Appendix F: Impacts Assessment Methodology

A number of potential impacts (ecological, visual, soils, heritage, and agricultural potential) were assessed through the basic assessment process for the proposed Garob Wind Farm to existing Kronos Substation 132 kV Power line, near Copperton in the Northern Cape Province. These impacts were identified through specialist reports, and are included in **Appendix D** of the Basic Assessment Report. All the specialists followed the methods outlined below to completely evaluate and assess the environmental impacts associated with the development.

Potential impacts associated with the construction and operation of the proposed 132kV power line and associated infrastructure are discussed below. The following methodology was used in assessing impacts related to the proposed development. All impacts are assessed according to the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected.
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - Medium-term (5–15 years) – assigned a score of 3;
  - Long term (> 15 years) - assigned a score of 4; or;
  - Permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);

- Assigned a score of 2 is improbable (some possibility, but low likelihood);
- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» The **status**, which is described as positive, negative or neutral.
» The degree to which the impact can be reversed.
» The degree to which the impact may cause irreplaceable loss of resources.
» The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance** weightings for each potential impact are as follows:

» < **30 points**: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» **30-60 points**: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
> 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Impact Assessment

IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN PHASE
Alternative (preferred alternative)

No impacts are anticipated that may result from the planning and design phase of the proposed development.

IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION AND OPERATIONAL PHASES

1. Potential impacts on Ecology (Flora & Fauna)

Potential ecological impacts resulting from the development of Proposed Garob Wind Farm to existing Kronos Substation 132 kV Power line would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project including the following:

Construction Phase
» Vegetation clearing & site preparation
» Operation of heavy machinery at the site
» Human presence

Operational Phase
» Site maintenance activities
» Human presence

The above activities are likely to manifest themselves as the following impacts:
» Impacts on vegetation and listed plant species
» Direct and indirect faunal impacts
» Increased ecological degradation

The major impact resulting from the development is likely to occur during the construction phase, but this would be transient and in the long-term the operational phase of the power line is not likely to generate significant terrestrial ecological impact.

Significant Plant species

Garob Substation (The proposed power line runs from the on-site Garob substation located roughly in the centre of the wind farm property, southwest towards the R357)

The site consists of an open shrubland dominated largely by low woody shrubs such as *Pentzia incana*, *Ruschia spinosa*, *Aptosimum marlothii*, *Rosenia humilis and Pegolettia retrofracta*. Grasses are also present typically consisting of *Stipgrostis obtusa*, *Enneapogon desvauxii*, *Stipagrostis ciliata* and *Eragrostis lehmanianna*. Larger shrubs consist of *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Lycium pumilium*. No listed or protected species were observed within the substation footprint and it is very unlikely that any such species were not observed within the affected area. The substation location is not considered sensitive however the initial section of the overhead line runs through a similar area before traversing a short section of the quartzitic hills.

Substation to Quartzitic Ridge (from the substation the power line route runs across the plain and over a low quartzitic ridge)

The gently sloping plain leading towards the ridge is more sandy than the area around the substation and is consequently dominated by a higher proportion of grasses, largely *Stipagrostis ciliata* and *Stipagrostis obtusa*. Woody species common on the plain includes *Salsola tuberculata*, *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Lycium bosciifolium*. There are also scattered individuals of the alien tree *Prosopis glandulosa* on the plain. Along the ridge itself the density of large woody plants increases significantly with species such as *Acacia mellifera*, *Boscia albitrunca* and *Rhus burchellii*. The species richness of the ridge areas is higher than the adjacent plains and is considered relatively sensitive. Species of significance which were observed on the ridges include *Lithops hallii, Pachypodium succulentum*, *Mestoklema tuberosum*, *Tritonia laxifolia*, *Aloe claviflora* and *Avonia ustulata*. The extent of the line across the ridge habitat is however short and the power line traverses the rocky ridge for less than 500m.

Quartzitic Ridge to R357 (From the ridge the line traverses a flat open plain towards the R357)

The area near the ridge has fairly deep sandy soils and is dominated by similar species to the plain on the other side of the ridge. Away from the ridge the soils are a lot more silty and contain a larger proportion of woody shrubs such as *Salsola tuberculata*, *Eriocephalus ericoides subsp. ericoides, Pentzia incana* and *Rosenia humilis*. This is not a sensitive community and no listed plant species were observed or are likely to occur in this area. The community is lightly invaded by *Prosopis glandulosa*. This community occupies about 3.5km of the power line route and as such is one of the more extensive communities occupied by the route.

R357 to Kronos Substation (The final section of the power line route from where it meets the R357 to the Kronos substation)

The final section occurs on shallow stony soils dominated by woody and succulent shrubs. Typical species include *Zygophyllum lichtensteinianum, Lycium cinereum, Hermannia spinosa, Pteronia sordida, Pteronia inflexa, Osteospermum armatum* and *Aristida adscensionis*. This is a low and open vegetation type and there are few trees or larger woody elements present. The distribution of this community type at the site coincides with the distribution of Bushmanland Basin Shrubland and the composition is typical for that which has been described for this vegetation type. This is not considered a sensitive community type and there are not likely to be any major impacts associated with this section of the route. In terms of the extent, this is largest community present along the route as it occupies the last 7 km of the route indicating that is forms more than half the route.

Drainage Lines

The drainage lines at the site are generally poorly developed on account of the low rainfall and flat topography. There are no major drainage lines within the power line corridor. Between the substation and the first deviation in the line, the route traverses a large drainage basin through which water occasionally moves, there is however no clearly defined drainage channel and the area is characterized by deeper sandy soils and the predominance of large shrubs such as *Rhigozum trichotomum*, *Phaeoptilum spinosum and Lycium oxycarpum*. Towards the Kronos substation the route traverses a depression with an open drainage course at the bottom. In this area the vegetation is characterized by species such as *Lycium horridum*, *Rhigozum trichotomum* and *Osteospermum armatum*. These areas are considered more sensitive than the surrounding landscape and disturbance within these habitats should be kept to a minimum as they are vulnerable to erosion on account of the water which moves these areas on occasion.

Faunal Communities

Terrestrial Mammals

The site falls within the distribution range of 43 terrestrial mammal species, indicating that the potentially has quite high mammalian diversity. However, only two species of conservation concern may occur at the site, the Black-footed cat Felis nigripes (Vulnerable) and the Honey Badger Mellivora capensis (SA RDB Endangered).

Reptiles

The site falls within the distribution of range of 39 reptile species and an additional four species have been recorded from the area by SARCA, which are outside their published distribution range. No listed reptiles are known from the area, which when considered in light of the low footprint of the current development suggests that significant impacts on reptiles is not likely to occur as a result of the development of the power line and substation. It is likely that the structure provided by the substation will attract species such as geckos and agamas which utilize such man-made habitats.

Amphibians

The site lies within the distribution range of 10 frog species. Of these, only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened. This species is associated with temporary pans and as there were no temporary or permanent water bodies within the site, it is not likely that it is an important area for the Giant Bullfrog. .

Ecological Sensitivity

The ecological sensitivity map for the site is depicted below (Figure 1). The rocky hill and the drainage areas are the only major features of a sensitive nature which occur along the power line route. There are no perennial drainage channels present or other sensitive habitats of features that would require specific attention or avoidance from the development. Given that the line traverses the rocky hills for less than 500m it is not likely that the line would have a highly significant impact on this environment. Similarly, the impact on the ephemeral drainage areas can also be kept to a minimum through the considered placement of the pylons.

