IMPACT ASSESSMENT METHODOLOGY

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance (with and without mitigation);
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 1.

Table 1: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	*Proposed site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 2 below.

Table 2: Description of the significance rating scale

Rating	Symbol	Score	Description
NO IMPACT	**NO**	0	There is no impact at all - not even a very low impact on a party or system.
VERY LOW	**VL**	1	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
LOW	**L**	2	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
MODERATE	**M**	3	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
HIGH	**H**	4	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
VERY HIGH	**VH**	5	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 3**.**

Table 3: Description of the significance rating scale

Rating	Symbol	Score	Description
Isolated Sites / proposed site	**S**	1	The impact will affect an area no bigger than the servitude.
Study Area	**SA**	2	The impact will affect a route corridor not exceeding the boundary of the corridor.
Local	**L**	3	The impact will affect an area up to 5 km from the proposed route corridor.
Regional/Provincial	**R**	4	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
Global/National	**N**	5	The maximum extent of any impact.

Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 4.

Table 4: Description of the temporal rating scale

Rating	Symbol	Score	Description
Incidental	**I**	1	The impact will be limited to isolated incidences that are expected to occur very sporadically.
Short-term	**ST**	2	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
Medium term	**MT**	3	The environmental impact identified will operate for the duration of life of the line.
Long term	**LT**	4	The environmental impact identified will operate beyond the life of operation.
Permanent	**P**	5	The environmental impact will be permanent.

Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in Table 5 below.

Table 5: Description of the degree of probability of an impact occurring

Rating	Symbol	Score	Description
Practically impossible	**IMP**	1	It is practically impossible that the impact will occur
Unlikely	**UN**	2	The impact is unlikely to occur
Could happen	**CH**	3	The impact could occur given the under certain circumstances
Very Likely	**VL**	4	The impact is very likely to occur
Is going to happen / Will happen	**WH**	5	The impact has occurred already or will occur if the activity takes place

Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard “degree of certainty” scale is used as set out in Table 6. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 6: Description of the degree of certainty rating scale

Rating	Symbol	Description
Can't know	**CN**	The consultant believes an assessment is not possible even with additional research.
Unsure	**UN**	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Possible	**PO**	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Probable	**PR**	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Definite	**DE**	More than 90% sure of a particular fact.

Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\textbf{\textit{Impact Risk}} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{\mathbf{3}} \times \frac{\text{Probability}}{\mathbf{5}}$$

An example of how this rating scale is applied is shown in Table 7 below:

Table 7: Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	*Local*	Medium-term	*Could Happen*	
Impact to water	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the Table 8 below.

Table 8: Impact Risk Classes

Rating	Impact class	Symbol	Description
0.1 – 1.0	1	**VL**	Very Low
1.1 – 2.0	2	**L**	Low
2.1 – 3.0	3	**M**	Moderate
3.1 – 4.0	4	**H**	High
4.1 – 5.0	5	**VH**	Very High

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a **Low** impact.

Cumulative Impacts

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement the impact assessment will take cognisance of any existing impact before commencement of the proposed activity, any mitigation measures already in place, and any additional direct and indirect impact to environment through continued and proposed future activities.

DESCRIPTION OF IMPACTS DURING PLANNING, CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING PHASE.

Planning phase

No impacts are expected during the planning phase of the proposed project.

Construction phase

Loss and Disturbance of Wetland Habitat: The routes of the proposed power lines pass through two temporary to seasonal hillslope seepage wetlands, the channel of the Taaibosspruit and the switching station is located in an area delineated as unchannelled valley bottom. Construction of the power line and switching station as proposed will lead to the direct loss of wetland habitat due to clearing of wetland vegetation and disturbance of the soil profile.

**Mitigation: Limit the footprint of wetland areas to be excavated or cleared of vegetation; Minimise disturbance to wetland habitat outside the construction areas by clearly demarcating the construction area and limiting all activities to this area; A suitable rehabilitation programme should be developed and implemented in all disturbed areas post construction.*

Wetland Habitat Fragmentation: The proposed power line routes that cross wetland habitat will lead to the fragmentation and isolation of wetland habitat as a result of vegetation clearing during the construction phase, and the presence of physical barriers, such as the pylon footprints and the switching station once constructed.

**Mitigation: Where possible, the power lines should be aligned with existing linear infrastructure or routed through already transformed areas; Limit the footprint of wetland areas to be excavated or cleared of vegetation; and where possible, fences and other barriers associated with the power line servitude and switching station should be designed to allow fauna to move across these barriers.*

Interruption in Hydrology: The proposed switching station and power line associated infrastructure will cross several wetland HGM units ranging from temporarily to seasonally/permanently saturated. It is unlikely that the power lines and towers will impact

the surface or subsurface flows, however may contribute to erosion to a small degree. The substation infrastructure may interrupt surface and/or subsurface flows, leading to flow concentration, change in flow pathways, flow impoundment, increased surface runoff and increased risk of erosion.

