km radius around such structure. » Structures lower than 45 m, which are considered as a danger to aviation shall be marked as such when specified.		phase of the project. Appropriate marking is required to meet the specifications as detailed in the CAR Part 139.01.33.
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, 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.	» 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
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 dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	Provincial 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).
Development Facilitation Act (Act No 67 of 1995)	» Provides for the overall framework and administrative structures for planning throughout the Republic » Sections 2- 4 provide general principles for land development and conflict resolution.	» Local Municipality, District Municipality	» The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			with procedures set out in the DFA.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	» Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	» Local Municipality, District Municipality	» Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project.
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 *(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	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 waste management license is required in this regard. » Permits for the discharge of waste water (brine water) into the evaporation ponds will be sought in terms of Section 21 of the NWA. » 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
	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		
Promotion of Access to Information Act (Act No 2 of 2000)	» All requests for access to information held by state or private body are provided for in the Act under S11.	» National Department of Environmental Affairs (DEA)	» No permitting or licensing requirements
Promotion of Administrative Justice Act (Act No 3 of 2000)	» In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable and rational decisions » Interested and affected parties have right to be heard	» National Department of Environmental Affairs (DEA)	» No permitting or licensing requirements
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;	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. 15 protected species were identified within the greater project study area.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	» 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.		

Table 3.2: Standards applicable to the Solar Reserve Kotulo Tsatsi CSP 2 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
	National Dust Control Regulations of November 2013	
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

Theme	Standard	Summary
	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 DWA 2006	Provides guidelines to the management of stormwater
	South African Water Quality Guidelines	Provides water quality guidelines
Temporary hazardous waste storage(bunds)		Provides guidelines to what materials, capacity and dimensions to be used in bund construction. Also outlines maintenance of bunds and permeability rates.

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 4

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced."[1] 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 EMP 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 remediation (i.e. soil stabilisation, re-vegetation), during operation and decommissioning (i.e. similar to construction phase activities).

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. 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

[1] Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

» 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.

The developer must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process it is important that this document be read in conjunction with the final Scoping and EIA Reports. 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 current 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 and shall be enforceable at all levels of contract and operational management within the project.

Multiple CSP projects are proposed to be developed within the proposed SolarReserve Kotulo Tsatsi Solar Project. Should more than one project be developed, additional mitigation measures to mitigate the potential **cumulative impacts** may need to be included within the EMP.

STRUCTURE OF THIS EMPR CHAPTER 5

The first two chapters provide background to the EMP and the proposed project, while the chapters to follow consider the following:

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

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

OBJECTIVE: Description of the objective, 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	Time periods for implementation of measures

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

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

» Planned activities change (i.e. in terms of the components and/or layout of the facility)
» Modification to or addition to environmental objectives and targets
» Relevant legal or other requirements are changed or introduced
» 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.

5.1. Project Team

This draft EMP was compiled by:

	Name	Company
EMP Compilers:	Jared Padavattan Michelle Moodley Karen Jodas – Environmental Assessment Practitioner (EAP)	Savannah Environmental
Specialists:	Marianne Strohbach - Ecology, including flora and terrestrial fauna	Savannah Environmental
	Rob Simmons - Avifauna Impact Assessment	Birds Unlimited Environmental Consultants
	Martiens Prinsloo - Surface Water and Groundwater Assessment including aquifer tests	Future Flow Groundwater and Project Management Solutions cc
	Johan van Tol - Soils and Agricultural potential	HydroPedological Solutions
	Jaco van der Walt - Heritage impact assessment	Heritage Contracts and Archaeological Consultants
	Jon Almond - Palaeontological impact assessment	Natura Viva
	Mandy van der Westhuizen - Visual impact assessment	NuLeaf
	Morne De Jager - Noise assessment	Enviro-Acoustic Research cc
	Callie Fouche - SKA Risk Assessment	ITC Services
	Paul van der Westhuizen - Traffic	Siyazi

	Impact Assessment	
	Candice Hunter - Social impact assessment	Savannah Environmental
	Elena Broughton - Economic Impact Assessment	Urban-Econ Development Economists

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

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 6

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 any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the linear components, including the raw water pipeline and power line alignment.
» Enables the solar energy facility 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.

6.1. Objectives

OBJECTIVE 1: Ensure the selection of the best environmental option for the project and associated infrastructure

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

» 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 stormwater management plan – this will detail how stormwater 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 – Apart from the raw water pipeline, all project components were subjected to a heritage survey during the EIA. A survey of the raw water pipeline infrastructure will be undertaken prior to construction. If a heritage object of significance is found within the development footprint, a heritage specialist must be brought in to assess the site, notify the administering authority of the item/site, and undertake due/required processes.
» Avifauna monitoring programme – to further observe and record movement and abundance of avifauna through the development footprint and consider additional mitigation strategies.

Project Component/s	» Solar field and associated infrastructure » Power generation components and associated infrastructure » Water related infrastructure (i.e. pipeline, associated reservoirs, and abstraction point). » Access roads. » Power lines.
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facilities components (i.e. including the infrastructure across the broader site to include the access road, pipeline, reservoirs and treatment facilities, and power line towers).
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. » Minimise or prevent any loss to biodiversity.

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 over the CSP 2 project site.	Heritage specialist	Pre-construction
Undertake a heritage pre-construction survey along the water pipeline route.	Heritage specialist	Pre-construction
Undertake a geotechnical pre-construction survey.	Geotechnical specialist	Pre-construction
Implement an avifauna monitoring programme throughout the project development footprint, for pre-construction and construction phases.	Avifaunal specialist/ Developer/Owner/ ECO	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/ ECO	Project planning

Mitigation: Action/Control	Responsibility	Timeframe
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 and internal access roads to be carefully planned to maximise road user safety, minimise dust emissions and faunal casualties.	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 systems around the plant to prevent contamination of clean water and contain of dirty water, install silt traps (to prevent excess sediment/ silt from discharging into the environment), water inlet structures (to direct stormwater into channels, minimising bank erosion and sedimentation) and breakwater structures (to reduce stormwater flow velocities, preventing downstream erosion and soil capping).	Developer/Owner EPC Contractor	Design
Consult a lighting engineer in the planning and placement of light fixtures for the plant and the ancillary infrastructure.	Developer/Owner EPC Contractor	Planning.
Reduce the construction period through careful planning and productive implementation of resources.	Developer/Owner EPC Contractor	Planning
Plan the placement of lay-down areas and temporary construction accommodation in order to minimise vegetation clearing.	Developer/Owner EPC Contractor	Planning
Minimise the loss of riparian habitat as a result of physical removal and replacement by hard surfaces.	Developer/Owner EPC Contractor	Planning and design
Develop a comprehensive rehabilitation plan for the site	Developer/Owner/ Specialist	Pre-construction
The holder of an environmental authorisation has the responsibility to notify the competent authority of any alienation, transfer and, change of ownership rights in the property on which the activity is to take place.	Developer/Owner	On-going
Submit a revised layout plan for the entire solar thermal power plant for approval to the department, as required by the Environmental Authorisation	Developer/Owner	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	Developer/Owner	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.		

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: Ensure the selection of the best environmental option for the alignment of the pipeline and associated access roads

The study area is covered by Lower Gariep Broken Veld, Bushmanland Basin Shrubland, and the Inland Azonal wetland type Bushmanland Vloere as described by Mucina and Rutherford (2006), with riparian vegetation on the banks of few small ephemeral water washes that drain mostly into lower-lying pan-systems beyond the CSP 2 project site.

Within the development site, no 'no go' areas were identified. Areas ascribed to have high environmental sensitivity within the development site include ephemeral drainage lines and larger valley floor areas.

Several protected plant species occur the CSP 2 project site, some of which are red data species. Clearing of large indigenous shrubs should be minimised as far as possible (regardless of protection status), whilst many of the succulent and geophytic protected species can be relocated with relative ease.

Opportunities to mitigate the negative impacts of large-scale solar developments largely arise during the planning and design stages. The correct choice of footprint location and layout is paramount, thus ecosystem components such as biodiversity and ecosystem function should be given full consideration during the design phase, as determined by the Environmental Impact Assessments. The timing of pre-commencement, construction, maintenance and decommissioning activities also provides opportunities to reduce negative impacts on biodiversity.

Once the layout has been finalised, a detailed investigation of the footprint area, during the optimal growing season and as described below must be conducted before activity commences. The walkthrough survey of the footprint area can still be used for micro-siting where desirable.

Project Component/s	» Solar field » Tower and power block » Grid connection and associated servitudes » Access roads » Pipeline » Workshop, guardhouses, substation and other related infrastructure » Temporary construction camps » Accommodation facilities » Protective fencing around development » Potential topsoil stockpiles and/or borrow pits
Potential Impact	» Placement that damages and degrades the environment unnecessarily, particularly with respect to habitat destruction, loss of indigenous flora, damage to rocky niche habitats, establishment, and persistence of alien invasive plants, and erosion.
Activities/Risk Sources	» Positioning of solar components and internal access routes » Positioning of workshop, guardhouses, substation and other related infrastructure » Alignment of power lines and servitudes » Alignment of access roads to development » Positioning of temporary sites
Mitigation: Target/Objective	» To ensure selection of best environmental option for positioning alignment of proposed infrastructure » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Avoid, where possible: » All vegetation and habitats with high sensitivity » New disturbance to riparian vegetation where such may be crossed » Destruction of indigenous trees along raw water pipeline route Minimise: » Clearing of high indigenous shrubs must be kept to the lowest number possible, regardless of species/protection status	Project Company	Design phase
Undertake pre-construction walk-through survey of the footprint area for protected flora and burrowing terrestrial vertebrates: The final walkthrough survey of the footprint area(walkthrough) is aimed to fully inform the Project Company, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about:	Project Company, carried out by Specialist	Design review phase

Mitigation: Action/Control	Responsibility	Timeframe
» Potential micro-siting requirements » Protected and red data species that will be affected by the development o indicating the red-data and protection status of each species observed (what red-data classification, which legislation) » Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence, especially dense patches (alternatively, for linear structures, between which structures or other markers) » Identification of the affected species by providing a representative photo record that enables EO/ECOs and contractors to identify such plants » How many specimens per species may be affected – estimate based on random transect surveys » Which species can be successfully relocated, which and how many will have to be destroyed » Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s) o GPS coordinates must be provided for such burrows and nests observed, with clear photographs that will enable the EO/ECO and contracting staff to identify more that will most likely be on the footprint area » Approximate location and nature of any alien invasive species that will have to be cleared by the contractor o Invasive Plant Management (Appendix E) o Also assess alien invasives along all neighbouring and main transport routes that may be introduced to the site o Provide clear photographs of all alien invasive species that occur on site or could potentially be introduced to enable the EO/ECO and contracting staff to identify these » Location and nature of any other significant environmental concerns, e.g. extreme gully erosion, that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint » Note: should more than 1000 specimens of any critically endangered or endangered species be affected, as risk assessment report for that species must be prepared according to Section 15 of the NEMA:BA Draft Threatened or Protected Species Regulations, Gazetted General Notice		

Mitigation: Action/Control	Responsibility	Timeframe
388 of 2013.		
The above pre-construction footprint investigations will be used together with results from the ecological specialist report to draft the following: » In line with Appendix F, a comprehensive search and rescue program for plants and possible burrowing animals » A comprehensive alien invasive species eradication and management plan o Basic requirements of these EMPs are listed under the Construction and operational Phase EMPr » Update and finalise the rehabilitation and revegetation plan (Appendix B of the EMPr) o This must include a topsoil management plan if required » Update and finalise the erosion control management plan	Project Company, carried out by Specialist	Design review phase
Obtain permits for protected plant removal and relocation prior to commencement of the construction activities. » As a minimum, permits will be required to remove all or some of the species listed (refer to the Appendices)	Project Company, or contractor responsible for vegetation clearing	Pre-construction
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the EIA Report: » This includes positioning components of the development as close as possible together and as much as possible on the low sensitivity portions of the study area. » Strictly adhere to existing tracks/roads where ever possible to gain access to the site. Any deviations must be approved by the ECO » Sites for storing, mixing, and handling topsoil piles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 100 m from any type of pan. Such sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and/or management plans requested from the relevant contractor or environmental firm. o For topsoil stockpiles: the Project Company and EPC contractor must indicate these in the original application and layout already, also approximate volumes and areas affected	Project Company	Prior to submission of final construction layout plan
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and	Project Company	Design phase

Mitigation: Action/Control	Responsibility	Timeframe
disturbance of topsoils, prevent obstruction or alteration of natural water flow		
Compile a comprehensive erosion control and stormwater management plan for the footprint area as part of the final design of the project » Basic requirements of these EMPs are listed under the Construction and Operational Phase EMPr	Project Company and relevant specialist	Design phase
Permissible biodiversity: » Depending on the final layout and maintenance requirements taken into consideration, it has to be decided upon and made clear: o Permissible vegetation: maximum height, desirable density and composition o Maintenance of this vegetation – mowing, small livestock grazing, etc. Note: there may be no application of herbicides for maintaining vegetation in a desirable state o Permissible terrestrial fauna that could be allowed to migrate/return to the area below/between the development components – including species that must be excluded due to potential damage to the development	Project Company, in consultation with relevant specialist	Design phase
After the permissible biodiversity has been determined, compile a comprehensive vegetation rehabilitation management plan. » Basic requirements of these EMPrs are listed under the Construction and operational Phase EMPr	Project Company and relevant specialist	Design phase
A response and management plan must be drafted and available to deal with accidental breakages and potential release of harmful substances. This plan must include as a minimum: » Specifications of harmful substances that could be released from accidental breakages or leakage of project components » How such harmful substances can best be salvaged and removed as soon as an accidental breakage has occurred » How and where broken components and potential harmful substances can be disposed of – it must also be indicated if any material can be recycled, and where materials must then be taken for recycling o The above will have to be incorporated into the waste management plan	Project Company and relevant waste management specialist	Design phase

Performance Indicator	» Grid connection and road alignments meet environmental objectives. » Solar components and all associated temporary and permanent infrastructure and access road alignments meet environmental objectives

	» Ecosystem fragmentation is kept to a minimum » Ecosystem functionality is retained and any unjustified disturbance and degradation prevented
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and the ECO prior to the commencement of activity.

OBJECTIVE 3: Minimise stormwater runoff and subsequent alteration of the local hydrological regime

To affectively control storm water and limit impacts to hydrological features, stormwater management plans and infrastructure must be planned/ designed prior to construction and implemented during the construction phase.

Project Component/s	» Stormwater management components » Reservoirs » Abstraction point (boreholes – if required during construction). » All hard engineered surfaces (i.e. pipeline, access roads). » Solar field » Power block
Potential Impact	» Poor stormwater management and alteration of the hydrological regime. » Poor planning and design of new abstraction infrastructure and new flood protection measures on the floodplain, resulting in bank erosion or slumping to occur during river flooding events. » Poor culvert structures that impede the flow of water, resulting in erosion and/ or flooding. » Poorly designed stormwater canals that increase erosion from the banks of canals and increase sediment flow into receiving drainage lines. » Contaminated stormwater from construction activities can enter hydrological systems.
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces). » Construction of water abstraction infrastructure. » Construction of stormwater infrastructure.
Mitigation: Target/Objective	» Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through construction of break water structures at the stormwater drain ends.	Developer/Owner EPC Contractor	Planning and design
Adjacent riparian habitats outside the "development	Developer/Owner	Planning and

Mitigation: Action/Control	Responsibility	Timeframe
footprint" of the new infrastructure should be declared sensitive habitats and out of bounds.	EPC Contractor	design
Evaporation ponds should be lined in a suitable manner to prevent any groundwater contamination. The banks of the evaporation ponds must be shaped and compacted to prevent bank erosion.	Developer/Owner EPC Contractor	Planning and design
Careful rehabilitation using natural riparian vegetation or brush packing must be used to stabilise the riverbanks and all disturbed areas in the riparian zone.	Developer/Owner EPC Contractor	construction
Appropriately plan hard-engineered bank erosion protection structures where required.	Developer/Owner EPC Contractor	Planning and design
Design a comprehensive stormwater management system for the entire site footprint as part of the final project design. This must include appropriate means for the handling of stormwater within the site, e.g. separate clean and dirty water systems around the plant to prevent contamination of clean water and containment of dirty water, install silt traps (to prevent excess sediment/ silt from discharging into the environment), water inlet structures (to direct stormwater into channels, minimising bank erosion and sedimentation) and breakwater structures (to reduce stormwater flow velocities, preventing downstream erosion and soil capping)	Developer/Owner EPC Contractor	Planning and design
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 through appropriate break water structures.	Developer/Owner EPC Contractor	Planning and design
Sedimentation traps should be installed along/ at the end of stormwater channels to minimise sediment flow into the hydrological systems and environment.	Developer/ Owner EPC Contractor	Planning and Design/ Construction
Clean and dirty stormwater systems must be installed to prevent contamination of clean stormwater systems. Where dirty water systems cannot be contained in contention ponds are be diverted to the evaporation ponds, then oil/ chemical traps must be installed to prevent contaminants from entering hydrological systems and the environment.	Developer/ Owner EPC Contractor	Planning and design/ Construction
A temporary stormwater system must be designed to ensure temporary stormwater management is implemented during pre-construction activities and before permanent stormwater structures are constructed.	Developer/ client/ EPC Contractor	Planning/ Design/ Pre-construction

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

	» No sedimentation discharged into the environment and hydrological systems. » No dirty water discharged into the environment and hydrological systems. » Evidence of clean and dirty stormwater separation.
Monitoring	» Surface water quality monitoring plan. » Visual inspection of hydrological systems and stormwater infrastructure.

OBJECTIVE 4: To ensure effective communication with surrounding landowners and site personnel during construction

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the CSP 2 facility. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» Electrical infrastructure » Fence perimeter » Access roads » Central Receiver
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 A) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and	Developer/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
site personnel. This procedure should be in line with the South African Labour Law.		
Liaison with landowners is to be undertaken prior to the commencement of construction should they be required to plan accordingly.	Developer/Owner EPC Contractor	Pre-construction
All minor and major environmental incidences must be communicated to the ECO, including the cause, extent, future mitigation measures and time frame for which the incident will be resolved.	EPC Contractor	pre-construction/ construction

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

OBJECTIVE 5: Ensure protection of fauna and avifauna during facility design

The avifaunal survey undertaken recorded a low species richness of sixty four avifaunal species recorded within the broader study area, five of which are threatened (red listed species) and forty of which are endemic. Species identified to be of most concern due to their interactions with the broader areas are the large nomadic Ludwig's Bustard *Neotis ludwigii* and Kori Bustard *Ardeotis kori*, the Martial Eagle *Polemaetus bellicosus* the Sclaters Lark (*Spizocorys sclateri*) and Lanner Falcons *Falco biarmicu*. The occurrence of an active Martial Eagle nest on a pylon of the Aries – Helios power line resulted in a 3km buffer around the nest being prescribed by the avifaunal specialist. Adequate measures must be undertaken at the pre-construction phase to ensure that the impact on sensitive avifauna is minimised.

