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ESMP SUMMARY

XINA SOLAR ONE PROJECT

Republic of South Africa

MAY 2014

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN SUMMARY

Project Title:	**Xina Solar One Project**
Project Number:	**P-ZA-FF0-003**
Country:	**South Africa**
Division:	**OPSM 3**

1. Brief description of the project and key environmental and social components

1.1 The Pofadder Solar Thermal Plant, being planned by !XiNa CSP South Africa (Pty) Ltd is proposed to consist of Concentrating Solar Power (CSP) and Concentrating/Tracking Photovoltaic Power (CPV) components. !XiNa CSP is located on Portion 4 of the Farm Skuit-Klip 92, which lies approximately 30 km north-east of the town of Pofadder in the Northern Cape in South Africa; the same site covered by the !Kaxu ESIA. The environment and social impact assessment done in the !Kaxu EIA covers both !Kaxu and !Xina projects cumulatively. !XiNa Solar One (RF) (Pty) Ltd, ("XiNa"), is a special purpose vehicle ("SPV") established to carry out the 100 MW concentrating solar power project CSP XiNa Solar One (the Project). The Project entails the design, construction, operation and maintenance of a turnkey, concentrating solar power project with a nominal power of 100 MW. The plant will use parabolic trough technology and a superheated steam cycle with a storage capacity of 1,650 MWh (equivalent to approximately 5 hours of full capacity operation), configured to be used during the South African peak load demand. Following an extensive site identification process undertaken by !XiNa CSP, a 33 km2 site which falls within the Khai !Ma Local Municipality was identified for consideration within an EIA process. A sensitivity analysis was undertaken during the Scoping Phase which identified potentially sensitive areas which should be avoided within the broader 33 km2 site. These sensitive areas included natural drainage lines, areas of increased gradient/slope, and areas containing vegetation of conservation importance. As a result, the southern portion of the triangular shaped site was identified as a preferred area for development of the solar thermal plant, based on the following characteristics:

» ***Relief profile:*** the high relief areas within the north-western and the north-eastern corners of the site should be avoided as the former includes the Konkonsieskop hill and the latte

» ***Centre of Endemism****:* the north-western portion of the site falls within the core vegetation type of the Gariep Centre of Floristic Endemism.

» ***Proximity to the grid connection point:*** being in close proximity to the point of connection to the grid will minimise the length of the power line that is required between the proposed facility and the Paulputs Substation. In turn, this would reduce the potential for the linear disturbance associated with the power line including the potential for impacts on avifauna species.

1.2 Subcomponents among others will include:

» A **steam turbine** and **generator** typically housed within a 2-storey building

» A generator **transformer** and a small **substation** located outside and adjacent to the 2-storey building

» An **auxiliary steam generator** and associated energy storage vessels containing saturated steam, oil or salt (i.e. fossil fuel steam boiler/ generator), proposed to be fired by either diesel fuel or liquid petroleum gas (LPG).

» An **overhead power line** feeding into the Eskom electricity network at the Paulputs Substation, which is situated adjacent to the site

» An **abstraction point** on the Orange River and an associated water **supply pipeline** to the facility of approximately 30 km in length

» A **suspension reservoir** located approximately 3-6 km south of the raw water abstraction point (i.e. outside the boundaries of the identified site) to rid the raw water of particles in suspension (silt)

» A **storage reservoir** located within the boundaries of the identified site. The water stored within the reservoir will be used during the steam generation process (boiler makeup), for washing of the heliostats/mirrors, troughs and PV panels, potable water supply and fire protection supply.

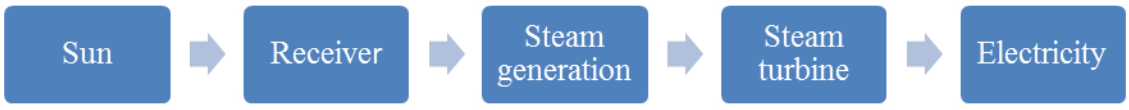
» Lined **evaporation ponds** to allow for the evaporation of process waste water not to be re-used within the facility

» **External access road** leading to the site from the R358 which branches off the N14 towards Onseepkans

» **Internal access roads** for construction and maintenance purposes

» Workshop, office and storage areas

Figure 1: CSP Technology



1.3 As shown above, the parabolic concentrator is made of curved mirrors which track the sun from east to west during the day to ensure that the sun is continuously focused on a synthetic oil filled absorber pipe. The oil in absorber pipe is heated to 395°C and is then transferred to a heat exchanger. At the heat exchanger the oil is used to heat water and generate steam which is used to turn a 100MW steam turbine. The oil is also used to heat 47,155 tons of molten salt, which is placed in massive thermal energy storage tanks which can generate electricity for 5 hours after sunset. Unlike other intermittent, non-dispatchable sources, such as photovoltaic and wind power, where energy cannot be stored and later be converted into electricity, CSP's dispatchability is clearly a key point to supply electricity at evening peaks. It offsets diesel fueled open cycle gas turbine (OCGT) operating at peak demand and avoids fossil fuel electricity generation.