Outside of the delineated wetlands, the soils within the study area support a perched water table that, although not shallow enough to directly influence the herbaceous plant community and therefore be considered a wetland, does represent an important water resource that is responsible for sustaining the areas of wetland across the study area. As such, it is important that the movement of water through the landscape, not only within the wetlands, also be maintained. Any activity or infrastructure that impedes or alters the natural subsurface flow in the catchment's soils could have indirect but potentially significant effects on the wetlands.

**Mitigation: The proposed development should aim to maintain connectivity of flows across the full width of the wetlands being crossed. Where possible, all tower infrastructures should be placed outside the delineated wetlands. Where this is not possible, engineered solutions for allowing seepage water to pass underneath and around the pylon footprints should be investigated for the hillslope seepage crossings, to ensure that water can move unhindered across the servitude;*

In the event that culverts and pipes are used to convey flows at the switching station, they should be designed and constructed in such a way that they do not lead to impoundment and ponding of flows upslope of the crossing, or flow concentration and erosion downslope of the crossing during regular return events;

Regular monitoring of all stormwater discharge points from the switching station should be employed to check for erosion. Erosion damage should be repaired immediately;

Stormwater off the switching station access tracks and roads should not be allowed to accumulate into high volume and high velocity flows, rather regular discharge points for small volumes of water should be encouraged;

Subsurface and surface flows within the wetlands need to be maintained across the power line servitude;

Soil compaction should be avoided wherever possible to limit changes in subsurface flow characteristics; and

No pylons or pedestals should be placed in the active channel of a wetland.

Erosion: Erosion may occur on exposed soils as a consequence of vegetation clearing during construction. Erosion of the wetland soils will lead to habitat deterioration, changes in the natural wetland hydrology, further concentration of flows, lowering of the water table within the wetlands and possible desiccation of areas of the wetlands.

**Mitigation: Construction should take place in winter; Rehabilitate and re-vegetate disturbed areas as soon as possible and monitor for successful establishment of indigenous vegetation; Monitor adjacent wetlands for signs of erosion. If observed, corrective measures should be implemented immediately through consultation with a wetland specialist; Stormwater discharge points should be protected against erosion; and Attenuation facilities should be provided for to ensure flows from regular return events (1:2 year event) do not differ from pre-development flow velocities.*

Loss of Biodiversity and Red Data Species: The proposed power line and switching station will lead to a direct loss of wetland habitat and vegetation communities within the footprint of the switching station and the pylons, and the subsequent loss of species relying on these habitats. There is the potential that the removal of these habitats could lead to the loss of Red Data species, such as the African Grass Owl, which is a species typical of moist grassland habitat and has been previously observed in hillslope seepage wetland to the west of the Taaibosspruit just before its confluence with the Vaal River (approx. 8km N of the study area). The wetlands that will be affected are considered to be of Moderate Ecological Importance and Sensitivity and therefore play a role in biodiversity support and flow regulation and supply to major watercourses.

**Mitigation: The construction of the switching station and the placement of power line pylons may disturb/displace African grass owls (or their habitat) in the area. The presence of African grass owl within the study area should be confirmed by a dedicated survey prior to construction or vegetation clearing works. If African grass owl presence is confirmed, the Gauteng Department of Agriculture and Rural Development (GDARD) recommend a buffer of 170m around all confirmed African grass owl sites. However, placement of infrastructure within 170m of the hillslope seepage wetland i.e. within the wetlands catchment, will likely disrupt the hydrology supporting the seepage wetland, resulting in changes to the vegetation of the seepage wetland and the potential loss of suitable habitat for the African grass owl. Should African grass owl presence be confirmed within the study area, it is recommended that an ornithologist be consulted in this regard to provide recommendations on suitable buffer zones etc.;*

All wetland areas not located directly within the footprint of the proposed developments should be demarcated prior to the commencement of construction activities and no construction machinery or any other vehicles should be allowed access to these areas other than along existing roads;

An alien vegetation management plan should be compiled and implemented during construction for the entire New Vaal mining area. Regular Surveys for alien species should be done and clearing and control of all invasive species should be undertaken; and

Water Quality Deterioration: Water quality deterioration within the wetlands is expected during the construction phase as a consequence of vegetation removal and the increased risk or erosion and sediment transport off exposed soils after rainfall events, and due to accidental spills of potentially hazardous or polluting materials, e.g.: cement , diesel and oil from construction vehicles. During the operational phase, polluted stormwater runoff could discharge into the wetlands. The construction phase impacts to water quality are also anticipated during the closure phase.