Project component/s	» Evaporation ponds. » Electrical infrastructure. » Security fence design. » Solar field. » Central receiver.
Potential Impact	» Loss and injury of fauna and avifauna from facility infrastructure. » Loss of protected and endangered faunal and avifaunal species.
Activity/risk source	» Activities associated with site infrastructure.
Mitigation: Target/Objective	» Prevent or minimise loss to fauna and avifauna. » Prevent or minimise the loss of protected and endangered fauna.

Mitigation: Action/control	Responsibility	Timeframe
Compile a faunal removal plan/ rescue plan with designated personnel and contact numbers. » Faunal removal plan must be approved by the ECO. » Competent persons must be responsible for removal of fauna. » Faunal injury/ death register must be kept on site to record all faunal related incidents » Ensure the competent persons have the relevant capture, release and transportation permits issued by the NCDENC before pre-construction commences. » Identify farm/ land portion where fauna will be released and ensure that prior consent from land owner has been obtained. » Ensure animal capture/ removal/ transportation equipment is available on site, such as snake hooks, tongs, bags, eye shield, etc. » Contract services of a veterinarian or ranger with access to tranquilisers for larger fauna. » Ensure contact numbers of responsible persons are displayed around site. Ensure information signs are placed around site indicating protected and dangerous faunal species.	EPC Contractor/ Developer/ ECO	Planning and design.
Bird friendly towers and infrastructure must be used to prevent perching, nesting and flashovers from streamers, resulting in avifaunal injuries/ deaths.	EPC Contractor	Planning and design
Identify appropriate bird deterrent devices: » Around the solar field to prevent avifaunal collisions with the heliostats » At the top of the tower to prevent avifauna from nesting and perching. » Around the evaporation ponds to detract avifauna from the site. » At the designated waste area, in order to detract avifauna from site and prevent ingestion of harmful objects/ substances	EPC Contractor	Planning and design/ construction.

Mitigation: Action/control	Responsibility	Timeframe
Openings at the ends of the heliostat mirror support structures must be closed off in order to prevent avifauna from nesting.	EPC Contractor/ Developer	Planning and design
Bird flight diverters must be installed on the earth wires along the length of present and future power lines. Anti-perching spikes must be placed on the power line strain arms.	EPC Contractor	Planning and design/ Construction
Capture, release and transportation permits to be applied for by the person responsible for animal control. Correct equipment for animal removal must also be provided on site.	EPC Contractor	Pre- construction/ Construction
Performance Indicator	» Identification of avifauna and fauna carcasses.	
Monitoring	» Pre-construction and construction phase avifauna monitoring to record movement and abundance through the development footprint. » Faunal monitoring to detect movement through the development footprint.	

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 7

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 site should they be uncovered.
» Establishes an environmental baseline during construction activities on the site, where possible.

7.1. Institutional Arrangements: Roles and Responsibilities for the Construction Phase

The developer 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 the developer 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 EMP.

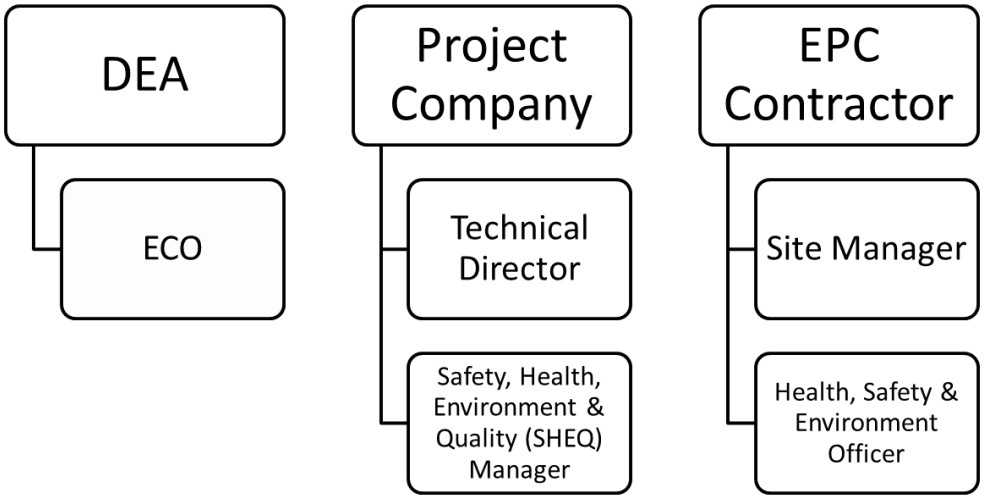

Figure 6.1: Organisational structure for the implementation of the EMP

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 the Developer and its Contractor(s) are made aware of all stipulations within the EMPr.
» Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
» 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 EMP must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMP 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 EMP (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 EMP, 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.

7.2. 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 site establishment

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 languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	» Area infrastructure (i.e. power block, etc.). » Linear infrastructure (i.e. raw water 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. » Impact on heritage sites.
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 and ECO.	EPC Contractor	Duration of contract
Where necessary control access, fence, and secure area as agreed with the ECO.	EPC Contractor	Duration of contract
Fence and secure contractor's equipment camp as agreed with the ECO.	EPC Contractor	Duration of contract
Develop an efficient access control system which allows for the identification of all people on site	EPC Contractor	Duration of contract
Establish SABS 089: 1999 Part 1 approved bunded areas for storage of hazardous materials and hazardous waste.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
All development footprints for the road, pipeline and reservoirs should be appropriately fenced off and clearly demarcated.	EPC Contractor	Duration of contract
Minimise vegetation clearance or removal associated with site establishment activities, trim trees under supervision. Compile a method statement specific to vegetation clearance.	EPC Contractor	Duration of contract
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	Duration of contract
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	Duration of contract
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands.	EPC Contractor	Duration of contract
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	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 permitted municipal landfill site. Slips of disposal to be retained as proof of responsible disposal	EPC Contractor	Duration of contract
Liquid waste: No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances and hazardous waste: 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. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered h:H or H:H landfill site. Depending on the classification of the waste, a registered service provider with the necessary permits is to collect, transport and dispose of hazardous waste. Proof of appropriate disposal to be provided to the ECO.	EPC Contractor O&M Contractor Owner	Duration of contract
Keep a record of all hazardous substances stored on site for submission to the ECO. Clearly label all the containers storing hazardous waste.	Contractor O&M contractor Owner	Duration of contract
The quantity of water needed for the duration of the construction phase is to be calculated and planned for in detail. Water to be abstracted from surface and groundwater resources to be in compliance with the relevant permits issued by the DWA. Water resources to be used sparingly and use not to exceed the resource potential or recharge rate. Contractor to keep detailed records of water quantities used.	EPC Contractor	Pre-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 EMP. » 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

Conduct: 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	» Solar field » Subcontractors' camp » Equipment laydown area
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. The location of the construction camp/s shall be approved by the project ECO.	EPC Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	EPC Contractor	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp and man camp as soon as construction is complete within an area.	EPC Contractor	Duration of Contract
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
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	EPC Contractor	Duration of construction
Safety representatives, managers and workers must be	EPC Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	and sub-contractor/s	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 be provided per 15 persons at each working area such as the Contractor's camp	EPC Contractor and sub-contractor/s	Duration of contract
All contractor camps must have sufficient amount of drip trays for construction vehicles, generators and temporary storage of small quantities of chemicals.	EPC Contractor and sub-contractors	Duration of contract
All contractor camps must have SABS approved spill kits on hand.	EPC Contractor and sub-contractors	Duration of contract
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 disposal facilities are maintained and emptied as and when required.	EPC Contractor	Site establishment, and duration of construction
No one other than the ECO or personnel authorised by the ECO 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	EPC Contractor and sub-contractor/s	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.		
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, as approved by the ECO. » 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 by the ECO. » 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 ECO. » An incident reporting system should be used to record non-conformances to the EMP. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE 3: Management of the on-site man camp

Housing of construction workers: A man camp is proposed for the duration of the project construction period due to the distance between Kenhardt and Brandvlei and the limited accommodation opportunities provided there for the workforce expected to be required. The man camp will be constructed to accommodate the maximum amount of staff required for the construction of a single CSP tower facility. The man camp could therefore be operational for up to 10 years or longer depending on project phasing in the larger solar project. The import of labour over this period could potentially result in a security risk and conflict with residents who have farmed in this area for generations. It

will be incumbent on the project developer to foster and maintain good relationships with neighbouring land owners and institute adequate grievance control mechanisms.

Project Component/s	» Man camp
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 and workers due to inadequate sanitation, lack of waste removal and waste storage facilities. » Pollution/contamination of the environment. » Injury/ death to workers.
Activities/Risk Sources	» Unauthorised extension of man camp for facility or recreational purposes. » Inadequate ablution facilities. » Inadequate accommodation and dining facilities. » Inadequate waste storage areas. » Consuming alcohol/ taking drugs/ tomfoolery.
Mitigation: Target/Objective	» Ensure the man camp and associated infrastructure remain within the designated areas. » Ensure all workers are aware of rules in the man camp. » Ensure adequate sanitation facilities and waste management practices. » Ensure adequate accommodation, eating and kitchen facilities. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
The designated man camp must be clearly demarcated with a physical barrier. The ECO must agree on the location of the camp and a walkthrough done to identify protected flora and faunal burrows. The man camp must be 100 m from a 1:100 year flood line including water courses and wetlands.	EPC Contractor	Duration of contract
A man camp management plan must be compiled, outlining: » Maintenance and operation of ablution, kitchen, dining, bathing, medical and accommodation facilities by the EPC contractor. » Rules to be followed by all workers occupying the camp. » Maximum allowable workers allowed in the camp. » Camp restrictions. » Dedicated first aiders, animal removers and fire fighters.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
» Emergency procedures.		
All relevant sections of the Occupational Health and Safety Act, 85 of 1993 and regulations must be adhered too.	EPC Contractor	Duration of contract
Drinking water must always be stored in excess to ensure safe drinking water is always available.	EPC Contractor	Duration of contract
No drugs or alcohol is allowed on site and this must be monitored by the health and safety manger.	EPC Contractor	Duration of contract
Provision must be made for an outdoor and indoor recreational area, however this specific area must be approved by the ECO in order to limit environmental degradation.	EPC Contractor	Duration of contract
Ablution facilities with septic tanks must be utilised throughout the camp and not portable toilets. Sewage waste must either be removed daily be a registered subcontractor to a registered sewage facility, or a sewage waste treatment facility must be constructed, with all treated waste disposed in the evaporation ponds. Amendments should be made to the water use license if required.	EPC Contractor	Duration of contract
A dedicated waste storage area must be constructed. The area must be maintained daily and waste separated according to the relevant waste stream. Waste must be removed daily.	EPC Contractor	Duration of contract
There must be adequate showers, washbasins, toilets and urinals within the sanitation facilities and provision must be made for both sexes.	EPC Contractor	Duration of contract
Each room/ building in the man camp must be energised and no open fires are allowed in or near buildings.	EPC Contractor	Duration of contract
Generators used to power the man camp must operate within a SABS 089:1999 Part 1 approved bund.	EPC Contractor	Duration of contract

Performance Indicator	» Waste and ablution facilities are well maintained and there is no stench of sewage or sewage leaking onto the ground. » There is no overflow of septic tanks or out of order toilets. » Kitchen and dining facility is well maintained » There is no increase of vermin in the man camp. » Man camp does not encroach outside of the designated area. » Fauna is not harmed and vegetation is not removed without consent.
Monitoring	» The EPC contractor or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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

Project Component/s	» Construction of the proposed project and associated infrastructure
Potential Impact	» The opportunities and benefits associated with the creation of local employment and skills development to be maximised.
Activities/Risk Sources	» Construction procurement practice employed by the EPC contractor » Developers investment plan
Mitigation: Target/Objective	» The developer should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors.

Mitigation: Action/Control	Responsibility	Timeframe
Employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria	Developer/Owner EPC Contractors	Pre-construction & construction phase
Adopt a local employment policy to maximise the opportunities made available to the local labour force	Developer/Owner EPC Contractors	Pre-construction & construction phase
In the recruitment selection process; a minimum percentage of women must be employed	EPC Contractors	Pre-construction & construction phase
Set realistic local recruitment targets for the construction phase.	Developer/Owner EPC Contractors	Pre-construction & construction phase
Training and skills development programmes to be initiated prior to the commencement of the construction phase	Developer/Owner EPC Contractors	Pre-construction & construction phase

Performance Indicator	» Employment and business policy document that sets out local employment and targets completed before construction phase commences; » Employ as many local semi and unskilled labour as possible. » Training and skills development programme undertaken prior to the commencement of construction phase.
Monitoring	» The developer and EPC contractor must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes. .

OBJECTIVE 5: Maximise the local economic multiplier effect during construction phase

Project Component/s	» Construction activities associated with the establishment of the facility, including the associated infrastructure.
Potential Impact	» Potential local economic benefits.
Activities/Risk Sources	» Developers procurement plan
Mitigation: Target/Objective	» Increase the procurement of goods and services especially within the local economy

Mitigation: Action/Control	Responsibility	Timeframe
A local procurement policy to be adopted to maximise the benefit to the local economy	Developer/Owner EPC Contractors	Pre-construction & construction phase
Develop a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) prior to the tender process and invite them to bid for project-related work where applicable	Developer/Owner EPC Contractors	Pre-construction & construction phase
Source as much goods and services as possible from the local area. Engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible	Developer/Owner EPC Contractors	Pre-construction & construction phase

Performance Indicator	» Local procurement policy is adopted » Local goods and services are purchased from local suppliers where feasible
Monitoring	» The developer must monitor indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 6: Reduce the pressure on resources, cellular network coverage, service delivery, infrastructure and social dynamics from a population change as a result of an increase of construction workers during the construction phase

Project Component/s	» Construction of the proposed CSP project and associated infrastructure
Potential Impact	» Population changes resulting in additional pressure on resources, cellular network coverage, service delivery, infrastructure maintenance and social dynamics during the construction phase as a result of an influx of construction workers into the study area
Activities/Risk Sources	» Influx of construction workers
Mitigation: Target/Objective	» To avoid or minimise the potential impact on local infrastructure, services and communities and their livelihoods

Mitigation: Action/Control	Responsibility	Timeframe
Implement a grievance and communication system for community issues and appoint community liaison officer	Developer/Owner EPC Contractors	Pre-construction & construction phase

Performance Indicator	» Community Liaison Officer is appointed
Monitoring	» The developer and EPC contractor must monitor the indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 7: Reduce the pressure on economic and social infrastructure and social conflicts from an influx of jobseekers during the construction phase

Project Component/s	» Construction of the proposed CSP project and associated infrastructure »
Potential Impact	» Decline on local economic and social infrastructure and services as well as a rise in social conflicts from an influx of jobseekers
Activities/Risk Sources	» Influx of jobseekers
Mitigation: Target/Objective	» To avoid or minimise the potential impact on local infrastructure, services and communities and their livelihoods

Mitigation: Action/Control	Responsibility	Timeframe
A 'locals first' policy should be advertised for construction employment opportunities, especially for semi and low-skilled job categories. Enhance employment opportunities for the immediate local area, Kenhardt and Brandvlei, if this is not possible, then the broader focus areas should be considered for sourcing workers such as KGLM and HLM	Developer/Owner EPC Contractors	Pre-construction & construction phase
Tender document is to stipulate the use of local labour as far as possible	EPC contractor	Pre-construction & construction phase
Inform local community members of the construction schedule and exact size of workforce (e.g. ward councillor, surrounding landowners)	Developer/Owner EPC Contractors	Pre-construction & construction phase
Recruitment of temporary workers at the gates/ on site of the development is to not be allowed. A recruitment office with a Community Liaison officer should be established to deal with jobseekers.	EPC contractor	Pre-construction & construction phase
Set up labour desk in a secure and suitable area to discourage the gathering of people at the gates of the construction site.	EPC contractor	Pre-construction & construction phase
Have clear rules and regulations for access to the proposed site	EPC contractor	Pre-construction & construction phase
Local community organisations and policing forums must be informed of construction times and the duration of the construction phase. Also establish procedures for the control and removal of loiters at the construction site	Developer/Owner EPC Contractors	Pre-construction phase & Construction phase
Security company to be appointed and appropriate security procedures to be implemented	Developer/Owner EPC Contractors	Pre-construction phase & Construction phase

Performance Indicator	» Ensure 'locals first' policy is adopted/advertised » Ensure no recruitment takes place on site » Control/removal of loiters
Monitoring	» The developer must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes

OBJECTIVE 8: To avoid or reduce traffic disruptions and movement patterns of local community during the construction phase

Project Component/s	» Increase in traffic disruptions, safety hazards, and impacts on movement patterns of local community as well as impact on private property due to the upgrade of the existing road and heavy vehicle traffic in the local area
Potential Impact	» Construction activities affecting daily living and movement patterns
Activities/Risk Sources	» To avoid or minimise the potential impact on local communities and their livelihoods
Mitigation: Target/Objective	» Increase in traffic disruptions, safety hazards, and impacts on movement patterns of local community as well as impact on private property due to the upgrade of the existing road and heavy vehicle traffic in the local area

Mitigation: Action/Control	Responsibility	Timeframe
Working hours to be kept between 6am and 6pm as per the ECA during the construction phase, and/or as any deviation that is approved by the relevant authorities.	EPC contractor	Construction phase
All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential road safety issues	EPC contractor	Pre-construction phase & Construction phase
Heavy vehicles should be inspected regularly to ensure their road safety worthiness.	EPC contractor	Construction phase
Provision of adequate and strategically placed traffic warning signs and control measures along the R27 and access road to warn road users of the construction activities taking place for the duration of the construction phase. Ensure that all signage is visible at all times.	EPC contractor	Construction phase
Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.	EPC contractor	Construction phase
Infrastructure such as fencing/ electric fencing along access route must be maintained in the present condition or repaired if disturbed due to project activities	Developer/Owner EPC Contractors	Construction phase
Ensure roads utilised are either maintained in the present condition or restored if disturbed from project activities	Developer/Owner EPC Contractors	Construction phase