1.4 This field plant will be interconnected by a 3km transmission line ("t-line") to the existing Paulputs substation located adjacent to the Project site on the land owned by Abengoa. Abengoa will construct, finance, own and operate this new short, USD 5.4 million, 220kV line. Due to the location of the sub-station, no relocation or wayleaves are required for the t-line. The t-line is expected to take 3 months to construct, leaving enough buffer until completion of the plant. In accordance with South African law, a minimum stake of 8% has to be held by a local community trust, referred to as Broad Black Based Economic Empowerment company ("BBBEE"). The project will therefore enable BBBEE ownership in the Project and facilitating local economic development through their implementation. In order to achieve these objectives the project shall target the allocation of 20% of the shareholding in the Project Company to a BBBEE. Dividends flowing to the BBBEE HolCo over the life of the project will be applied towards local economic development beneficiary projects.

The specialist studies undertaken in the EIA Phase did not identify any absolute no go areas for the proposed facility. However, the following potentially sensitive areas within the preferred south-eastern portion of the project area were identified:

» Areas of **ecological** sensitivity (i.e. drainage lines, areas with remaining natural vegetation and protected tree species, potential habitat for various red data species, and activities which lead to the proliferation of alien invasive plants)

» Sensitivity in terms of **water resources** (i.e. in terms of drainage lines and riverine areas along the Orange River at the abstraction point)

» Issues regarding **avifaunal** sensitivity (i.e. potential impacts on red data species through collision or electrocution events with the overhead power line and the solar infrastructure)

» Areas of **geological** sensitivity (i.e. drainage lines on-site which may be more susceptible to erosion)

» **Visual** sensitivity (i.e. the visibility of sensitive receptors along major routes, arterial, and secondary roads in the area, built-up centres or populated places and on individual/isolated landowners/homesteads identified within the study area)

2. Major environmental and social impacts

2.1 Various planning, construction, and operation-related environmental impacts identified includes disturbance of the ecological environment (i.e. flora and fauna); impacts on avifauna (i.e. particularly on Red Data Species); impacts on water resources (i.e. in terms of quantity and quality); impacts on the visual aesthetics and sensitive receptors; impacts on the underlying geology (i.e. in terms soil disturbance and erosion; impacts on heritage resources and socio-economic impacts.

2.2 Fauna - it was concluded that no mammal, reptile or amphibians species of conservation cold occur in the project area. Those that would be found would be temporarily affected during construction and Avifauna habitats would also be affected through collision with the infrastructure and electrocution for all fauna.

2.3 Flora - vegetation in the area may be affected during construction and there would be loss of habitats. The area has vulnerable Aloe Dichotoma and protected tree species in the area include Camel Thorn, Grey Camel Thorn, Sheppard's Tree and Cape Ebony but in the project's area only Sheppard's Tree was identified. The trees are however in the part of the area where there will be no construction.

2.4 Water catchment - the non-perennial drainage lines and water courses are classified as wetlands or water resources and therefore construction may lead to changes in the catchment area

2.5 Ecosystem health - Honey Mesquite shrub is potentially the most problematic alien invasive species that may result in ecosystem disturbance in the area.

2.6 Soils & Geology - excavations, compaction, and construction at large will result is acidification, water logging, soil erosion and pollution of land.

2.7 Water resources - riparian vegetation in the area is already in a deteriorated state and construction or concretising some areas may irreversibly destroy the areas during construction.

2.8 Visual impacts - the project shall affect visual impacts both during construction and operations. Within 4km the users of a secondary road with very little traffic volumes will be affected. Between 8-16 km sections of the N14 users and some households may be impacted by sight of the infrastructure.

2.9 Social - the project's impacts on social are mostly positive. They include creation of employment (400-600 jobs during construction and up to 80 during operation) and skills development opportunities. Negative social impacts include disruption to family life, increased number of sexually transmitted diseases, increased crime and alcohol and substance abuse.