**Mitigation: Avoid wetland crossings as far as possible; To minimise water quality deterioration during the construction phase, construction activities should be undertaken during the winter months to prevent erosion due to surface run-off following rains; Dust suppression will need to be practiced during the construction period; Construction servitudes should be kept as narrow as possible and should be clearly demarcated to limit disturbance to the wetlands; No storage of potentially hazardous materials should take place on site, e.g. diesel or oil, other than what will be used within the course of a single day; Handling of such hazardous materials should only take place outside the wetland areas and drip trays or plastic sheeting should be provided to capture any spills; No stockpiling of materials should take place within the wetlands; It is strongly recommended that the dirty and clean water pipelines lie above ground to allow easy access for maintenance and to address any leaks or spills that may occur; and Apply effective dust management measures.*

Collision Risk to birds: Power lines present a collision risk to certain bird species. Birdlife South Africa has developed a list of priority bird species for which wind energy infrastructure (including power lines) present a particular risk (Retief et al., last updated Feb 2013). The risk to listed species is scored based on factors including the conservation status of the species, susceptibility to collisions based on structural factors, and susceptibility due to the behavioural characteristics of a particular species. The greater the score, the greater the risk; the highest possible score being 395 and the lowest 170.

Species that have been recorded by Golder Associates within the study area that feature on the list include Secretarybird, African grass-owl, and lesser kestrel. These, together with species that are potentially present in the study area, their conservation status, and their probability of presence are presented in Table 10. The table is ranked according to those species with the greatest priority score in terms of collision risk. Species that have been recorded, or have moderate probability of occurrence within the study area are highlighted.

The proposed power line route will be located parallel to the existing power line. Birds present in the study area may be habituated to the presence of the existing power line; however the construction of additional power lines in the area may present a cumulative

impact in terms of collision risk. Suitable habitat for African grass owl is present within 500 m of the proposed power line route.

** Mitigation: measures recommended to address potential collision risk to bird species of concern include:*

Given the presence of suitable habitat for African grass owl within 500 m of the proposed power line, a targeted survey for this species should be undertaken prior to construction;

If African grass owl is found to be present, the data should be shared with relevant stakeholders for incorporation into conservation and management plans for this species that have been previously recommended (Golder Associates, 2012) for the adjacent New Vaal Colliery Life Expansion mining rights area;

Route power line in parallel with existing power line, and locate as close to the existing line as feasible;

Bird diverters or 'flappers' help birds to see power lines and avoid collisions – these should be installed on all new power lines being constructed, particularly where the power lines cross areas of High conservation importance;

Habitat loss and degradation associated with vegetation clearing: Habitat loss refers to the removal of natural habitat. In terrestrial ecosystems habitat loss occurs primarily through the clearing of indigenous vegetation or through the homogenisation of available habitat. This results not only in the immediate destruction of individual plants and some fauna species, but may also lead to a breakdown in ecosystem functioning and a contingent loss of biodiversity.

Habitat degradation refers to an extreme form of ecosystem disturbance. In such instances much of the original ecosystem processes have been disrupted and many of the original species have been excluded (Begon et al. 2002).

Although habitat loss and degradation are normally associated with the immediate vegetation clearing which precedes construction, the impacts can be long term, persisting throughout the operational and closure phases. In certain instances these impacts can be ameliorated by successful rehabilitation of the site.

** Mitigation: management measures are recommended to mitigate habitat loss and degradation and associated impacts:*

Vegetation clearing should be restricted to the proposed switching station and pylon footprints, with no unnecessary clearing permitted outside of this area. Areas to be cleared, including construction sites and lay-down and vehicle turning points, should be demarcated to prevent unnecessary disturbances; Removed topsoil should be stockpiled and used to

rehabilitate disturbed areas; It is recommended that an environmental control officer (ECO) be appointed during construction to oversee the vegetation clearing process; and A suitable rehabilitation programme should be developed and implemented in all disturbed areas post construction. A suitably experienced person should be responsible for overseeing the rehabilitation programme.

Habitat fragmentation: Habitat fragmentation refers to the partitioning and breakup of natural habitat into smaller less viable habitat patches. In essence fragmentation leads to changes in habitat configuration which manifest as a decrease in patch size and an increase in patch number and isolation (Fahrig, 2003). These alterations change the ecological properties of remaining habitat which may affect species diversity and system function (Fahrig, 2003). Linear developments such as fences, pipelines, roads and conveyors are primary causes of habitat fragmentation.

In terms of ecological functioning, one of the primary outcomes of habitat fragmentation is an increase in habitat edge effects. Edge effect refers to changes in microclimate near the edge of habitat patches which not only reduce the effective size of viable, interior habitat, but may also create parameter conditions more conducive to predators, parasites and exotic species invasion (Begon et al. 2002). In addition, patch isolation can negatively affect the ability of fauna to disperse and move across the landscape thereby affecting fauna population abundance and distribution (Begon et al. 2002).

