
PROPOSED ILANGA CSP 4 PROJECT, NORTHERN CAPE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

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

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Prepared for

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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.

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

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per Regulations GNR 983, 984 and 985 of December 2014. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

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

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

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

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

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

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

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

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

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

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

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

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

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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

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

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

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

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

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

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

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

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

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

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

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INTRODUCTION

CHAPTER 1

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

The EMPr has been developed on the basis of the findings of the EIA, and must be implemented to protect sensitive on-site and off-site features through controlling construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all Emvelo Holdings (Pty) Limited employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Ilanga CSP 4 Facility. The document must be adhered to, updated as relevant throughout the project life cycle. This document fulfils the requirement of the department and is a draft EMPr submitted with the draft EIA.

PROJECT DETAILS

CHAPTER 2

Emvelo Holding (Pty) Ltd, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek Site 5 CSP/ Ilanga LFTT 2 (1 x 100 MW Parabolic Trough) Site 5, DEA Ref No.: 14/12/16/3/3/2/295) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape (refer to Figure 1.1). The proposed project is to be known as the **Ilanga CSP 4** Project. The **Ilanga CSP 4** Project is proposed to generate up to 50MW in capacity and will be constructed within an area of approximately 200ha in extent within the broader property.

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

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

- » Parabolic troughs utilising a heat transfer fluid (HTF).
- » Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
- » Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

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

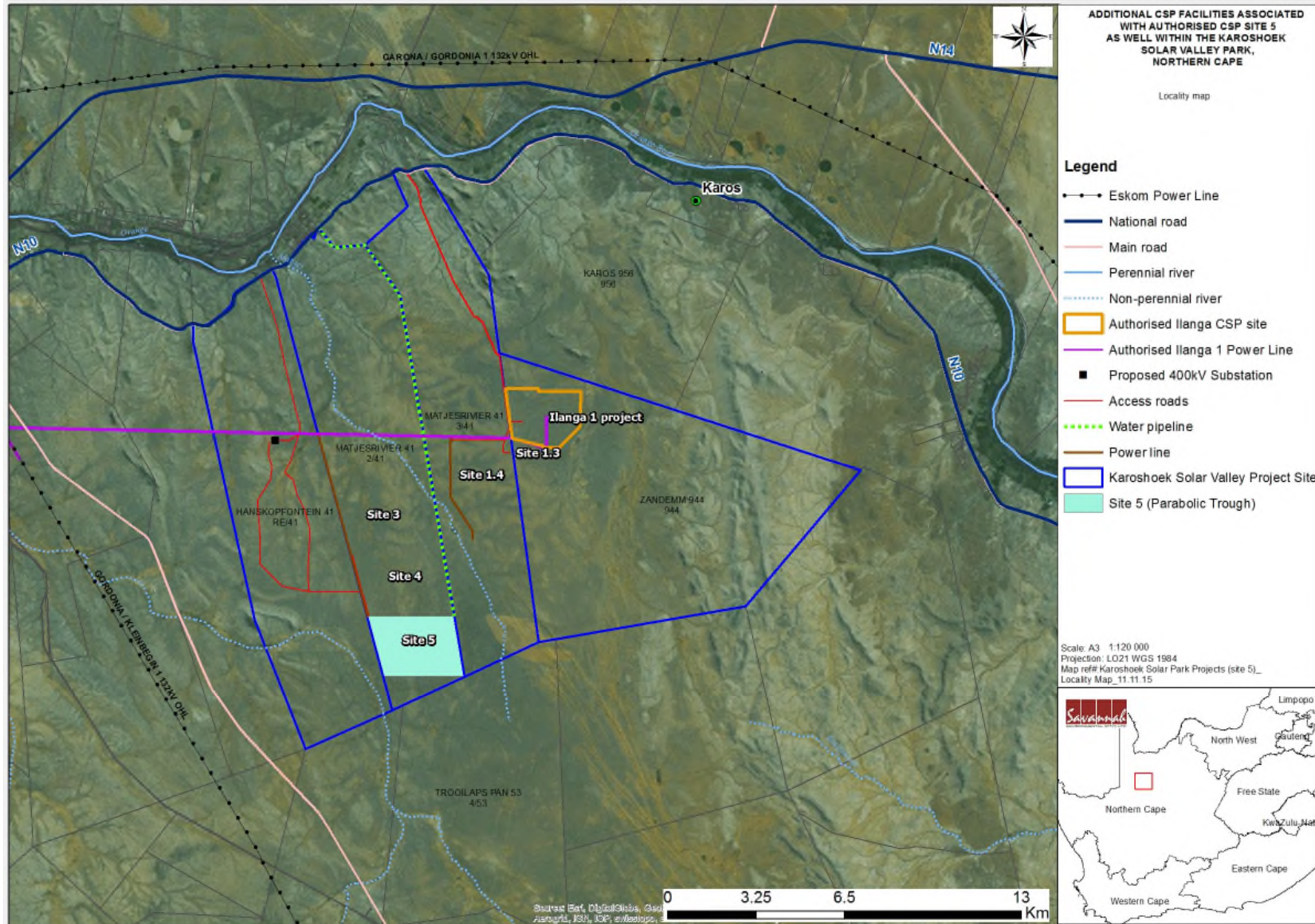


Figure 2.1: Locality map showing the proposed location of Ilanga CSP 4 Project (previously referred to as Site 5) within the extent of the farm Portion 2 of the Farm Matjiesrivier 41.

2.1. Findings of the Environmental Impact Assessment

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

The assessment of potential environmental impacts presented in this report is based on a preliminary layout of the troughs and associated infrastructure (for the 150MW facility) provided by Emvelo Holdings (Pty) Ltd. A broader study area of approximately 6800ha is being considered, within which the development footprint for the Project of approximately 200 ha in extent would be appropriately located. The site can adequately accommodate the proposed larger 150MW CSP Project with a footprint of 680ha (proposed facility and authorised facility. It is anticipated that the Project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (Refer to Figure 2.1). All identified sensitivities were excluded from the proposed development were feasible.

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

- » Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
- » Impacts on avifauna.
- » Impacts on water resources.
- » Visual impacts.
- » Impacts on the social environment.
- » Cumulative impacts.

2.1.1 Local site-specific impacts

The development of the Ilanga CSP 4 project is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat due to hard infrastructure such as the reflector arrays, roads, operations buildings, etc. There are however no features at the site considered to be very high sensitivity or present a no go area and the abundance of species of concern within the

development area is also low. The only feature of high sensitivity is a small pan. It is likely that the pan would be lost to the development as there is little scope for avoidance under CSP development. However, the loss of the pan would not significantly impact the availability of this habitat in the area as there are many larger pans in the broader area. Loss of this pan to the development is therefore considered to be acceptable.

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

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

2.1.2 Impacts on Avifauna

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

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

- » Well-structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme in conjunction with management interventions (as detailed in the tables above) will determine this and can provide appropriate mitigations.