3. Enhancement and mitigation program

3.1 Fauna disturbance would be managed through ensuring that construction does not affect unnecessarily large areas and that the same vegetation is kept to ensure continuation of the same ecosystem. **Flora** removed during construction (especially the Bushmanland Arid Grassland and Lower Gariep Broken Veld) shall be replanted. The same applies for tree species even though none were identified even along the lines. **Catchment management** will

be mitigated by complying to permit conditions issued by Department of Water Affairs. **Avifauna** losses will be minimised by avoiding development in the north eastern site and minimum vegetation shall be cleared. The servitudes of the lines will follow existing roads to avoid disturbance of avifauna. Bird deterrent equipment will be installed around the site to minimise collision incidents and perching in general where nesting happens on site, species preservation shall be done by having a procedure of relocating after getting permission from the Northern Cape Department of Environment for relocation of nests for sociable weavers and White Browed Sparrow Weavers.

3.2 Soil erosion control measures will be adopted, chemicals and other polluting substances shall be handled at designated areas. A buffer area of 16 km has been provided for **aesthetics** and the facilities have a life of 30yrs. The transmission visual impacts are not easy to mitigate due to the flat landscape but will be absorbed by existing lines in the area. **Riparian vegetation** will be protected by staying away from such areas and preserving as much vegetation as possible especially woody vegetation. **Storm water** from the site shall be channelled accordingly. Sediment laden runoff from the proposed site of the solar plant is unlike but elevated sediment input into the Orange River during development of the abstraction point will be minimised through sediment traps, and installing stilling basins to capture large volumes of run off. **Social** impacts shall be mitigated by ensuring that most employees are from the surrounding areas, working with an existing or creating an HIV/AIDS awareness program. Further mitigation is entailed in the monitoring program below.

4. Monitoring program and complementary initiatives

Mitigation: Action/Control	Responsibility	Timeframe
DESIGN FAILURE IMPACT		
Undertake pre-construction geotechnical surveys.	Specialists	Design phase
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, flora, water resources and associated ecology, avifauna, and heritage, as detailed within the EIA report and relevant appendices.	EPC contractor, solar component suppliers, and !XiNa CSP	Design review stage
Appropriate bird deterrent devices must be placed at locations around the facility to lessen the impact on avifauna.	EPC contractor !XiNa CSP	Design phase
Obtain all relevant permits (e.g. protected plants and trees) prior to construction in an area.	EPC contractor !XiNa CSP	Design phase
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	EPC contractor !XiNa CSP	Design phase
Road alignments must be planned in such a way that the minimum of cut and fill operations are required.	EPC contractor !XiNa CSP	Design phase
As far as possible, existing roads must be used or upgraded.	"	Design phase
A detailed geotechnical investigation is required for the design phase.	!XiNa CSP	Design phase
Compile a comprehensive storm water management plan for hard surfaces (e.g. substation and power islands footprints) as part of the final design of the project (refer to Appendix D).	EPC contractor, and !XiNa CSP	Design phase
A sustainable design approach should be considered in finalising the design of key elements.	EPC contractor, and !XiNa CSP	Tender design, and design review stage
Submit a final layout to DEA prior to the commencement of construction	EPC contractor, and !XiNa CSP	Pre-construction
ROUTE & SUB-STATION DEGRADING VISUAL AESTHETICS, LOSS. OF INDIGENOUS FLORA, EROSION etc.		
Select an alignment that curtails environmental impacts and enhances environmental benefits.	EPC contractor, !XiNa CSP	Prior to submission of Final EIA