Habitat fragmentation initially occurs during vegetation clearing, but may persist throughout the remaining phases if linear barriers (e.g. fences conveyors and roads) are constructed.

* *The following mitigation measures are recommended to reduce the effects of habitat fragmentation:*

The proposed linear infrastructure (power line) will be aligned with existing linear infrastructure or routed through already transformed / degraded areas. Where it is necessary for linear infrastructure to be routed across important or sensitive habitats (e.g. wetlands), measures should be undertaken to:

Limit the footprint of areas to be excavated, and/or cleared of vegetation; Route infrastructure across the narrowest portion of the sensitive habitat; and Prevent obstruction/disruption of surface or subterranean water flow.

Spillage of harmful or toxic substances: The spillage of harmful or toxic substances including diesel, oil, lubricants and bitumen may negatively impact upon fauna and flora in the study area. Direct pathways by which harmful or toxic substances are assimilated by biota include uptake by roots and/or leaf absorption in the case of plants, and direct ingestion or dermal absorption in the case of fauna. Indirect pathways include the ingestion of contaminated plants or animals by other herbivorous or predatory species. The

consequences of contamination may include a reduction in fecundity, progressive weakening and often death.

The spillage of harmful toxic substances most commonly occurs during the construction phase of a project, yet will occur throughout all phases of the project.

** The following mitigation measures should be adhered to: all harmful or toxic substances kept on site should be stored in bunded areas, or in the correct manner as stipulated by the relevant Material Safety Data Sheets (MSDS); all vehicles and machinery should be adequately maintained to prevent the leakage of fuels and lubricants; and should be refuelled and stored in designated areas only; and an emergency spillage containment plan should be developed and implemented to control for the spillage of harmful and toxic substances.*

Sensory disturbances: Sensory disturbances typically include artificial lighting, noise and vibration associated with construction-related activities, and flood-lighting of buildings for security purposes.

Artificial lighting can result in the disruption of various ecological processes, most notably through its effect on animal behaviour. Longcore & Rich (2004) note that inter alia artificial light can alter reproductive behaviours, cause disorientation, hamper communication, affect nesting choices, disrupt competitive hierarchies and either increase or reduce predation success rates of various species. These impacts can all negatively affect fauna population dynamics.

Anthropogenic noise can be both distracting and physically harmful to fauna (Francis et al. 2009). Owing to their reliance on acoustic communication, birds are particular susceptible to elevated noise levels. Noise may disrupt communication and species interactions amongst birds leading to increased stress levels and ultimately, changes in bird species composition (Francis et al. 2009). Various other taxa that rely on acoustic communication including frogs, mammals and arthropods are similarly affected (Parris & Schneider, 2009). Moreover, noise may negatively affect the foraging success of species such as bats that rely on acoustic cues when hunting (Schaub et al. 2008).

Depending on whether the switching station will be lit at night during operation, sensory disturbances from noise and light may persist throughout all phases and will only cease upon final closure and rehabilitation.

** Mitigations: Switching stations will be fitted with day/night switches meaning the lights will be off during the day and on at night. The lights will be on at night in the event that Eskom field staff need to come out and do emergency maintenance, switching, etc., and for safety and security reasons. Impacts related to light pollution and other sensory disturbance may be mitigated by:*

Lighting shields, directional lighting and low level lights should be implemented; Noise emanating from construction machinery and equipment should be kept to a minimum by the fitting of exhaust silencers and through the regular maintenance of construction vehicles; and where possible, construction activities should be restricted to daylight hours.

Dust generation: The clearing of vegetation for construction, coupled with increased vehicular traffic and the establishment of top soil, overburden and waste stockpiles, will result in increased potential for dust entrainment.

Dust settling on plant material can affect photosynthesis, respiration, transpiration rates, and allow for the penetration of phototoxic gaseous pollutants into plant tissue (Farmer, 1993). These impacts can result in decreased plant productivity which may lead to alterations in plant community structure and consequent changes in herbivore diversity and abundance (Farmer, 1993).

Dust may also directly affect fauna. Arthropods exposed to dust for example, may be smothered by dust particles and/or have their chemical cues used for mating disrupted (Talley et al. 2006). Likewise, mammals exposed to coal dust have been observed to show abnormal respiratory afflictions (Borm & Tran, 2002).

Impacts from dust are likely to be most prevalent in the dry season, and during the construction phase of the proposed project, yet if not controlled may persist throughout all phases.

* *The following mitigations can be used to prevent conditions conducive to dust generation and suppress dust should it occur:*

All topsoil stockpiles and cleared areas should be re-vegetated, covered or kept moist to prevent dust generation; dust suppression through the use of water bowsers should be implemented on all exposed areas including roads, parking zones and lay down areas. Water spraying on high use roads should be prioritised; and all onsite traffic can be restricted to specific designated roads. Off-road travel can only be authorized on a case-by-case basis. Traffic speed can also be restricted to an appropriate level on all designated roads.