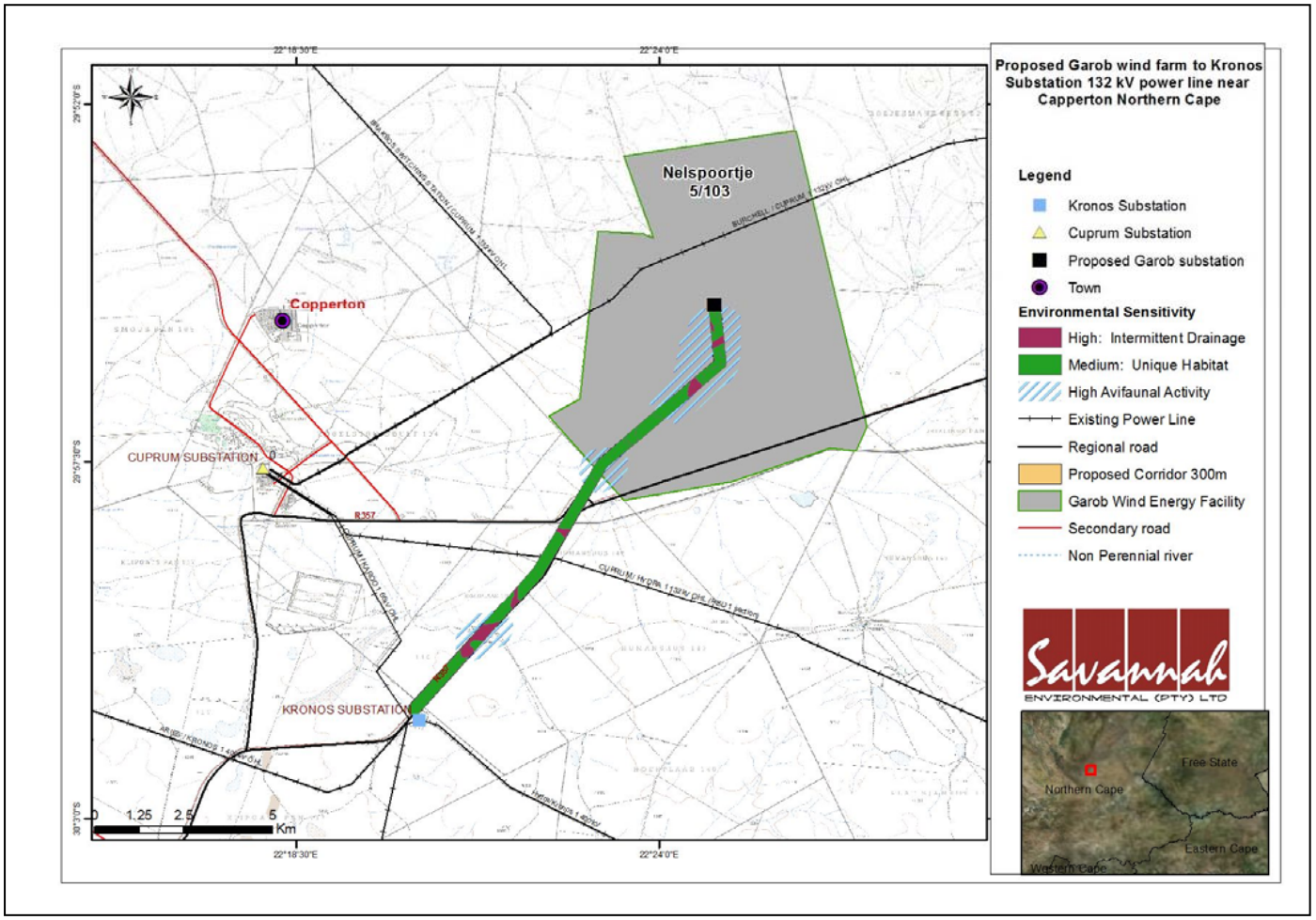

Figure 1: Ecological Sensitivity map of the proposed Garob Wind Energy Facility to existing Kronos Substation 132kV power line corridor

Nature: Impacts on vegetation and protected plant species would occur due to construction activities such as site clearing and access roads

Some loss of vegetation is an inevitable consequence of the development. The vegetation will have to be cleared for the along parts of the power line route to create access roads. No listed species were observed at the substation site, but a variety of protected species are likely to be present along the power line route, especially the section over the rocky hills.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (2)
Magnitude	Medium-Low (3)	Low (2)
Probability	Highly Likely (4)	Probable (3)
Significance	**Medium (32)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a large extent	

Mitigation:

» Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
» The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction.
» No collection of plants or plant parts to be allowed by construction personnel. The ECO should provide environmental induction to all construction staff to ensure that they are aware of this and other environmental sensitivities at the site.
» No fuelwood collection should be allowed on-site.
» No fires allowed on-site.

Cumulative impacts:

» The potential for cumulative impacts is quite low on account of the small development footprint of power line in relation to the overwhelmingly intact nature of the surrounding landscape.

Residual Impacts:

» Some loss of vegetation is inevitable and cannot be avoided

Nature: Fauna will be directly and indirectly impacted by the development as a result of construction activities (power line and access roads) and human presence at the site.

The substation and power line will result in some habitat loss for fauna. The activity and noise generated during the construction phase will also deter many fauna from the area and there will also be secondary risks such as poaching, illegal collection and collision with

construction vehicles.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (3)	Short-term (3)
Magnitude	Medium (4)	Medium-Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (32)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some extent	

Mitigation:

» Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
» No dogs should be allowed on site.
» If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
» No unauthorized persons should be allowed onto the site.
» All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. Educate staff to keep construction activities within the demarcated areas.

Cumulative impacts:

» The potential for cumulative impacts is relatively low as there are few other developments currently underway in the area which might generate similar impacts.

Residual Impacts:

» Residual impacts for fauna can be mitigated to a large degree, although some mortality of a few immobile species can be expected.

Nature: Habitat Loss and Ecological Degradation.

Disturbance created at the site during construction (power line and access roads) would leave the site vulnerable to alien plant invasion, erosion and would potentially result in the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in local climate or other conditions. The woody invasive *Prosopis glandulosa* is already present at the site and is likely to invade disturbed areas if not controlled.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)

Duration	Medium-term (3)	Short-term (2)
Magnitude	Medium (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Disturbance related impacts can be mitigated but not the impacts related to the presence of the permanent infrastructure.	

Mitigation:

» Hardened surfaces should be kept to a minimum
» Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road, except in very steep areas where it would be difficult to prevent erosion of natural surfaces.
» Should a service road beneath the power line be required, this should be restricted to a track and a formal cleared road should not be necessary, especially through the rocky hills and drainage lines.
» Vegetation should be allowed to remain alongside or encroach on the roads as much as possible.
» Temporary lay-down areas should be in previously transformed areas or areas that will be used by the development.
» Regular monitoring for erosion during construction to ensure that no erosion problems have developing as result of the construction disturbance.
» All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques

Cumulative impacts:

» The development would contribute a small amount to the cumulative loss of landscape connectivity, but this is not likely to be highly significant when considered at the landscape scale.

Residual Impacts:

» Although the construction phase itself will be transient and is not likely to result in any long-term impacts, the infrastructure will remain and it may take many years for the disturbance created during construction to recover. The extent of the development is however limited and this is not likely to be highly significant.

Operational Phase

Nature: Impacts on vegetation and protected plant species

Maintenance or repair activities (power line and access roads) could impact intact vegetation and individuals of listed or protected plant species.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (2)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Unlikely (2)

Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Site access should be controlled and only authorized staff and contractors should be allowed on-site.
» Notice boards stating that fauna and flora may not be collected, harvested etc should be placed at the entrances to the site.
» Any maintenance activities should avoid listed plant species and strive to keep the footprint as low as possible.
» No herbicides should be used and if vegetation clearing needs to take place, this should be done by hand.
» Although it is not likely to be required, if any taller vegetation needs to be cleared beneath the power line to comply with the Eskom requirements, this should be done by hand and protected species should be avoided where possible. Alternatively, it may be possible to reduce the height of some species by cutting the trees back and allowing them to resprout without killing them. As the growth rate of important species is very slow, this would not need to be occur very often.

Cumulative impacts:

» The contribution of the current infrastructure to the overall cumulative impact in the area would be low as the footprint is very low in comparison to the wind farm development itself

Residual Impacts:

» The area is not highly sensitive and with mitigation, there will be very little residual impacts on the terrestrial environment.

Nature: Impacts on the faunal habitat due to the proposed development (power line and access roads)

The presence of the power line and associated infrastructure (including access roads) will impact fauna as a result of some permanent habitat loss as well as from increased levels of human activity likely to be associated with the operation and maintenance of the infrastructure.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium-Low (4)	Low (3)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (27)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Some aspects such as those relating to human activity can be mitigated, but habitat loss cannot be	

	mitigated as it is a long-term impact
Mitigation: » The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. » No dogs should be allowed on site. » If the substation buildings must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » No unauthorized persons should be allowed onto the site. » All maintenance vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	
Cumulative impacts: » The operation of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.	
Residual Impacts: » Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated, but is not very large or significant.	