Mitigation: Action/Control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, flora, ecology (i.e. drainage lines), avifauna, and heritage, as detailed within the EIA report and relevant appendices.	EPC contractor	Design phase
Plan new access roads according to contour lines to minimise cutting and filling operations.	EPC contractor	Design phase
Use bird-friendly power line tower and conductor designs.	EPC contractor	Design phase
Monopole bird friendly structures must be used for the power line to minimise the number of electrocutions	EPC contractor	Design phase
The most sensitive landscape features for planning purposes in the study area will be the presence of drainage lines, and areas of indigenous natural vegetation	EPC contractor	Design phase
LOSS OF IMPORTANT HABITAT AND FRAGMENTATION OF THE RIVERINE SYSTEMS		
Select a favourable site having the least impact or within an area that is least sensitive, i.e. the south-eastern portion of the site (i.e. south of the existing Eskom 132kV distribution line).	!XiNa CSP	Planning & design phase
Select a favourable site, having the least impact or within an area that is least sensitive, i.e. the south eastern portion of the site below the existing Eskom 132 kV distribution line.	!XiNa CSP	Planning, and design phase
POOR STORM WATER MANAGEMENT		
The most significant form of mitigation would be to select a development area that contained no drainage lines. However due to the nature of the site, this was not possible, thus an area, with the least number of riparian systems was earmarked, i.e. the south eastern corner of the site. Any stormwater within the site will be handled in a suitable manner, i.e. splitting clean and dirty water streams around the plant, install stilling basins etc.	EPC contractor	Planning, design, and operation phase
AFFECTED LAND OWNERS AND LAND USE		
Compile and implement a grievance mechanism procedure for the public to be implemented during both the construction and operational phases of the facility (refer to generic grievance mechanism included within Appendix E). 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.	!XiNa CSP	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	!XiNa CSP Contractor	“
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	!XiNa CSP Contractor	Pre-construction
CAMP DEVELOPMENT		
The siting of the construction equipment camp will take cognisance of any sensitive areas identified by the EIA studies. The location of this construction equipment camp shall be approved by the project ECO.	!XiNa, and EPC contractor	Pre-construction
No temporary site camps will be allowed outside the footprint of the development area.	EPC Contractor	Contract duration
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	EPC contractor	Construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	EPC contractor	Post construction
SITE ESTABLISHMENT		
Secure site, working areas and excavations in an appropriate manner.	EPC contractor	Construction
Where necessary to control access, fence and secure area.	EPC contractor	Construction
Fence and secure Contractor’s equipment camp.	EPC contractor	Construction
All development footprints for roads, buildings, underground cables, laydown areas should be fenced off or demarcated. There is to be no disturbance outside these demarcated areas without the permission of the ECO.	EPC contractor	Construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	EPC contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands or within a horizontal distance of less than 100 m, whichever is applicable.	EPC contractor	site establishment, construction, and operation
Supply adequate waste collection bins at site where construction is being undertaken.	EPC contractor	Construction
Dispose of all solid waste collected at an appropriately registered disposal sites	Contractor	Construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management	EPC contractor	Site establishment, & construction
EMPLOYMENT DURING CONSTRUCTION		
Ensure that as many as possible of the low-skilled workers are sourced from the local area.	EPC contractor	Before and during construction phase commences.
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase.	EPC contractor	
Identify potential opportunities for local businesses.	!XiNa CSP / EPC contractor	
Where possible source low-skilled workers from the local area, the local area being in and around the towns of Pofadder, Keimoes, and Kakamas where possible.	EPC contractor	Before construction phase
Identify local contractors who are qualified to undertaken the required work and afford them the opportunity to tender for opportunities.	!XiNaEPC contractor	Before construction phase commences
Develop a Code of Conduct to cover the activities of the construction workers housed on the site	!XiNa CSP and, EPC contractor	
Ensure that construction workers attend a briefing session before they commence activities, the aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	!XiNa CSP, and EPC contractor	Before construction phase commences
Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	EPC contractor	Before construction phase commences
On completion of the construction phase all construction workers must leave the site.	EPC Contractor	At the end of the construction phase
Implement an HIV/AIDS awareness and prevention plan (refer to Appendix F)	EPC Contractors	Construction Phase
SAFETY, DUST, NOISE, AIR, NUISANCE, FARMING		
Ensure that open fires on the site are not permitted.	EPC Contractors	Construction Phase
Ensure construction personnel are aware of the consequences of starting a fire on site to avoid	EPC Contractors	Construction Phase
Implement dust suppression measures for heavy vehicles such as wetting roads on a regular basis when required by climatic conditions, such as strong wind conditions and ensuring that vehicles used to transport sand and building materials to and from site are fitted with tarpaulins or covers.	EPC contractor	Pre-construction and during construction
Ensure that all vehicles are road-worthy, drivers are qualified and are made aware of the potential noise, dust and safety issues.	EPC contractor	
Ensure that drivers adhere to speed limits.	EPC contractor	Construction phase
Ensure that damage to roads is repaired before completion of construction phase.	EPC contractor	Prior to completion of construction phase
Ensure that maintenance is done on all public and private access roads used by the contractor in order to minimise erosion and surface damage. Potholes, rutting must be repaired and storm water management mechanisms must be maintained.	EPC contractor	Construction phase
Public and private roads used by the contractor must be maintained and cleaned. Litter, spilled cement and gravel must be cleared from the roads	EPC contractor	Construction phase
Minimise the footprint of the facility and the associated infrastructure.	!XiNa CSP, and EPC contractor	Duration of construction
Rehabilitate disturbed areas on completion of the construction phase.	EPC contractor	