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate signage along the R27 and access road to warn motorists of the construction activities taking place and displaying road safety messages and speed limits	EPC contractor	Pre-construction phase & Construction phase
The developer/proponent would need to establish appropriate measures together with the landowner from the farm Klaas Jobs Vley 1/302 to ensure that livestock moving between the farm and the watering point will be able to safely access water in the event of access to water being restricted during construction (due to traffic impacts and road surfacing). This could be in the form of traffic attenuation, or infrastructure solutions with the objective that no harm comes to livestock and that adequate water is provided throughout construction.	Developer/Owner	Pre-construction phase
Appoint a community Liaison Officer as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process	EPC contractor	Pre-construction phase & Construction phase

Performance Indicator	» Vehicles are roadworthy, inspected regularly and speed limits are adhered to » Ensure that there are traffic warning signs along the R27 and access road, ensure they are well illuminated at night » Roads and electric fencing are maintained or improved upon if disturbed from project activities » Ensure livestock on Farm Klaas Jobs Vley 1/302 have safe access to water supply. Ensure there is an agreement between the proponent and the landowner of Klaas Jobs Vley 1/302.
Monitoring	» The developer and EPC contractor must monitor the indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 9: Reduce the negative impacts associated with a man camp during the construction phase

Project component/s	» CSP facility and associated infrastructure
Potential Impact	Pressure on existing serviced and infrastructure, potential pollution impacts, unhygienic living conditions, risk of fires, risk of crime, and

	increased noise levels.
Activity/risk source	Influx of construction workers
Mitigation: Target/Objective	To avoid or minimise the potential impact on local infrastructure, services local communities, the workforce and their livelihoods

Mitigation: Action/control	Responsibility	Timeframe
Safety at and around the construction site and man camp must be ensured by fencing off the construction area to avoid unauthorised access and employing security personnel	EPC contractor	Pre-construction phase & Construction phase
The perimeter of the construction site and man camp must be appropriately secured to prevent any unauthorised access to the site; the fencing of the site should be maintained throughout the construction periods	EPC contractor	Pre-construction phase & Construction phase
Security company to be appointed and appropriate security procedures to be implemented	EPC contractor	Pre-construction phase & Construction phase
Family members and friends should not to be permitted access into the man camp	EPC contractor	Construction phase
Ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas	EPC contractor	Construction phase
Provide adequate firefighting equipment on site and provide firefighting training to selected construction staff	EPC contractor	Pre-construction phase & Construction phase
A comprehensive employee induction programme must be implemented to cover land access protocols, fire management and access controls. This must be addressed in the construction EMPr as the best practice.	EPC contractor	Pre-construction phase & Construction phase
Have personal trained in first aid on site to deal with smaller incidents that require medical attention	EPC contractor	Pre-construction phase & Construction phase
Rubble and other solid waste must be disposed of appropriately on a regular basis	EPC contractor	Construction phase
Appropriate sanitation and waste facilities to be provided to eliminate possible pollution problems. These facilities should be cleaned and maintained on a regular basis.	EPC contractor	Construction phase
Provide adequate and safe drinking water	EPC contractor	Construction phase

A comprehensive employee induction programme should address issues such as HIV/ AIDS and sexually transmitted diseases as well as alcohol and substance abuse. The induction should also address a code of conduct for employees that would align with community values.	Developer/Owner EPC Contractors	Pre-construction & construction phase
Appoint a Health and Safety Officer. Contact details of this person should be made available to the construction crew and local community and procedures to lodge complaints set out.	Developer/Owner EPC Contractors	Pre-construction & construction phase
Appoint a Community Liaison Officer to administrate a grievance mechanism for the construction workers as well for the local community. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the construction workers/ local community to express any complaints or grievances.	EPC contractor	Pre-construction phase & Construction phase

Performance Indicator	» Employee induction programme, covering land access protocols, fire management and road safety » Security company to be appointed and appropriate security procedures to be implemented Security personnel on site on a permanent basis » Man camp is managed efficiently
Monitoring	» The developer and EPC contractor must monitor the indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 10: To avoid or minimise the potential intrusion impacts such as aesthetic pollution, noise and light pollution during the construction phase

Project component/s	CSP project and associated infrastructure
Potential Impact	Intrusion impacts could impact the areas 'sense of place'
Activity/risk source	Construction activities
Mitigation: Target/Objective	To avoid or minimise the potential intrusion impacts such as aesthetic pollution, noise, dust and light pollution during the construction phase

Mitigation: Action/control	Responsibility	Timeframe
Limit noise generating activities to normal daylight working hours and avoid weekends and public holidays	EPC Contractor	Construction phase
The movement of heavy vehicles associated with the construction phase should be timed to avoid	EPC Contractor	Construction phase

weekends, public holidays and holiday periods where feasible		
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers	EPC Contractor	Construction phase
All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits	EPC Contractor	Construction phase
Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues	EPC Contractor	Construction phase
Communication, complaints and grievance channels must be implemented and contact details of the Community Liaison Officer is to be provided to the local community in the study area.	EPC Contractor	Construction phase

Performance Indicator	» Limit noise generating activities » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase » Enforcement of strict speeding limits » Community liaison officer available for community grievances and communication channel
Monitoring	» The EPC contractor must monitor the indicators to ensure that they have been met for the construction phase

OBJECTIVE 11: To avoid or minimise the potential impacts of noise and dust from construction activities during the construction phase

Project component/s	CSP project and associated infrastructure
Potential Impact	Heavy vehicles and construction activities can generate noise and dust impacts.
Activity/risk source	Construction activities
Mitigation: Target/Objective	To avoid and or minimise the potential noise and dust impacts associated with construction activities

Mitigation: Action/control	Responsibility	Timeframe
The movement of heavy vehicles associated with the construction phase must be timed to avoid weekends and holiday periods, where feasible	EPC Contractor	Construction phase

Ensure that damage caused by construction related traffic/ project activities to the existing roads is repaired before the completion of the construction phase.	EPC Contractor	Construction phase
Implement dust suppression measures for heavy vehicles such as wetting the roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers	EPC Contractor	Construction phase
Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues	EPC Contractor	Construction phase
Ensure that drivers adhere to speed limits	EPC Contractor	Construction phase
Implement a grievance and communication system for community issues and appoint community liaison officer	Developer/Owner EPC Contractors	Pre-construction & construction phase

Performance Indicator	» Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase » Enforcement of strict speeding limits » Road worthy certificates in place for all vehicles » Community liaison officer available for community grievances and communication channel
Monitoring	» The EPC contractor must monitor the indicators to ensure that they have been met for the construction phase

OBJECTIVE 12: To avoid or reduce the possibility of the increase in crime and safety and security issues during the construction phase

Project component/s	CSP project and associated infrastructure
Potential Impact	Increase in crime due to influx of non-local workforce and job seekers into the area
Activity/risk source	Safety and security risks associated with construction activities
Mitigation: Target/Objective	To avoid or minimise the potential impact on local communities and their livelihoods

Mitigation: Action/control	Responsibility	Timeframe
Working hours to be kept between 6am and 6pm as per the ECA during the construction phase, and/or as any deviation that is approved by the relevant authorities.	EPC contractor	Construction phase
The perimeter of the construction site and man camp	The Proponent &	Pre-construction

is to be appropriately secured to prevent any unauthorised access to the site. The fencing of the site and man camp is to be maintained throughout the construction period.	EPC contractor	phase & Construction phase
Local community organisations and policing forums must be informed of construction times and the duration of the construction phase.	The Proponent & EPC contractor	Pre-construction phase & Construction phase
Access in and out of the construction camp should be strictly controlled by a security company	EPC contractor	Construction Phase
A security company is to be appointed and appropriate security procedures are to be implemented	EPC contractor	Construction Phase
Family members and friends are not to be permitted access into the man camp	EPC contractor	Construction Phase
No unauthorised entry to the site is to be allowed. Access control is to be implemented.	EPC contractor	Construction Phase
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	EPC contractor	Construction phase
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	EPC contractor	Pre-construction phase & Construction phase
A comprehensive employee induction programme to be developed and utilised to cover land access protocols, fire management and road safety	EPC contractor	Pre-construction phase & Construction phase
Have a personal trained in first aid on site to deal with smaller incidents that require medical attention	EPC Contractor	Pre-construction phase & construction phase
A Community Liaison Officer should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process	EPC Contractor	Pre-construction phase & construction phase

Performance Indicator	» Employee induction programme, covering land access protocols, fire management and road safety » The construction site is appropriately secured with a controlled access system » Ensure a security company is appointed and appropriate security procedures and measures are implemented
Monitoring	» The developer and EPC contractor must monitor the indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 13: 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. Space requirements for temporary storage and laydown areas should be optimised where possible and rehabilitated as soon as possible.

Project Component/s	» CSP facility. » Water pipeline and water storage/treatment reservoirs. » 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. » Pipeline construction activities. » 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 areas so that impact on flora and fauna is restricted.	EPC Contractor	Site 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

Mitigation: Action/Control	Responsibility	Timeframe
Topsoil must be stockpiled and managed in terms of the stockpile management plan	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 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 14: Minimise the impacts on and loss of indigenous vegetation

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:	» Retain natural vegetation in the highly sensitive areas of the site.

Target/Objective	» 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
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	EPC Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only. Driving is only allowed on access roads and within designated areas in the site footprint. If driving is required outside of the designated areas then the ECO must approve before the activity commences.	EPC Contractor	Construction
Ensure all permits from DAFF and NCDENC are up to date. If new vegetation has been identified for removal then permits need to be updated and re-submitted.	Developer/ ECO	Pre-construction/ Construction
» Search and Rescue (S&R) (refer to Appendix F: Plant Search and Rescue Plan) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, lay down areas, and panel positions) must take place. » Plants that can be considered for rescue and included in subsequent rehabilitation programs are all desirable geophytes[2] and indigenous succulents including *Acacia erioloba, Psilocaulon coriarium, Aridaria noctiflora, Brownanthus vaginatus, Babiana species Aloe claviflora, Drosanthemum hispidum, Brownanthus vaginatus, Hoodia gordonii, Prenia tetragona, Jamesbrittenia canescens, Nemesia anisocarp, Larryleachia, Moraea* and *Microloma sagittatum* species. » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist or community members with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately or bagged (or succulents left to first	Developer/Owner and specialist/ ECO	Pre-construction

[2] *Desirable* geophytes would include only those that are of conservation concern and non-invasive; the reduction of toxic geophytes that increase exponentially where natural rangelands are degraded would rather be a positive impact.

Mitigation: Action/Control	Responsibility	Timeframe
air-dry before planting) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site or land portion once all construction is completed and rehabilitation of disturbed areas is required. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment.		
A site rehabilitation programme must be implemented	EPC Contractor in consultation with Specialist	Duration of contract
No one other than the ECO or personnel authorised by the ECO must disturb flora or fauna outside of the demarcated construction area/s.	EPC Contractor	Construction
All protected tree and herbaceous species that are found near construction activities must be demarcated with highly visible barriers, in order to prevent accidental damage or removal by subcontractors	EPC Contractor	Pre-construction/ 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 15: Manage and reduce the impact of invasive vegetation

Within the project area invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. Additional alien species grow along major transport routes to the area and thus could be potentially spread there as well.

Species that must be monitored and eradicated according to CARA and NEMA:BA:

» *Alternanthera pungens*
» *Argemone ochroleuca* (growing on embankments of railway track)
» *Datura* species (growing around watering points and along drainage lines)

- » *Flaveria bidentis* (growing along most road reserves)
- » *Nicotiana glauca* (growing in road reserves outside study area)
- » *Opuntia ficus-indica*
- » *Opuntia humifusa* (growing in road reserves outside study area)
- » *Prosopis glandulosa* (but see notes above)
- » *Salsola kali* (growing in road reserves outside study area)

Ruderal species that are easily distributed by vehicles or staff and should be eradicated when they become invasive:

- » *Chenopodium album*
- » *Laggera decurrens*
- » *Setaria verticillata*
- » *Tribulus terrestris*

Potentially invasive and/or toxic plants that will indicate degradation and will need to be eradicated from the development and associated infrastructure footprint to prevent their spread to neighbouring rangelands:

- » *Acacia mellifera s. detinens*
- » *Rhigozum trichotomum*

It can be expected that more species may be added after the pre-commencement walk-through survey. A detailed Invasives Management Plan need to be drafted after this walk-through. Operational standards must adhere to those set out by Working for Water. The use of chemicals may only commence with the approval of the relevant authorities.

Project Component/s	» Permanent and temporary infrastructure » Access roads
Potential Impact	» Impacts on natural vegetation » Impacts on soil (reduced water and nutrient content) » Impact on faunal habitats. » Degradation and loss of agricultural potential
Activity/Risk Source	» Transport of construction materials to site » Movement of construction machinery and personnel » Site preparation and earthworks causing disturbance to indigenous vegetation » Construction of site access road » Stockpiling of topsoil, subsoil and spoil material » Routine maintenance work – especially vehicle movement
Mitigation: Target/Objective	» To significantly reduce the presence of weeds and eradicate alien invasive species » To avoid the introduction of additional alien invasive plants to the project control area » To avoid further distribution and thickening of existing alien plants and

	invasive shrubs on the project area » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area

Mitigation: Action/Control	Responsibility	Timeframe
Compile a detailed invasive plant management and monitoring programme as guideline for the entire construction, operational and decommissioning phase as per Appendix E of the EMPr. » This plan must contain WfW-accepted species- specific eradication methods » It must also provide for a continuous monitoring programme to detect new infestations	Specialist	Pre-construction
Avoid creating conditions in which invasive plants may become established: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible » Shred all non-seeding material from cleared invasive shrubs and other woody vegetation and use as mulch as part of the rehabilitation and revegetation plan (Appendix B of the EMPr) » Where possible, destroy seeding material of weeds and invasives by piling burning (in designated areas or suitable containers) » Do not import soil from areas with alien plants » Monitor and control bush encroaching species from disturbed areas.	Contractor, monitored by ECO	Construction phase Operational phase
» Careful planning must be taken during the clearing of vegetation and topsoil in the solar field: » If it is decided that all vegetation and topsoil is stripped in the solar field, then continuous dust suppression, and monitoring and removal of alien vegetation and bush encroaching species must be an on-going process.	Developer/ EPC Contractor	Pre-Construction / Construction
» Eradicate all invasive plants that occur within the development's temporary and permanent footprint areas » Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed	Contractor, monitored by ECO	Construction phase Operational phase
» Immediately control any alien plants that become newly established using registered control measures	Contractor, monitored by ECO	Construction phase Operational phase

Performance Indicator	» Visible reduction of number and cover of alien invasive plants within the project area.

	» Improvement of vegetation cover from current dominance of invasive shrubs to dominance of perennial grasses and dwarf shrubs » No establishment of additional alien invasive species.
Monitoring	» Ongoing monitoring of area by ECO during construction. » Ongoing monitoring of area by EO during operation » Audit every two to three years by a suitably qualified botanist to assess the status of infestation and success of eradication measures » If new infestations are noted these must be recorded. A comprehensive eradication programme with the assistance of the WfW (Working for Water) Programme is advisable.

OBJECTIVE 16: Minimse the impacts on avifauna

The avifaunal survey undertaken recorded a low species richness of sixty four avifaunal species recorded within the broader study area, five of which are threatened (red listed species) and forty of which are endemic. Species identified to be of most concern due to their interactions with the broader areas are the large nomadic Ludwig's Bustard *Neotis ludwigii* and Kori Bustard *Ardeotis kori*, the Martial Eagle *Polemaetus bellicosus* the Sclaters Lark (*Spizocorys sclateri*) and Lanner Falcons *Falco biarmicu*. The occurrence of an active Martial Eagle nest on a pylon of the Aries – Helios power line resulted in a 3km buffer around the nest being prescribed by the avifaunal specialist.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas. » Heliostats » Solar tower » Power lines and associated infrastructure
Potential Impact	» Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site. » Loss of avifauna due to interactions with humans and site infrastructure
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment. » Pipeline construction activities. » Power lines and associated electrical infrastructure
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 avifauna and their habitats are restricted.	EPC Contractor	Site establishment & duration of contract
Bird friendly structures must be used to prevent perching, nesting and flashovers from streamers, resulting in avifaunal injuries/ deaths.	EPC Contractor	Planning and design/ Construction
Install bird deterrent devices: » Around the solar field to prevent avifaunal collisions with the heliostats » At the top of the tower to prevent avifauna from nesting and perching. » Around the evaporation ponds to detract avifauna from the site. » At the designated waste area, in order to detract avifauna from site and prevent ingestion of harmful objects/ substances	EPC Contactor/ Specialist	Planning and Design/ Construction
Deterent technology as recommended by the avifaunal specialist can also be used to deter avifauna from high impact areas.	EPC Contractor	Planning and design/ Construction
Openings at the ends of the heliostat mirror support structures must be closed off in order to prevent avifauna from nesting.	EPC Contractor	Planning and design/ Construction
Anti-perching spikes must be placed on the power line to minimise the chance of electrocutions from avifaunal streamers. Bird flight diverters must be installed on the earth wires along the 53 km of present and future power lines.	EPC Contractor	Planning and design/ Construction
Implement a construction phase avifauna monitoring programme	Avifaunal specialist/ Developer/Owner/ ECO	Construction
An avifaunal register must be implemented at the start of construction and maintained by the ECO and EO and contain the following: » Record of all avifaunal injuries and fatalities, » Time, location and GPS co-ordinates of such incidence, » Common and species name of individual, » Possible cause of incident, » Conservation status and, » Photographic evidence	EPC Contractor/ ECO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
The EPC contractor must ensure that all subcontractors report avifaunal incidents to the ECO/ EPC immediately		

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) » Identification of avifauna and fauna carcasses.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks » Faunal monitoring to detect movement through the development footprint. » Recording faunal fatalities to monitor success of relocation efforts » Construction phase avifauna monitoring to record movement and abundance through the development footprint. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE 17: Minimise the impacts on fauna

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas. » Heliostats » Solar tower » Power lines and associated infrastructure » Evaporation ponds » Man camp
Potential Impact	» Loss of faunal habitats. » Traffic to and from site. » Loss of fauna due to interactions with humans and site infrastructure.
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment. » Pipeline construction activities. » Power lines and associated electrical infrastructure » Vegetation clearance
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) faunal species.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance of faunal habitats.	EPC Contractor in consultation with Specialist/ ECO	duration of contract
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats are restricted.	EPC Contractor	duration of contract
Implement a faunal removal plan/ rescue plan with designated personnel and contact numbers. • Faunal removal plan must be approved by the ECO. • Competent persons must be responsible for removal of fauna. • Faunal injury/ death register must be kept on site to record all faunal related incidents • Ensure the competent persons have the relevant capture, release and transportation permits issued by the NCDENC before pre-construction commences. • Identify farm/ land portion where fauna will be released and ensure that prior consent from land owner has been obtained. • Ensure animal capture/ removal/ transportation equipment is available on site, such as snake hooks, tongs, bags, eye shield, etc. • Contract services of a veterinarian or ranger with access to tranquilisers for larger fauna. • Ensure contact numbers of responsible persons are displayed around site. Ensure signs are placed around site indicating protected and dangerous faunal species.	EPC Contractor	Pre-construction
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	EPC Contractor	Duration of contract
Site perimeter and evaporation pond fence must be constructed with a concrete base (or any alternative approved by the ECO) foundation that extends at least 600mm below the NGL, to prevent access of fauna	EPC Contractor	Construction
Traffic calming or extensive use of speed limit/ warning signs must be installed along access roads to prevent/ reduce faunal mortalities.	EPC Contractor	Construction
Vehicle movements must be restricted to designated roadways. Movements outside of designated roadways and proposals for the construction of informal access roads must be done with the agreement of the ECO.	EPC Contractor	Pre-construction/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
Faunal register must be implemented and maintained during construction by the ECO and EO, which must contain the following: » Record of all avifaunal injuries and fatalities, » Time, location and GPS co-ordinates of such incidence, » Common and species name of individual, » Possible cause of incident, » Conservation status and, » Photographic evidence The EPC contractor must ensure that all subcontractors report faunal and avifaunal incidents to the ECO/ EPC immediately	EPC Contractor/ ECO	Duration of contract

Performance Indicator	» Minimal sightings of fauna throughout site. » Minimum loss of faunal habitats during clearing of existing/natural vegetation. » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	» Supervision of all clearing and earthworks by ECO throughout the construction phase. » Faunal monitoring to detect movement through the development footprint. » Recording faunal fatalities to monitor success of relocation efforts. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE 18: Minimise impacts on groundwater resources

The average depth to groundwater level in the project area as recorded by the hydrocensus boreholes ranges between 6.65 and 32.48 mbgl. From a supply perspective, based on the evaluation of selected existing boreholes near to the project site, sustainable groundwater yields for operational purposes are not anticipated, however should be sufficient for construction phase purposes. Calculations show that the sustainable yield for the tested boreholes (using a 24 hour pumping day, 365 days a year), is between 0.036m^3 to 5.4m^3 per hour. The groundwater levels should be managed so that the main aquifer is not dewatered on a regular or long term basis as it could lead to a decrease in the sustainable yield of the aquifer over time.