Nature: Habitat loss and ecological degradation The presence of the infrastructure and the alterations to the habitat will disrupt the connectivity of the landscape for some fauna which may avoid passing through the area and the residual disturbance from the construction phase will leave the site vulnerable to alien plant invasion and erosion. .		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium-low (4)	Low (3)
Probability	Probable (3)	Unlikely (2)
Significance	**Medium (30)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Disturbance related impacts can be mitigated, but not those elements related to the presence of the permanent infrastructure.	
Mitigation: » Hardened surfaces should be kept to a minimum » Roads should be as narrow as possible and as short as possible. A natural surface such as gravel would be preferable to a tarred or concrete road.		

» Vegetation should be allowed to remain alongside or encroach on the roads as much as possible. » Regular monitoring for erosion post-construction to ensure that no erosion problems have developed as result of the past disturbance. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » Regular monitoring for alien plant invasion, which is likely to occur in previously disturbed areas or in areas receiving runoff from the hardened surfaces of the infrastructure.
Cumulative impacts: » The development would contribute a small amount to the cumulative loss of landscape connectivity and habitat degradation, but this is not likely to be highly significant after mitigation when considered at the landscape scale.
Residual Impacts: » Provided with regular monitoring with associated intervention where necessary to prevent alien plant invasion and erosion, there would be very little residual impact.

Implications for Project Implementation

» Removal of vegetation and trampling in the area must be kept to a minimum.
» The final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction.
» No collection of plants or plant parts to be allowed by construction personnel.
» If the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
» Along the power line some species of conservation concern are likely to be encountered, particularly within the section along the rocky hills. This section is however short and number of affected individuals is likely to be very low. Minor adjustment of the pylon positions would most likely to be sufficient to avoid damage to such species. Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
» Educate staff to keep construction activities within the demarcated areas.
» Species of Special Concern should be identified and rescued.
» Species of special concern should be rescued however if a species cannot be rescued it must be avoided and untouched.
» Permits will be required to remove species of special concern.
» Avoid fragmentation of vegetation by avoiding clearing large areas of vegetation, especially for roads.
» Where possible, access roads and tracks should be aligned with existing roads on site.

» The power line must to be erected in such a way as to ensure any sensitive vegetation or habitats are avoided, therefore the power line may not be erected in a straight line.
» Removal of existing alien species should be consistently done.
» Rehabilitation of disturbed areas after the construction of the power line should be done as soon as possible after construction is completed.
» An on-going monitoring program should be implemented to track whether alien species are becoming established and assist with the management of the infestations.

2. Potential impacts on Avifauna

Up to 97 bird species could occur on the site, including 3 Red Data species: 1 Vulnerable (Ludwig's Bustard *Neotis ludwigi*); and 2 Near-threatened (Greater Flamingo *Phoenicopterus roseus* and Sclater's Lark *Spizocorys sclateri)*. In addition to these a number of other species are considered likely to occur in the area. Of the priority species for this project, the Ludwig's Bustard is of most concern.

The birds of greatest potential relevance and importance in terms of the possible impacts of the proposed power line are likely to be:

» The priority species are probably Ludwig's Bustard and Sclaters Lark, although the likelihood of either occurring in any abundance on site is low.
» Other large terrestrial species that are likely to occur in the area include Secretary bird (Near-threatened), and non-threatened species such as Northern Black Korhaan and Karoo Korhaan.
» Various large raptors such as Verreaux's Eagle Aquila verreauxii could also occur in the area. Greater Kestrel and Southern Pale Chanting Goshawk are medium size raptors that are frequently recorded in the area.
» It must be noted that many "non Red Data" bird species also occur in the study area and could be impacted on by the power line. Although this impact assessment focuses on Red Data species, the impact on non Red Data species was also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red Data species will also protect non Red Data species in the study area.

Nature: Destruction of natural bird habitat on and near site – impact on sensitive and threatened species and habitat specialists.
During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to

allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat.

Habitat destruction will undoubtedly occur, however the general nature of the study area (already relatively disturbed, and extremely uniform throughout wider area) means that this is not likely to impact significantly on the avifauna of the area.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium(32)**	**Medium(32)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss?	Yes – bird habitat	Yes
Can impacts be mitigated?	Yes – but only partially, some habitat removal is inevitable	

Mitigation:

The primary mitigation measure is to ensure that any sensitive habitats along the alignment are spanned by the line, i.e. ensuring that no pylons or poles are erected in these sensitive areas. The sensitive areas have so far been identified to be the drainage lines, shown in the figure below. These areas should also be avoided as far as possible by vehicles and heavy machinery. In addition care should be taken to minimise any unnecessary impact on the vegetation in these areas through activities such as storing materials, turning vehicles, labour camps and others.

Cumulative impacts:

The cumulative impacts of the construction of new electrical and energy infrastructure in this Copperton area could be quite significant. This author is aware of at least two other wind energy facilities and several solar facilities proposed. All of these facilities, plus their grid connection power line, will remove a significant amount of natural vegetation from the land surface in this wider area. A full cumulative impact assessment is beyond the scope of this current study, and the competitive nature of the bidding process makes it unlikely that developers will provide information on all projects. It is however recommended that the Department of Environmental Affairs take note of the number of applications for this area and intervene by commissioning a full cumulative impact assessment if deemed necessary.

Residual Impacts:

The residual impacts of the proposed power line would be primarily through habitat alteration. In these arid areas it can take a very long time for vegetation to recover. It is therefore likely that the residual impacts would be relatively high.

Nature: Disturbance of birds on site and in surrounding area. Sensitive and threatened species are of most concern and particularly whilst breeding.
Construction and maintenance activities impact on bird through disturbance, particularly during breeding activities.

Certain bird species could also choose to nest on the pylons of the proposed power line. In this arid and largely tree less landscape any form of available nesting substrate will probably be utilised by medium sized raptors, crows and the Sociable Weaver (a nest of which is pictured on the title page of this report). Since the proposed power line is likely to be built on a monopole structure, which is not the most conducive structure for nesting, and this interaction is not strictly speaking an impact of the proposed development

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Very short (1)	Very short (1)
Magnitude	Minor (2)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Low (16)**	**Low (16)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss?	Yes – bird habitat	Yes
Can impacts be mitigated?	Yes – but only partially, some disturbance is inevitable.	

Mitigation:
The primary mitigation measure is to ensure that any sensitive habitats along the alignment are spanned by the line, i.e. ensuring that no pylons or poles are erected in these sensitive areas. The sensitive areas have so far been identified to be the drainage lines, shown in the figure below. These areas should also be avoided as far as possible by vehicles and heavy machinery. In addition care should be taken to minimise any unnecessary impact on the vegetation in these areas through activities such as storing materials, turning vehicles, labour camps and others. It is possible that one or more sensitive bird species could be found breeding close to the alignment. The avifaunal walk through (recommended elsewhere in this report) will determine this if the season is appropriate. Alternatively the environmental control officer will need to survey the area when construction starts. Case specific mitigation measures and management plans will then need to be drawn up by a suitably qualified ornithologist.

Cumulative impacts:
The cumulative impacts of the construction of new electrical and energy infrastructure in this Copperton area could be significant. This author is aware of at least two other wind energy facilities and several solar facilities proposed. All of these facilities, plus their grid connection power line, will represent quite a significant disturbance to avifauna in the wider area. A full cumulative impact assessment is beyond the scope of this current study, and the competitive nature of the bidding process makes it unlikely that developers will provide information on all projects. It is however recommended that the Department of Environmental Affairs take note of the number of applications for this area and intervene

by commissioning a full cumulative impact assessment if deemed necessary.

Residual Impacts:

Since the disturbance of avifauna is a short term, temporary impact, there should be no residual impact after the power line is decommissioned.

Nature: Electrocution of birds whilst perched or roosting on pylons or towers. Mostly large eagles affected.