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

2.1.3 Impacts on water resources

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

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

2.1.4 Visual impacts

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

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

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

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

2.1.5 Impacts on the social environment

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

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

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

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

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

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

2.2. Environmental Sensitivities

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

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

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

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

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

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

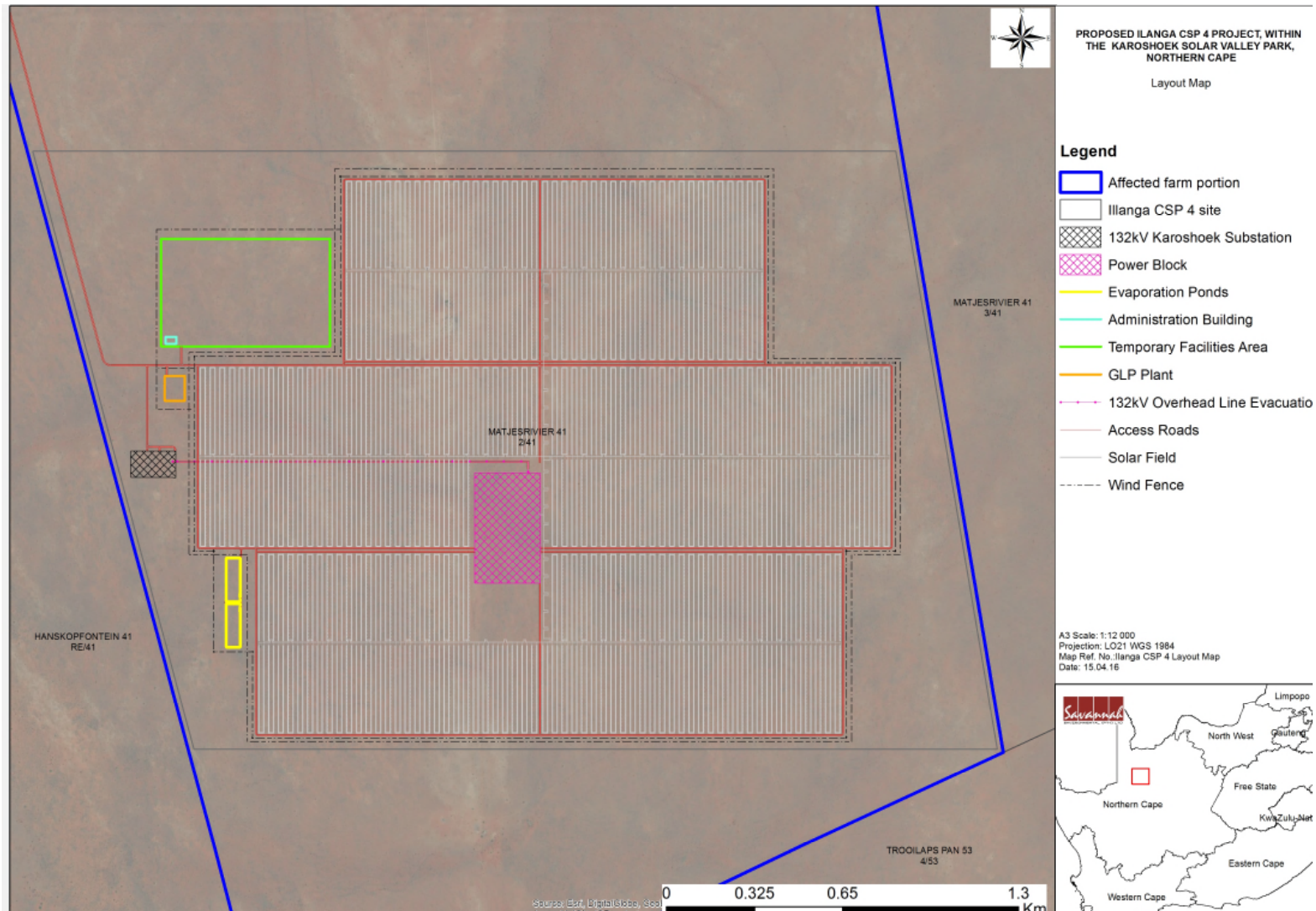


Figure 2.2: Layout map for the proposed Ilanga CSP 4 Facility

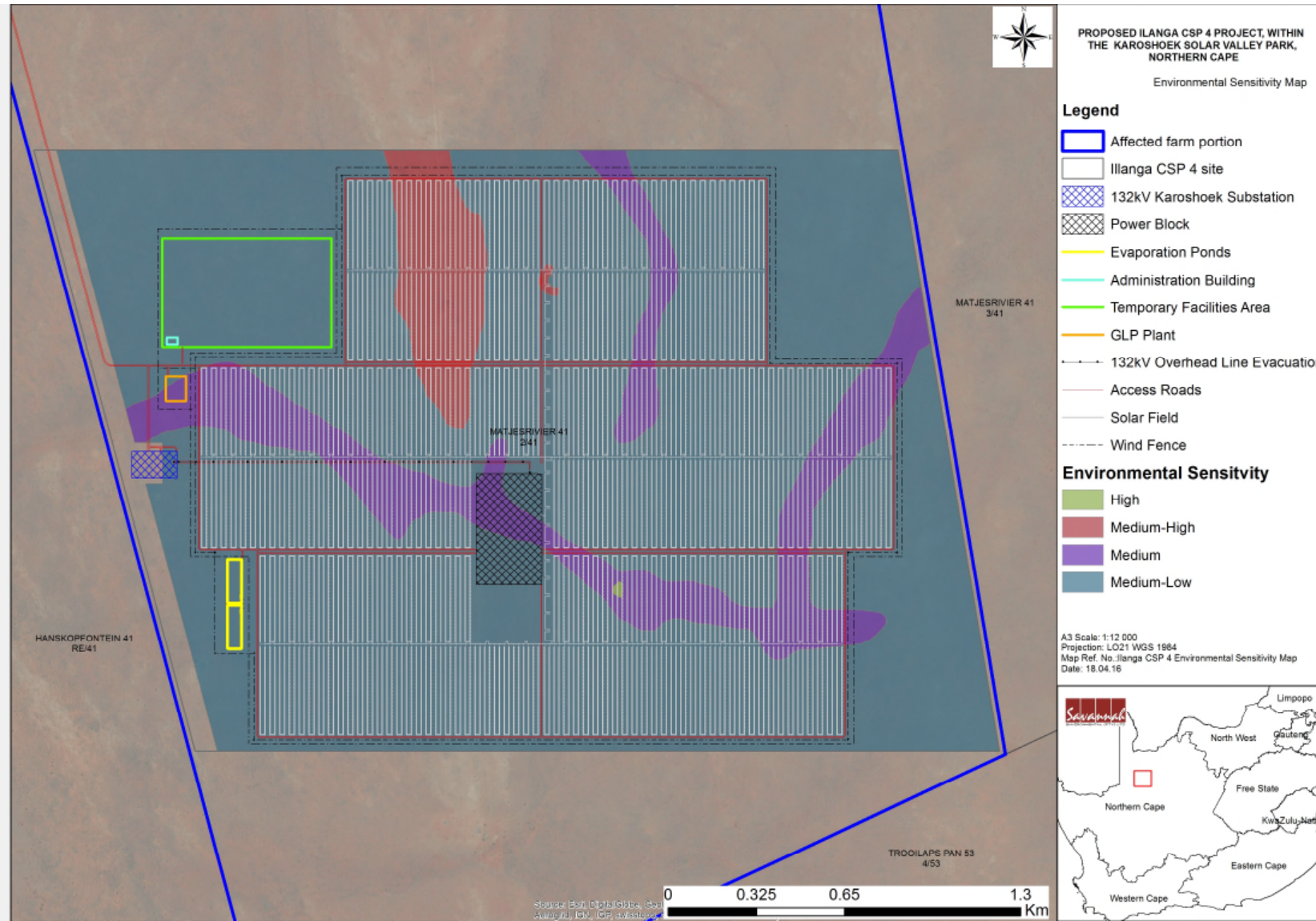


Figure 2.3: Development footprint overlain on the environmental sensitivity map

2.3. Activities and Components associated with the Solar Thermal Facility

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

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

PRE-CONSTRUCTION AND CONSTRUCTION

- » *Staff requirements* (full 150MW facility) – on average an estimated labour force of 250 to 350 will be used on-site during the construction phase. However during peak construction periods approximately 150 to 200 workers will be required on-site. These positions will be comprised of low skilled, semi-skilled, and skilled workers, the latter of which will most likely be sourced outside Upington (i.e. as these skills are unlikely to be available within the local community- 90% will be South Africa, approximately 40% should be local depending on skills pool available). The specialists forming part of the construction team are likely to be sourced from outside the area and are likely to make use of the local establishments for accommodation facilities. The use of local contractors such as Small, Medium, and Micro Enterprises (SMMEs) operating in the area will be considered by the EPC partner, and will be driven largely by what skills and services could be sourced from local SMMEs (i.e. as part of a competitive tendering process). The EPC partner will determine the standards which all workers need to comply to and this will be in line with South African standards and laws applicable to the construction industry. The actual planning and recruitment phase is expected to start approximately 6 months to one year after financial close.
- » *Construction materials and equipment requirements* - around 30 - 40% of the construction material and equipment may be sourced locally (i.e. within South Africa), depending on technical capabilities and prices of local industry. The materials and equipment will be transported to site by road, rail, and air if necessary.
- » *Water requirements* - The proposed development will require approximately 240 000 m³ per annum will be required over the 30-36 month construction phase.
- » *Housing of the labour force* – although the majority of the low and semi-skilled work force will be sourced from the local area and will be housed off-site, it is possible that employees will be housed permanently on-site within the proposed location for the site village. The security team will operate on site in shifts over 24 hours.
- » *Length of the construction phase* - commencement of the construction phase is dependent on the project being approved by DOE a generating license being issued by NERSA, and a Power Purchase Agreement being secured with Eskom/ Treasury or the designated buyer of renewable energy electricity and successfully reaching financial close.

Activity	Detailed description
Pre-construction surveys	Prior to initiating construction, a number of surveys will be required including, but not limited to: <ul style="list-style-type: none"> » Geotechnical survey - the geology and topography of the development footprint will be surveyed. The geotechnical study will focus on topographical constraints, foundation conditions, potential for excavations, and the availability of natural construction materials. The geotechnical examination will include surface and subsurface exploration, soil sampling and laboratory analysis. » Site survey - will be done for the finalisation of the design layout of the solar arrays, and the other associated infrastructure. The micro-siting footprint will consider any environmental sensitivity identified during the EIA Phase investigations and will need to be confirmed in line with the Environmental Authorisation issued for the Project.