Project Component/s	» Hazardous chemical and hydrocarbon bunds. » Hazardous chemical and hydrocarbon waste bunds. » Ablution facilities. » Heavy machinery and construction vehicles. » Evaporation pond. » Batching plant.
Potential Impact	» Pollutants such as lime-containing (high pH) construction materials such as concrete, cement, grouts, etc could be harmful to aquatic biota, particularly during low flows when dilution is reduced. » Health risk to locals using the river water for domestic purposes.
Activity/Risk Source	» Fuelling, usage and maintenance of construction vehicles. » Cement batching and usage. » Labourer using ablution facilities. » Use of any chemicals or hazardous materials during construction.
Mitigation: Target/Objective	» No incidents related to spills of chemicals and hazardous materials. » No release of contaminated water, which includes any 'backwash" or process water that could be released back into the environment. » No misbehaviour of construction workers (i.e. ablution activities, washing).

Mitigation: Action/Control	Responsibility	Timeframe
Construction of temporary dirty stormwater system with associated pollution control dam on site to prevent any contaminated runoff from entering into water resources.	EPC Contractor	Construction
Strict use and management of all hazardous materials used on site.	EPC Contractor	Construction
Strict management of potential sources of pollution (hydrocarbons from vehicles and machinery, cement during construction, etc.).	EPC Contractor	Construction
Containment of all contaminated water, which includes any 'backwash" or process water that could be released back into the environment.	EPC Contractor	Construction
Strict control over the behaviour of construction workers.	EPC Contractor	Construction
Any current erosion or destabilisation of the river banks due to existing structures near the abstraction sites should be repaired and stabilised as part of the present project.	EPC Contractor	Construction
Ensure hard-engineered erosion-control structures are maintained and rehabilitated using appropriate indigenous vegetation.	EPC Contractor	Construction

Performance Indicator	» Compliance with the terms and conditions of the water use license in terms of use, quality control and changes to drainage lines.

Monitoring	» Groundwater monitoring plan

OBJECTIVE 19: Minimise stormwater runoff and alteration of the hydrological regime

An ephemeral drainage line of high sensitivity is situated within the CSP 2 development footprint. The anticipated downstream catchment impact from the proposed CSP project on the drainage line is considered to be low due to the drainage line having low stream flows and being unable to support flow dependent aquatic life.

During the construction phase the natural vegetation in the project site will be removed for the construction of access roads, power block, heliostats and other associated infrastructure. There will be a higher potential for sediment transport during storm events as soil particles are loosened due to an increased percentage of bare surfaces. Reduced vegetation cover will decrease infiltration and increase surface runoff which would result in a higher potential for hydrological yield.

Project Component/s	» Solar field. » Power block » Access roads. » Culvert crossings
Potential Impact	» Poor stormwater management and the alteration hydrological regime
Activities/Risk Sources	» Placement of hard engineered surfaces
Mitigation: Target/Objective	» Reduce the potential increase in surface flow velocities and the impact on dry riverbeds and the localised drainage systems

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through construction of break water structures at the ends of stormwater drains.	EPC Contractor	Planning and design/ Construction
Evaporation ponds should be lined in a suitable manner to prevent any groundwater contamination. The banks of the evaporation ponds must be shaped and compacted to prevent bank erosion.	EPC Contractor	Construction
Careful rehabilitation using natural riparian vegetation or brush packing must be used to stabilise the riverbanks and all disturbed areas in the riparian zone.	EPC Contractor	Construction
Appropriately plan hard-engineered bank erosion protection structures where required.	EPC Contractor	Planning and design/ Construction
Design a comprehensive stormwater management	EPC Contractor	Planning and

Mitigation: Action/Control	Responsibility	Timeframe
system for the entire site footprint as part of the final project design. This must include appropriate means for the handling of stormwater within the site, e.g. separate clean and dirty water systems around the plant to prevent contamination of clean water and containment of dirty water, install silt traps (to prevent excess sediment/ silt from discharging into the environment), water inlet structures (to direct stormwater into channels, minimising bank erosion and sedimentation) and breakwater structures (to reduce stormwater flow velocities, preventing downstream erosion and soil capping).		design/ Construction
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 through appropriate break water structures.	EPC Contractor	Planning and design/ Construction
Sedimentation traps should be installed along/ at the end of stormwater channels to minimise sediment flow into the hydrological systems and environment.	EPC Contractor	Planning and design/ Construction
Clean and dirty stormwater systems must be installed to prevent contamination of clean stormwater systems. Where dirty water systems cannot be contained in contention ponds are be diverted to the evaporation ponds, then oil/ chemical traps must be installed to prevent contaminants from entering hydrological systems and the environment.	EPC Contractor	Planning and design/ Construction
A temporary stormwater system must be designed to ensure temporary storm water management is implemented during pre-construction activities and before permanent stormwater structures are constructed.	EPC Contractor	Planning and design/ Construction
Where access roads cross natural drainage lines or azonal wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Developer/Owner / EPC Contractor O&M Operator	Planning, design and operation
Drainage line crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water.	Developer/Owner / EPC Contractor O&M Operator	Planning, design and operation

Performance Indicator	» Water quality and quantity management - "Water Use Licence Conditions" » Minimal level of increased siltation in drainage lines or pans » Evidence of clean and dirty water separation

	» No sediment or dirty water discharge into the hydrological system and stormwater infrastructure
Monitoring	» Surface water monitoring plan » Physical inspection of hydrological systems and stormwater infrastructure

OBJECTIVE 20: 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 lines.
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems.

Project Component/s	» Power block. » Solar field. » Water pipeline, water storage/treatment reservoirs, and water abstraction facilities. » Offices and workshops. » Access roads. » Electrical infrastructure.
Potential Impact	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site. » Contaminated run-off from 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.
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	During and after construction
Newly rehabilitated areas must be adequately demarcated until vegetation is established.	EPC Contractor	Construction/ operation
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	EPC Contractor	Design and 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	Design, before and during construction
Minimise removal of vegetation which adds stability to soil.	EPC Contractor	Construction
If any clearing is done near the abstraction point, this area is to be monitored for plant re-growth, firstly to prevent alien plant infestations and to ensure no erosion or scour takes place.	EPC Contractor O&M Operator Owner	Planning, design, construction and operation
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion	EPC Contractor	Before and during construction
Erosion control measures: Run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets, rip-rap, brush packing or temporary mulching over denuded area as required.	EPC Contractor	Erection: Before construction Maintenance: Duration of contract
Top soil recovered from site or which stockpiled may not be used for any construction related activities. Bedding for electrical and communication infrastructure must be outsourced.	EPC Contractor	Construction
Control depth of excavations and stability of cut faces/sidewalls.	EPC Contractor	Before construction and Maintenance Duration of contract

Performance Indicator	» No activity outside demarcated disturbance areas. » Acceptable level of activity within disturbance areas, as determined by the ECO.

	» Acceptable level of soil erosion around site, as determined by the ECO. » Acceptable level of increased siltation in drainage lines, as determined by the ECO. » Acceptable state of excavations, as determined by the ECO. » No activity in restricted areas.
Monitoring	» Monthly inspections of the site by the ECO. » 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 21: 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.

CSP 2 project site: The age of the Valsvlei farmhouse located on the CSP 2 project site should be established to determine whether the building is older than 60 years. Should it prove to be older than 60 years, no alteration or destruction of the building may occur without a heritage permit. A heritage site walkthrough is recommended before commencement with construction.

Power line: The construction of towers associated with a new power line should avoid the six find spots identified within the power line corridor. Granite outcrops in the south should rather be avoided as they contain LSA material as well as quarry sites.

Water pipeline: Re-alignment of the section of pipeline in the vicinity of the cemeteries is required to be undertaken and a 15m buffer zone around the sites implemented should the R27 alignment be technically preferred. Chance finds of heritage artefacts within the water pipeline alignment within the existing road reserves should be reported to the ECO during the construction phase to determine whether the inputs of an archaeologist are required to assess the significance of the find.

Project Component/s	» Solar field » Power block. » Raw water pipeline » Power line
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 » Construction of power line towers » 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
Undertake a heritage site walkthrough prior to construction.	Owner / EPC Contractor / Heritage specialist	Pre-construction
A heritage conservation management plan is recommended for the entire CSP development area.	Owner / EPC Contractor / Heritage specialist	Pre-construction
Micro adjustments of pylon positions can ensure in situ preservation of sites identified within the power line corridor	Owner / EPC Contractor	Pre-construction
Realignment of water pipeline along the route R27 to ensure that the cemeteries are not impacted. The cemeteries will have to be fenced off with 15 m buffer zone to protect them from damage during road construction.	Owner / EPC Contractor	Pre-construction
Familiarise all staff and contractors with procedures for dealing with chance finds of heritage objects/sites.	Specialist	Pre-construction
Project employees and any contract staff will maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Owner / EPC Contractor	Duration of contract
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	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.	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 ECO 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 22: Minimisation of visual impacts associated with construction

During the construction period, there will be an increase in heavy vehicles utilising the roads to the construction sites that may cause, at the very least, a visual nuisance to other road users and landowners in the area in close proximity. Within the region, dust as a result of construction activities may be visible, especially in this receiving environment, and as such will result in visual impact during construction. 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	» Subcontractor's camps. » Laydown areas. » Ablution facilities. » Waste facility.
Potential Impact	» Visual impact of general construction activities and construction accommodation, 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
Keep vegetation removal to a minimum where	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
possible.		
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 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
Storage of hazardous and general waste must be located at a designated area on site	EPC Contractor	Construction
Bunds and service area platforms to be cleaned and maintained regularly.	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 23: Appropriate handling and management of waste

The construction of the CSP project 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 during the construction phase include:

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

Project Component/s	» Power block. » Water pipeline and water storage/treatment reservoirs.

	» Power line » Offices, workshops and man camp. » Access roads. » Solar field
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices » Increase in vermin » Eutrophication of nearby water sources » Breeding ground for bacteria and viruses » Illness, viral infections » Soil pollution » Groundwater and surface water pollution
Activity/Risk Source	» Packaging » Other construction wastes » Hydrocarbon and chemical use, handling and storage » Spoil material from excavation, earthworks and site preparation » Septic tanks and portable toilets
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. » To prevent airborne viruses and bacteria from spreading » To minimise impacts on the environment and human health »

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. 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.	EPC Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors. ECO to be made aware of the details of such facilities.	EPC Contractor	Duration of contract
Uncontaminated waste must 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 including contaminated soil must be contained and stored in sealed containers within a SABS 089:1999 Part 1 approved 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.	EPC Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate.	EPC Contractor	Duration of construction
Septic tanks and portable toilets must be monitored and maintained daily	EPC Contractor	Duration of construction
Leakage of effluent must be prevented and if leaks do occur, the leak must be fixed and the contaminated vegetation/ soil must be removed immediately	EPC Contractor	Duration of construction
No effluent is allowed to be discharged into the environment.	EPC Contractor	Duration of construction
Ensure that there is at least 1 portable toilet per 30	EPC Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
workers for each sex.		construction
Ensure the above ground septic tank is in an impermeable bund that can contain at least 110% of the tanks contents. Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	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 made available to the ECO. All waste facilities and waste transportation contractors must be licensed and registered where necessary.	EPC Contractor	Duration of Construction/ Operation
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
Unless designated areas are provided, no vehicles or machinery are to be washed on the site.	EPC Contractor	Duration of contract

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. » No vermin identified at the general waste areas » No illness resulting from leaking toilets and septic tanks and accumulation of solid waste.
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 24: 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.

Project Component/s	» Storage bunds. » Contractors' camp. » Generators. » Chemical storage warehouse.
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Pollution of water and soil resources
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
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	EPC Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment 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. A report must be submitted to the DEA (section 30) within 14 days from the spill occurring.	EPC Contractor. Client (During operation of the facility)	Construction phase. Operational phase
A bioremediation procedure and procurement plan must be drawn up prior to construction to ensure prompt application in the event of a major spill.	EPC Contractor	Duration of contract
In the event where more than 20 L of hydrocarbon or chemical is spilt into the environment, bioremediation must be undertaken under the	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
discretion of the ECO.		
Spilled cement must be cleaned up as soon as possible, stored as hazardous waste and disposed of at a suitably licensed waste disposal site.	EPC Contractor	Duration of contract
Any contaminated/polluted soil must be removed and stored as hazardous waste and disposed of at a licensed hazardous waste disposal facility. Contaminated soil must be stored in a sealed container as per the requirements of SABS 089:1999 Part 1.	EPC Contractor	Duration of contract
Dedicated service bunds must be constructed for the purpose of vehicle repairs as approved by the ECO.	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. Hydrocarbon and chemicals must be stored in a bund that will be able to contain 110% of the stored volume.	EPC Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. Chemicals, hydrocarbon or stormwater which has spilled in the bund must be removed/ pumped out immediately and stored as hazardous waste.	EPC Contractor	Duration of contract
Separate storage bunds must be temporary constructed for the storage of hydrocarbons/ hydrocarbon waste and chemical/ chemical waste. Where more hydrocarbon and chemicals are anticipated on site, further SABS approved bunds must be constructed.	EPC Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area. If machinery cannot be stored in a sealed area then a drip tray must be used.	EPC Contractor	Duration of contract
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands, a drainage line or hillside wetlands.	EPC Contractor	Duration of contract
SABS 089:1999 Part 1 approved bunds around site must be maintained on a regular basis. A bund maintenance EMS must be compiled and approved by the ECO before bunds are constructed.	EPC Contractor	Duration of contract
Drip trays must be placed under all generators on site, including generators that are turned off and are not operational. Drip trays must be maintained	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
on a regular basis. A drip tray maintenance EMS must be compiled and approved by the ECO during pre-construction.		
All EPC and sub-contractors' camps, laydown area and parking areas must have drip trays placed under all their vehicles and machinery to prevent hydrocarbon leaks/ spills.	EPC Contractor	Duration of contract
Drip trays must be placed under all construction vehicles that are parked on site. Extra drip trays must be purchased and kept at the service and parking areas at the security gates, and placed underall delivery vehicles/ trucks/ machinery awaiting access clearance.	EPC Contractor	Construction
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded as per SABS 089:1999 Part 1, and stored in compliance with Material Safety Data Sheets (MSDS), 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 complied 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.	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, use 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 stormwater system.	EPC Contractor	Construction
Upon the completion of construction, the area must be cleared of potentially polluting materials.	EPC Contractor	Completion of construction
Permanent chemical and waste chemical warehouse facility must be designed according to	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
SANS 10263-0: Part 0, NEM: WA, OHSACT regulations and other relevant legislation and standards. » A separate spill containment sump must be constructed and able to contain 110% of the total volume of stored chemicals and hydrocarbon. Spilled substances must be removed immediately. » Chemicals must not be stored with other reactive substances. » An emergency plan must be compiled and implemented at the commissioning of the warehouse. » A firefighting system must be installed within the warehouse to control fires. » A spill removal and storage procedure must be compiled and implemented.		

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 25: 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. Potential pollutants contained in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant. » Temporary storm water system
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 » Respiratory illnesses
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
Where possible 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 wind barriers such as trees and landforms may help control the emission of dust from the plant.	EPC Contractor	Construction phase
Artificial wind barriers (approved by the ECO) must be installed around the batching plant to minimise air, land and water pollution. Wind barriers must enclose the entire batching plant and be at least 2 m from the NGL and not allow cement and other dusts from moving through the barrier. The artificial barrier must be maintained daily for any defects and corrected when necessary.	EPC Contractor	Pre-construction/ construction
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
The concrete batching plant site should demonstrate good maintenance practices, including regular sweeping to prevent dust build-up	EPC Contractor	Construction phase
The concrete wash bay structure must be constructed in a double brick arrangement or be reinforced to maintain its integrity throughout operation.	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	EPC Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
agent should be correctly applied to reduce dust emissions and reduce water usage throughout the batching plant.		
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
The site should be designed and constructed such that clean stormwater, including roof runoff, is diverted away from contaminated areas. The batching plant must be designed and constructed to allow for clean and dirty stormwater separation. Dirty water must be contained within an impermeable collection sump.	EPC Contractor	Construction phase
Any liquids stored on site, including admixtures, fuels and lubricants, must be stored in bunds and accordance with applicable legislation.	EPC Contractor	Construction phase
Contaminated stormwater and process wastewater should be captured and recycled where possible. A wastewater collection and recycling system should be designed to collect contaminated water.	EPC Contractor	Construction phase
Process wastewater and contaminated stormwater collected from the entire batching plant area must be diverted to an impervious settling tank or pond. Water must be reused in the concrete batching process, where possible.	EPC Contractor	Construction phase
Areas where spills of oils and chemicals may occur must be equipped with easily accessible spill control kits to assist in prompt and effective spill control.	EPC Contractor	Construction phase
Ensure that all practicable steps are taken to minimise the adverse effect from noise emissions. This responsibility includes not only the noise emitted from the plant and equipment but also associated noise sources, such as radios, loudspeakers and alarms.	EPC Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site. If activities allow for waste concrete to be used on site, then an area of low ecological importance must be used as a temporary storage area, as agreed on by the ECO.	EPC Contractor	Construction phase

Performance Indicator	» No dust complaints » No water or soil contamination by chemical spills/ concrete spills » No complaints received regarding waste on site or indiscriminate dumping » Integrity of wash bays and perimeter netting not compromised throughout the operation of the batch plant.
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

7.3. Detailing Method Statements

OBJECTIVE 1: 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. Method statements must be reviewed by the ECO and owners engineering team for further technical and health and safety input.