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. Electrocution is possible on 132kV lines such as those proposed, depending on the exact pole structure used.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium (48)**	**Low (16)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss?	Yes – birds are killed	Yes
Can impacts be mitigated?	Yes – but only partially, some habitat removal is inevitable	

Mitigation:

Eskom has guidelines and standards for the construction of bird friendly pole and pylon structures. These should be adhered to. Only a bird friendly pole structure should be used. It is recommended that a monopole structure be used with the standard Eskom Bird Perch installed on all pole tops in order to provide safe perching substrate for bird well clear of the dangerous hardware below. Large eagles occur in the area, and anecdotal reports (from the Garob Wind Energy Facility landowner) exist of vultures (probably White-backed Vulture) occasionally visiting the area. This means that the pole structure must be designed to accommodate these large birds.

Cumulative impacts:

The cumulative impacts of the construction of new electrical and energy infrastructure in this Copperton area could be significant. This author is aware of at least two other wind energy facilities and several solar facilities proposed. All of these facilities, plus their grid connection power lines, will remove a significant amount of new perching substrate in this wider area, where natural perches are largely absent. This means that the cumulative electrocution risk could be quite substantial. Fortunately this impact is more easily mitigated than the others under discussion in this report, through simply ensuring that all pylon and pole tops are 100% bird friendly. A full cumulative impact assessment is beyond the scope of this current study, and the competitive nature of the bidding process makes it unlikely that developers will provide information on all projects. It is however recommended that the Department of Environmental Affairs take note of the number of applications for this area and intervene by commissioning a full cumulative impact

assessment if deemed necessary.

Residual Impacts:

If the power line is decommissioned the impact will cease and there will be no residual impact, except for any birds already killed.

Nature: Collision of birds with overhead cables, in particular the earth wires of the proposed power line.

Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality, with the result that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (6)	Minor (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium(48)**	**Low(16)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss?	Yes – birds are killed	Yes
Can impacts be mitigated?	Yes – but only partially, line marking devices are not fully effective for some species.	

Mitigation:

The high risk sections of this power line must be installed with suitable and Eskom approved anti bird collision line marking devices. The best device available at the time of construction must be used. Either Eskom or Juwi (whoever operates and maintains the line) will be responsible for ensuring that these devices are in working order, and replacing them if not. It is recommended that in order to identify the exact spans of line requiring marking, an avifaunal walk through be done as part of the site specific environmental management plan for this project. This exercise will identify the high risk sections of line, as well as considering other factors such as any breeding sensitive species on or close to site. This report has identified the high risk line generically in the figure below.

Cumulative impacts: The cumulative impacts of the construction of new electrical and energy infrastructure in this Copperton area could be significant. This author is aware of at least two other wind energy facilities and several solar facilities proposed. All of these facilities, plus their grid connection power lines, will represent a significant amount of new

overhead power line in this wider area. This means that the cumulative collision risk could be quite substantial. A full cumulative impact assessment is beyond the scope of this current study, and the competitive nature of the bidding process makes it unlikely that developers will provide information on all projects. It is however recommended that the Department of Environmental Affairs take note of the number of applications for this area and intervene by commissioning a full cumulative impact assessment if deemed necessary.
Residual Impacts: Once the line is decommissioned the impact will cease. Of course birds that have collided with the line previously and been killed cannot be recovered.

Implications for Project Implementation

» Marking of identified sensitive areas of the power line with industry standard bird flight diverters, use of bird friendly power hardware.
» Abbreviating maintenance times, scheduling activities in relation to avian breeding and/or movement schedules and lowering levels of associated noise.
» In order to identify the exact spans of line requiring marking, an avifaunal walk through be done as part of the site specific environmental management plan for this project.

3. Potential impacts on Archaeological Sites

Construction of the power line foundations and service roads may impact on remains which are buried, but these impacts will be limited and restricted to the local area.

The study area consists of a featureless flat plain with relatively low vegetation.

Even though no pans were identified during the study, the archaeological significance of pans in the area is well known and if any occur anywhere near the power line they should be fenced off with a buffer zone of at least 100 meters.

A total of 7 artefact clusters have been recorded located within the buffer zone of the proposed power line. Four of these were recorded by van der Walt (2012b) on the farm Nels Poortje while the remaining three was recorded by Orton (2012).

The survey by van der Walt was aimed at covering the proposed infrastructure associated with the Garob wind energy facility, but also focused on specific areas of the landscape that would be more likely to contain archaeological and/or other heritage remains like drainage lines, rocky outcrops as well as slight elevations in the natural topography. These areas were searched more intensively, but many other areas were walked in order to confirm expectations in those areas. At the start of the survey a high density of Stone Age material was immediately noticed

scattered in varying densities throughout the study area. Therefor low density scatters (between 3 - 5 artefacts per m²) was recorded as find spots (background scatter). Scatters higher than 5 artefacts per m² were given site numbers. Scatters with densities less than 2 artefacts per m² were not recorded as they occur throughout the area. Individual occurrences were not point plotted within the recorded scatters however an attempt was made at determining site extent. GPS readings were taken roughly in the middle of each identified scatters

Orton's survey followed the same methodology for the Hoekfontein solar farm, where the study area was covered through a combination of driving and walking. The driving aimed to locate areas that, through experience, would be more likely to contain archaeological and/or other heritage remains. These typically consisted of hills, dense gravel patches and pan and stream margins. Orton distinguished Stone Age finds between background scatter and sites. Allocating field numbers to the background scatters and actually giving site numbers to those with good integrity (See Figure 2 and Table 1 below).

Table 1: Heritage artefacts that were located within the power line corridor

Site No	Type Site	Cultural Markers	Recorded	Heritage Significance
Find Spot 12	Stone Age	Single possible ESA tool in the road	Van der Walt 2012b	Low Significance
Find Spot 13	Stone Age	Very low density scatter of MSA and LSA tools. Near open patch with calcrete.	Van der Walt 2012b	Low Significance
Find Spot 14	Stone Age	Similar scenario as above	Van der Walt 2012b	Low Significance
Find Spot 18	Historical	Porcelain as well and ostrich egg shell fragments. (Late 19th century).	Van der Walt 2012b	Very low significance
Field number 086	Stone Age	Background scatter in sandy area with many cores and one handaxe.	Orton 2012	Very low significance
Field no 089	Stone Age	Background scatter in sandy area with some gravel	Orton 2012	Very low significance
Field no 090	Stone Age	Background scatter in gravel area including one very large unfinished cleaver	Orton 2012	Very low significance