Increases in exotic and / or declared invader species: Clearing of natural vegetation may create conditions conducive to the establishment and colonisation of exotic and/or declared CARA Category 1, 2 & 3 invader plants. Most exotic, invasive species if left uncontrolled will suppress or replace indigenous plants leading to a concomitant reduction in fauna species diversity and abundance (Bromilow, 2010). Moreover, certain common invasive plants, such as the exotic Acacias (Wattle trees), are highly flammable and can increase the frequency and intensity of fires which may further alter ecosystem structure and functioning.

Facilitated by indigenous vegetation clearing, encroachment by exotic invasive species may initially occur during the construction phase. However, if not controlled, the scale and

magnitude of infestation will rapidly increase and may persist for the entire lifecycle of the project.

**Mitigation: An exotic species control programme, including monitoring, must be developed and implemented to reduce the encroachment of exotic invasive species; and It is recommended that the ECO be responsible for monitoring the nature and extent of on-site exotic, invasive plants.*

Loss of species of conservation importance: The loss of species of conservation importance, and particularly Red Data and protected plant species, is most likely to occur during the initial vegetation clearing associated with the construction phase. Moreover, habitat loss, fragmentation and degradation may result in the populations of species of conservation importance becoming unsustainable, leading to local extinctions.

**Loss of species of conservation importance may be mitigated in the following ways:*

An ECO should be appointed during the construction phase to monitor for the presence of Red Data and protected flora and fauna identified by the respective specialists in all areas where vegetation clearing and associated construction activities are to be undertaken. Should such species be identified and require relocation, rescue permits should be obtained from the provincial authority, and suitable ex-situ, and/or in-situ conservation measures developed and implemented. Conservation measures must be approved by the provincial authority and overseen by the ECO.

Operational phase

Inspection and Maintenance of the Power lines: This will result in increased traffic on the nearby road. It may inconvenience the landowners and pose a risk of pollution from litter, waste metal, spillages during maintenance.

**Mitigation: Establish a relationship with local landowners. Notify the landowner before accessing properties, and when leaving the property. Ensure that properties are only accessed on appointment. Ensure that a servitude wide clean-up is undertaken at the end of every maintenance cycle to ensure that no pollution has occurred. Where this has happened appropriate remedial action is to be taken.*

Maintenance of the substation/Switching Station: Spills and leaks from transformers could pollute soils during maintenance and replacement.

**Mitigation: Ensure a suitable hydrocarbon management plan is established. Ensure that spill kits are available at all places where maintenance work is being done and spills are cleaned immediately.*

Hydro-carbon and chemical usage at substation sites during the operational phase: Spills and leaks from transformers could pollute soils.

**Mitigation: Ensure a suitable hydrocarbon management plan is established. Ensure that spill kits are available at all times. Clean spills immediately. Transformers are to be installed in suitably designed concrete bays with sufficient protection to ensure that no leaks can enter the environment. Regular inspections of transformer bays are to be undertaken. All chemicals used on site are to be stored in a suitably designed chemical store. Chemical usage is to be controlled and monitored at all time to ensure safe work procedure is executed, and any spills are appropriately cleaned.*

Transmission of electricity along conductors: Bird collisions and electrocutions.

**Mitigation: Implementation of Eskom distribution line avifauna management procedure; Post-construction monitoring surveys should be undertaken following construction to determine whether birds are colliding with/being electrocuted by power lines, using established protocols (Jenkins et al., 2011); Post-construction monitoring data should be periodically collated and analysed, and the findings integrated into the operational Environmental Management Programme (EMPr) and the broader mitigation scheme.*

Vegetation management and control of alien invasive species: A sustainable vegetation layer on all areas not concreted will be maintained at the substation, switching station, and power line corridor. Alien invasive species will be removed.

**Mitigation: Monitoring of alien invasive species and established vegetation layer should be done.*

Decommissioning Phase

Decommissioning phase activities will involve the reversal of the construction phase. The end result of the decommissioning phase will be a positive impact on the environment. However during the decommissioning phase similar nuisance impacts such as noise, traffic, and the influx of people to the area will be experienced. These too can be mitigated. The decommissioning phase was not assessed as part of this application and will be the focus of a separate application nearer to the time.

No-Go Option

Without electricity the mine (Anglo Coal) will not be able to expand its operation and will need to close down. The loss of employment and income generated by the mine (Anglo Coal) will have a MODERATE to HIGH negative impact on the economy at a national level. The negative impact of the mine (Anglo Coal) not being able to expand and continue operations will not be felt immediately but will last beyond the life of the proposed project, so it's rated as being a long term impact

*Mitigation: construction of the two proposed 88kV power lines, associated infrastructures and a new Vaalbank Switching Station is necessary to enable the mine (Anglo Coal) to expand its operations and prevent mine closing down.