Undertake site preparation	<ul style="list-style-type: none"> » Site preparation activities will include: <ul style="list-style-type: none"> * Clearance of vegetation within the development area. * Levelling of site (as necessary) * The development of stormwater control management systems which will include drainage channels which will collect all rain water and lead it to the natural stormwater drainage system. » These activities will require the stripping of topsoil which will need to be backfilled as construction progresses and stockpiled for future rehabilitation.
Establishment of access roads	<ul style="list-style-type: none"> » The study site is accessible via the N10 from Upington to Groblershoop. Access to the site will be off the N10 located to the north of the site. » Depending on the feasibility and on the environmental sensitivities there will be a 17 km internal tarred access road¹ of approximately 8 m wide which will lead directly to the power island. Between the heliostats there will be a stabilised gravel track that would be used for maintenance purposes during the operational phase. The final layout of the access roads will be determined following the identification of site related sensitivities.
Transport of components to site	<ul style="list-style-type: none"> » The components for the proposed Project will be transported to site in sections by road. Some of the Project components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of

¹ To be assessed through a separate BAR process

Activity	Detailed description
	<p>1989)² by virtue of the dimensional limitations (i.e. length and weight). Components of various specialised construction and lifting equipment are required (e.g. for the power tower) and will need to be transported to site. In addition to the specialised lifting equipment/cranes, the typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line.</p> <ul style="list-style-type: none"> » The equipment will be transported to the site using appropriate National, Provincial and local roads, and then the dedicated access/haul road to the site itself. In some instances, the dimensional requirements of the loads to be transported during the construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) as a result of abnormal loading.
<p>Establishment of construction equipment camps, storage facilities and laydown areas</p>	<ul style="list-style-type: none"> » Once the required equipment has been transported to site, dedicated construction equipment camp(s), storage facilities, and laydown area/s will need to be established. These areas serve to confine activities to a designated area to limit potential site disturbance. The laydown area will be used for the assembly of the parabolic troughs, as a logistical area for the contractors and as a prefabrication area. » The fuel required for on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction equipment camp to prevent leakages and soil contamination.
<p>Establishment of electricity generation infrastructure</p>	<ul style="list-style-type: none"> » Following the pre-construction surveys and clearing activities, the power block infrastructure (i.e. the steam turbine, generator, substation, and thermal storage units) will be constructed. Foundations will be established using concrete mixed at an off-site or on-site batching plant. » The parabolic troughs will be assembled in the parabola assembly building located in the solar field logistic area and transported around the site to the exact position where they will be erected and connected to its adjacent trough and the pipes conveying the heat transfer fluid. Approximately one loop which consists of 48 collectors will be constructed per day (i.e. one loop is approximately 300 metres in length).

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

Activity	Detailed description
Undertake site rehabilitation and establishment of the stormwater management plan	<ul style="list-style-type: none"> » Areas requiring rehabilitation will include those areas disturbed during the construction phase and are not required for operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. » Where relevant disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. » All temporary facilities, temporary equipment, and waste materials must be removed from site. » Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and drainage lines), to minimise loss of topsoil and control erosion. » Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

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

OPERATION	
<ul style="list-style-type: none"> » <i>Staff requirements</i> - approximately 100 staff members (for the full 50MW) are expected to be required on-site during the operational phase of the project. » <i>Length of the operation phase</i> - the facility is expected to be commissioned in 2019 and is expected to be operational for 20 - 25 years, where after it could be decommissioned or its lifespan extended depending on the power generation requirements at the time. 	