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 approved, 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.

7.4. 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:

7.4.1 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.

7.4.2 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.

7.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives from different subcontractors 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.

7.5. 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, the applicant 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

The ECO will ensure compliance with the EMPr, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks.

7.5.1. 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.

7.5.2. 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.

7.5.3. 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 8

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

8.1. 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	» Project footprint 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	EPC Contractor	Following execution of the works
Restoration must be undertaken as soon as possible after completion of construction activities to reduce	EPC Contractor	Following execution of

Mitigation: Action/Control	Responsibility	Timeframe
the area of habitat converted at any one time and to speed up recovery of natural habitats.		the works
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 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/ scarified, 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 9

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.

9.1. 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 wind energy 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 nitrification 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. » Loss of protected faunal species.
Activity/Risk Source	» Movement of employee vehicles within and around site.
Mitigation:	» Maintain minimised footprints of disturbance of vegetation/habitats

Target/Objective	on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation. » Power lines and associated infrastructure, and heliostat mirrors. » Evaporation ponds

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
Avifauna monitoring on power line and solar field, tower and evaporation pond infrastructure to assess the integrity of mitigation measures in place. Further mitigation measures must be implemented if carcases and injuries are being noted. A faunal/ avifauna incident register must be maintained on site.	Owner O&M Operator	Operation
Implementation of an animal removal plan to ensure safety of workers and scavengers.	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: Protection of avifauna and priority bird species during operation

The potential impacts to avifauna from the operation of the proposed CSP facility include:

» Habitat alteration,

- » Interaction of avifauna with the facility and potential impact of solar flux singeing, and
- » Direct collision with the power line network.

Habitat alteration: The evaporation ponds are considered to be a potential water resource which may attract water birds to the area potentially putting them at risk. Insects may also be attracted to the intense light at the CSP tower plant which in turn may attract species such as bustards which eat mainly insects (especially grasshoppers and beetles) and other insectivorous species within close proximity to central receivers.

Sensitive species: The CSP tower is ~4.5km from an active Martial Eagle nest identified on a pylon of the existing Aries – Helios 400kV power line. Martial Eagle territories can be in excess of 100km^2 and there is the potential for these birds to fly over the CSP sites and near to the tower during operation, placing them at risk. The existing power line was flagged during the survey as being the source of a significant number of Bustard mortalities due to collisions.

It is considered essential to provide mitigation measures along with implementation of an avifaunal monitoring programme.

Project component/s	» Power line infrastructure. » Solar field and flux points. » Evaporation ponds
Potential Impact	» Loss or injury to avifauna. » Decrease in avifaunal diversity. » Decrease in avifaunal populations.
Activity/risk source	» Overhead power lines. » Electrical pylons. » Heliostat mirrors. » Flux points
Mitigation: Target/Objective	» To prevent or minimise fatalities of avifauna through feather singeing, collision and electrocution events.

Mitigation: Action/control	Responsibility	Timeframe
Develop and implement an appropriate operation phase monitoring programme to record movement through the development footprint and fatalities. The monitoring programme must include carcass counts. The programme should make adjustments to current mitigation measures, where these can be justified.	Owner/ ECO / Ornithologist	Operation
Monitor the movements of known birds at risk including Martial Eagles.	Owner/ ECO / Ornithologist	Operation
Investigate a combination of bird radar and acoustics	EPC Contractor	Operation

Mitigation: Action/control	Responsibility	Timeframe
or the use of trained animals as measures to divert or deter birds from the vicinity of the CSP site		
Bird deterrent devices must be placed around the facility (outer edge of heliostat field and tower) where determined to be required based on the monitoring.	EPC Contractor	Operation

Performance Indicator	» Record of avifauna mortalities occurring as a result of the facility. » Identification of avifauna carcasses.
Monitoring	» Avifaunal monitoring programme to be implemented during operations.

OBJECTIVE 4: Minimisation of visual impacts

The primary visual impact of the tower and central receiver 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. The number of sensitive visual receptors within the region is low.

Project Component/s	» Power block. » Power line. » Water pipeline and water storage/treatment reservoirs. » 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. » Power lines. » 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	Owner	Operation and

will be designed to contain rather than spread light.	O&M Operator	maintenance
» Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. » Make use of minimum lumen or wattage in fixtures. » Make use of down-lighters, or shielded fixtures. » Make use of Low Pressure Sodium lighting or other types of low impact lighting. » Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.	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 5: 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.
» Degradation of the natural soil profile due to pollution.

Project Component/s	» Power block. » Power lines. » Water pipeline, water storage/treatment reservoirs, and water abstraction facilities. » 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 measures to do so be inadequate.	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

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 6: Minimise dust and air emissions

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

Project Component/s	» Hard engineered surfaces » On-site vehicles » Solar field.
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	Operation
Appropriate dust suppressant with high moisture retention properties must be applied to the roads as required to minimise/control airborne dust.	Owner	Operation
Speed of vehicles must be restricted, as defined by the SHEQ Manager.	Owner	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Owner	Operation

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

The vegetation in the project area may be at risk of fire, particularly in the dry season.

Project Component/s	» Solar field. » Topsoil stockpile areas. » Undisturbed areas. » Chemical warehouse.
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	» The presence of operation and maintenance personnel and their

Sources	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.	Owner O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff as per Appendix J	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 prominently displayed on site	Owner O&M Operator	Operation

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 8: Maximise local employment and skills opportunities associated with the operation phase

Project Component/s	» Solar facility. » Associated infrastructure
Potential Impact	» Loss of opportunities to stimulate production and employment of the local economy
Activities/Risk Sources	» Labour practices employed during operations
Mitigation: Target/Objective	» Maximise local community employment benefits in the local economy

Mitigation: Action/Control	Responsibility	Timeframe
Adopt a local employment policy to maximise the	The Proponent &	Operation phase

Mitigation: Action/Control	Responsibility	Timeframe
opportunities made available to the local labour force.	EPC contractor	
Establish vocational training programs for the local labour force to promote the development of skills	The Proponent	Operation phase

Performance Indicator	» Percentage of workers that were employed from local communities » Number of people attending vocational training on an annual basis
Monitoring	» The developer must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes

OBJECTIVE 9: 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	» Substation. » 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. » Water storage and treatment reservoirs. » Hazardous substances » 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, 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	Owner	Operation

Mitigation: Action/Control	Responsibility	Timeframe
appropriately sealed and bunded.	O&M Operator	
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Owner O&M Operator	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	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. Waste manifests must be kept for all waste streams generated on site.	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

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	» Waste collection must be monitored on a regular basis.

	» Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates with the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 10

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of 30 years and eventual extension (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.

» ***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.

10.1. Objectives

OBJECTIVE 1: Minimise impacts related to the decommissioning of site

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 languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	» Solar facility » Linear infrastructure (i.e. raw water pipeline, access road, power line).
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 from removal of underground cabling and foundations. » Movement of 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
Before the commencement of decommissioning, the EMPr must be reviewed and amended by an environmental assessment practitioner	Environmental assessment practitioner Owner	Decommissioning
Secure site, working areas and excavations in an appropriate manner, as agreed with the decommissioning Manager.	Owner	Decommissioning
Where necessary control access, fence, and secure area.	Owner	Decommissioning
Fence and secure contractor's equipment camp.	Owner	Decommissioning
Develop an efficient access control system which allows for the identification of all people on site	Owner	Decommissioning
Establish SABS 089: 1999 Part 1 approved bunded areas for storage of hazardous materials and hazardous waste.	Owner	Decommissioning
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for workers (1 toilet per every 30 workers) at appropriate locations on site.	Owner	Decommissioning
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands.	Owner	Decommissioning
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 permitted municipal landfill site.	Owner	Decommissioning
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shadecloth) at site where decommissioning 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.	Owner	Decommissioning
Liquid waste: No liquid waste, including grey water, may be	Owner	Decommissioning

Mitigation: Action/Control	Responsibility	Timeframe
discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works.		
Hazardous substances and hazardous waste: 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. The onus is on the Contractor to identify and interpret the applicable legislation. Hazardous waste to be disposed of at a registered h:H or H:H landfill site. Depending on the classification of the waste, a registered service provider with the necessary permits is to collect, transport and dispose of hazardous waste.	Owner	Decommissioning
The quantity of water needed for the duration of the decommissioning phase is to be calculated and planned for in detail. Water to be abstracted from surface and groundwater resources to be in compliance with the relevant permits issued by the DWA. Water resources to be used sparingly and use not to exceed the resource potential or recharge rate. Contractor to keep detailed records of water quantities used.	Owner	Decommissioning

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 decommissioning site.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMP. » EO to monitor all decommissioning areas on a continuous basis until all decommissioning is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE 2: To avoid and or minimise the job losses ssociated with the decommissioning phase

Project Component/s	» Decommissioning phase of the solar energy facility
Potential Impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life. » Decommissioning is similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the solar energy facility.

Mitigation: Target/Objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the solar energy facility.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with current South African Labour Legislation.	Owner	decommissioning
Undertake activities as prescribed by the legislation at the time of decommissioning and comply with all legal requirements administered by the competent authority at the time.	Owner	decommissioning
Ensure that local jobs are created from the decommissioning activities. Low-unskilled workers should be used from the neighbouring towns.	Owner	Decommissioning

Performance Indicator	Relevant South African Labour Legislation.
Monitoring	No occurrences of dismissals not in-line with South African Labour Legislation.

OBJECTIVE 3: To avoid impacts on fauna and flora

Project Component/s	» Dismantling of the solar facility
Potential Impact	» Loss of indigenous vegetation and fauna.
Activity/Risk Source	» Decommissioning of the solar energy facility. » Movement of vehicles. » Worker activities on site
Mitigation: Target/Objective	» To avoid and or minimise the potential impacts on fauna and flora.

Mitigation: Action/control	Responsibility	Timeframe
Undertake activities as prescribed by the legislation at the time of decommissioning and comply with all legal requirements administered by the competent authority at the time.	Owner	Decommissioning
Minimise vegetation clearance or removal associated with site decommissioning activities, trim trees under supervision. Compile a method statement specific to vegetation clearance.	Owner	Decommissioning
Areas to be cleared must be clearly marked in the	Owner	Decommissioning

Mitigation: Action/control	Responsibility	Timeframe
field to eliminate unnecessary clearing.		
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only. Driving is only allowed on access roads and within designated areas in the site footprint.	Owner	Decommissioning
Ensure all permits from DAFF and NCDENC are up to date. If new vegetation has been identified for removal then permits need to be updated and re-submitted.	Owner	Decommissioning
Search and Rescue (S&R) (refer to Appendix F: Plant Search and Rescue Plan) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, lay down areas, and panel positions) must take place. » Plants that can be considered for rescue and included in subsequent rehabilitation programs are all desirable geophytes[3] and indigenous succulents including *Acacia erioloba, Psilocaulon coriarium, Aridaria noctiflora, Brownanthus vaginatus, Babiana species Aloe claviflora, Drosanthemum hispidum, Brownanthus vaginatus, Hoodia gordonii, Prenia tetragona, Jamesbrittenia canescens, Nemesia anisocarp, Larryleachia, Moraea* and *Microloma sagittatum* species. » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist or community members with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately or bagged (or succulents left to first air-dry before planting) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site or land portion once all decommissioning is completed and rehabilitation of disturbed areas is required. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment.	Owner	Decommissioning

[3] *Desirable* geophytes would include only those that are of conservation concern and non-invasive; the reduction of toxic geophytes that increase exponentially where natural rangelands are degraded would rather be a positive impact.

Mitigation: Action/control	Responsibility	Timeframe
A site rehabilitation programme must be implemented	Owner	Decommissioning
All protected tree and herbaceous species that may be found near decommissioning activities must be demarcated with highly visible barriers, in order to prevent accidental damage or removal by subcontractors	Owner	Decommissioning
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance of faunal habitats.	Owner	Decommissioning
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats are restricted.	Owner	Decommissioning
Implement a faunal removal plan/ rescue plan with designated personnel and contact numbers. • Competent persons must be responsible for removal of fauna. • Faunal injury/ death register must be kept on site to record all faunal related incidents • Ensure the competent persons have the relevant capture, release and transportation permits issued by the NCDENC before decommissioning commences. • Identify farm/ land portions where fauna will be released and ensure that prior consent from land owner has been obtained. • Ensure animal capture/ removal/ transportation equipment is available on site, such as snake hooks, tongs, bags, eye shield, etc. • Contract services of a veterinarian or ranger with access to tranquilisers for larger fauna. • Ensure contact numbers of responsible persons are displayed around site. Ensure signs are placed around site indicating protected and dangerous faunal species.	Owner	Decommissioning
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas before the start of site decommissioning and relocated to safe areas.	Owner	Decommissioning
Traffic calming or extensive use of speed limit/ warning signs must be installed along access roads to prevent/ reduce faunal mortalities.	Owner	Decommissioning

Performance Indicator	» Minimal loss of indigenous floral species. » No loss of fauna. » Minimum loss of faunal habitats during clearing of existing/natural vegetation.
Monitoring	» Monitoring done by owners EO. » Supervision of vegetation and infrastructure clearing activities. » Monitor compliance against EMP and associated management plans.

OBJECTIVE 4: Appropriate handling and storage of chemicals, hazardous substances

The decommissioning phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents for the maintenance of various machinery and vehicles.

Project Component/s	» Storage bunds. » Contractors' camp. » Generators. » Chemical storage warehouse.
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Pollution of water and soil resources
Activity/Risk Source	» Vehicles associated with site infrastructure removals and earthworks. » Decommissioning 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
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Owner	Decommissioning
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 and implementing preventive measures.	Owner	Decommissioning
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. A report must be submitted to the DEA (section 30) within 14 days	Owner	Decommissioning

Mitigation: Action/Control	Responsibility	Timeframe
from the spill occurring.		
A bioremediation procedure and procurement plan must be drawn up prior to decommissioning to ensure prompt application in the event of a major spill.	Owner	Decommissioning
In the event where more than 20 L of hydrocarbon or chemical is spilt into the environment, bioremediation must be undertaken under the discretion of the EO.	Owner	Decommissioning
Any contaminated/polluted soil must be removed and stored as hazardous waste and disposed of at a licensed hazardous waste disposal facility. Contaminated soil must be stored in a sealed container as per the requirements of SABS 089:1999 Part 1.	Owner	Decommissioning
Dedicated service bunds must be constructed for the purpose of vehicle repairs as approved by the ECO.	Owner	Decommissioning
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and stored in compliance with Material Safety Data Sheets (MSDS), applicable regulations and safety instructions.. Hydrocarbon and chemicals must be stored in a bund that will be able to contain 110% of the stored volume. Bunds must be maintained on a regular basis.	Owner	Decommissioning
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function. Chemicals, hydrocarbon or stormwater which has spilled in the bund must be removed/ pumped out immediately and stored as hazardous waste.	Owner	Duration of contract
Machinery must be stored in an appropriately sealed area. If machinery cannot be stored in a sealed area then a drip tray must be used.	Owner	Decommissioning
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands, a drainage line or hillside wetlands.	Owner	Decommissioning
Drip trays must be placed under all generators on site, including generators that are turned off and are not operational. Drip trays must be maintained on a regular basis.	Owner	Decommissioning

Mitigation: Action/Control	Responsibility	Timeframe
Sub-contractors' camps, laydown area and parking areas must have drip trays available for placement under vehicles and machinery to prevent hydrocarbon leaks/ spills.	Owner	Decommissioning
Drip trays must be placed under all vehicles that are parked on site. Extra drip trays must be purchased and kept at the service and parking areas at the security gates, and placed under all delivery vehicles/ trucks/ machinery awaiting access clearance.	Owner	Decommissioning
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with.	Owner	Decommissioning
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Owner	Decommissioning
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage.	Owner	Decommissioning
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	Owner	Decommissioning
Upon the completion of decommissioning, the area must be cleared of potentially polluting materials.	Owner	Decommissioning

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 decommissioning 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 5: Appropriate handling and management of waste

The decommissioning of the CSP project 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

decommissioning wastes must be implemented. The main wastes expected to be generated during the decommissioning phase include:

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

Project Component/s	» Power block. » Water pipeline and water storage/treatment reservoirs. » Power line » Offices, workshops and man camp. » Access roads. » Solar field
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices » Increase in vermin » Eutrophication of nearby water sources » Breeding ground for bacteria and viruses » Illness, viral infections » Soil pollution » Groundwater and surface water pollution
Activity/Risk Source	» Packaging » Other decommissioning wastes » Hydrocarbon and chemical use, handling and storage » Spoil material from excavation, earthworks and site preparation » Septic tanks and portable toilets
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. » To prevent airborne viruses and bacteria from spreading » To minimise impacts on the environment and human health

Mitigation: Action/Control	Responsibility	Timeframe
A detailed recycling and waste management plan must be implemented in order to ensure maximum re-use, and recycling of all waste from decommissioned infrastructure.	Owner	Decommissioning
Each contractors must provide specific detailed waste management plans to deal with all waste streams generated from their activities.	Owner	Decommissioning
A designated waste area must be established and monitored for the sorting and storage of recyclable (concrete, metals, wood etc.) and non-recyclable wastes from decommissioned infrastructure.	Owner	Decommissioning

Mitigation: Action/Control	Responsibility	Timeframe
Location of the waste area must seek to minimise the potential for impact on the surrounding environment, including the construction of a temporary stormwater system must be constructed in order to separate clean and dirty water around the waste area		
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Owner	Decommissioning
Hydrocarbon waste including contaminated soil must be contained and stored in sealed containers within a SABS 089:1999 Part 1 approved bunded area and clearly labelled.	Owner	Decommissioning
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.	Owner	Decommissioning
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage.	Owner	Decommissioning
Septic tanks and portable toilets must be monitored and maintained daily	Owner	Decommissioning
Leakage of effluent must be prevented and if leaks do occur, the leak must be fixed and the contaminated vegetation/ soil must be removed immediately	Owner	Decommissioning
No effluent is allowed to be discharged into the environment.	Owner	Decommissioning
Ensure that there is at least 1 portable toilet per 30 workers for each sex.	Owner	Decommissioning
Ensure the above ground septic tank is in an impermeable bund that can contain at least 110% of the tanks contents. Ensure that the below ground storage of the septic tank can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	Owner	Decommissioning
Daily inspection of all portable toilets and septic tanks must be performed by SHE/ environmental representatives on site.	Owner	Decommissioning
Waste manifests must be provided for all waste streams generated on site, and must be made available to the ECO.	EPC Contractor	Completion of construction

Mitigation: Action/Control	Responsibility	Timeframe
All waste facilities and waste transportation contractors must be licensed and registered where necessary.		
Upon the completion of de, 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	Duration of contract
Unless designated areas are provided, no vehicles or machinery are to be washed on the site.	EPC Contractor	Duration of contract

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. » No vermin identified at the general waste areas » No illness resulting from leaking toilets and septic tanks
Monitoring	» Observation and supervision of waste management practices throughout decommissioning 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.