ALTERNATIVE 1 and 2- Vaalbank 88kV Power Line and Substation / Switching Station Construction

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
PRE-CONSTRUCTION PHASE						
1	Appointment of construction contractor (Positive Impact)	Direct	Economic benefit to local economy	MODERATE	MODERATE	Ensure that the workforce utilised for construction of the infrastructure are predominately South Africans.
		Indirect	None			
		Cumulative	None			
CONSTRUCTION PHASE						
1	People moving into the area to undertake the project	Direct	Increased risk to community safety and security	VERY LOW	LOW	Ensure that labours are provided with transport to and from the site. Control labour moving around the site. Ensure site access is controlled, fenced, and patrolled. Report crimes to the police. Establish a relationship with the local police and community policing forum. No housing of workers on site. Security to be provided for 24 hrs during the construction phase.
		Direct	Additional strain on municipal infrastructure	VERY LOW	VERY LOW	Ensure the labour is sourced locally from people already resident in the area. Do not recruit casual labour. Use only reputable local contractors. No job recruiting to be done at the construction site.
		Indirect	None			
		Cumulative	None			
2	Transportation, handling, and storage of construction materials	Direct	Additional vehicle traffic	VERY LOW	LOW	Ensure that proper road signage is used. Limit access to the construction site to construction vehicles only. Ensure drop-off / collection areas for workers is demarcated and controlled.
		Direct	Pollution from chemical / hydrocarbon spills	VERY LOW	LOW	Establish a chemical storage area that is suitably designed to contain all spills. Ensure that hydrocarbons are stored in a bunded area with a capacity of 110% of storage volume. Ensure that the bunded area is suitably designed to allow for cleaning and prevent spillage to the environment. Ensure that all vehicles, storage, and usage areas have suitable spill kits. Develop a chemical and hydrocarbon spill procedure. Ensure that chemical and hydrocarbon usage is controlled.
		Indirect	Pollution may enter ground / surface water	LOW	LOW	Undertake monitoring to determine if any impacts downstream of the construction site are occurring and take necessary preventative actions.
		Cumulative	None			
3	Surveying and	Direct	Uncontrolled activity may	VERY LOW	LOW	Demarcate the site, and access roads

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
	pegging of construction area		cause the creation of vehicle tracks, vegetation damage, and erosion.			on a plan prior to site survey commencing. Negotiate with land owners for access prior to commencing with site survey and pegging.
		Indirect	None			
		Cumulative	None			
4	Construction camps	Direct	Loss of vegetation and habitat	VERY LOW	LOW	Locate construction camp in substation and switching station footprints. Demarcate construction camp footprint and layout prior to commencing with construction. Once infrastructure is no longer required, ensure that the area is rehabilitated to former land use. Undertake red data species rescue programme prior to construction phase commencing.
		Direct	Alien invasive species infestation	VERY LOW	LOW	Establish an alien invasive species monitoring and control programme. Follow Eskom's alien invasive protocol.
		Direct	Compaction of the soils	VERY LOW	LOW	Rip soils to depth of 300mm after construction phase is complete in all areas where infrastructure is not permanent. Once infrastructure is no longer required, ensure that the area is rehabilitated to former land use.
		Direct	Erosion and loss of soil resources	VERY LOW	LOW	Develop a storm water management plan be prior to commencement with construction. Use silt traps where necessary. Use bumps, humps, and cut off drains to control water velocity of exposed soils.
		Direct	Pollution of soils	LOW	LOW	Store hydrocarbons in bunded areas. Develop a hydrocarbon management plan. All hazardous materials and chemicals to be stored in such a manner to avoid spills or exposure to the elements. Develop a spill management procedure. Develop a waste management plan. Ensure waste is stored in designated areas and controlled. Chemical toilets are to be provided and serviced regularly. All waste / effluent to be contained and disposed of at a suitably license facility.
		Direct	Increased noise	LOW	LOW	Limit construction activities to daylight working hours.
		Indirect	Pollution may enter ground / surface water	LOW	LOW	Implement the mitigation measures documented above. Undertake monitoring to determine if any impacts downstream of the construction camps are occurring and take necessary preventative actions.
		Cumulative	None			
5	Establish and operate cement batching plants	Direct	Pollution of soils	VERY LOW	VERY LOW	Ensure a demarcated and bunded cement batching area is utilised.
		Indirect	Pollution of ground / surface water	VERY LOW	VERY LOW	Ensure a demarcated and bunded cement batching area is utilised.
		Cumulative	None			
6	Construction and use of access roads	Direct	Loss of vegetation and habitat, including potentially red data species located in wetland areas	VERY LOW	LOW	Use existing access roads where possible. Ensure only two access points to the power line servitude are available, one at the Makalu Substation, the

