4. ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED IKAROS SUBSTATION

The construction of a new substation was determined by Eskom Transmission to be the most cost-effective alternative, since the minimum length of additional Transmission and Distribution lines would be required to supply the required future load requirements in the Rustenburg area, as well as the increasing load requirements of the surrounding mines.

The identification of a feasible locality for the construction of the proposed new Ikaros Substation preceded the identification of alternative Transmission line corridors. A broader area (approximately 5 km x 5 km in size) was identified for the establishment of the Ikaros Substation, approximately 4 km south of the Bospoort Dam, straddling the farms Elandsheuwel 282 JQ, Klipgat 281 JQ and Turffontein 302 JQ. Three potential sites within this broader study area were identified as being technically feasible for the establishment of the Ikaros Substation (Figure 4.1). These are referred to as Sites A, B and C.

- *Site A:*

  The total site is approximately 600 m x 600 m. This site size is considered to be restricting, as the total substation site is anticipated to be of a similar size. This site has been earmarked as a reserve site for Anglo Platinum's future mining operations (Grové, 2002). The site lies adjacent to the existing Trident-Bighorn 275 kV line. A perennial watercourse lies to the north of the site.

- *Site B:*

  The total site is approximately 850 m x 600 m. The site has little relief, and no rivers or perennial watercourses. An informal township development (Boitekong) lies some distance to the west and south-west of the site.

- *Site C:*

  The total site is approximately 1 000 m x 600 m. This site has high-lying ground to the north, and a perennial watercourse to the south. Thekwane township is some distance from the site (to the south-west), but expansion plans for this township are evident.

Detailed studies undertaken within the EIA considered these three technically feasible sites.