Appendix A:

Grievance Mechanism Guideline

AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will 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 will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will 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.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on 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 will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent.
» The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
» Draft copies of the minutes will 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 will 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 will 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, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will 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 will 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 will 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 will 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. As indicated above, 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 B:

Rehabilitation and Revegetation Plan

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed 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 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

Overall, the vegetation is described by Mucina and Rutherford (2006) to consist of the following vegetation types:

» Lower Gariep Broken Veld (Least Threatened)
» Bushmanland Basin Shrubland (Least Threatened)
» Inland Azonal Wetland type Bushmanland Vloere (Least Threatened) with riparian vegetation on the banks of few small ephemeral water washes that drain mostly into lower-lying pan-systems beyond the study area.

Vegetation associations within the larger Solar Park study area can be primarily divided into habitats with alluvial deposits and habitats without such deposits, the latter mainly with shallow soils and a high percentage of surface rock.
Associations on Alluvial Soils (habitats derived/influenced strongly by fluvial action) include:

» Association 1: *Cenchrus ciliaris – Lycium bosciifolium* ephemeral drainage lines
» Association 2: *Rosenia spinescens – Salsola rabieana* pans

» Association 3: *Rosenia humilis – Enneapogon desvauxii* valley floors
» Association 4: *Aridaria noctiflora – Salsola namaqualandica* Boesmanland Vloere

Associations on shallow soils with calcrete hardpans, dolerite boulders or shales include:
» Association 5: *Microloma sagittatum – Osteospermum armatum* Broken Plains
» Association 6: *Stipagrostis ciliata – Zygophyllum chrysopteron* Calcrete Plains
» Association 7: Mixed shrublands on undulating rocky plains

Of the seven vegetation associations identified within the broader study area, four occur within the Project Site with Mixed Shrublands and Calcrete Plains dominating, followed by valley floors and ephemeral drainage lines.

2.1. Mixed shrublands

The mixed shrublands have been mapped as a single unit, as their general ecosystem processes, sensitivity and functionality are relatively uniform. However, due to differences in micro-topography and underlying geology and associated soil moisture regimes, the vegetation ranges from a very sparse, low shrub layer to areas with denser, higher shrubs.

It is anticipated that most of the Proposed Project development will be situated on these areas which have an overall low conservation and sensitivity value.

2.2. Calcrete Plains *(Stipagrostis ciliata – Zygophyllum chrysopteron)*

These undulating plains are associated most with broken plains, and occasionally border on small pans and other fluvial systems. The vegetation consists mostly of a taller grass layer of variable density, interspersed by a low density of low and medium shrubs. High shrubs are generally rare, but do occur in smaller groves where these seem to be preferred places for fauna to rest under during the midday heat.

Localised species diversity was low during the survey, but is expected to be higher after sufficient rains when geophytes and annual species emerge.

2.3. Ephemeral Drainage Lines *(Cenchrus ciliaris – Lycium bosciifolium)*

Drainage lines can be found in narrower incisions within the undulating plains, most of them too small to map individually. Occasionally, smaller washes can also be found within smaller valley floor areas, indicating that these smaller valley floors do not have the same flood-buffering capacities as the larger systems. Generally, the steeper the surrounding undulating low slopes, the larger the drainage lines with a more pronounced

and deeper sand-bed in the centre, resulting from many centuries of accumulation of sands.

The riparian vegetation consists of a relatively dense low shrub and palatable grass layer – the latter often characterised by patches of the more nutritious grass, *Cenchrus ciliaris*. High shrub cover within the riparian vegetation is extremely variable, ranging from almost none, to dense stands of *Lycium*, *Phaeoptilum* and *Rhigozum* and/or *Parkinsonia* species.

2.4. Valley Floors *(Rosenia humilis – Enneapogon desvauxii)*

The Valley Floors are generally very old, well-established and stable floodplains – typical of the pre-river optimal runoff accumulation and flow systems of southern African drier ecosystems.

The ecosystem processes here can be summarised as follows:

- » The Valley Floors are relatively continuous fluvial systems, accumulating runoff from higher undulating areas to lower-lying pans, but always with the possibility of a unidirectional flow of water to lower-lying areas.
- » These systems are relatively wide, occasionally with wider lower-lying plains, therefore runoff is seldom concentrated in a narrower channel.
- » As there is unidirectional flow of water, and, depending on rainfall volumes, flows may be high, there is accumulation of silts and sandy loams, but not an accumulation of excess minerals (as in pans where the water ends up).
- » The deeper alluvial deposits enable a higher retention of water during moist seasons, which enables the establishment of a relatively permanent vegetation layer (shrubs and grasses).
- » Fine-grained soils (accumulated from thousands of years of occasional runoff) generally have a low infiltration rate and surface layers dry out very quickly, but the vegetation layer does not only slow down accumulated runoff, but also significantly increases moisture infiltration to such degree that ground water reserves can also be significantly replenished (larger systems).
- » While there is a high permanent shrub component, reaching up to 6 m height in places and providing nesting, shelter, browsing, there is also a strong palatable dwarf shrub and herbaceous (grass) layer, which will provide valuable grazing beyond the rainfall season.

The importance of these Valley Floors to the overall ecosystem processes therefore depends largely on the length and width of the channels and their connectivity to lower-lying larger fluvial systems (pans, rivers, dams). Within the CSP 2 Project Site, such connectivity is not as pronounced as in other areas of the larger study area.

2.5. Vegetation associations along the water pipeline alignment

The vegetation associations along the two water pipeline alignment alternatives between Kenhardt and the Project Site have not been determined as the servitudes along both options have been variably disturbed in the past and can, at best, be described as semi-natural veld. Some sections of these servitudes have been and remain completely transformed.

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 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.
» 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 EO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project company 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 (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 until the decommissioning phase has been completed.

Appendix C:

Erosion Management Plan

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 significant 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 be accelerated by construction related activities.
» An outline of general methods to monitor, manage and rehabilitate erosion, ensuring that all erosion resulting from all phases of the development is addressed.

2. RELEVANT ASPECTS OF THE SITE

2.1. Geological background

As shown in Figure 1, the north-eastern two thirds or so of the broader study area are underlain by glacially-related sediments of the Permo-Carboniferous Dwyka Group (Karoo Supergroup, C-Pd). However, only the northernmost sector of the CSP Project study area itself is underlain by Dwyka rocks. The majority of the CSP Project study area, including the entire development footprint on Steyns Vlei 280, is underlain by postglacial basinal mudrocks of the Prince Albert Formation (Karoo Supergroup, Ecca Group, Pp) of Early Permian age. The Karoo Supergroup sediments have been locally intruded and baked by extensive intrusive sheets or sills of the Karoo Dolerite Suite (Jd) which build a north-south trending zone of rocky terrain running along the eastern border of Steyns Vlei 280 as well as scattered outcrops further to the northeast and east (e.g. Klipheuwels). Small exposures of much older Precambrian basement rocks of the Namaqua-Natal Province are mapped to the east of the present broader study area on the farm Karee Boom Kolk 248 and similar outcrops may also occur subsurface in the broader study area itself. These comprise two billion year old granitoid intrusions.

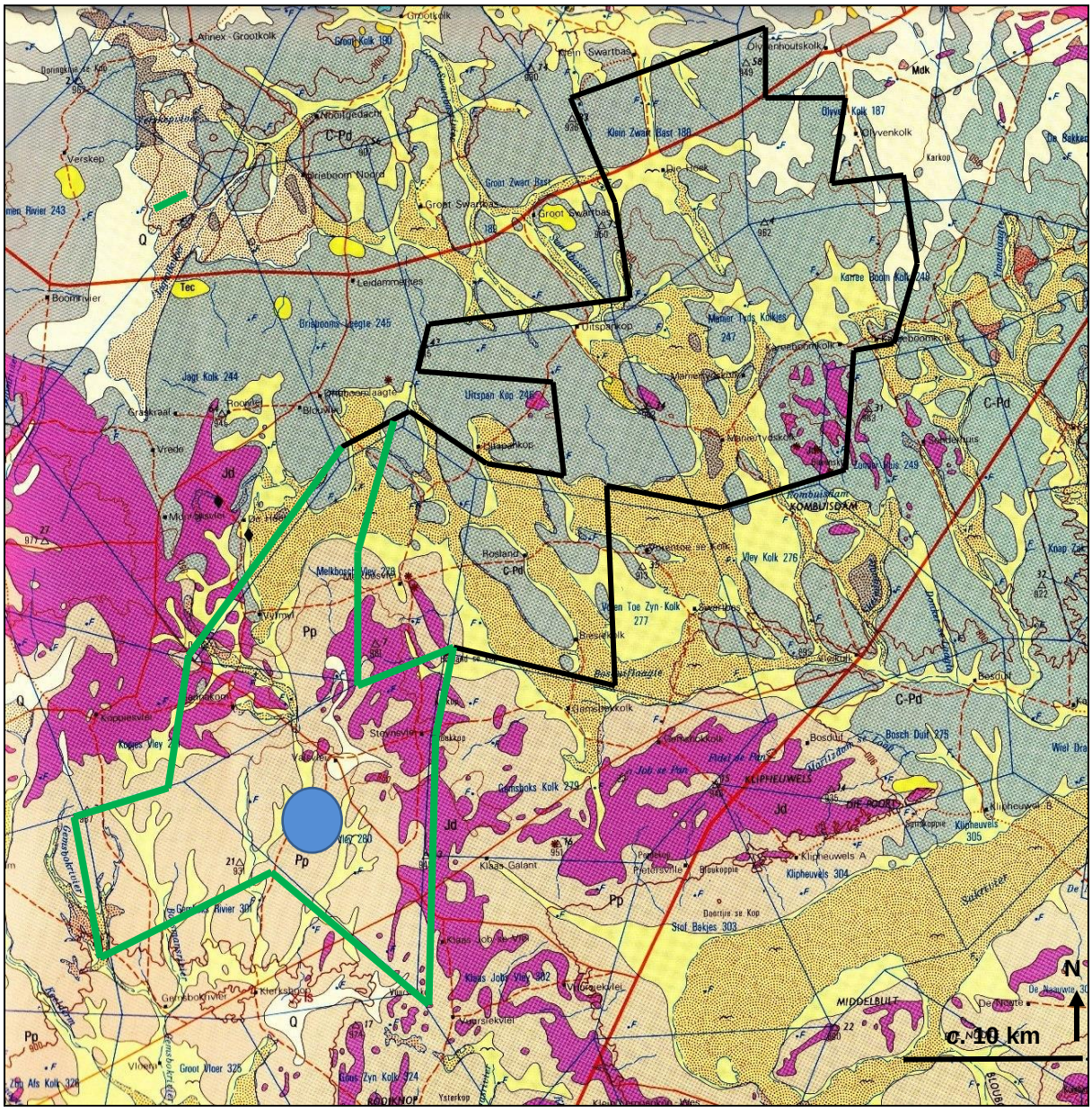

Figure 1: Extract from 1: 250 000 geological map 2920 Kenhardt (Council for Geoscience, Pretoria) showing the approximate outline of the broader study area, including land parcels involved in with the power line (black polygon) as well as the larger study area (green polygon) and Project Site (blue circle).

2.2. Soil and agricultural potential

The soil association map was interpreted and related to the agricultural potential of the different soil associations. In general, deep soils (>600 mm), with adequate clay and organic matter to store and supply water and nutrients, with good internal and external drainage are considered to be high potential agricultural soils. Besides the soil characteristics; topography and climatic parameters should also be assessed in order to classify the potential of the land. Rainfall should be adequate during the growing season

with sufficient heat units. These criteria were used to determine the agricultural potential of the land. In addition, the current potential and the potential of the land under future scenarios with specific reference to availability of irrigation water were also determined.

2.3. Soil association

The surface colour, topography and drainage lines (Figure 4) were used to create a soil association map (Figure 2). General properties of the different soil associations are briefly discussed below.

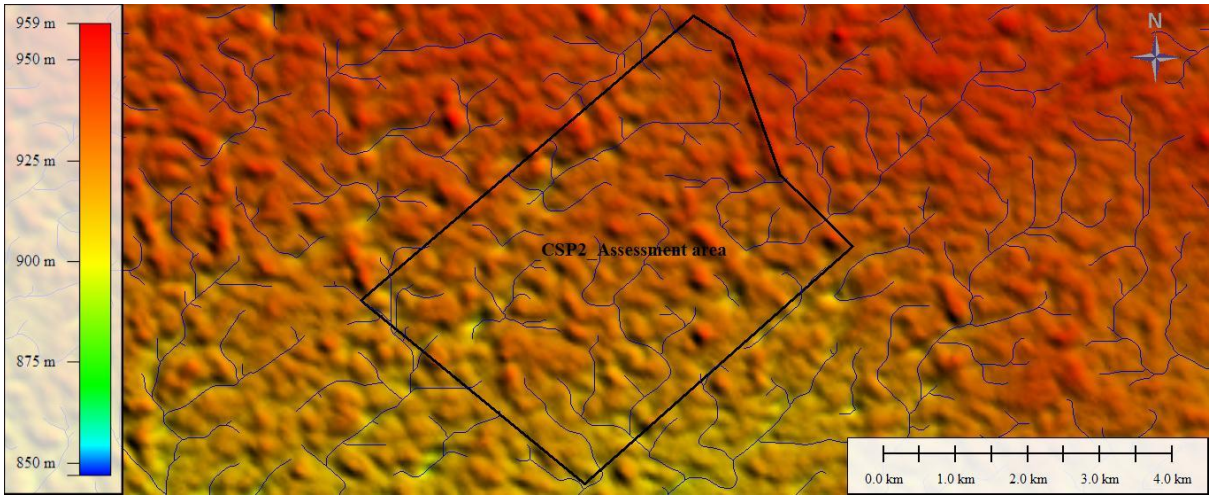

Figure 2. Drainage lines of the CSP2 assessment area.

Ag: Augrabies soils (orthic A/neocarbonate B) occurred in the majority of the drainage lines (Figure 2) which were covered with large shrubs. These soils are relatively deep (>850 mm) due to alluvial deposits.

Cv/Ag: These are deep (>1 000 mm) apedal soils occurring in valley bottom pans. The surface and subsurface colours were bright yellow (10YR4/4). The clay content of these soils is slightly higher than the rest of the site (approximately 25% in the B1 horizon). The absence or presence of carbonates classified these soils either as Clovelly or Augrabies soil. This soil association occur on relatively small isolated patches.

Ms/Ag/R: Large parts of the study area are covered by rock outcrops or shallow Mispah (orthic A/rock) and Coega (orthic A/harpan carbonate). Since the observations were made with hand augers it was not always possible to determine whether the underlying material was solid rock or hardpan carbonate. In terms of potential and sensitivity to erosion, these soils will however be very similar. Due to the shallow depths and hence limited storage capacity, erosion might be a problem on steeper slopes.

Pr: Prieska soils consists of orthic A on neocarbonate horizons on harpan carbonate horizons. These soils are generally shallow (approximately 450 mm). The soils are sandy with a clay content of less than 12 and 15% in the A and B horizons respectively.

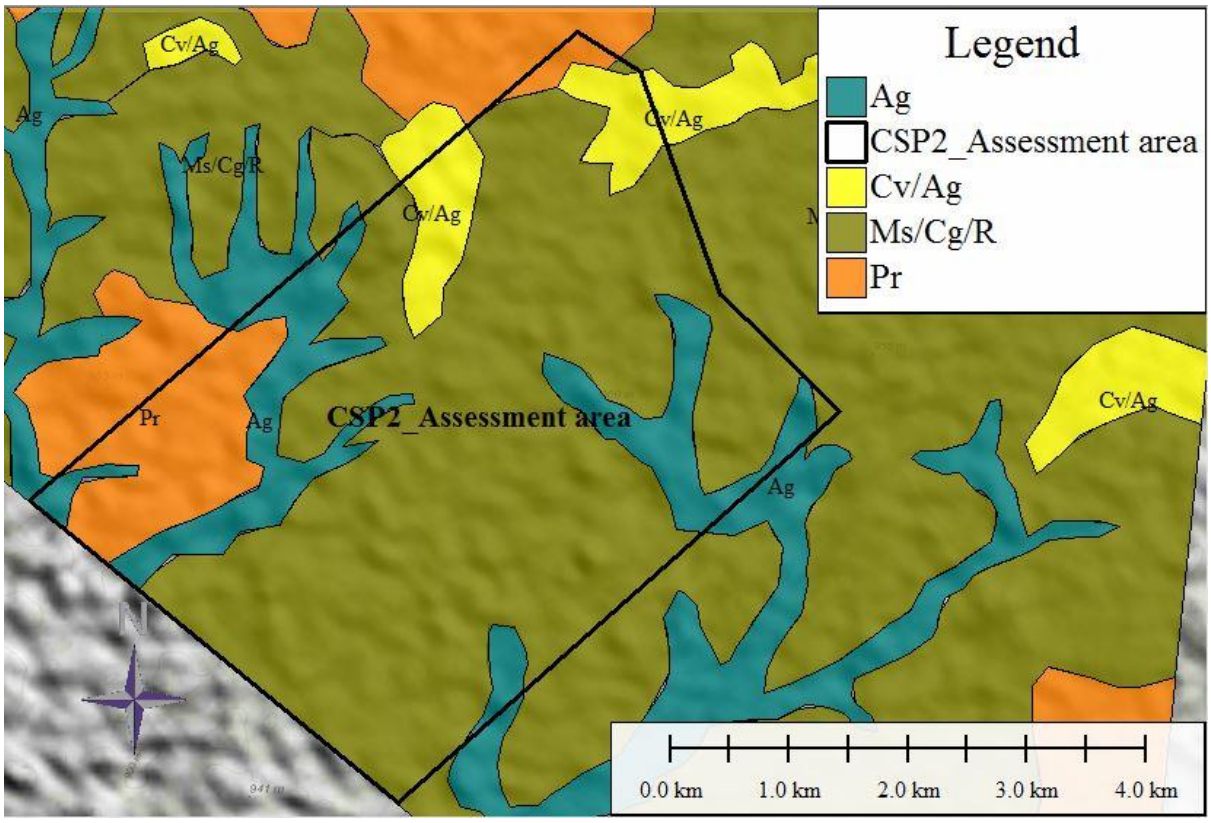

Figure 3. The soil association map of the CSP2 area of the Kotulu Tsatsi Solar Park.