Activity	Detailed description
Sourcing, treatment and use of water	<ul style="list-style-type: none"> » Approximately 300 000 – 400 000 m³ of water will need to be abstracted annually from the Leerkrans Abstraction_Point on the Orange River to meet the proposed development requirements (i.e. 150 MW CSP facility). The water will be pumped to the de-gritting and filtration reservoir. The water will flow by gravity through the pipeline (as described above) to the storage reservoir at the power block area, where it will be treated according to the needs of the project. » Through a series of heat exchanges the water will be converted into steam to drive the turbine. The water cycle will be cooled through a process of dry cooling (i.e. air cooled condensers will be used instead of cooling towers). The HTF will be cooled in the boiler of the water steam cycle (i.e. main

Activity	Detailed description
	<p>heat exchanger). No additional cooling of the HTF is foreseen, apart from minor fan coolers for certain equipment in the HTF system.</p> <ul style="list-style-type: none"> » Once the water leaves the cycle, it will be released into the evaporation pond.
Treatment and disposal of waste water	<ul style="list-style-type: none"> » Water from the polishing plant will be collected in a neutralisation basin and then will be directed to the collecting pond while wastewater from the demineralisation plant will go directly to the collecting pond. » All surface water, stormwater, and drains, etc. will pass through an oil separator station and all chemical waste water will be pH adjusted before entering the collection pond. The water from the collecting pond is finally directed to the evaporation pond system. » Any water from ablution facilities will be collected in a septic tank.
Chemical dosing for the water-steam cycle	<p>In order to maintain the required condensate quality of the water-steam cycle, ammonia is dosed in small quantities.</p>
Inhibitor dosing for the closed cooling system	<p>To minimise oxidation of the system a corrosion inhibitor (carbohydrazide) is dosed to the closed system.</p>
Operation of the solar field	<ul style="list-style-type: none"> » The solar radiation will be concentrated by the mirrors onto the receiver which contains the heat transfer fluid. The heat transfer fluid is heated and circulated through the solar field back to the power block area where heat exchangers will transfer the collected solar thermal energy from the heat transfer system to the water steam cycle where superheated steam is generated. » The thermal energy in form of superheated steam is routed to the steam turbine generator in which the thermal energy is converted into electric power. » The solar collectors will track the sun during the progression of the day in order to maximise the solar energy yield.
Antifreeze heating	<ul style="list-style-type: none"> » Thermal oil in the HTF-system freezes at ambient conditions. Hence, the oil always has to be kept at a certain operation temperature, even if the plant is not in operation. For this purpose, antifreeze heaters will be installed, running on LPG. The installed boilers will comply with the relevant emission standards and regulation.
Operation of the electrical infrastructure	<ul style="list-style-type: none"> » The steam turbine generator will generate electricity at a voltage of approx. 16 kV and will be alternating current (AC). The electricity will be stepped up to a voltage of 132 kV and evacuated into the overhead distribution line and into the electricity grid.

Activity	Detailed description
Site operation and maintenance	<ul style="list-style-type: none"> » It is anticipated that a full-time security, maintenance, and control room staff will be required on site. » The facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.

Table 2.3: Activities to be undertaken during the decommissioning phase

DECOMMISSIONING	
<ul style="list-style-type: none"> » <i>Length of the decommissioning phase</i> – following the operational phase it could be decommissioned or its lifespan extended depending on the power generation requirements at the time. » <i>Activities during the decommissioning phase</i> - it is most likely that decommissioning would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time. 	
Activity	Detailed description
Site preparation	<ul style="list-style-type: none"> » Site preparation activities similar to those undertaken in the construction phase will be required during the decommissioning phase. This will include confirming the integrity of site access to the site in order to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and remove existing components	<ul style="list-style-type: none"> » The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

PURPOSE AND OBJECTIVES OF THE EMPr

CHAPTER 3

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

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

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

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of December 2014. This document is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

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

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

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

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

Emvelo Holdings (Pty) Limited must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process for the proposed Ilanga CSP 4 Project, it is important that this document be read in conjunction with the Scoping and EIA Reports compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

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

STRUCTURE OF THIS EMPR

CHAPTER 4

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

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

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

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the EIA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

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

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions

required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

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

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

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

Table 4.1: Management plans for the proposed project

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

4.1 Project Team

This draft EMPr was compiled by:

	Name	Company
EMPr Compilers:	Jared Padavattan	Savannah Environmental
	Tebogo Mapinga	
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	Name	Company
	Peter Kimberg	The Biodiversity Company
	Stuart Dunsmore	Fourth Element Consulting (Pty) Ltd
	Jaco van der Walt	Heritage Contracts
	John Marshall	Afzeilia Environmental Consultant & Environmental Planning and Design
	Garry Paterson	ARC-Institute for Soil, Climate and Water

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

MANAGEMENT PROGRAMME: PLANNING AND DESIGN

CHAPTER 5

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

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
- » Ensures that adequate regard has been taken of identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

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

5.1 Objectives

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

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

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

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

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

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

Project Component/s	<ul style="list-style-type: none"> » Solar field and associated infrastructure. » Construction camps & other temporary infrastructure » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all the facility components (i.e. including the infrastructure within Site 4 and across the broader site to include the access road, pipeline, reservoirs and treatment facilities).
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The design of the facility responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer/Owner EPC Contractor	Pre-construction
Undertake a heritage pre-construction survey.	Heritage specialist	Pre-construction
Preconstruction walk-through of facility footprint and support structure positions and use micro-siting to reduce local impact where possible.	Ecologist	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Geotechnical specialist	Pre-construction
Obtain any additional environmental permits required (e.g. water use license, protected tree and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Developer/Owner	Project planning
Affected individuals of protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include	Developer/Owner EPC Contractor/ Specialist	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
trees which cannot be translocated and where these are protected by DAFF and permit for their destruction would be required.		
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the EIA Report and relevant appendices.	Engineering design consultant, solar component supplier, and Developer	Design review
External access point and internal access road to be carefully planned to maximise road user safety and limit any intrusion on the neighbouring property owners and road users.	Developer/Owner EPC Contractor	Design
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of stormwater within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the mirrors), as well as appropriate drainage around the site.	Developer/Owner EPC Contractor	Design
Plan and place light fixtures for the plant and the ancillary infrastructure in such a manner as to minimise glare and impacts on the surrounding area.	Developer/Owner EPC Contractor	Planning.
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer/Owner EPC Contractor	Planning
Plan new access roads according to contour lines to minimise cutting and filling operations.	<u>Developer/Owner</u> <u>EPC Contractor</u>	Design
Plan the placement of lay-down areas and construction equipment camps in order to minimise vegetation clearing.	Developer/Owner EPC Contractor	Planning
Develop a comprehensive rehabilitation plan for the site (refer to Appendix E).	Developer/Owner	Pre-construction
Submit a revised layout plan for the entire solar thermal power plant for approval to the department prior to commencement of construction.	Developer/Owner	Pre-construction
The quantity of water needed for the duration of the construction phase is to be calculated and planned for in detail.	EPC Contractor	Pre-Construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer/Owner	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name	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.		
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts	Developer/Owner EPC Contractor	Tender process
The procurement and design strategy of the project is required to implement technically feasible and cost-effective measures of reducing resource consumption and greenhouse gases, the measures of which should be communicated to all relevant staff members.	Developer/Owner EPC Contractor	Planning & Design phase Duration of project life cycle

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Review of the design by the Project Manager and the Environmental specialist prior to the commencement of construction.