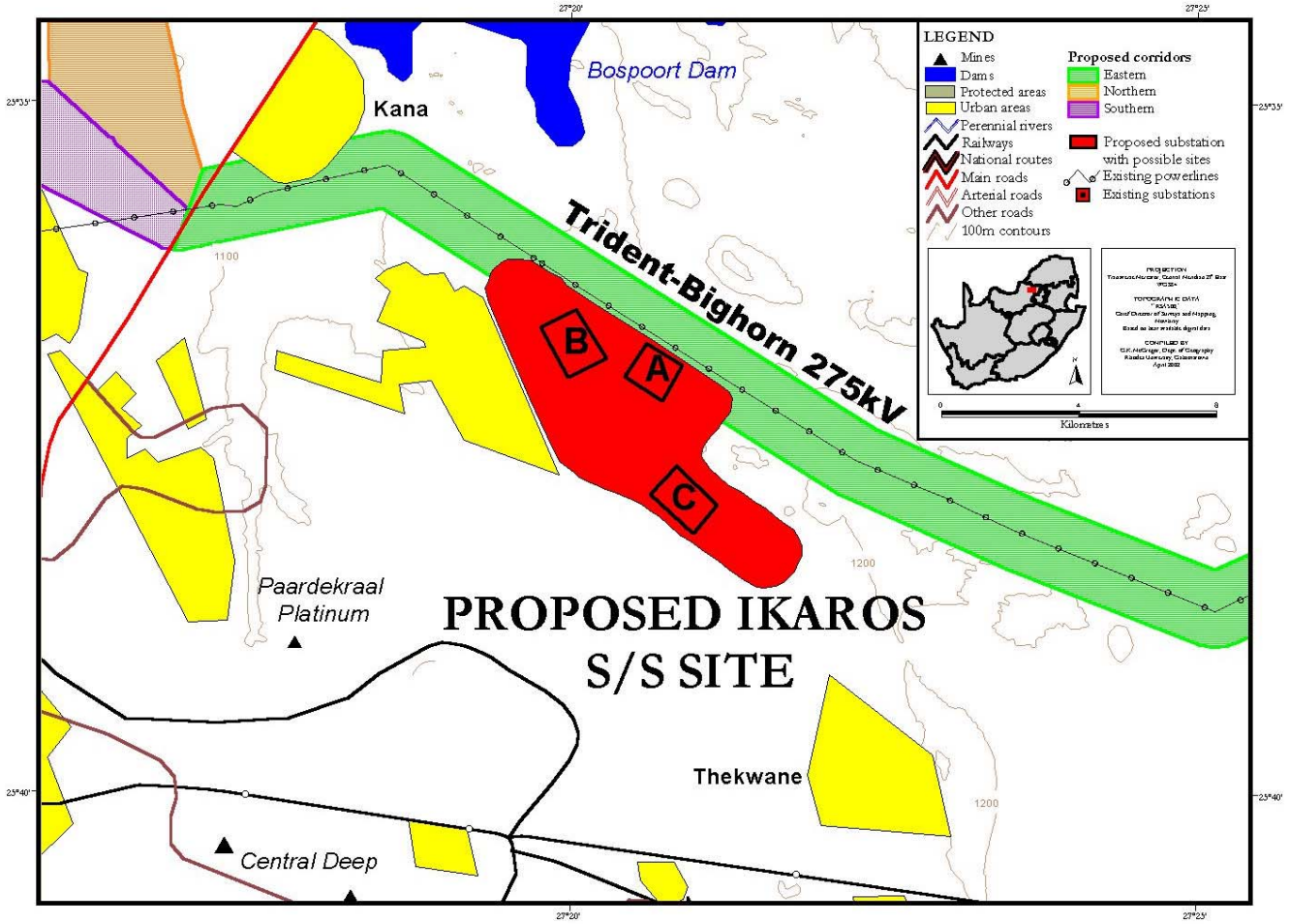

Figure 4.1: Broader area identified for the establishment of the Ikaros Substation, showing the location of Sites A, B and C

4.1. Potential Impacts on Substation Components associated with Climate and Atmospheric Conditions

The local climate is expected to have very little impact on the substation components, but may cause small variations in the transmission of electricity. Extreme weather phenomena are unlikely to pose a threat to the substation components, although secondary effects, such as flood conditions associated with high rainfall may present problems.

High wind speeds may also cause some stress to the components of the substation, and it is necessary to ensure that the sideways movement or swing of the conductors caused by the maximum gust which can be expected in the next 100 years does not exceed the required breaking strain of the substation structures.

With the adoption of mitigating measures to alleviate the threat posed by lightning to the transmission of electricity, no negative impacts are anticipated from this phenomenon.

Levels of pollution within the atmosphere may present operational problems to the substation. Oxidation and subsequent corrosion of metallic components may occur with time, but is considered to be highly unlikely.

Table 4.1: Potential impacts on substation components associated with climate and atmospheric conditions

Nature	Extent	Duration	Probability	Significance	Status
Local climate	Local	Long-term	Low	Low	Negative
Extreme weather conditions	Regional	Short-term	Low	High	Negative
High wind speeds	Local	Short-term	Low	High	Negative
Pollution	Local	Long-term	Low	High	Negative

4.2. Potential Impacts associated with Surface Watercourses

All three identified sites are situated on fairly steep terrain with varying sizes of catchment areas. There are two perennial watercourses situated on the north side of Site A and on the southern side of Site C (Grové, 2002).

4.2.1. Site A

The perennial watercourse on the north side of the site has a catchment of 7,15 km^2, which produces a peak flow of 85,3 m^3/second during a 1 in 50 year flood occurrence (Grové, 2002).

- Depth of flow watercourse – 2,8 m
- Height of site above invert of watercourse – 4 m
- No danger of flooding during a 1:50 year storm

Run-off over the site as follows:

- Average slope – 1:60
- Total catchment – 0,67 km^2
- Total peak flow over site – 11,95 m^3/second

4.2.2. Site B:

There are no rivers or perennial watercourses near this site (Grové).

Run-off over the site is as follows:

- Average slope – 1:80
- Total catchment – 0,42 km^2
- Total peak flow over site – 5,3 m^3/second

4.2.3. Site C

The perennial watercourse on the south side of the site has a catchment of 14,1 km^2, which produces a peak flow of 148,1 m^3/second during a 1 in 50 year flood occurrence (Grové, 2002).