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:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional summer thunder storms can also cause significant soil loss. 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 devegetated 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 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 at a one time, 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 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 separately during construction activities, and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on 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.

3.2. Erosion control mechanisms

The contractor may use the following mechanisms 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
- Tilling

3.3. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers 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).
- The location, area/extent (m^2/ha) and specifications of all temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
- An onsite Engineer or Environmental Officer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- The Developer 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.

4. 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 (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.
- 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.
- All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the Competent Authority (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor/ Developer (in consultation with an appropriate specialist) 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 adapt or adjust to ensure the accelerated erosion is controlled.
- Continue monitoring until the area has been stabilised.

5. CONCLUSION

The Erosion Management Plan is a document to assist the Developer with guidelines on how to manage erosion. 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.

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Appendix D:

Soil Management Plan

1. PURPOSE

Some of the most significant impacts on soil properties occur as a result of activities associated with construction. Construction activity can have adverse impacts on soil in a number of ways by:

» Covering soil with impermeable materials, effectively sealing it and resulting in significant detrimental impacts on soils' physical, chemical and biological properties, including drainage characteristics.
» Contaminating soil as a result of accidental spillage or the use of chemicals.
» over-compacting soil through the use of heavy machinery or the storage of construction materials.
» Reducing soil quality, for example by mixing topsoil with subsoil.
» Wasting soil by mixing it with construction waste or contaminated materials, which then have to be treated before reuse or even disposed of at landfill as a last resort.

Careful management of topsoil and subsoil is an important aspect of sustainable use of materials that are being stripped. Without a proper Soil Resource Plan there is the risk of losing, damaging or contaminating valuable soil resources. The purpose of this Soil Management Plan is to outline principles for soil management to ensure the integrity of the resource during and post-construction. This plan should be read together with the Emergency Response Plan in order to minimise the risk of contamination of soils.

2. SOIL HORIZONS

Topsoil

The top-most soil layer (0-25 cm) in undisturbed areas. This soil layer is important as it contains nutrients, organic material, seeds, communities of micro-organisms, fungi and soil fauna. All the contents of the topsoil layer are necessary for soil processes such as nutrient cycling, and support growth of new plants. The biologically active upper layer of soil is fundamental in the development of soils and the sustainability of the entire ecosystem. Fungi, algae, cyanobacteria and non-vascular plants form a 'living crust' on the soil surface that influences the retention of resources (principally nutrients and water), as well as reducing the potential for soil erosion.

In general, the greatest concentration of seeds (i.e. up to 90% of the seedbank) is found in the top 5-10 cm of topsoil. Soil nutrients and other biological elements also have a higher concentration in the top 5 – 10 cm of soil, but can occur up to 25 cm.

Subsoil

Soil generally deeper than 25 cm. The subsoil contains lower levels of nutrients, but the soil texture is still suitable for plant growth.

Overburden

All the soil below the subsoil layer, generally characterised by a fine soil texture which is sometimes high in clay and salt content which makes plant growth difficult. Such soils comprise a sterile growth medium, devoid of nutrients, and depending on the clay content, are of high salinity and often phytotoxic. Even shallow-lying overburden soils are largely depleted of nutrients. These soils constitute an unsuitable medium for the establishment of plants.

3. PRINCIPLES FOR SOIL MANAGEMENT

3.1. The correct handling of topsoil

- Before beginning work on site, topsoil should be stripped from all areas that will be disturbed by construction activities. Appropriate equipment must be used and appropriate work practices must be implemented for soil stripping as mishandling soil can have an adverse effect on its properties.
- Topsoil should be stripped in the driest condition possible.
- Topsoil must be retained on site in order to be used in site rehabilitation. The correct handling of the topsoil layer is in most cases the key to rehabilitation success.
- It is important that the correct depth of topsoil is excavated in order to ensure good plant growth. If excavation is too shallow, then an important growth medium for new seedlings could be lost. If excavation is too deep, this could lead to the dilution of the seed and nutrient rich topsoil with deeper sterile soil.
- Topsoil and subsoil layers must never be mixed. The mixture of topsoil with the deeper sterile soil hinders the germination of seeds which are buried too deep in the soil layer. Mixture of soil layers also leads to the dilution of nutrient levels which are at highest concentration within the topsoil, resulting in lower levels of nutrients available for new seedlings.
- To enable soil to be reused on site at a later stage, it needs to be stored in temporary stockpiles to minimise any damage or loss of function. Stockpiles should not be higher than 2m. Alternatively topsoil berms can be created on the site boundaries. There are a number of important considerations when creating stockpiles - including soil erosion, pollution to watercourses and the risk of flooding.

These will be affected by the size, height and method of forming stockpiles, and how they are protected and maintained.

» Topsoil must stored separately from other soil in heaps until construction in an area is complete.
» The duration of topsoil storage should be minimsed as far as possible. Storing topsoil for long periods leads to seed bank depletion following germination during storage, and anoxic conditions develop inside large stockpile heaps.
» All stockpiles must be positioned away from drainage lines.
» Sediment fencing should be erected downslope of all stockpiles to intercept any sediment and upslope runoff should be diverted away from stockpiles.

3.2. Stripping of Subsoil

The following protocols must be followed when stripping subsoil:

» On many sites subsoil will not need to be stripped but merely protected from damage. However, on other sites it might need to be temporarily removed. Where subsoil is required to be stripped, this should be undertaken before commencement of construction from all areas that are to be disturbed by construction activities or driven over by vehicles.
» Subsoil stripping depths depend on the correct identification of the sub-soil types on an ad-hoc basis, where no formal survey data exists.
» Subsoil should be stripped in the driest condition possible.
» To enable soil to be reused on site at a later stage, it needs to be stored in temporary stockpiles to minimise any damage or loss of function. There are a number of important considerations when creating stockpiles - including soil erosion, pollution to watercourses and the risk of flooding. These will be affected by the size, height and method of forming stockpiles, and how they are protected and maintained.
» All stockpiles must be positioned away from drainage lines.
» Sediment fencing should be erected downslope of all stockpiles to intercept any sediment and upslope runoff should be diverted away from stockpiles.

Appendix E:

Alien Plant 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 SolarReserve Kotulo Tsatsi concentrated solar plant 2. 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

Within the project area invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. Additional alien species grow along major transport routes to the area and thus could be potentially spread there as well.

Species that must be monitored and eradicated according to CARA and NEMA:BA:

» *Alternanthera pungens*
» *Argemone ochroleuca* (growing on embankments of railway track)
» *Datura* species (growing around watering points and along drainage lines)
» *Flaveria bidentis* (growing along most road reserves)
» *Nicotiana glauca* (growing in road reserves outside study area)
» *Opuntia ficus-indica*
» *Opuntia humifusa* (growing in road reserves outside study area)
» *Prosopis glandulosa* (but see notes above)
» *Salsola kali* (growing in road reserves outside study area)

Ruderal species that are easily distributed by vehicles or staff and should be eradicated when they become invasive:

» *Chenopodium album*
» *Laggera decurrens*
» *Setaria verticillata*
» *Tribulus terrestris*

Potentially invasive and/or toxic plants that will indicate degradation and will need to be eradicated from the development and associated infrastructure footprint to prevent their spread to neighbouring rangelands:

» *Acacia mellifera s. detinens*
» *Rhigozum trichotomum*

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, 198 alien species were listed as declared weeds and invaders and 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.

Plants listed under the categories above are detailed within Notice 1 of the Alien and Invasive Species published in GNR599 of 01 August 2014. 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. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion. 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. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. http://www.dwaf.gov.za/wfw/Control/

» **Mechanical control**

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on 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 and in the case of Opuntia removed from the site.
- 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.

Construction Phase

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:

Plant Rescue and Protection Plan

1. PURPOSE

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the SolarReserve Kotulo Tsatsi concentrated solar plant 2 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

2.1. Vegetation characteristics

Overall, the vegetation is described by Mucina and Rutherford (2006) to consist of the following vegetation types:

- Lower Gariep Broken Veld (Least Threatened)
- Bushmanland Basin Shrubland (Least Threatened)
- Inland Azonal Wetland type Bushmanland Vloere (Least Threatened) with riparian vegetation on the banks of few small ephemeral water washes that drain mostly into lower-lying pan-systems beyond the study area.

Vegetation associations within the larger Solar Park study area can be primarily divided into habitats with alluvial deposits and habitats without such deposits, the latter mainly with shallow soils and a high percentage of surface rock.
Associations on Alluvial Soils (habitats derived/influenced strongly by fluvial action) include:

- Association 1: *Cenchrus ciliaris – Lycium bosciifolium* ephemeral drainage lines
- Association 2: *Rosenia spinescens – Salsola rabieana* pans
- Association 3: *Rosenia humilis – Enneapogon desvauxii* valley floors
- Association 4: *Aridaria noctiflora – Salsola namaqualandica* Boesmanland Vloere

Associations on shallow soils with calcrete hardpans, dolerite boulders or shales include:

- Association 5: *Microloma sagittatum – Osteospermum armatum* Broken Plains
- Association 6: *Stipagrostis ciliata – Zygophyllum chrysopteron* Calcrete Plains
- Association 7: Mixed shrublands on undulating rocky plains

Of the seven vegetation associations identified within the broader study area, four occur within the Project Site with Mixed Shrublands and Calcrete Plains dominating, followed by valley floors and ephemeral drainage lines.

2.2. Mixed shrublands

The mixed shrublands have been mapped as a single unit, as their general ecosystem processes, sensitivity and functionality are relatively uniform. However, due to differences in micro-topography and underlying geology and associated soil moisture regimes, the vegetation ranges from a very sparse, low shrub layer to areas with denser, higher shrubs.

It is anticipated that most of the Proposed Project development will be situated on these areas which have an overall low conservation and sensitivity value.

2.3. Calcrete Plains *(Stipagrostis ciliata – Zygophyllum chrysopteron)*

These undulating plains are associated most with broken plains, and occasionally border on small pans and other fluvial systems. The vegetation consists mostly of a taller grass layer of variable density, interspersed by a low density of low and medium shrubs. High shrubs are generally rare, but do occur in smaller groves where these seem to be preferred places for fauna to rest under during the midday heat.

Localised species diversity was low during the survey, but is expected to be higher after sufficient rains when geophytes and annual species emerge.

2.4. Ephemeral Drainage Lines *(Cenchrus ciliaris – Lycium bosciifolium)*

Drainage lines can be found in narrower incisions within the undulating plains, most of them too small to map individually. Occasionally, smaller washes can also be found within smaller valley floor areas, indicating that these smaller valley floors do not have the same flood-buffering capacities as the larger systems. Generally, the steeper the surrounding undulating low slopes, the larger the drainage lines with a more pronounced and deeper sand-bed in the centre, resulting from many centuries of accumulation of sands.

The riparian vegetation consists of a relatively dense low shrub and palatable grass layer – the latter often characterised by patches of the more nutritious grass, *Cenchrus ciliaris*. High shrub cover within the riparian vegetation is extremely variable, ranging from almost none, to dense stands of *Lycium*, *Phaeoptilum* and *Rhigozum* and/or *Parkinsonia* species.

2.5. Valley Floors *(Rosenia humilis – Enneapogon desvauxii)*

The Valley Floors are generally very old, well-established and stable floodplains – typical of the pre-river optimal runoff accumulation and flow systems of southern African drier ecosystems.

The ecosystem processes here can be summarised as follows:

- » The Valley Floors are relatively continuous fluvial systems, accumulating runoff from higher undulating areas to lower-lying pans, but always with the possibility of a unidirectional flow of water to lower-lying areas.
- » These systems are relatively wide, occasionally with wider lower-lying plains, therefore runoff is seldom concentrated in a narrower channel.
- » As there is unidirectional flow of water, and, depending on rainfall volumes, flows may be high, there is accumulation of silts and sandy loams, but not an accumulation of excess minerals (as in pans where the water ends up).
- » The deeper alluvial deposits enable a higher retention of water during moist seasons, which enables the establishment of a relatively permanent vegetation layer (shrubs and grasses).
- » Fine-grained soils (accumulated from thousands of years of occasional runoff) generally have a low infiltration rate and surface layers dry out very quickly, but the vegetation layer does not only slow down accumulated runoff, but also significantly increases moisture infiltration to such degree that ground water reserves can also be significantly replenished (larger systems).
- » While there is a high permanent shrub component, reaching up to 6 m height in places and providing nesting, shelter, browsing, there is also a strong palatable dwarf shrub and herbaceous (grass) layer, which will provide valuable grazing beyond the rainfall season.

The importance of these Valley Floors to the overall ecosystem processes therefore depends largely on the length and width of the channels and their connectivity to lower-lying larger fluvial systems (pans, rivers, dams). Within the CSP 2 Project Site, such connectivity is not as pronounced as in other areas of the larger study area.

2.6. Vegetation associations along the water pipeline alignment

The vegetation associations along the two water pipeline alignment alternatives between Kenhardt and the Project Site have not been determined as the servitudes along both options have been variably disturbed in the past and can, at best, be described as semi-natural veld. Some sections of these servitudes have been and remain completely transformed.

2.7. Search and rescue

Prior to commencement of any activity, including earthworks (grading, road construction, etc.) within areas of natural vegetation a plant Search and Rescue program should be developed and implemented, preceded by a meticulous investigation of all footprint areas by a suitably qualified botanist, conducted during the optimal growing season (late January to March) along the entire footprint area.

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 development footprints (i.e. all buildings, new roads and tracks, lay down areas, and panel positions) should take place and the necessary permits should be in place:

- » Plants that can be considered for rescue and included in subsequent rehabilitation programs are all desirable geophytes and indigenous succulents.
- » All development footprints should be surveyed and pegged out as soon as possible, after which a local horticulturist or community members with Search and Rescue experience should be appointed to undertake the S&R.
- » All rescued species should be transplanted immediately or bagged (or succulents left to first air-dry before planting) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site or land portion once all construction is completed and rehabilitation of disturbed areas is required.
- » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment.

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:

- » Prior to construction, a walk-through of the final development footprint should be undertaken by a suitably qualified botanist/ecologist to locate and identify all listed

and protected species which fall within the development footprint, as well as to identify species suitable for search and rescue.

» A permit is required to translocate or destroy any listed and protected species even if they do not leave the property. This permit should be obtained prior to ay 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 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 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 he rescued individual/s must be recorded to aid in future monitoring of that plant.
» During construction, the ECO 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 ECO or Environmental Officer 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 that were not previously observed be translocated to a safe site.
» The collecting of plants of their parts should be strictly forbidden. Appropriate signage in this regard should be placed at the entrance gates to the site. 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 G:

Stormwater Management Plan

1 INTRODUCTION

Any potential developments may significantly alter the hydraulic properties of the area where a proposed project is developed. The negative impacting of the properties typically lead to degradation of the land by means of erosion and mass movement. Removal of vegetation cover exposes the soil to the impact of rain and wind, which may lead to increased erosion. The permeability of layers are reduced and consequently they often become impermeable.

Natural watercourses and drainage patterns need to be considered in stormwater management as they should be involved and remain unaffected where possible. Stormwater management is the science of controlling negative impacts on the environment and improving the positive impacts with the accurate consideration of hydraulic properties of a development to minimize the associated negative environmental impacts.

2 NEED FOR STORMWATER MANAGEMENT

Managing and controlling stormwater runoff, in turn, prevents uncontrollable impacts on the environment from occurring. Both water quantity and quality comprise stormwater management. There is a considerable need for the development of these plans for renewable energy projects and their inclusion in Environmental Management Plans as the Department of Environmental Affairs has placed much emphasis on in the last few years. The construction of stormwater management ponds on site has been the preferred stormwater management practice. Historically, reducing the rate of runoff had been the primary focus in managing and prevention of flooding and erosion.

Developers now also focus on water quality issues in addition to quantity concerns when constructing water catchment ponds. These facilities were typically one of three types: wet ponds, infiltration basins, and dry ponds. Recently, another category of stormwater management facilities has become widely used. They are collectively referred to as "green technology" and address water quality through more natural means such as infiltration. The aim of the Stormwater Management Plan is to set guidelines and deliver a practical implementation manual of the Best Management Practices to follow.

Various forms of stormwater management and erosion management practices, including:

- » Control flooding and erosion through managing stormwater;
- » Plan and construct stormwater management systems to remove contaminants/undesirables before they pollute surface waters or groundwater resources;
- » Source control hazardous materials to prevent release of pollutants into the environment;
- » Identify, assess, protect and rehabilitate natural watercourses where needed;
- » Build or use natural storage and filter systems such as ponds, swales or wetlands to combine with existing man made drainage structures, such as pipes and concrete channels;
- » Revise current stormwater regulations to address comprehensive stormwater needs;
- » Enhance and enforce existing ordinances to make sure property owners consider the effects of stormwater before, during and after development of their land;
- » Educate a community about how its actions affect water quality, and about what it can do to improve water quality; and
- » Plan and manage stormwater thoughtfully to create resolutions before the problems become too great.

3. STORMWATER CONSIDERATIONS

3.1. Hydrology

The hydrology of the site plays an important role in the erosion potential. Rainfall, if not intercepted by vegetation or by artificial surfaces, falls on the earth where it may evaporate, infiltrate, lie in depression storage, or end up as surface run-off. The permeability of the ground influences the percentage of rainfall which infiltrates. Where soil cover is thin or impermeable, infiltration will tend to be lower and vice versa. Surface run-off is generally inversely proportional to infiltration, ceteris paribus. Rainfall intensity, infiltration, and slope gradient influence the volume, velocity, and energy of the surface run-off. The energy of the hydraulic system and the soil texture and consistency are the main determining factors of the erosion potential.