Mitigation: Action/Control	Responsibility	Timeframe
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 damage to roads is repaired before completion of construction phase.	EPC contractor	Site establishment Duration of construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as and where required to minimise/control airborne dust.	EPC contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins.	EPC contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the XiNa's Safety Manager.	EPC contractor	Duration of contract
The frequency of application of dust control/suppressants may have to be increased during periods of high winds if visible dust is blowing toward nearby residences.	EPC contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable as per requirements of the Vegetation Management Plan	EPC contractor	Completion of the construction phase
Vehicles and equipment must be maintained in a road-worthy condition at all times.	EPC contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	EPC contractor	Duration of contract
VEGETATION		
Clearance of indigenous vegetation must be kept to a minimum and rehabilitation of the cleared areas must start as soon as possible.	EPC Contractor	Construction phase
All species of special concern (SSC) must be identified and every effort must be made to rescue and/or protect them.	EPC Contractor Specialist	Construction phase
The *Aloe Dichotoma* tree is endemic to the Northern Cape. Care must be taken as to not damage these trees. If removal of these trees must be done, the necessary permits must be obtained from the relevant Department	EPC Contractor Specialist	Construction phase
The construction impacts must be contained to the footprint of the infrastructure.	EPC contractor	Construction phase
Limit unnecessary impacts on surrounding natural vegetation must be avoided, e.g. driving around in the veld, use access roads only.	EPC contractor	Construction phase
Disturbed areas must be rehabilitated as soon as possible once construction is completed in an area.	EPC contractor	Construction phase
All flora and natural features to be protected during construction must be identified, located and mapped.	EPC contractor and ECO	Construction phase
Areas around to protected flora and natural features that may become damaged during construction must be demarcated/fenced for protection	EPC contractor	Construction phase
Vegetation demarcations must be maintained until the completion of construction work.	EPC contractor	Construction phase
Do not remove any trees or shrubs outside the working areas. Trees earmarked for removal must be marked prior to felling.	EPC contractor	Construction phase
No construction equipment, machinery of vehicles may be parked under any tree.	EPC contractor	Construction phase
No vegetation or natural feature may be disturbed, destroyed or removed, whether fenced, marked or not, for the duration of the Contractor's presence on site, unless authorized by the ECO.	EPC contractor and ECO	Construction phase
Permission must be obtained from the ECO to proceed with any vegetation clearing.	EPC contractor and ECO	Construction phase
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, and !XiNa CSP	Construction, and operational phase
An alien invasive management plan must be compiled and implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	EPC Contractor	Construction phase Operational phase
Establish an on-going 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).	EPC contractor, and !XiNa CSP	Construction, and operational phase

Mitigation: Action/Control	Responsibility	Timeframe
Immediately control any alien plants that become established using registered control methods.	EPC contractor, and !XiNa CSP	Construction, and operational phase
All invasive and exotic alien plants to be eradicated must be identified, located and mapped.	EPC contractor, and !XiNa CSP	Construction, and operational phase
DRAINAGE LINES AND ECOLOGY		
For any new construction, cross watercourses perpendicularly to minimise disturbance footprints.	EPC contractor,	Construction, and operational phase
Rehabilitate any disturbed areas as quickly as possible.	EPC contractor, and ECO	Construction, and operational phase
Control storm water and runoff water.		
Obtain a permit from DWA to impact on any wetland or water resource.	EPC contractor, and ECO	Construction, and operational phase
Restrict construction activity within disturbance areas.	ECO and EPC contractor	Before and during construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.		
Dust control on construction site: wetting of denuded areas, where and when required.	ECO and EPC contractor	During construction
Minimise removal of vegetation which adds stability to soil.	"	"
Rehabilitate disturbance areas as soon practicable when an area is vacated.	"	"
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion.	ECO and EPC contractor	Before and during construction
Erosion control measures: Run-off attenuation on slopes (sand bags, logs), silt fences, storm-water catch-	ECO and EPC contractor	Before and during
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	ECO and EPC contractor	Before and during construction Maintenance for duration of contract
Control depth of excavations and stability of cut faces/sidewalls.		
Compile and implement an erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	EPC Contractor	
Any stormwater within the site will be handled in a suitable manner, i.e. clean and dirty water streams around the plant will be separated and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities (i.e. water used when washing the mirrors). The placement of pump inlets and the supporting infrastructure to prevent the potential for scour / erosion and downstream sedimentation of the Orange River. The current placement is within an area of dense reed growth (*Phragmites australis*), and would not be considered a severe impact. Care should however be taken that if any clearing is done, that this area is monitored for plant re-growth, firstly to prevent alien plant infestations and to ensure no erosion or scour takes place.	EPC contractor	Planning, design, construction and operation phase
» The risk of erosion and bank slumping or collapse during both pre-construction, construction work can readily be prevented by careful design and planning. » Appropriate hard-engineered bank erosion protection structures. » Careful rehabilitation using natural riparian vegetation to stabilize the riverbanks and all disturbed areas in the riparian zone. » Local storm-water run-off over the flood embankments and natural riverbanks could potentially cause erosion and subsequent bank slumping, unless storm-water drains are correctly located and designed with appropriate erosion-control features. » During construction, adjacent riparian habitats outside the "footprint" of the new infrastructure should be declared sensitive habitats and out of bounds for all construction activities and for all construction workers.	EPC contractor	Planning, design, construction and operation phase
HERITAGE		
Provision for on-going heritage monitoring which provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of development or operation.	!XiNa CSP;ECO and EPC contractor	Before commencement of development
All features and sites of social/or cultural historical significance must be identified, located and mapped to be protected during construction.	EPC contractor and ECO	Construction phase
Should any archaeological sites, artefacts, palaeontological fossils or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped, SAHRA informed and the services of an accredited heritage	!XiNa CSP ECO	Construction phase