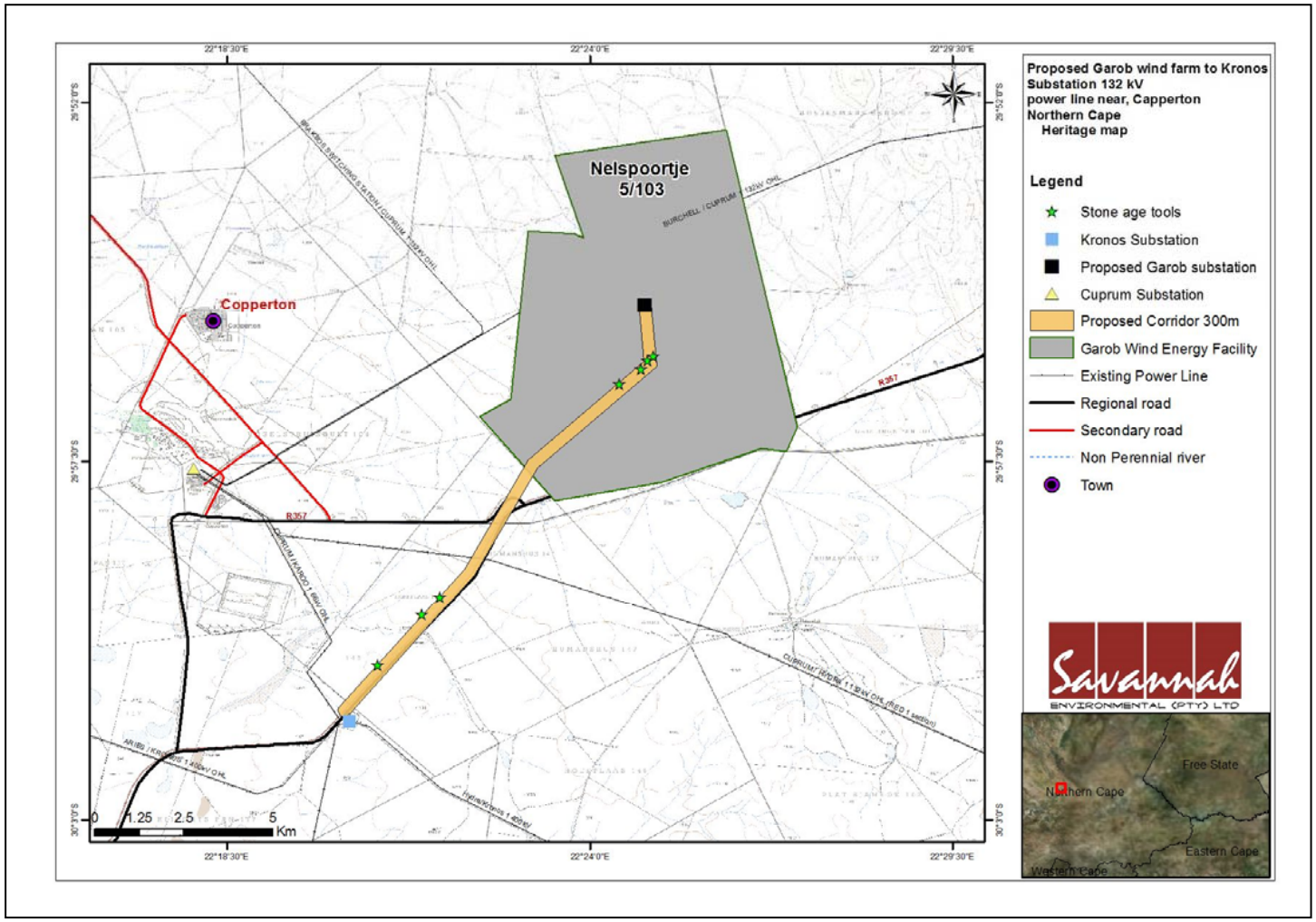

Figure 2: The location of the seven (7) artefact clusters that were recorded located within the buffer zone of the proposed power line- all are of low sensitivity

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (1)
Probability	Probable (1)	Probable (1)
Significance	**9 (low)**	**8 (low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation » The sites are all of low significance and no further mitigation is necessary.		
Cumulative impacts: » Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive. The number of the power line foundations will determine the impact on the buried materials (if any) and if these increase so will the possible impact.		
Residual impacts: » Depletion of archaeological record of the area.		

Implications for Project Implementation

» If archaeological material is located on site, all work in the vicinity of the find must stop for an archaeologist to investigate.

» If any pans occur anywhere near the power line they should be fenced off with a buffer zone of at least 100 meters.

» Find spot 12, 13, 14, 18 and background scatter 086, 089,090 are located within the power line corridor and will potentially be impacted. These sites are all of low significance and are sufficiently recorded. No further mitigation will be necessary as the impact of the pylon positions are considered to be extremely low and comparative material will remain on the unaffected areas of the site.

» If any possible finds such as tool scatters, bone or fossil remains are exposed or noticed during construction, the operations in the vicinity must be stopped and a qualified archaeologist must be contacted to assess the find.

4. Potential Visual Impacts

Potential Visible Exposure

The proposed power line will have a large core area of potential visual exposure within a 5km radius of the alignment. This is due to the flat topography of the study area. There are only a few lower-lying areas to the north of the alignment that are shielded from the power line structures. A large section of the exposed area (virtually the entire northern section) is located on the Garob Wind Energy Farm site itself, where the power line structures are expected to be largely overshadowed by the much taller wind turbine generators.

Visibility from the R357 is expected where the power line crosses this road. Additional exposure is highly likely, at very short distances, from the R357 loop-road traversing adjacent to the proposed alignment.

The only homestead (within a 5km radius of the alignment) expected to be exposed to the power line, is the Nels Poortjie residence located on the Garb Wind Energy Farm development site, south of the R357 arterial road.

Visibility beyond 5km is expected to be negligible/highly unlikely due to the long viewing distance and the relatively constrained vertical dimensions of this type of power line. This zone includes the town of Copperton and all the other identified homesteads within the study area.

The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed power line, therefore signifying a worst-case scenario.

The proximity radii (calculated from the proposed project infrastructure) are shown on **Figure 3** and are as follows:

» 0 – 0.5km - Short distance view where the structures would dominate the frame of vision and constitute a very high visual prominence.
» 0.5 – 1.5km - Medium distance views where the structures would be easily and comfortably visible and constitute a high visual prominence.
» 1.5 - 3km - Medium to longer distance view where the structures would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
» Greater than 3km - Long distance view where the structures would still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the power line.

Figure 3: Potential visual exposure of the proposed Garob to Kronos power line

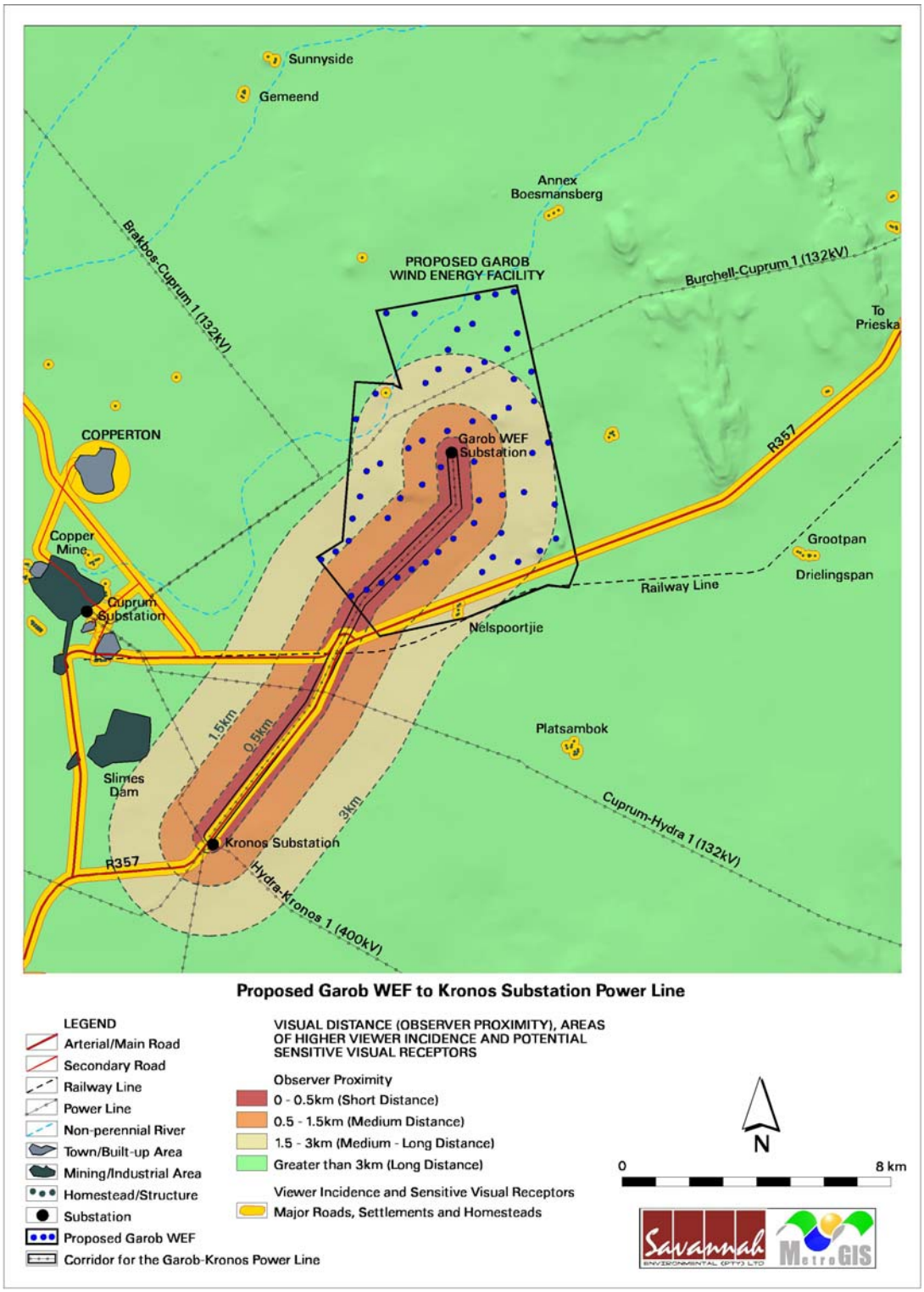

Figure 4: Observer proximity to the proposed Garob to Kronos power line and areas of higher viewer incidence.