The presence of vegetation and other erosion inhibitors will tend to reduce the energy of the hydraulic system as well as providing an anchoring effect on the soil mass. In this particular study area, the Quaternary soil cover is moderately to highly permeable and the slope gradients are low which means that under normal conditions, infiltration is high and run-off and subsequent erosion is likely to be low. However, the existence of a well-defined drainage pattern is an indication that exceptional heavy rainfall and run-off may occur, during which time, a significant proportion ends up as run-off, and this results in moderate erosion along the drainage lines.

3.2. Construction of the Roads

The construction of the internal and access roads will lead to disturbance of soils and exposure which may lead to erosion. These exposed areas have a habit of forming water channels and water accumulation occurs. It is therefore important that roads be constructed at an angle with the highest point being the lane divider line or in the case of a single lane the entire road should be angled outward so that all stormwater runoff be directed to the lower side of the roads. At this point it should then be collected in side drains and disposed of in preselected places by means of suitable outlet structures and berms. All roads should therefore be carefully designed and constructed to make the handling of stormwater possible.

Key point for consideration:

1. The principle of overland flow should apply to roadways where possible and roads should be designed and graded to avoid concentration of flow along and off the road.
2. Where flow concentration is unavoidable, measures to incorporate the road into the major stormwater system should be taken, with the provision of detention storage facilities at suitable points.
3. Inlet structures at culverts must be designed to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point and detention storage should be provided on the road and/or upstream of the stormwater culvert.
4. Outlet structures at a road culvert or a natural watercourse must be designed to dissipate flow energy and any unlined downstream channel must be adequately protected against soil erosion.

3.3. Buildings

Any building will inevitably result in some degree of flow concentration, or deflection of flow around the building. The developer/owner shall ensure that the flow path of the stormwater on his site is adequately protected against erosion and is sufficiently roughened to retard stormwater flow to the same degree, or more, as that found in the natural predevelopment state of the site. 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 eliminated by the provision of approved artificial soil stabilization devices, or alternative vegetation suited to the changed conditions on the site. Any inlet to a piped system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be done immediately on installation of the piped system. No building works, earthworks, walls or fences may obstruct or encroach on a watercourse inside or outside the site without approved plans that do not compromise the objectives of the Stormwater Management Plan.

4. EXISTING DRAINAGE FEATURES/PATTERNS

Preferably all rivers and 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. No rivers must be rerouted or diverted due to the construction of the internal access roads.

The potential degradation by vehicle tracks cause subjection of the soil surface which leads to ditch formation. The natural drainage channels that collect water from the present tracks and secondary roads will be upgraded and should be used as drainage channels as far as possible to assist dissipation of stormwater. It is proposed that the drainage channels for the new internal roads should follow natural drainage lines where and if possible. Integrating and linking these drainage channels with the existing drainage routes on site would benefit erosion control and stormflow.

Depressions are raised to prevent ponding. Surfaces and conduits are constructed to drain runoff more efficiently. Natural vegetation is often removed, allowing reduced interception and transpiration.

5. EROSION / DEPOSITION MITIGATION PROCEDURES

The following proposals should be investigated during detail design to prevent excessive erosion or deposition from occurring:

1. **Low Flow Channels** – The use of smaller low flow lined channels inside the larger external canals should be investigated to ensure self-cleansing velocities for smaller flows. This should be evaluated for both the concrete lined and earth canals. Providing a lined low flow channel in the middle of the earth canals will also reduce the risk of erosion in the middle of the canal where flow velocities will be the highest.

2. **Flow Retarders** - Stormwater flow should be retarded wherever possible through the use of surface roughening or other flow restricting devices, provided these are designed and built to avoid blockages that could result in environmental and structural damage. All such constructions must be regularly maintained

3. **Armouring of Earth Channels –** If during construction the in situ material for the earth canals are found to be unsuitable, the option of armouring of the canals should be investigated. This could be done by obtaining more suitable material or with the use of erosion blocks or rip-rap. The use of native material excavated during construction activities should be preferred over imported materials and will also help in reducing costs.

4. **Earth Canals vs Concrete Canals** – The use of earth canals can be more beneficial than the use of concrete lined canals. The use of earth canals has the added advantage of allowing infiltration and recharging of the ground water and at the same time reducing the run-offs peaks to be discharged at the outlet, as a result of additional routing. Lined and unlined channels may be constructed to convey stormwater to a natural watercourse where deemed necessary and unavoidable. Channels must be constructed with rough artificial surfaces, or lined with suitable, hardy vegetation, to be non-erodible and to provide maximum possible energy dissipation to the flow.

5. **Inlet / Outlet Structures** – The inlet / outlet drop structures for discharging the internal field run-offs into the external canals should be designed to prevent erosion of the canal, especially during low flows in the external canal. The use of concrete or gabion box and Reno mattress structures should be investigated during the final detail design.

6. **Energy Dissipaters** - Measures should be taken to dissipate flow energy wherever concentrated stormwater flow (such as buildings) is discharged down an embankment or erodible slope and the resulting supercritical flow poses a significant risk to the stability of the waterway.

7. **Stormwater Storage Facilities** - The sufficiency and effectiveness of on-site detention and retention storage to meet stormwater attenuation requirements within the minor and major stormwater systems is the responsibility of the promoter. Any detention pond shall be integrated with the landscape on the site and maintained in good condition. Retention ponds shall be maintained in good condition and shall not be permitted to become a health hazard or nuisance.

8. **Subsurface Disposal of Stormwater** - Any construction providing for the subsurface disposal of stormwater should be designed to ensure that such disposal does not cause slope instability, or areas of concentrated saturation or inundation. Infiltration structures should be integrated into the terrain so as to be unobtrusive and in keeping with the natural surroundings.

6. STORMWATER ATTENUATION POND

The primary objective of the attenuation pond is to release water into the natural area at a velocity no greater than the original velocity and in the same direction. Armoured stilling basin is proposed for energy dissipation and to allow the release of the flow as sheet flow to minimise downstream erosion.

The stilling basin should be below natural ground and should be armoured with the correctly sized rip-rap which should be obtained from the excavation activities required for the construction activities

7. WATER QUALITY ENHANCEMENT PROPOSALS

The water quality of the stormwater run-off from the developed plant, as well as during the construction thereof should be controlled to prevent contamination and excessive sedimentation downstream of the development. The following is examples of possible pollutants:

- Vehicle / machineries fluids, including oil, grease, petroleum and coolants;
- Asphaltic emulsions associated with asphalt paving operations;
- Cement materials associated with concrete;
- Base, subbase and aggregate material;
- Joint and curing compounds;
- Solvents, thinners and acids;
- Rubble and general litter

Construction activities that have the potential to contribute sediment to stormwater discharges include:

- Clear and grub operations;
- Grading operations;
- Paving operations;
- Drilling operations;
- Delivery/transport operations;
- Utility trenching and containment excavation operations;
- Foundation/structure construction operations
- Vehicle and equipment cleaning, fueling and maintenance; and
- Painting

Erosion control or soil stabilisation consists of source control measures to prevent soil particles from being transported in stormwater run-off. The following Best Management Practices (BMPs) are proposed for temporary and final erosion control, but should not be seen as the only possible BMPs:

- Monitor the weather to track conditions and be able to warn construction teams of the onset of rainfall events
- Install temporary fencing prior to construction along the boundaries of the construction zone to prevent vehicles or personnel from straying onto adjacent habitat.
- Sequence construction activities with the installation of both erosion and sediment control measures. Arrange the construction schedule as much as

practical to leave existing vegetation undisturbed until immediately prior to grading.
- Stabilize non-active areas as soon as possible after construction is complete.
- Place covers over stockpiles during windy conditions
- Apply erosion control BMPs in areas where erosion is evident as soon as possible.
- At completion of construction apply permanent erosion control to all remaining disturbed soil areas.

The following final water quality control measures are proposed:

- Sediment basin should be used to capture sediment discharges, as well as around the common area to capture the sediment and prevent the downstream transport thereof.
- Earth ditches should also be introduced in the common area to divert sediment laden run-off to sediment basin
- Oil traps are proposed at areas where potentially polluted stormwater run-offs could enter the drainage system (turbine hall, inside the fuel storage building, from the shredder bunded area and from the main boiler structure bunded area)
- Maintain natural vegetation on site where possible to reduce erosion and sediment run-off.

Appendix H:

Open Space Management Plan

Immediately after clearing of vegetation, the open spaces should be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A perennial vegetation cover of at least 30%, preferably more, will be desirable (on all areas where vegetation is permissible).

The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

The first vegetation layer should be developed further until a desirable end state, as determined during the design phase and taking the original vegetation description as guideline, is established.

Within open spaces invasive species – indigenous and alien - occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. Additional alien species grow along major transport routes to the area and thus could be potentially spread there as well.

Species that must be monitored and eradicated according to CARA and NEMA:BA:

» *Alternanthera pungens*
» *Argemone ochroleuca* (growing on embankments of railway track)
» *Datura species* (growing around watering points and along drainage lines)
» *Flaveria bidentis* (growing along most road reserves)
» *Nicotiana glauca* (growing in road reserves outside study area)
» *Opuntia ficus-indica*
» *Opuntia humifusa* (growing in road reserves outside study area)
» *Prosopis glandulosa* (but see notes above)
» *Salsola kali* (growing in road reserves outside study area)

Ruderal species that are easily distributed by vehicles or staff and should be eradicated when they become invasive:

» *Chenopodium album*
» *Laggera decurrens*
» *Setaria verticillata*
» *Tribulus terrestris*

Potentially invasive and/or toxic plants that will indicate degradation and will need to be eradicated from the development and associated infrastructure footprint to prevent their spread to neighbouring rangelands:

» *Acacia mellifera s. detinens*
» *Rhigozum trichotomum*

Traffic on open space areas

» Designated tracks shall be created for pedestrian of vehicle traffic where necessary.
» Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed.
» All livestock shall be excluded from newly revegetated areas, until vegetation is well established.

Establishment of open spaces

» The establishment and new growth of revegetated and replanted species shall be closely monitored
- Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created

Appendix I:

Traffic and Transportation Management Plan

1. PURPOSE

The purpose of this traffic and transportation management plan (TMP) 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 project site. The objectives of this plan include the following:

» 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 ensure compliance with all legislation regulating traffic and transportation within South Africa.
» 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 broader site can be accessed via an existing gravel access road (known as Soafskolk Road) branching off of the R27 between Kenhardt and Brandvlei. Higher traffic volumes are expected to take place during the construction phase, estimated at 442 vehicle movements daily, over a 36 month period. Minor geometric layout upgrades to improve road safety and intersection functionality are required (for the development of the CSP 2 Project as well as multiple CSP facilities within a Solar Park)[4]. The proposed road layout is shown in Figure 4.

[4] Based on the findings of the traffic impact assessment conducted.

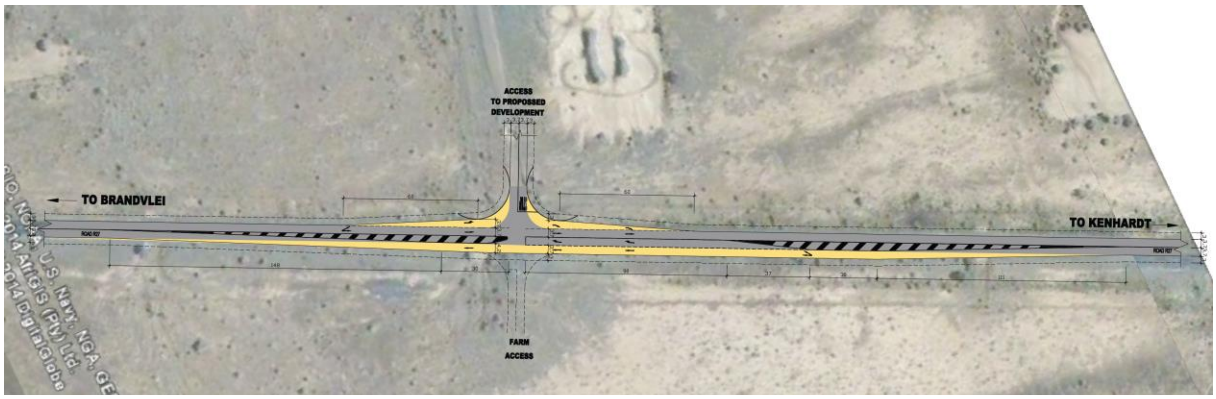


Figure 4: Proposed road layout at junction of Soafskolk Road with the R27

Within the site itself, access will be required to the individual facility components for construction purposes (and later limited access for maintenance). The proposed CSP 2 project access road is situated approximately 20.5km from the intersection at the R27 and can be accessed via the Soafskolk gravel road. Nearer to the Project Site, some internal access roads will be required to be constructed. The amount of earthworks and compaction required in the maintenance of the existing gravel roads and the establishment of new access roads will be established through the detailed geotechnical study to be conducted for the Proposed Project.

There will be one internal surfaced access road of approximately 8m in width which will lead directly to the power block. Between the heliostats there will be a stabilised gravel track that would be used for maintenance purposes and cleaning during the operational phase. The final layout of the access roads will be determined following the identification of site related sensitivities.

Although infrastructure will result from the project, access roads will have to be shared with existing landowners and farmers. The traffic report compiled for the CSP 2 project has considered the potential cumulative impacts should all three CSP Projects become a reality. Minor geometric layout upgrades to improve road safety and intersection functionality are required for the development of a single solar energy facility as well as multiple solar facilities. Traffic congestion is not anticipated due to the man camp accommodating people on site.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

» Prior to the commencement of construction the contractor must develop their own Transport Management Plan (TMP) based on the requirements laid out in this plan.
» The 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. 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 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.
- 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 rearview 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. Repeat offenders must be penalised. A speeding register must be kept with details of the offending driver.

» Where traffic signs are not being adhered to, engineering structures must be used to ensure speeds are reduced.

Appendix J:

Fire Management Plan

1. PURPOSE

The purpose of this plan is to address firefighting requirements throughout the construction of the CSP facility and to preserve and protect human life as well as tangible goods and equipment in the event of a fire.

2. RELEVANT ASPECTS OF THE PROJECT

- A fire protection system will employ measures to contain and prevent fires or from veld fires entering the site/plant.
- A construction phase fire protection and prevention plan will be instituted accordingly.
- During construction, the CSP Project will be serviced with an intermediate fire protection system which may entail an auxiliary pressure pump, fire extinguishers and other portable fire-fighting equipment.
- In addition, a fire break along the site perimeter will be maintained.
- The vegetation in the study area may be at risk of fire and the increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

3. FIRE MANAGEMNET PRINCIPLES

- Provide adequate firefighting equipment on site.
- Provide fire-fighting training to selected operation and maintenance staff.
- Ensure all firefighting personnel are competent.
- Fire management must be incorporated into the induction programme.
- Ensure that appropriate communication channels are established to be implemented in the event of a fire.
- Occupational certificates must be issued before buildings on site can be occupied.
- 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.).
- Open fires must not be allowed on site.
- 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.
- Contact details of emergency services should be prominently displayed on site.

4. MONITORING

- » Health and safety managers and SHE representatives must ensure that no fires are allowed on site, unless an EMS or health and safety risk assessment has been approved.
- » All firefighting equipment must be inspected on a regular basis.
- » ECO, OE or HS officer must ensure fire breaks are maintained where necessary.

Appendix K:

Waste Management Plan

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management. This purpose of this plan is to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the activities on site. 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.

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 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

Waste generated on site, originates from various sources including:

- Concrete waste generated from removal and demolition of the batching plant, dummy columns, plinths, temporary bunds and foundations, spoilt and excess concrete.
- Contaminated water, soil and vegetation due to hydrocarbon spills.
- Hydrocarbon waste from vehicle, equipment and machinery parts (oil cans, filters, rags etc), and servicing.
- Hazardous/ non-hazardous chemical waste from, chemical dosing in the WTP/WWTP, cleaning of steam/ heat storage vessels and pipework, flouresent tubes and waste ink carteridges.
- Recycable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE), Cardboard and rockwool.Organic waste from food waste and alien vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from excess rock and soil from site clearence and trenching works.

3. LEGISLATIVE REQUIREMENTS

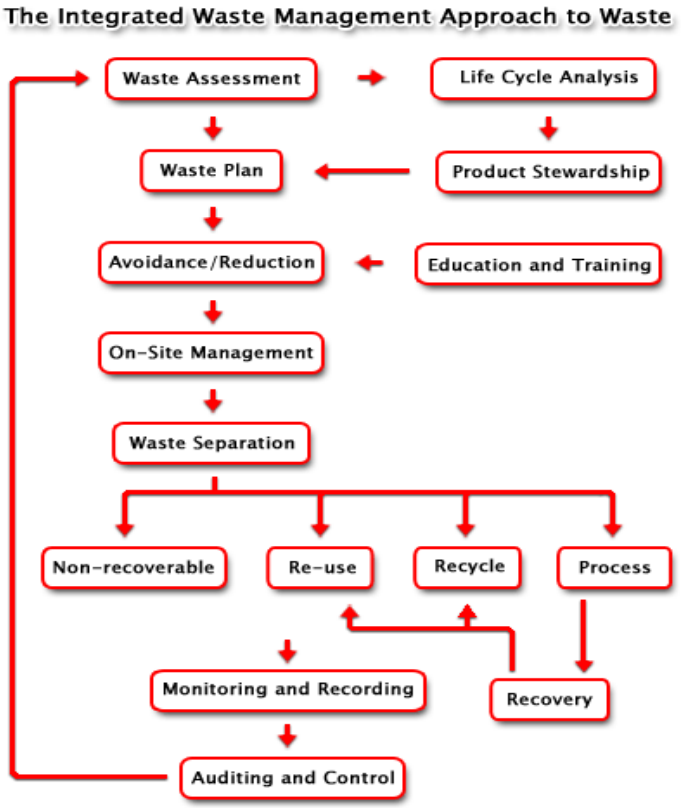
Waste in South Africa is currently governed by means of a number of pieces of legislation, including:

» 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)
» 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 below.



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 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 Environmental Officer 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

» Each subcontractor must implement their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
» 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 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.
» 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.
» 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.

4.1.3. Management of waste storage areas

» The position of all waste storage areas must be located 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 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. 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 Environmental Officer. 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.

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

5. Operational phase

It is expected that the operational phase will result in the production of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Limited 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 Environmental Manager must develop, implement and maintain a waste inventory reflecting all waste generated during construction 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) at each construction area prior to being taken to the construction camp for final sorting (if required) and further temporary storage. 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.

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.