Mitigation: Action/Control	Responsibility	Timeframe
professional obtained for an assessment of the heritage resources must be made.		
VISUAL IMPACTS		
Implement an environmentally responsive planning approach to roads and infrastructure to limit cut and fill requirements.	EPC contractor	During construction
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	EPC contractor	During construction
Limit access to the construction sites (during both construction and operational phases) along existing access roads.	EPC contractor	Construction / operational phases
Rehabilitate all disturbed areas to acceptable visual standards.	EPC contractor	
Maintain the general appearance of the facility in an aesthetically pleasing way by maintaining the site in a neat and tidy condition and keeping the site free of litter.	!XiNa CSP	Construction and Operational phase
The visual impact of the pipeline must be mitigated by placing the pipe underground and rehabilitating the vegetation within the pipeline servitude.	EPC contractor	Construction and operational phases
Ensure that proper planning is undertaken regarding the placement of lighting structures. Undertake regular maintenance of light fixtures.	EPC contractor and !XiNa CSP	
Ensure that proper planning is undertaken regarding the placement of lighting structures.	EPC contractor	Construction, operation, and maintenance
Care must be taken in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.	EPC contractor	Erection and maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	!XiNa CSP	Operation and maintenance
Undertake regular maintenance of light fixtures.	!XiNa CSP	
Limit access to the solar energy facility site, power line, water supply pipeline and associated infrastructure.	!XiNa CSP	
Avoid the unnecessary removal of vegetation for the distribution power line servitude and limit access to the servitudes (during both construction and operational phases) along existing access roads.	EPC contractor and !XiNa CSP	
TRAFFIC & MOVEMENT OF EQUIPMENT		
All relevant permits for abnormal loads must be applied for from the relevant authority.	EPC contractor	Pre-construction
A designated access to the proposed site must be created to ensure safe entry & exit.	EPC contractor	Pre-construction
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	Pre-construction
Appropriate dust suppression techniques must be used to minimise dust emissions on un-surfaced roads when and if required.	EPC contractor	Duration of contract
Times for arrival and departure of heavy vehicles must be co-ordinated to minimise congestion as is possible.	EPC contractor	Duration of contract
Any traffic delays as a result 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).	EPC contractor	
Appropriate maintenance of all vehicles of the contractor must be ensured	EPC contractor	
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
Keep hard road surfaces as narrow as possible.	EPC contractor	Duration of contract
Prevent damage to roads by construction vehicles.	EPC contractor	
Fine grained aggregates transported to and from site must be covered with tarpaulins.	EPC contractor	
Overloading of any transport vehicles is prohibited.	EPC contractor	
Compile and implement a traffic management plan for the site access road to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters.	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
HANDLING AND STORAGE OF CHEMICALS AND HAZARDOUS SUBSTANCES AND WASTE		
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	EPC contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is received, 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
Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	EPC Contractor	Duration of contract
Leakage of fuels must be avoided at all times and if spillage occurs, it must be remediated immediately.	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 and disposal at appropriately licensed waste disposal sites.	EPC contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	EPC contractor	Duration of contract
Waste and surplus dangerous goods 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 and ECO	Duration of contract.
An incident/complaints register must be established and maintained on-site.		
The sediment control and water quality structures used on-site must be monitored and maintained in a fully operational state at all times.	EPC contractor	Duration of contract
An integrated waste management approach that is based on waste minimisation must be used and must incorporate reduction, recycling, re-use and disposal where appropriate. A waste management plan must be implemented for the duration of construction (refer to Appendix J).	EPC Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	EPC contractor	Completion of construction
Wire fencing around all development footprints in areas of natural vegetation as determined by the ecological specialist. The wire to be inter-threaded with two coloured shade cloth netting, and signage saying "Sensitive Area – Keep Out / Sensitiewe Gebied – Bly Weg" placed on fences at appropriate intervals.	ECO and EPC Contractor	To be completed prior to construction activities
All temporary facilities, equipment, and waste materials must be removed from site.	EPC contractor	Following execution of the works
All temporary fencing and two coloured shade cloth netting must be removed once the construction phase has been completed.	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	
Hazardous substances (such as used/new transformers) must be stored in sealed containers within a clearly demarcated designated area.	!XiNa CSP	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	!XiNa CSP	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.	!XiNa CSP	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it will be cleaned up according to specified standards regarding bioremediation.	!XiNa CSP	Operation and maintenance
Waste handling, collection, and disposal operations must be managed and	!XiNa CSP / waste	Operation