Viewer Incidence

Viewer incidence is calculated to be the highest in the residential area of Copperton. In addition, a higher incidence of visual receptors is expected along the arterial road (the R357) as well as along the secondary roads within the study area. Commuters using these roads could be negatively impacted upon by visual exposure to the power line, and are thus considered to be sensitive to visual intrusion (Refer to Figure: 4)

Other than the above, viewer incidence will be concentrated within the homesteads and farm residences within the study area.

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed power line are displayed on Figure 5. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

An area with short distance visual exposure to the proposed power line, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index for the power line is further described as follows.

» The visual impact index map indicates a core zone of high visual impact within a 0.5km radius from the alignment.

» Sensitive visual receptors within this zone include users of the R357 and especially users travelling along the R357 gravel loop-road. These receptors are likely to experience very high visual impact.
» The extent of potential visual impact subsides very quickly within the 0.5km and 1.5km zone from the alignment. This predominantly vacant land is expected to have a moderate visual impact.
» Visual impacts beyond 1.5km and up to 3km from the alignment, is expected to be low to very low. Visibility beyond 5km from the power line is expected to have a negligible visual impact.
» There is only one homestead within a 5km radius of the alignment. This homestead is Nels Poortje, which is situated on the Garob Wind Energy Facility site. It could potentially have a moderate visual impact, but is expected to have a low probability of this impact occurring due to its association with the project.

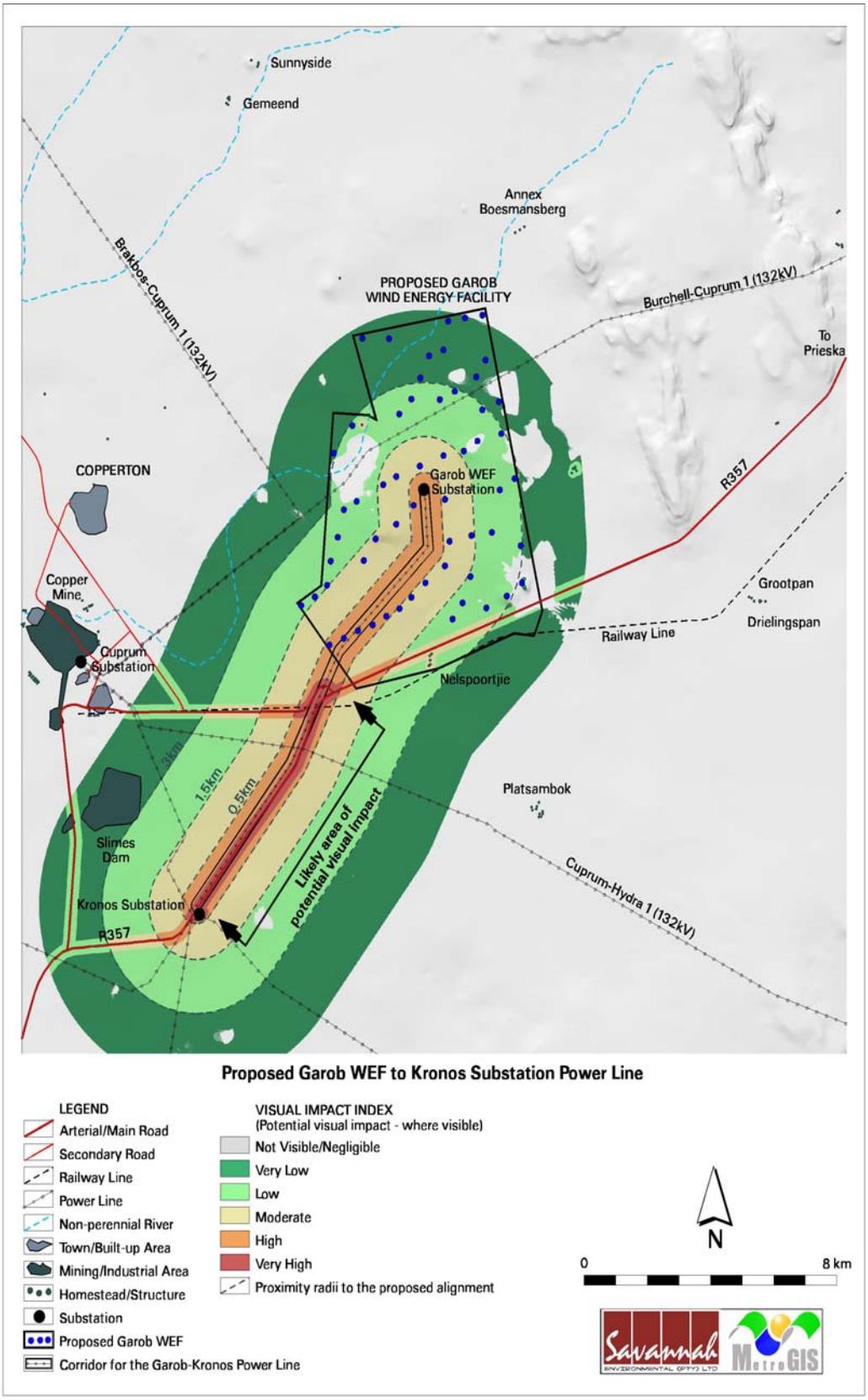

Figure 5: Visual impact index of the proposed Garob to Kronos power line

Nature of Impact: Visual impact on users of arterial roads in close proximity to the proposed power line

Visual impacts of the power line on the R357 arterial road (especially the loop-road section) are expected to be of very high magnitude within a radius of 0.5km from the proposed alignment, due to the power line traversing immediately adjacent to this road.

The relatively low incidence of users travelling along these roads reduces the probability of this impact occurring. The visibility of the much larger wind turbines of the Garob Wind Energy Facility will also distract attention away from the power line infrastructure, ultimately reducing the overall visual impact significance to **low**.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Very high **(10)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	**Low (18)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.

Operations:

» Maintain the general appearance of the servitude as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the servitude.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions

Cumulative impacts:

» The construction of an additional power line, together with the existing power lines to the Kronos and Cuprum substations, the wind turbines of the Garob Wind Energy Facility and the mining activity near Copperton, is likely to increase the potential cumulative visual impact of industrial type infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Visual impact on residents of homesteads and settlements in close proximity to the proposed facility

The potential visual impact on residents of homesteads within a 5km radius of the proposed power line is expected to be of low significance. This only includes the Nels Poortje residence, which is located on the Garob Wind Energy Facility site and forms part

of the project initiative.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Moderate **(6)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	**Low (14)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.

Operations:

» Maintain the general appearance of the servitude as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the servitude.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions

Cumulative impacts:

» The construction of an additional power line, together with the existing power lines to the Kronos and Cuprum substations, the wind turbines of the Garob Wind Energy Facility and the mining activity near Copperton, is likely to increase the potential cumulative visual impact of industrial type infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

Nature: Visual impact on sensitive visual receptors within the region

The visual impact on the users of roads and the residents of towns, settlements and homesteads within the region (i.e. beyond the 5km radius) is expected to be **negligible**.

	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Minor **(2)**	N/a
Probability	Very Improbable **(1)**	N/a
Significance	**Low (9)**	N/a
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.

Operations:

» Maintain the general appearance of the servitude as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site/servitude.

» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.

» Monitor rehabilitated areas post-decommissioning and implement remedial actions

Cumulative impacts:

» The construction of an additional power line, together with the existing power lines to the Kronos and Cuprum substations, the wind turbines of the Garob WEF and the mining activity near Copperton, is likely to increase the potential cumulative visual impact of industrial type infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: Visual impact of construction on sensitive visual receptors in close proximity to the proposed power line.

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and land owners in the area.

Access to the power line servitude will however be along the existing R357 loop-road and very limited removal of vegetation cover is expected. There are also a very limited number of observers present along the length of the alignment, further negating potential visual impacts.

	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Short term **(1)**	Short term **(1)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Very Improbable **(1)**
Significance	**Low (18)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain and maintain natural vegetation in all areas outside of the development footprint/servitude.

Construction:

» Ensure that vegetation is not unnecessarily removed during the construction period.