- Depth of flow of watercourse – 4,2 m
- Height of site above invert watercourse – 2 m
- The first 120 m of the south-east corner of the site will flood with a 1:50 year storm

Run-off over the site is as follows:

- Average slope – 1:50
- Total catchment – 2,26 km^2
- Total peak flow over site – 22,5 m^3/second

4.2.4. Potential Impacts

Any substation components located on floodplains would be at risk from flood waters in flood conditions. Site C is the only site at potential risk of flooding (with a portion of the site below the 1:50 year floodline). The overall stability of the substation is not threatened by high water flows, and therefore, the overall effects of the flood waters on the substation site as a whole will be of low intensity and significance.

4.3. Potential Impacts on Geology and Soils

A detailed geotechnical survey of the three identified sites within the broader substation area was undertaken by Eskom Transmission: Geotechnical Services (Grové, 2002).

4.3.1. Soil Profile

The soil profile for all three sites is similar, except for the presence of rock outcropping randomly in parts. Climatic factors have combined to create a mode of decomposition characterised by chemical disintegration. Therefore, the norite has decomposed down to depths in excess of 4,5 m in poorly drained areas. Overall, the norite, due to its composition, has resisted these climatic factors to a fair extent, and decomposition has been limited to shallow depths. Consequently the residual soils are limited in depth, and soft to hard rock is present close to surface. Core-stones/boulders, normally associated with igneous rock profiles, were observed frequently on surface and at shallow depths in test pits. The norite is overlain by residual soils, reworked at shallow depths, with a high concentration of organic material in the top 150 mm.

The material properties have been changed drastically to varying qualities, and consequently, suitable materials must be carefully selected during construction to ensure stability.

4.3.2. Geology Influences on Construction

The geology of the region will have a great effect on conventional construction methods. The area is blanketed with highly active clay and hard rocky outcrops are often present. The presence of these materials varies considerably and with depth, and these factors will require special attention during the design phase. These materials are not suitable for civil construction and will have to be removed during construction.

The presence of shallow bedrock, especially in the southern parts of Site B should be avoided during site orientation. Care should also be taken to avoid deep cuttings and excavations. It is believed that these bedrock features would have major influences on construction costs. The presence of sporadic cores-stones (boulders) at any level cannot be ruled out.

For these reasons, a detailed geotechnical investigation would be required to be undertaken, once a preferred site has been nominated and authorised.

4.3.3. Water Table

No signs of water seepage or a shallow water table were observed.

4.3.4. Maximum Cut Depth and Fill Slopes

The maximum depth of cut is approximately zero for all the sites. Maximum fill heights differ to a large extent from 0,5 m for Site A and B to 5 m for Site C.

4.3.5. Cut and Fill Slopes

The cut slopes in the transported and residual materials is expected to result in erosion which is expected to stabilise at slopes approximately 1:2. Fill slopes are anticipated to be sensitive to erosion, and would require special attention and slope protection in the form of grass. This must be considered in the Environmental Management Plan (EMP).

4.3.6. Undermining and Surface Subsidence

Anglo Platinum operations in the vicinity of the proposed Ikaros Substation are not anticipated to impact on the surface stability of the site. No surface subsidence is anticipated on any of the three proposed sites. The calculated depth of the underlying ore body is approximately 1 550 m below surface at the three sites (Grové, 2002). The country rock is considered to be very stable, and no subsidence is evident in the general area, even in areas mined out at a depth of 20 m below surface.

4.3.7. Suitability of Materials for Civil Construction

- *Site A, B and C*

  Considering the geotechnical properties of materials encountered on the above sites and their geometry, Site A and Site B are considered the most suitable for this development. The

geometry of these sites will limit excavation into the hard material or rock with depth and avoid high fills. Materials down to 1,3 m would most likely classify as soft excavation with boulders and rocky outcrops requiring blasting for removal. Below 1,3 m the material changes to intermediate and hard with depth.

Blasting would mostly be limited to excavations for foundations in excess of 1,5 m deep, considering the above simulations. Optimised levels should, however, be decided upon with the aid of the final geotechnical investigation, in an attempt to minimise the need for rock excavation.

- *Borrow Material:*

  The construction of a platform to accommodate movement sensitive equipment for any one of the sites evaluated will require over-excavation of the potentially expansive clay and importation of suitable, non-expansive fill material. Therefore, a borrow area will be required to be established. The site of this borrow pit is to be determined prior to construction, and the appropriate authorisations obtained.