Mitigation: Action/Control	Responsibility	Timeframe
controlled by a waste management contractor.	management contractor	
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.	!XiNa CSP	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	!XiNa CSP	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	!XiNa CSP	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	!XiNa CSP	Operation
DISTURBED AREAS		
A rehabilitation plan should be drawn up that specifies the rehabilitation process and should be approved by the ECO.	EPC contractor, !XiNa CSP and ECO	Pre-construction
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 the ECO.	EPC contractor, ECO	Following completion of construction activities
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	!XiNa CSP, ECO	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills and drainage lines where necessary.	!XiNa CSP, ECO	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	!XiNa CSP, ECO	Post-rehabilitation
Vehicle movements must be restricted to designated roadways.	!XiNa CSP	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	!XiNa CSP	Operation
An on-going weed monitoring and eradication programme must be implemented, where necessary.	!XiNa CSP	Operation
An environmental manager must be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.	!XiNa CSP	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	!XiNa CSP and specialist	Annual monitoring until successful re-establishment of vegetation in an area
Fire breaks should be established, where appropriate and applicable.	!XiNa CSP	Duration of contract
Appoint an environmental manager during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.	!XiNa CSP	Operation
PROTECTION OF AVIFAUNA AND PRIORITY BIRD SPECIES		
Fit the earth wire with bird marking/deterrent devices (i.e. in defined problem areas) which have proved to be extremely effective in preventing bird collisions by making the line more visible.	EPC contractor and !XiNa CSP	Construction
The power line should be kept as low as possible taking into account engineering and legal requirements.	EPC contractor	Construction
The span lengths should be kept as short as possible taking into account engineering and legal requirements.	EPC contractor	Construction
Notes of electrocution and collision events must be sent to a qualified Ornithologist for the recommendation of further mitigation measures	!XiNa CSP	Operation
FIRE CONTROL		
Provide adequate fire-fighting equipment on-site.	EPC contractor	Duration of construction
Provide fire-fighting training to selected operation and maintenance staff.	EPC contractor	
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	!XiNa CSP	Pre-construction
LABOUR UNREST		

Mitigation: Action/Control	Responsibility	Timeframe
Retrenchments should comply with current South African Labour Legislation.	!XiNa CSP	At decommissioning

5. Institutional arrangements and capacity building requirements

As the proponent, !XiNa CSP shall ensure that the implementation of the solar energy facility complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation and lender's requirements. This obligation is partly met through the development of the ESMP, and the implementation thereof through its integration into the contract documentation. !XiNa CSP will retain various key roles and responsibilities during the construction of the solar energy facility. These are outlined below.