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

Project Component/s	<ul style="list-style-type: none"> » Stormwater management components » All hard engineered surfaces
Potential Impact	<ul style="list-style-type: none"> » Poor stormwater management and alteration of the hydrological regime. » Risk of river system erosion and downstream sedimentation.
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction of the facility (i.e. placement of hard engineered surfaces). » Construction of internal access roads.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Appropriately plan hard-engineered erosion protection structures.	Developer/Owner EPC Contractor	Planning and design
Design an appropriate stormwater management plan to ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities).	Developer/Owner EPC Contractor	Planning

Mitigation: Action/Control	Responsibility	Timeframe
Construction must include appropriate design measures that allow surface and sub-surface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater runoff.	Developer/Owner EPC Contractor	Planning and design

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

OBJECTIVE 3: To ensure effective communication mechanisms

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

Project component/s	» Solar energy facility
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with solar energy facility construction » Activities associated with solar energy facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (following the guidelines of the grievance mechanism in Appendix C) to be implemented during both the construction and operational phases of the 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	Developer/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation

Mitigation: Action/control	Responsibility	Timeframe
employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.		procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer/Owner EPC Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	Owner EPC Contractor	Pre-construction and construction

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

MANAGEMENT PROGRAMME: CONSTRUCTION

CHAPTER 6

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

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- » Minimises the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value (i.e. drainage lines).
- » Minimises impacts on fauna using the site.
- » Minimises the impact on heritage sites should they be uncovered.
- » Establishes an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Emvelo Holdings (Pty) Limited must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. Emvelo Holdings (Pty) Limited will retain various key roles and responsibilities during the construction of the facility.

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

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

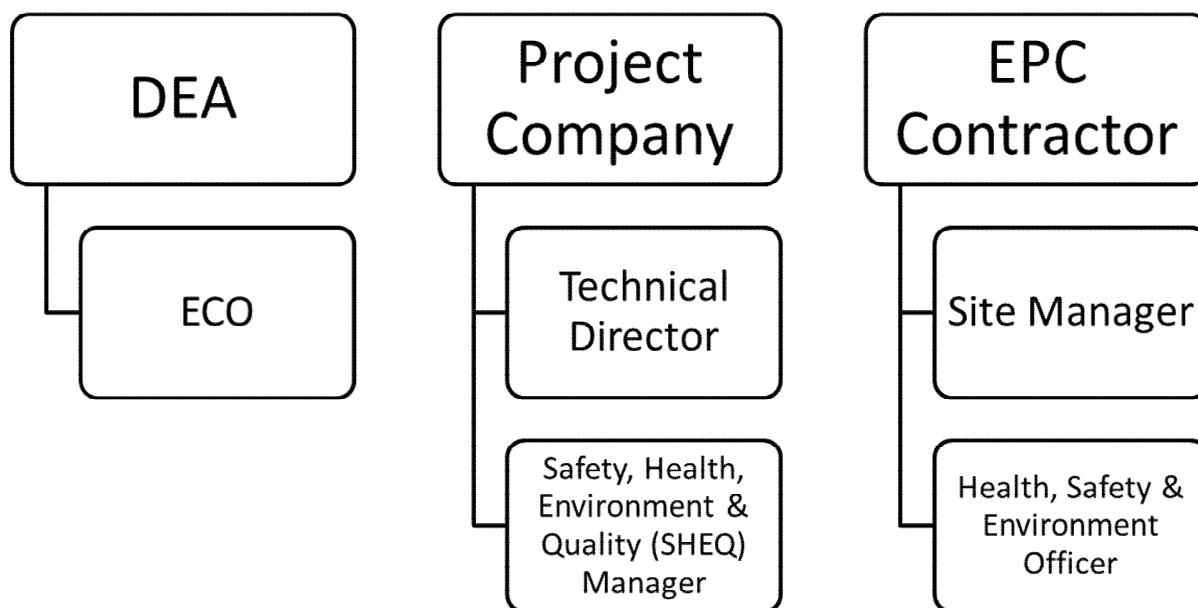


Figure 6.1: Organisational structure for the implementation of the EMP

Technical Director will:

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

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

- » Be fully knowledgeable with the contents of the EIA and risk management
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued)
- » Be fully knowledgeable with the contents of the EMPr
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these
- » Have overall responsibility of the EMPr and its implementation
- » Conduct audits to ensure compliance to the EMPr

- » Ensure there is communication with the Technical Director, the ECO, and relevant discipline engineers on matters concerning the environment.
- » Be fully knowledgeable with the contents of all relevant licences and permits.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site
- » Confine activities to the demarcated construction site

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

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

- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Submit independent reports to the DEA and other regulating authorities regarding compliance with the requirements of the EMP, 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 EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations)

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

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

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- » Keep accurate and detailed records of all EMP-related activities on site.

6.2 Objectives

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

OBJECTIVE 1: Minimise impacts related to inappropriate site establishment

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. troughs, power block, etc.). » Linear infrastructure (i.e. pipeline, access road).
Potential Impact	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

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

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » 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

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

In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project Component/s	» Area and linear infrastructure.
Potential Impact	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
The siting of the construction camp/s must take cognisance of any sensitive areas identified by the EIA studies and reflected on the site layout plan included within this EMPr. The ECO should be consulted with regards to the location of the construction camp/s.	EPC Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	EPC Contractor	Site establishment, and during construction

Mitigation: Action/Control	Responsibility	Timeframe
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan to be developed with emergency procedures in the event of a fire.	EPC Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	EPC Contractor	Duration of Contract
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Solid waste (general waste) to be disposed of at the nearest appropriately permitted waste disposal facility. Proof of disposal to be retained as proof of responsible disposal	EPC Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal	EPC Contractor	Maintenance: duration of contract within a particular area
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	EPC Contractor O&M Contractor Owner	During and post construction.
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor O&M contractor Owner	During and post construction.
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel (refer to Section 7.4 of this EMPr). Records of all training undertaken must be kept.	EPC Contractor	Duration of construction
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	EPC Contractor and sub-contractor/s	Duration of contract
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall	EPC Contractor and sub-contractor/s	Duration of contract

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

Performance Indicator

- » The construction camps have avoided sensitive areas.
- » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement.

	<ul style="list-style-type: none"> » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	<ul style="list-style-type: none"> » Regular audits of the construction camps and areas of construction on site by the Contractor's SHE Officer and the ECO. » Proof of disposal of sewage at an appropriate waste water treatment works. » Observation and supervision of Contractor practices throughout construction phase by the Contractor's SHE Officer and the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

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

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the facility, including the associated infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business.
Activities/Risk Sources	<ul style="list-style-type: none"> » Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Mitigation: Target/Objective	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

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

Performance Indicator	<ul style="list-style-type: none"> » Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » SMMEs are awarded contracts, where possible, during the construction phase. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities
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	regarding unrealistic employment opportunities or that only outsiders were employed.
Monitoring	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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

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

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

Project Component/s	» Availability of required skills in the local communities.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business could be maximised.
Activities/Risk Sources	<ul style="list-style-type: none"> » Unavailability of locals with the required skills resulting in locals not being employed and labour being sourced from outside the municipal area. » Locals are unavailable to assist farmers during pruning and harvesting seasons. » Higher skilled positions might be sourced internationally.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Employment of a maximum number of the low-skilled and/or semi-skilled workers from the local area where possible. » Appropriate skills training and capacity building

Mitigation: Action/Control	Responsibility	Timeframe
The developer/owner, in discussions with the Local Municipality, should aim to employ a maximum number of the low-skilled and/or semi-skilled workers from the	Developer/Owner, EPC Contractor	Duration of construction

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

Performance Indicator	<ul style="list-style-type: none"> » A skills development plan is developed. » Job opportunities, especially of lower skilled positions, are primarily awarded to members of local communities. » Skills training and capacity building initiatives are developed and implemented. » Local SMMEs and/or entrepreneurs awarded the opportunity to become involved in the tender process.
Monitoring	<ul style="list-style-type: none"> » Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