» Reduce the construction period through careful logistical planning and productive implementation of resources.
» Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
» Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
» Rehabilitate all disturbed areas immediately after the completion of construction works

Cumulative impacts:

» None.

Residual impacts:

» None, provided rehabilitation works are carried out as specified.

Nature: Visual impact of the proposed facility on the visual quality of the landscape and sense of place of the region

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), play a significant role. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a rural and undeveloped character. Settlements, where these occur, are limited in extent and domestic in scale. These vast, generally undeveloped landscapes are considered to have a high visual quality, except where development such as mining (i.e. the Copperton Mine) represent existing visual disturbances. A specific sense of place related to the wide open, undeveloped space characterises the region, but is not particular to this study area. The anticipated visual impact of the power line on the regional visual quality, and by implication, on the sense of place, is expected to be of **low** significance.

The relatively low incidence of visual receptors within this environment and the proximity of the proposed facility to the existing Copperton Mine and associated infrastructure reduces the probability of this impact occurring.

	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	N/a
Duration	Long term **(4)**	N/a
Magnitude	Very Low **(2)**	N/a
Probability	Improbable **(2)**	N/a

Significance	**Low (18)**	**N/a**
Status (positive or negative)	Negative	N/a
Reversibility	Recoverable **(3)**	N/a
Irreplaceable loss of resources?	No	N/a
Can impacts be mitigated?	No	

Mitigation:

Planning:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.

Operations:

» Maintain the general appearance of the power line servitude as a whole.

» Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site/servitude.

» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.

» Monitor rehabilitated areas post-decommissioning and implement remedial actions

Cumulative impacts:

» The construction of an additional power line, together with the existing power lines to the Kronos and Cuprum substations, the wind turbines of the Garob Wind Energy Facility and the mining activity near Copperton, is likely to increase the potential cumulative visual impact of industrial type infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain

Implications for Project Implementation

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. This measure will help to soften the appearance of the power line within its context.

» Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

» Ensure that vegetation is not unnecessarily cleared or removed during the construction period.

» Reduce the construction period through careful logistical planning and productive implementation of resources.

» Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.

» Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.

» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
» Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
» Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
» During operation, the maintenance of the power line structures will ensure that the power line does not degrade, thus aggravating visual impact.
» Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.
» Once the power line has exhausted its life span, all associated infrastructure not required for the post rehabilitation use of the site/servitude should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
» All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

5. Potential social impacts during construction

The following potential negative social impacts may occur during construction (i.e. the absence of proper management of the construction process):

» Influx of construction workers employed on the project;
» Increased risk of stock theft, poaching and damage to farm infrastructure associated with construction workers;
» Increased risk of veld fires associated with construction related activities;
» Impact of heavy vehicles, including damage to roads, safety, noise and dust;

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including:

» An increase in alcohol and drug use
» An increase in crime levels
» The loss of girlfriends and or wives to construction workers
» An increase in teenage and unwanted pregnancies
» An increase in prostitution
» An increase in sexually transmitted diseases (STDs)

Construction workers are likely to be sourced from the local area. The potential risk posed by these workers to local communities will therefore be low. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be low. The use of local residents to fill the low and semi-skilled job categories will also reduce the need to house construction workers on the site. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be low.

Nature: The presence of construction workers poses a potential risk to family structures and social networks in the area. In addition there are a number of potentially vulnerable farming activities, such as livestock farming.		
	Without Mitigation	***With Mitigation***
Extent	Local (3) (Rated as 3 due to potential severity of impact on local communities)	Local (2) (Rated as 1 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low for the community as a whole (27)** Moderate-High for specific individuals who may be affected by STDs etc. (57)	**Low for the community as a whole (24)** Moderate-High for specific individuals who may be affected by STDs etc. (51)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in	

	communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

The potential risks associated with construction workers can be mitigated. The aspects that should be covered include:

» Where possible, it should be made as a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories. This will reduce the potential impact that this category of worker could have on local family and social networks;
» The contractor should develop a Code of conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be dismissed. All dismissals must comply with the South African labour legislation;
» The contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis;
» The contractor should make the necessary arrangements for allowing workers from outside the area to return home over weekends and or on a regular basis during the 12 month construction phase. This would reduce the risk posed by construction workers to local family structures and social networks;
» It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site. This will make it possible to manage the potential impacts effectively.

Cumulative impacts:

» Impacts on family and community relations that may, in some cases, persist for a long period of time.
» In cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Residual impacts:

Job loss
Increased poverty in the general area
Increased crime as a result of the increased poverty

Implications for Project Implementation

» Locals should be provided an opportunity to be included in a list of possible local suppliers and service providers.

» Social benefits in terms of training, skills development and the use of local labour should thus be aspired to. These skills can be transferable to other employment sectors and would result in further sustainable benefits.
» The community representatives and neighbouring property owners should be kept informed of the progress, decisions taken with regards to the development and construction schedules.
» Attention should be given to the extension and improvement of the existing HIV/Aids awareness programmes.

IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING PHASE

Alternative (preferred alternative)

The impacts during the decommissioning and closure phases will be similar to impacts of the construction phase as discussed in this assessment. Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

In addition, the social impacts associated with final decommissioned are likely to be limited due to the relatively small number of permanent employees affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

No Go Alternative (Compulsory)

This is the option of not constructing the proposed power line within the proposed corridor. This option will result in limited impacts occurring on the biophysical environment (i.e. biodiversity, soils), and will result in a low visual impact being experienced. However, this will result in the situation where the Garob Wind Energy Facility cannot be connected to the electricity grid (as the current authorized connection point is no longer feasible). This will result in a lost opportunity for renewable energy production within the South Africa.

Assessment of No-Development Option

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South

Africa's position as one of the highest per capita producers of carbon emissions in the world, this would represent a negative social cost.

Nature: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy		
	Without Mitigation	**With Mitigation**
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (54)	Medium (54)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Mitigation: The development of the proposed power line corridor would represent an enhancement measure.		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

There is no impact as it maintains the current status quo. However, the no-go option would represent a lost socio-economic opportunity for Copperton and the Siyathemba Local Municipality..

Cumulative Impact

The construction of the power line and associated infrastructure will result in an increase the cumulative visual impact of industrial type infrastructure within the area. The cumulative impacts will be linked to combined visibility (including the other renewable energy projects in the area.

However, the visual character of the area has already been negatively impact by the existing power lines associated with the Cuprum and Kronos substations located to the west and south west of the site respectively. The visual character of the area has also been negatively impacted by the overburden and slimes dams associated with the historic mining in the area. The significance of the potential cumulative social impacts, specifically the impact on the landscape, is

therefore rated to be low. Despite this it is recommended that the environmental authorities consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of renewable energy facilities in the area. In addition, the siting and number of individual components of the plant should be informed by findings of the relevant VIAs, specifically with respect to the visual impact on farmsteads and important roads in the area.

Cumulative impacts

Nature: Visual impacts associated with the establishment of the power line and associated infrastructure and the potential impact on the areas rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (24)
Status	Negative	Negative
Reversibility	Yes.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation The recommendations contained in the VIA should be implemented.		
Cumulative impacts: Impact on other activities whose existence is linked to linked to rural sense of place and character of the area, such as tourism, bird watching, and hunting.		
Residual impacts: none		

A cumulative impact, in relation to an activity, refers to 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 undertaking in the area1. The Northern Cape is earmarked as a potential solar energy hub for South Africa The other proposed renewable energy in the Copperton area (other than the proposed Garob Wind Energy Facility) include the following: Nelspoortje Wind Energy Facility (developer - Plan 8), Klipgats pan Solar Energy facility (developer - Mulilo) and Plat Sjambok Solar and Wind Energy Facility (developer - Mainstream).

[1] Definition as provided by DEA in the EIA Regulations.

The cumulative impacts associated with the establishment and operation of the 132kV power line proposed to connect the Garob Wind Energy Facility to the Kronos Substation is predominantly of **low to medium** significance:

» **Ecology:** The potential impact is rated as having a predominately **low** significance. A sensitivity analysis confirmed that the majority of the power line corridor is located in an area of low sensitivity. However, a few small patches of drainage (however these are ephemeral drainage channels) are present in small areas within the corridor. The potential for cumulative impacts is quite low on account of the small development footprint of power line and substation in relation to the overwhelmingly intact nature of the surrounding landscape. The development would contribute a small amount to the cumulative loss of landscape connectivity, but this is not likely to be highly significant when considered at the landscape scale. The operation of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.