The **Project Manager** (EPC contractor's on-site representative) will:

- Ensure that all specifications and legal constraints specifically with regards to the environment are highlighted to the EPC Contractor(s) so that they are aware of these
- Ensure that the EPC Contractor(s) are made aware of all stipulations within the ESMP
- Ensure that the ESMP is correctly implemented throughout the project by means of site inspections and meetings with the site Manager, ECO and EPC Contractor. This will be documented as part of the site meeting minutes
- Be fully conversant with the EIA for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation

The **Site Manager** (!XiNa CSP's on-site representative) will:

- Be fully knowledgeable with the contents of the EIA
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued)
- Be fully knowledgeable with the contents of the ESMP
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these
- Have overall responsibility of the ESMP and its implementation
- Conduct audits to ensure compliance to the ESMP
- Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- 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) shall be appointed by !XiNa CSP prior to the commencement of any authorised activities. The **ECO** 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. The ECO shall remain on site on a full-time basis until the end of Phase 4 as per the Project Management Plan. Thereafter, monthly or bi-weekly site compliance inspections would probably be sufficient, reducing as construction proceeds, provided compliance is maintained. 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.

An **Environmental Officer** (EO) shall be appointed by the EPC contractor prior to the commencement of any authorised activities. The **EO** will be responsible for ensuring compliance by the EPC Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation.
o a minimum, as far as possible

EPC Contractors and Service Providers: 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

The Project Manager may suspend any activity if the EPC contractor fails to comply with any specifications of the EMP and/or relevant environmental, Health and Safety and Construction legislations.

6. Public consultations and disclosure requirements

In order to ensure that the views and interests of all project stakeholders are taken into accounts, public consultation has been carried out with relevant decision making and regulating authorities at national, provincial and local levels. Authority consultation with the National Department of Environment (the competent authority for authorisations) are conducted throughout all phases (pre, during and post) the development. A 30 day public review of the scoping report was undertaken and all stakeholders' inputs were recorded and taken into consideration. The ESIA report also went through a 30-day public review process. The Authorities were given an opportunity to visit the project site and among the consulted authorities. Among others authorities consulted included The South African Heritage Resources Agency; Department of Water Affairs; South African National Roads Agency Limited; Department of Agriculture; Department of Public Works; the municipality and conservation authorities. The public were encouraged to participate by registering as interested and affected parties. Interactions with the public were done in the form of focus groups meeting, public meetings advertised trough local press and email and fax where required. A general meeting was held on 29 November 2010 at the municipality offices. Issues raised by the public pertained to community development and employment opportunities; development of renewable energy projects; site selection motivation; project progress; the use of water resources and public participation. All issues raised by the public were included as part of the ESMP update approved in 2014 by the Department of Environmental Affairs. The EMP update further went through a 30 day public review process in 2013.

7. Estimated costs

Plan	Cost / Currency
1 - Construction Environmental Management Plan	916/456 $
2 - Public relations / stakeholder / community management plan	8.000 $
3 - HIV-AIDS awareness and prevention program (Annexed to H&S Plan)	5.000 $
4 - Security protocol and plan (Annexed to H&S Plan)	1.1 MUSD
5 - Emergency Preparedness and Response Plans (Annexed to H&S Plan)	1.3 MUSD
6 - List of Hazardous Materials that will be on site during construction (Annexed to H&S Plan)	Inc. @ pt.8
7 - Waste Management Plan during Construction	295.484$
8 - Health and Safety Plan	20M$
9 - Project Construction Management Plan	8000$
10 - Fire Management Plan (Annexed to H&S Plan)	(Inc. @ pt.8)
11 - Stormwater Management Plan	3M Euros
12 - Worker's Grievance Mechanism	8.000$
13 - Quality Plan	212.736$
14 - Labour Accommodation Plan	480.000$

8. Implementation schedule and reporting

The implementation agreement foresees up to 36-month construction period, commercial operation, followed by 20 years of operation. Nominated turnkey EPC Contractor is a joint venture comprising Abener & Teyma, subsidiaries of Abengoa and a BBBEE entity. Eskom Holdings will be the off-taker (20y PPA with energy payment, take-or-pay, and grid connection agreement with Eskom). O&M will be undertaken by another SPV predominately owned by Abengoa (20y O&M contract). The project will report any archeological findings to the South African Heritage Authority as and when they are suspected or found. The project will report to the Department of Water affairs as per all the water licence requirements. There will also be reporting to the Department of Environmental Affairs in line with the record of decision and its subsequent updates A decommissioning plan shall be submitted for approval to the national environmental authorities in line with the authorisation. The project shall conduct a full ESMP compliance audit and the report thereof shall be submitted to the AfDB annually during operation and quarterly during construction. The departments of water and environmental affairs will also undertake compliance monitoring in line with their authorisations and such reports shall be made available to the AfDB as part of the annual reporting.