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

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

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

Project Component/s	» Delivery of any component required within the construction phase.
Potential Impact	<ul style="list-style-type: none"> » Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	<ul style="list-style-type: none"> » Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix cement from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Substation construction activities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (refer to Appendix G).	Developer/Owner EPC Contractor	Pre-construction
Appropriate dust suppression must be implemented on gravel roads to limit dust creation.	Developer/Owner EPC Contractor	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Transport Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Transport Contractor	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	EPC Contractor (or appointed transportation)	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
	contractor)	
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	EPC Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	EPC Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	EPC Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	EPC Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	EPC Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	EPC Contractor	Duration of contract
To minimise impacts on local communities, consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.	EPC Contractor	Duration of contract
Source general construction material and goods locally where available to limit transportation over long distances.	EPC Contractor	Construction

Performance Indicator

- » Vehicles keeping to the speed limits.
- » Vehicles are in good working order and safety standards are implemented.
- » Local residents and road users are aware of vehicle movements and schedules.
- » No construction traffic related accidents are experienced.
- » Local road conditions and road surfaces are up to standard.
- » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).

Monitoring	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.
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OBJECTIVE 6: Minimise the potential impact on health, safety and security

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

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

Project Component/s	» Inflow of workers could result in increased safety and security risks.
Potential Impact	» Outside workers are involved in criminal activities and/or fires occur.
Activities/Risk Sources	<ul style="list-style-type: none"> » Safety of individuals and animals are at risk. » Theft of livestock. » Theft of construction material. » On-site accidents. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

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

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

Performance Indicator	<ul style="list-style-type: none"> » No criminal activities and theft of livestock attributable to the construction workforce are reported.' » Limited intrusions on surrounding property owners. » No reports from property owners regarding problems with construction activities and workforce. » No fires or on-site accidents occur.
Monitoring	<ul style="list-style-type: none"> » The Owner, and appointed ECO must monitor indicators listed above

to ensure that they have been implemented.

OBJECTIVE 7: Management of dust and air emissions

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

Project Component/s	» Construction activities associated with the area and linear infrastructure.
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment
Activities/Risk Sources	<ul style="list-style-type: none"> » Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	EPC Contractor	Duration of contract
Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources is not visibly excessive. Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	EPC Contractor	Site establishment and construction

Mitigation: Action/Control	Responsibility	Timeframe
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	EPC Contractor	Duration of contract
Height of spoil/subsoil/overburden (not topsoil) stockpiles to be limited to 5m. Spoil and subsoil to be compacted and watered down as necessary	EPC Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material tarpaulins shade cloth.	EPC Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the H&S Officer.	EPC Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	EPC Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	EPC Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	EPC Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	EPC Contractor	Duration of contract
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.	EPC Contractor	Duration of contract
The batching plant must be enclosed with shade cloth to reduce the amount of cement particulates/ particles released into the environment.	EPC Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » No complaints from affected residents or community regarding dust or vehicle emissions. » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility). » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
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Monitoring	<p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.
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OBJECTIVE 8: Minimisation of development footprint and disturbance to topsoil

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

Project Component/s	<ul style="list-style-type: none"> » CSP facility. » Offices and workshops. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Trenching activities for water supply pipeline. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. compaction). » Foundations or plant equipment installation. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » 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

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

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing and soil management activities by Contractor's SHE Officer and the ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

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

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

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

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

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

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

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	<ul style="list-style-type: none"> » Vegetation clearing. » Construction of access roads. » Construction/placement of water pipeline, storage/treatment reservoirs, and water abstraction infrastructure » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Retain natural vegetation in the highly sensitive areas of the site. » Minimise footprints of disturbance of vegetation/habitats on-site. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

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

Mitigation: Action/Control	Responsibility	Timeframe
<p>development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. The necessary permits must be in place</p> <ul style="list-style-type: none"> » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately as soon as possible. Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment. » Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment 		
<p>It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas.</p>	EPC Contractor	Duration of construction
<p>Minimise large-scale clearance of natural vegetation and disturbance to the proposed site.</p>	EPC Contractor	Duration of construction
<p>Limit impacts on riparian vegetation at the water abstraction point.</p>	EPC Contractor	Duration of contract
<p>A site rehabilitation programme must be implemented (refer to Appendix E).</p>	EPC Contractor in consultation with Specialist	Duration of contract
<p>All protected tree and herbaceous species that may be present near construction activities must be demarcated with highly visible barriers, in order to prevent accidental damage or removal by subcontractors</p>	EPC Contractor	Construction
<p>Monitor and control declared weeds and invader species.</p> <ul style="list-style-type: none"> » Continually monitor the re-emergence of these species and manage according to the invasive species management plan 	EPC Contractor	Duration of construction

<p>Performance Indicator</p>	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
<p>Monitoring</p>	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances

to the EMP.

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	EPC Contractor Owner	Construction and operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act) (refer to Appendix D).	EPC Contractor Owner	Construction and operation
Immediately control any alien plants that become established using registered control methods.	EPC Contractor Owner	Construction and operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	EPC Contractor	Construction and rehabilitation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
Monitoring	<ul style="list-style-type: none"> » Ongoing monitoring of area by Contractor's SHE Officer and the ECO during construction. » Ongoing monitoring of area by environmental manager during operation. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 11: Minimise the impacts on fauna

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats. » Traffic to and from site.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

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

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

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks » Recording faunal fatalities to monitor success of relocation efforts » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 12: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

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

Project Component/s	<ul style="list-style-type: none"> » CSP facility. » Offices and workshops. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	<ul style="list-style-type: none"> » Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity. » Establishment or extension of the water abstraction facilities etc on the banks and floodplains of the Orange River.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. » Minimise deposition of soil into drainage lines. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas.	EPC Contractor	Before and during construction
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	EPC Contractor	Construction
Access roads to be carefully constructed to	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.		
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	EPC Contractor	Construction
Minimise removal of vegetation which adds stability to soil.	EPC Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase must be protected from erosion	EPC Contractor	Construction
Implement erosion control measures denuded areas as required.	EPC Contractor	Construction
Control depth of excavations and stability of cut faces/sidewalls.	EPC Contractor	Construction
<p>Salvaging topsoil:</p> <ul style="list-style-type: none"> » Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material. <ul style="list-style-type: none"> ○ Topsoil stripping removes up to 30 cm or less of the upper soils. » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area. <ul style="list-style-type: none"> * This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. * Different types of topsoil – rocky soils and sands or loams must be stored separately » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year. 	EPC Contractor	Pre-construction/ Construction
<p>Storing topsoil:</p> <ul style="list-style-type: none"> » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: <ul style="list-style-type: none"> * At least 50 m from any wetland or watering point * Ideally a disturbed but weed-free area 	Contractor	Pre-construction/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
<ul style="list-style-type: none"> » Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower <ul style="list-style-type: none"> * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches <ul style="list-style-type: none"> * In such case, use one side of the linear development for machinery and access only * Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) * If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: <ul style="list-style-type: none"> * Preventing ponding on or between heaps of topsoil * Or covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring establishment of all invasive vegetation and removing such if it appears * Keeping heights of topsoil at 2m to prevent wind erosion * Keeping slopes of topsoil at a maximal 2:1 ratio * Monitoring and mitigating erosion where it appears * Where topsoil needs to be stored in excess 		