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
						other at the Vaalbank switching station. Ensure that no vehicles cross the river or work within 50m of the water course. Demarcate and fence the servitude prior to commencement with construction. Undertake red data species rescue programme prior to construction phase commencing.
		Direct	Alien invasive species infestation	VERY LOW	LOW	Establish an alien invasive species monitoring and control programme. Follow Eskom's alien invasive protocol.
		Direct	Compaction of the soils	VERY LOW	LOW	Rip and vegetate exposed soils to depth of 300mm after construction phase is complete in all areas where roads are not required, only the maintenance road required during the operational phase should remain. Once infrastructure is no longer required, ensure that the area is rehabilitated to former land use.
		Direct	Erosion and loss of soil resources	VERY LOW	LOW	Develop a storm water management plan be prior to commencement with construction. Use silt traps where necessary. Use bumps, humps, and cut off drains to control water velocity of exposed soils.
		Direct	Pollution of soils	LOW	LOW	No servicing of vehicles onsite. Regular inspection and servicing of vehicles. Develop a spill management procedure for vehicles that may leak accidently. Have a waste management plan.
		Direct	Increased noise	VERY LOW	VERY LOW	Limit construction activities to daylight working hours.
		Indirect	Sedimentation, siltation, and increased turbidity in surface water	LOW	LOW	Undertake monitoring to determine if any impacts downstream of the construction camps are occurring and take necessary preventative actions.
		Cumulative	None			
7	Vegetation clearing of power line servitude	Direct	Loss of vegetation and habitat, including potentially red data species located in wetland areas	VERY LOW	LOW	Use existing access roads where possible. Ensure only two access points to the power line servitude are available, one at the Makalu Substation, the other at the Vaalbank switching station. Ensure that no vehicles cross the river or work within 50m of the water course. Demarcate and fence the servitude prior to commencement with construction. Undertake red data species rescue programme prior to construction phase commencing.
		Direct	Erosion and loss of soil resources	VERY LOW	LOW	Develop a storm water management plan prior to commencement with construction. Use silt traps where necessary. Use bumps, humps, and cut off drains to control water velocity of exposed soils.
		Direct	Alien invasive species infestation	VERY LOW	LOW	Establish an alien invasive species monitoring and control

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
						programme.
		Indirect	Sedimentation, siltation, and increased turbidity in surface water	LOW	LOW	Undertake monitoring to determine if any impacts downstream of the construction camps are occurring and take necessary preventative actions.
		Cumulative	None			
8	Excavation of tower footings	Direct	Loss of vegetation and habitat, including potentially red data species located in wetland areas	VERY LOW	LOW	Use existing access roads where possible. Ensure only two access points to the power line servitude are available, one at the Makalu Substation, the other at the Vaalbank switching station. Ensure that no vehicles cross the river or work within 50m of the water course. Demarcate and fence the servitude prior to commencement with construction. Undertake red data species rescue programme prior to construction phase commencing.
		Direct	Erosion and loss of soil resources	VERY LOW	LOW	Develop a storm water management plan be prior to commencement with construction. Use silt traps where necessary. Use bumps, humps, and cut off drains to control water velocity of exposed soils. Stockpile soils from footings in demarcated areas. Use soil material from footings in rehabilitation of impacted areas wherever possible. Surplus spoils that cannot be utilised in rehabilitation are to be disposed of at a suitably licensed facility.
		Direct	Pollution of soils	VERY LOW	LOW	No servicing of vehicles onsite. Regular inspection and servicing of vehicles. Develop a spill management procedure for vehicles that may leak accidently. Have a waste management plan.
		Direct	Increased noise	VERY LOW	VERY LOW	Limit construction activities to daylight working hours.
		Indirect	Sedimentation, siltation, and increased turbidity in surface water	LOW	LOW	Undertake monitoring to determine if any impacts downstream of the construction camps are occurring and take necessary preventative actions.
		Cumulative	None			
9	Installation of tower foundations	Direct	Pollution of soils by cement spills, litter, waste metals, hydrocarbons and chemicals	VERY LOW	LOW	Regular inspection and servicing of vehicles. Develop a spill management procedure for vehicles that may leak accidently. Have a waste management plan. Ensure that concrete spills are cleaned up. Ensure litter is cleared regularly to designated waste areas. Ensure chemical toilets are regularly maintained.
		Direct	Increased noise	VERY LOW	VERY LOW	Limit construction activities to daylight working hours.
		Indirect	Fires may result in vegetation and habitat destruction, and loss of red data fauna and flora that will be killed	LOW	LOW	Undertake monitoring to determine if fires have any impact on the surrounding environment, suitable rehabilitation is to be undertaken where necessary.