The proposed project is considered to be acceptable from an ecological perspective provided that the appropriate mitigation is implemented (as recommended in the ecology specialist report).

» **Heritage:** The potential impact is rated as being **low or insignificant** as most of the Stone Age archaeology in the study area consists of low densities of scattered (and mixed) Middle Stone Age and Late Stone Age artefacts. These occurrences are referred to as background scatter and are of low significance

» **Visual**: The construction of an additional power line, together with the existing power lines to the Kronos and Cuprum substations, the wind turbines of the Garob Wind Energy Facility and the mining activity near Copperton, is likely to increase the potential cumulative visual impact of industrial type infrastructure within the region. However, due to the relatively low occurrence of receptors within the region (both residents of homesteads and users of roads) and the existing visual disturbance of the Copperton Mine, the power line infrastructure would be of **low** significance.

» **Avifauna:** The proposed line will possibly affect populations of regionally or nationally threatened (and impact susceptible) birds (mainly large terrestrial species and raptors) likely to occur within or close to the proposed alignment, and the line may have a detrimental impact on these birds, particularly in

terms of collision and electrocution mortality risk, unless commitment is made to mitigating these effects. The cumulative impacts of the construction of new electrical and energy infrastructure in this Copperton area could be quite significant. Grid connection power lines, will remove a significant amount of new perching substrate in this wider area, where natural perches are largely absent. This means that the cumulative electrocution and the cumulative collision risk could be quite substantial.

Therefore is no mitigation is followed the impacts on birds as a result of the 132kV power line will have a **medium** significance but if precautionary ensures are taken it will be **low to moderate.** Careful and responsible implementation of the required mitigation measures should reduce impacts to sustainable levels.

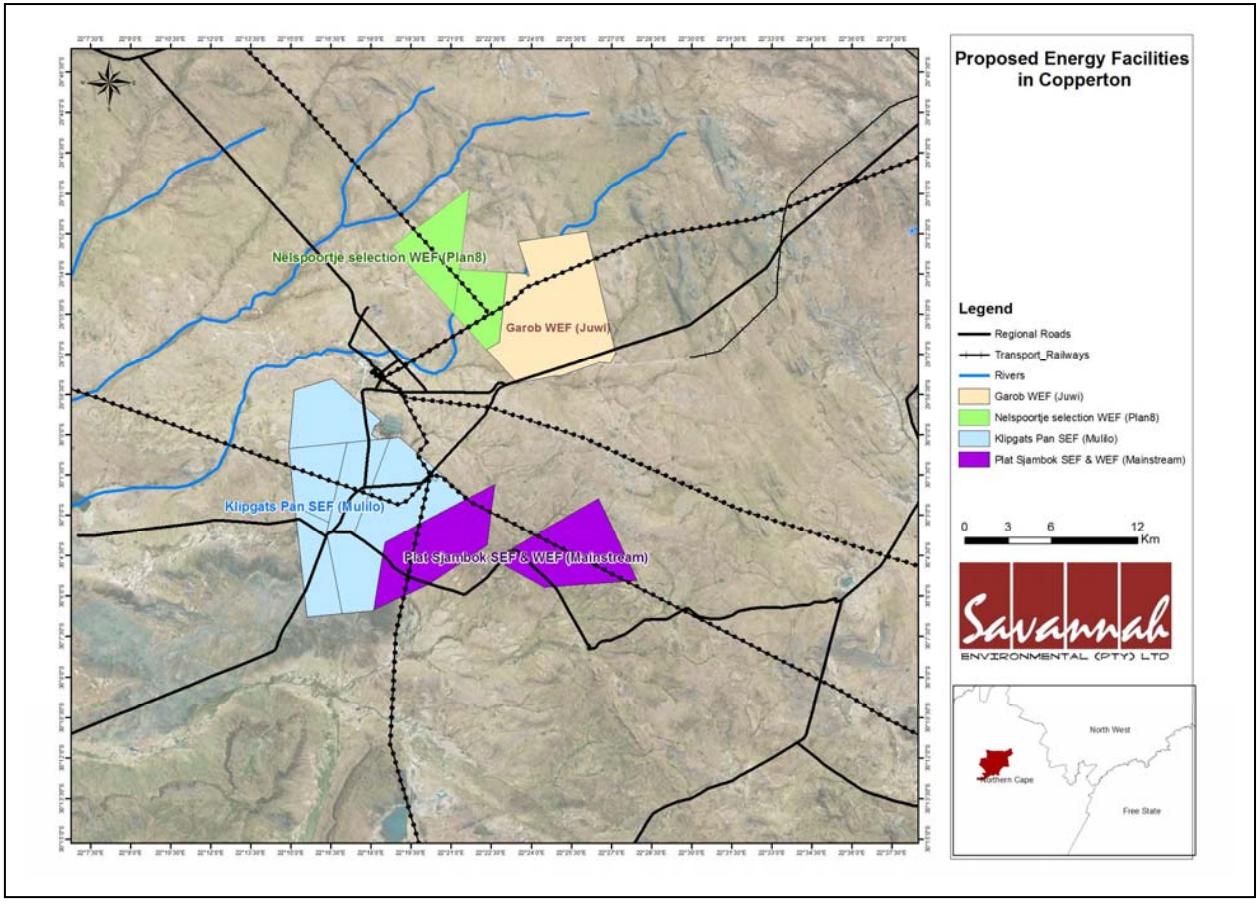

Figure 6: Other proposed renewable energy projects near the Garob Wind Farm

SUMMARY OF IMPACTS

The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

Ecology:

All of the impacts assessed can be reduced to a low level through mitigation and there are no impacts present which are likely to represent a red-flag for the development. The major contributing factors to the low post-mitigation impacts is the low sensitivity of the majority of the receiving environment and the low footprint of the development itself.

» Impacts on vegetation and listed or protected plant species
» Direct and Indirect Faunal impacts
» Habitat degradation and loss if landscape integrity

Visual:

» Potential visual impact on users of arterial and secondary roads in close proximity to the proposed power line is of low significance.
» Potential visual impact on residents of homesteads in close proximity to the proposed power line is expected to be of low significance.
» Potential visual impact on sensitive visual receptors within the region is expected to be negligible.
» Potential visual impact of construction on sensitive visual receptors in close proximity to the proposed power line is likely to be of low significance.
» Potential visual impact of the proposed power line on the visual quality of the landscape and sense of place of the region is expected to be of low significance.

It is therefore recommended that the construction of the power line as proposed be supported; subject to the implementation of the recommended mitigation measures and environmental management programme.

Avifauna:

» Electrocution of birds whilst perched or roosting on pylons or towers. **Mitigation:** Use bird friendly pole structure
» Collision of birds with overhead cables. **Mitigation:** Install anti bird collision line marking devices on high risk sections of power line
» Destruction of natural bird habitat on and near site. **Mitigation:** Provide protection for sensitive habitats.

» Disturbance of birds on site and in surrounding area. **Mitigation:** Provide protection for sensitive habitats and any breeding sensitive species close to site.

Heritage:
The impacts to heritage resources by the proposed development are not considered to be highly significant. . If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

Cognisant of the above-mentioned conclusions established through the Basic Assessment investigation, there were areas of ecological sensitivity identified in the power line corridor. These areas containing sensitivity vegetation and are shown in the environmental sensitivity Map (refer to Appendix A). Through implementation of the EMP (Refer to Appendix G) impact on this sensitive vegetation type can be mitigated to acceptable levels.

The overall **cumulative impact** for the proposed project as having a **low - medium sensitivity** should the recommended mitigations be implemented.

There are no environmental or social of high significance that would prevent the establishment of the proposed power line between the Garob Wind Energy Facility wind energy facility and the Kronos Substation. Although areas of sensitivity were identified, no environmental fatal flaws are associated with the proposed project.

Areas of ecological sensitivity that were identified in the power line corridor are regarding vegetation and avifauna sensitivities which are shown in the environmental sensitivity map (refer to Appendix A). Through the implementation of the EMPr (Appendix G) it is expected that impacts on these sensitive areas can be mitigated to acceptable levels.