Mitigation: Action/Control	Responsibility	Timeframe
<p>of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered</p>		
<p>Reapplying topsoil:</p> <ul style="list-style-type: none"> » Spoil materials and subsoil must be back-filled first, then covered with topsoil » Generally, topsoil should be re-applied to a depth equal to slightly greater than the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked out to optimise re-vegetation efforts with the topsoil available » Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts. » To stabilise reapplied topsoil and minimise raindrop impact and erosion: <ul style="list-style-type: none"> o Use organic material from cleared and shredded woody vegetation where possible o Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation 	EPC Contractor	Construction and rehabilitation
<p>Re-applied topsoil needs to be re-vegetated as soon as possible, following the specifications of the re-vegetation and rehabilitation plan.</p>	EPC Contractor	Construction monitored during operation phase
<p>General Erosion control measures:</p> <ul style="list-style-type: none"> » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas <ul style="list-style-type: none"> o Ensure that all soil surfaces are protected by 	EPC Contractor	Construction monitored during operational phase

Mitigation: Action/Control	Responsibility	Timeframe
<p>vegetation or a covering to avoid the surface being eroded by wind or water.</p> <ul style="list-style-type: none"> » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water 		

Performance Indicator

- » No activity outside demarcated disturbance areas.
- » Limited level of activity within disturbance areas.
- » Limited level of soil erosion around site due to construction activities.

	<ul style="list-style-type: none"> » Limited level of increased siltation in drainage lines. » Acceptable state of excavations. » No activity in restricted areas.
Monitoring	<ul style="list-style-type: none"> » 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 13: Protection of heritage resources

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

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

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

Project Component/s	<ul style="list-style-type: none"> » CSP facility. » Offices and workshops. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Pipeline construction activities.

Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation
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Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	EPC Contractor in consultation with Specialist	Site establishment
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	EPC Contractor in consultation with Specialist	Pre-construction
Project employees and any contract staff must maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Owner / EPC Contractor	Duration of contract
If 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
Shallow pans and depressions that contain seasonal water could be archaeologically significant and should be avoided as far as possible.	EPC Contractor in consultation with Specialist	Duration of contract
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	EPC Contractor in consultation with Specialist	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by Contractor's SHE Officer throughout construction phase » Supervision of all clearing and earthworks » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE 14: Minimisation of visual impacts associated with construction

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

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

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

Performance Indicator	» Vegetation cover on and near the site is intact with no evidence of degradation or erosion.
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	» Construction site is kept in a neat and tidy state.
Monitoring	» Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE 15: Appropriate handling and management of waste

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

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

Project Component/s	» CSP facility. » Offices and workshops. » Access roads.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/Risk Source	» Packaging » Other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	EPC Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/disposal at an appropriate frequency.	EPC Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	EPC Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	EPC Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	EPC Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	EPC Contractor	Duration of contract
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage.	EPC Contractor	Duration of contract
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	EPC Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management must be compiled and appropriate measures implemented to ensure compliance with legislative requirements.	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
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
Discharge of sewage into the environment must be prevented and if leaks occur from sewage systems, then this must be fixed and the contaminated vegetation/ soil must be removed immediately and treated as hazardous waste.	EPC Contractor	Duration of construction
Ensure the above ground septic tank is in an impermeable bund that can contain at least 110% of the tanks contents.	EPC Contractor	Duration of construction
Ensure that the below ground storage of any septic tanks can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	EPC Contractor	Duration of construction
Daily inspection of all portable toilets and septic tanks must be performed by SHE/ environmental representatives on site.	EPC Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	EPC Contractor	Duration of Construction
All waste facilities and waste transportation contractors must be licensed and registered where necessary.	EPC Contractor	Duration of Construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the material re-used for an appropriate purpose.	EPC Contractor	Completion of construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » 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.
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OBJECTIVE 16: Appropriate handling and storage of chemicals, hazardous substances

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

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

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

Mitigation: Action/Control	Responsibility	Timeframe
» Has adequate capacity to contain 110% of the largest container contents.		
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	EPC Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	EPC Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	EPC Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.	EPC Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	EPC Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	EPC Contractor	Duration of contract
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands or a drainage line.	EPC Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	EPC Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files and applicable regulations and safety instructions.	EPC Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	EPC Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	EPC Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	EPC Contractor	Duration of contract
Evaporation dams must be appropriately lined, as required by the NEM: Waste Act and associated Regulations, and in line with the water use license issued for the site (once issued).	EPC Contractor	Construction
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling,	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
installation and storage.		
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
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	EPC Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Where required, a NEMA section 30 report must be submitted to DEA within 14 days of the incident.	EPC Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » 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 17: Effective management of concrete batching plants

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

Project	» Batching plant and associated activities
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component/s	
Potential Impact	<ul style="list-style-type: none"> » Dust emissions » Release of contaminated water » Change in surrounding waterbodies' pH and resultant impacts. » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation
Activity/risk source	<ul style="list-style-type: none"> » Operation of the batching plant » Packaging and other construction wastes » Hydrocarbon use and storage
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised	EPC Contractor	Construction phase
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	EPC Contractor	Construction phase
Where there is a regular movement of vehicles, access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment	EPC Contractor	Construction phase
Good maintenance practices must be implemented, including regular sweeping to prevent dust build-up	EPC Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	EPC Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage	EPC Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include covering the conveyor with a roof, installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	EPC Contractor	Construction phase
Process wastewater and contaminated stormwater collected from the entire batching plant area should be diverted to an impervious settling tank or pond. Water should be reused in the concrete batching process, where possible.	EPC Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	EPC Contractor	Construction phase

Performance Indicator	<ul style="list-style-type: none"> » No complaints on dust » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr. » The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

6.3 Detailing Method Statements

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

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

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

- » Details of the responsible person/s

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

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

- » Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. Clearing vegetation, compacting soils and removing existing infrastructure and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure.
- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- » Stipulate the stormwater management procedures recommended in the stormwater management method statement.
- » Stormwater and water crossings method statement.
- » Ablution facilities (placement, maintenance, management and servicing)
- » Solid Waste Management:
 - * Description of the waste storage facilities (on site and accumulative).
 - * Placement of waste stored (on site and accumulative).
 - * Management and collection of waste process.
 - * Recycle, re-use and removal process and procedure.
- » Liquid waste management:
 - * The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
 - * Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.
- » Dust and noise pollution
 - * Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.

- * Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- » Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * Lists of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.
 - * Prevention protocol of accidental contamination of soil at storage and handling areas.
 - * All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (ie removal to reintroduction or replanting, if necessary).
 - * Rehabilitation, re-vegetation process and bush clearing.
- » Incident and accident reporting protocol.
- » General administration
- » Designate access road and the protocol on while roads are in use.
- » Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been reviewed by the ECO, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

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

OBJECTIVE 1: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

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

- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental “do’s” and “don’ts” (as per the environmental awareness training course) are erected at prominent locations throughout the site.

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

6.4.1 Environmental Awareness Training

Environmental Awareness Training must be undertaken by the EPC Contractor and must take the form of an on-site talk and demonstration by the ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the ECO on site.

6.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor’s or Engineer’s staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor’s SHE Officer and should include discussing the developer’s environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do’s and don’ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.3 Toolbox Talks

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

6.5 Monitoring Programme: Construction Phase of the Solar Energy Facility

OBJECTIVE 1: To monitor the performance of the control strategies employed against environmental objectives and standards.