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
						Rescue red data species in the servitude prior to the commencement with construction.
		Cumulative	None			
10	Construction of steelwork	Direct	Uncontrolled activities may lead to fires	LOW	LOW	A fire management plan to be established prior to construction commencing. Vegetation is to be cut back in areas where welding is undertaken to prevent fires from occurring. Fire breaks along the servitude are to be established. Suitable firefighting equipment and training is to be provided.
		Direct	Increased noise	VERY LOW	VERY LOW	Limit construction activities to daylight working hours.
		Direct	Pollution of the area by waste metals	VERY LOW	LOW	All waste metals are to be removed daily to a designated waste storage area from there can be taken for recycling or reuse.
		Indirect	None			
		Cumulative	None			
11	Stringing	Direct	No additional impact is expected from this activity.			
		Indirect	None			
		Cumulative	None			
12	Rehabilitation of disturbed areas once construction is completed (Positive Impact)	Direct	Soil fertility will be improved through soil amelioration.	LOW	LOW	No additional mitigation measures identified.
		Direct	Vegetation and habitat will be re-established.	LOW	LOW	No additional mitigation measures identified.
		Direct	Alien invasive species will be controlled	LOW	LOW	No additional mitigation measures identified.
		Indirect	None			
		Cumulative	None			
13	Testing and commissioning	Direct	No additional impact is expected from this activity.			
		Indirect	None			
		Cumulative	None			
OPERATIONAL PHASE						
1	Inspection and maintenance of the power line	Direct	Increased vehicle traffic	LOW	LOW	No real mitigation measures proposed.
		Direct	Inconvenience to land owners	VERY LOW	LOW	Establish a relationship with local landowners. Report to the landowner before accessing properties, and when leaving the property. Ensure that properties are only accessed on appointment.
		Direct	Increased safety and security risk to the community	VERY LOW	LOW	Ensure that labourers are provided with transport to and from the site. Control labour moving around the site. Ensure site is access controlled, fenced, and patrolled. Report crimes to the police. Establish a relationship with the local police and community policing forum. No housing of workers on site.
		Direct	Pollution from litter, waste metals, vehicle spills / hydrocarbon spills during maintenance activities	VERY LOW	LOW	Ensure that a servitude wide clean-up is undertaken at the end of every maintenance cycle to ensure that no pollution has occurred. Where this has happened appropriate remedial action is to be taken.
		Indirect	None			
		Cumulative	None			
2	Maintenance of substation	Direct	Spills and leaks from transformers could pollute soils during	VERY LOW	LOW	Ensure a suitable hydrocarbon management plan is established. Ensure that spill kits are available at all

NO	ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
			maintenance and replacement			places where maintenance work is being done. Clean spills immediately. Inform the relevant Eskom manager immediately
		Indirect	None			
		Cumulative	None			
3	Hydro-carbon and chemical usage at substation sites during the operational phase	Direct	Spills and leaks from transformers could pollute soils	VERY LOW	LOW	Ensure a suitable hydrocarbon management plan is established. Ensure that spill kits are available at all times. Clean spills immediately. Transformers are to be installed in suitably designed concrete bays with sufficient protection to ensure that no leaks can enter the environment. Regular inspections of transformer bays are to be undertaken. All chemicals used on site are to be stored in a suitably designed chemical store. Chemical usage is to be controlled and monitored at all time to ensure safe work procedure is executed, and any spills are appropriately cleaned.
		Indirect	None			
		Cumulative	None			
4	Transmission of electricity along conductors	Direct	Bird collisions	MODERATE	LOW	Implement Eskom distribution line avifauna management procedure.
		Direct	Bird electrocutions	MODERATE	LOW	Implement Eskom distribution line avifauna management procedure.
		Indirect	None			
		Cumulative	None			
5	Vegetation management and control of alien invasive species (Positive Impact)	Direct	A sustainable vegetation layer on all areas not concreted will be maintained at the substation, switching station, and power line corridor	LOW	LOW	No additional mitigation measures identified.
		Direct	Alien invasive species will be removed	MODERATE	LOW	No additional mitigation measures identified.
		Indirect	None			
		Cumulative	None			

DEDOMMISSIONING PHASE

Decommissioning of infrastructure: this will involve the reversal of the construction phase. The end result of the decommissioning phase will be a positive impact on the environment. The decommissioning phase was not assessed as part of this application and will be the focus of a separate application nearer to the time.

NO-GO ALTERNATIVE

NO	IMPACT / ACTIVITY	IMPACT SUMMARY	IMPACT	SIGNIFICANCE AFTER MITIGATION	IMPACT RISK	MITIGATION MEASURES
1	No activities undertaken	Direct	No negative environmental impacts			
		Indirect	None			
		Cumulative	None			
2	Project does not proceed	Direct	No electricity to the mine for expansion purposes	HIGH	VERY HIGH	Authorise and implement the proposed project activities.
		Indirect	Loss of jobs	MODERATE	MODERATE	Authorise and implement the proposed project activities.
		Cumulative	None			