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Ilanga CSP 4 Facility will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/Manager will ensure that the monitoring is conducted and reported.

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

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

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

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

6.5.2. Monitoring Reports

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

6.5.3. Final Audit Report

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

MANAGEMENT PROGRAMME: REHABILITATION

CHAPTER 7

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

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

7.1. Objectives

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

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

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

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Temporary construction areas. » Temporary access roads/tracks. » Pipeline servitude » Other disturbed areas/footprints.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
Implement revegetation and rehabilitation plan (refer to Appendix F).	EPC Contractor	Following execution of the works
Rehabilitation must be undertaken as soon as possible after completion of construction activities to reduce the area of habitat converted at any one time	EPC Contractor	Following execution of the works

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

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION

CHAPTER 8

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

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts
- » Enables the solar energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents
- » Minimises impacts on fauna using the site
- » Establishes an environmental baseline for solar energy facility sites in South Africa

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

8.1. Objectives

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

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

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

The **Operations Manager** will:

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

The **Technical/SHEQ Manager** will:

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

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

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

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

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitation at its completion
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site.

» Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Owner O&M Operator	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Owner O&M Operator	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Owner O&M Operator	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Owner in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Employ an EO for the duration of the operational phase of the plant to ensure compliance of all environmental related legislation and best practice.	Owner O&M Operator	Operation
Monitor avifaunal movement along the power line and solar field, to assess the integrity of mitigation measures in place. Further mitigation measures must be implemented if carcasses and/ or injuries are being recorded.	Owner O&M Operator	Operation
A faunal/ avifauna incident register must be maintained on site.		
Implement an animal removal plan to ensure safety of workers and fauna.	Owner O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts.
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by STPP Manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE 3: Minimisation of visual impacts

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

Project Component/s	<ul style="list-style-type: none"> » CSP facility. » Offices and workshops. » Access roads.
Potential Impact	<ul style="list-style-type: none"> » Visual impact of facility degradation and vegetation rehabilitation failure. » Lighting influences from the facility on surrounding areas.
Activity/Risk Source	<ul style="list-style-type: none"> » The proposed facility. » Reservoirs.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise potential for visual impact. » To ensure a well maintained and neat facility.

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Monitoring of rehabilitated areas.

OBJECTIVE 4: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

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

Project Component/s	<ul style="list-style-type: none"> » CSP facility. » Offices and workshops. » Access roads.
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Potential Impact	<ul style="list-style-type: none"> » Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Inspections of site on a bi-annual basis. » Water management plan

OBJECTIVE 5: Minimise dust and air emissions

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

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

Project Component/s	<ul style="list-style-type: none"> » Hard engineered surfaces » On-site vehicles
Potential Impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and the augmentation plant.
Activities/Risk Sources	<ul style="list-style-type: none"> » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints

- from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon.
- » An incident reporting system must be used to record non-conformances to the EMPr.

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate fire fighting equipment on site and establish a fire fighting management plan during operation (refer to Appendix K).	Owner O&M Operator	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Owner O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Owner O&M Operator	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Owner O&M Operator	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Owner O&M Operator	Operation
Contact details of emergency services should be prominently displayed on site.	Owner O&M Operator	Operation

Performance Indicator	<ul style="list-style-type: none"> » Fire fighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring	<ul style="list-style-type: none"> » The project developer must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 7: Maximise local employment and business opportunities

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

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

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

Project Component/s	<ul style="list-style-type: none"> » Operation and maintenance of the facility.
Potential Impact	<ul style="list-style-type: none"> » The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	<ul style="list-style-type: none"> » Locals are not employed where the skills exist. » Local procurement is not undertaken if possible. » Local businesses are not supported.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maximise the appointment of local employees.

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

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

Performance Indicator	<ul style="list-style-type: none"> » An employee list drawn up indicating the percentage of locals employed. » Local procurement is undertaken.
Monitoring	<ul style="list-style-type: none"> » The project developer should be able to demonstrate that the above indicators are implemented.

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

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

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

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

Project Component/s	<ul style="list-style-type: none"> » Capacity building and skills training undertaken during the operational phase.
Potential Impact	<ul style="list-style-type: none"> » Positive contribution to the capacity of individuals involved with the project, and equipping them with transferable skills. » Contribution towards local development initiatives.
Activities/Risk Sources	<ul style="list-style-type: none"> » No social responsibility from developer. » No contribution towards local development initiatives.

	» Inefficient training or lack of capacity building and skills training.
Mitigation: Target/Objective	» Capacity building and skills training continuously undertaken during the operational phase of the project. » Positive social responsibility initiatives.

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

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

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

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

Individuals leaving their existing full time employment positions at farms in the area to obtain work at the facility could result in possible negative impacts on the farming community. Employing outsiders on the other hand and accommodating them at the planned accommodation facility on site could also affect the community's social dealings with each other as well as the traditional character of the area. In worst cases it could

result in social conflict between the various groupings. The recruitment and employment process would thus have to be sensitively dealt with to limit any possible negative impacts on the daily living patterns of the existing farming community and other community members.

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

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

Project Component/s	<ul style="list-style-type: none"> » Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	<ul style="list-style-type: none"> » Possible limited intrusion impact on surrounding land owners. » Possible phasing out of cattle farming.
Activities/Risk Sources	<ul style="list-style-type: none"> » Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.

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

Performance Indicator	<ul style="list-style-type: none"> » No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities.
Monitoring	<ul style="list-style-type: none"> » The Owner should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.

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

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

Project Component/s	<ul style="list-style-type: none"> » Parabolic troughs (i.e. heat transfer fluid). » Substation. » 15% of back up fuel will be sourced from LPG or biofuel. » Water treatment works. » Operation and maintenance staff. » Workshop.
Potential Impact	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Transformers and switchgear – substation. » Parabolic troughs. » Water storage and treatment reservoirs. » Fuel, oil, HTF, and LNG storage. » Maintenance building.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, HTF, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Owner O&M Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	Owner O&M Operator	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	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	Owner O&M Operator	Operation and maintenance

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

Performance Indicator	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor. » All appropriate waste disposal certificates with the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING

CHAPTER 9

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

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

» **Site Preparation**

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

» **Disassemble and Remove Infrastructure**

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

9.1. Objectives

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

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

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

**APPENDIX A:
LAYOUT AND SENSITIVITY MAPS**

**APPENDIX B:
KEY LEGISLATION APPLICABLE TO THE
DEVELOPMENT**

**APPENDIX C:
GRIEVANCE MECHANISM FOR PUBLIC
COMPLAINTS AND ISSUES**

**APPENDIX D:
WASTE MANAGEMENT PLAN**

**APPENDIX E:
ALIEN INVASIVE AND OPEN SPACE
MANAGEMENT PLAN**

**APPENDIX F:
RE-VEGETATION AND REHABILITATION PLAN**

**APPENDIX G:
PLANT PROTECTION AND RESCUE PLAN**

**APPENDIX H:
TRAFFIC MANAGEMENT PLAN**

**APPENDIX I:
STORMWATER MANAGEMENT PLAN**

**APPENDIX J:
EROSION MANAGEMENT PLAN**

**APPENDIX K:
FIRE MANAGEMENT PLAN**

**APPENDIX L:
CURRICULUM VITAE OF THE PROJECT TEAM**