4.3.8. Recommendations

Considering all geotechnical factors and the terms of evaluation, the order of preference for the establishment of the Ikaros Substation site is:

- Site B is recommended as the first option;
- Site A the second option; and
- Site C the last option.

Site B and Site A are preferred due to their typical topography and geotechnical properties. However, there is a possibility that Site A would require larger quantities of over-excavation of the expansive soils.

Site B and Site C should be further investigated with reference to the availability of suitable borrow material. Present information indicates that the norite profile is weathered to greater depths on Site C, possibly having large quantities of suitable sandy gravel material available. Indications are that suitable material is also available in lesser quantities adjacent to Site B (to the north-west).

A phase-II geotechnical investigation of the preferred nominated site, addressing the workability of on-site materials and obtaining design parameters, should be conducted prior to the commencement of construction activities.

4.4. Potential Impacts on Agricultural Potential

From a soils perspective, all three potential sites identified for the establishment of the Ikaros Substation fall within land type Ea3 (refer to Table 4.2 overleaf), which comprises dark, swelling clay soils of variable depth. Some rock also occurs in certain areas.

Due to the small size of Site A, and the anticipated uniformity between the three sites, this site was not surveyed in detail.

Sites B and C were investigated on a 150 m x 150 m grid, using a hand-held soil auger, to a maximum depth of 1,2 m (or shallower, where bedrock was encountered).

Table 4.2: Soil properties per land type

Property Land type	Dominant soils	Sub-dominant soils	Slopes	Agricultural Potential (%)
Ea3	Ar40/20 450-1200 mm, SaCl-Cl 70%	Rock + Ms10 50-250 mm, SaLm 10% 6%	<3%	H: 7.1 M: 77.1 L: 15.8

The soils occurring on the two sites investigated comprise only one soil type, namely the black, swelling clay soils of the Arcadia soil form (map unit Ar). There is little depth variation, with most of these soils being deep. Several small areas were also encountered where rock outcrops occur (map unit ArR). Here, the soils tend to be shallower, although deep soils do occur between rocks. However, cultivation on site would be problematic due to the rock outcrops which are present. The main characteristics of the two units are provided in Table 4.3 below (refer to Figure 4.2).

Table 4.3: Soil characteristics recorded at the proposed Ikaros Substation site

Map Unit	Dominant soils	Soil characteristics	Slopes	Agricultural Potential
Ar	Arcadia	Moderately deep to deep (700-1 200+ mm), black, moderately to strongly structured, swelling clay soils on weathering norite.	1-3%	Moderate
ArR	Arcadia Rock	Shallow to moderately deep (300-900 mm), black, moderately to strongly structured,	1-3%	Low

Map Unit	Dominant soils	Soil characteristics	Slopes	Agricultural Potential
		swelling clay soils on hard to weathering norite. Rock outcrops occur		

Table 4.4: Potential impacts on agricultural potential associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Construction of substation	Local	Long-term	Likely	Moderate	Negative

4.4.1. Recommendations

The soils present on all sites are black, swelling clay soils, with little variation. The small areas of surface rock outcrops (ArR unit) are isolated and easily observed. There is little difference between the sites in terms of soils or agricultural potential. Therefore, no one site is recommended as a preferred site.

4.5. Potential Impacts on Flora and Terrestrial Fauna

The site of the proposed Ikaros Substation is in an island of relatively undisturbed open woodland. It is, however, surrounded by densely populated townships, and the traffic through the area is heavy. The area is also utilised by people for firewood, and game that may have occurred there have most likely been hunted to extinction. No sensitive plant or animal species were identified within the broader area proposed for the establishment of the Ikaros Substation.

Although a localised impact on the flora and fauna will occur as a result of the construction of the Ikaros Substation, this impact is anticipated to be of low significance due to the relative low sensitivity of the flora and fauna recorded on the site.

Table 4.5: Potential impacts on flora and terrestrial fauna associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Red Data species	Local	Long-term	Not likely	High	Negative
Clearing of vegetation for establishment of substation	Local	Permanent	Definite	Low	Negative

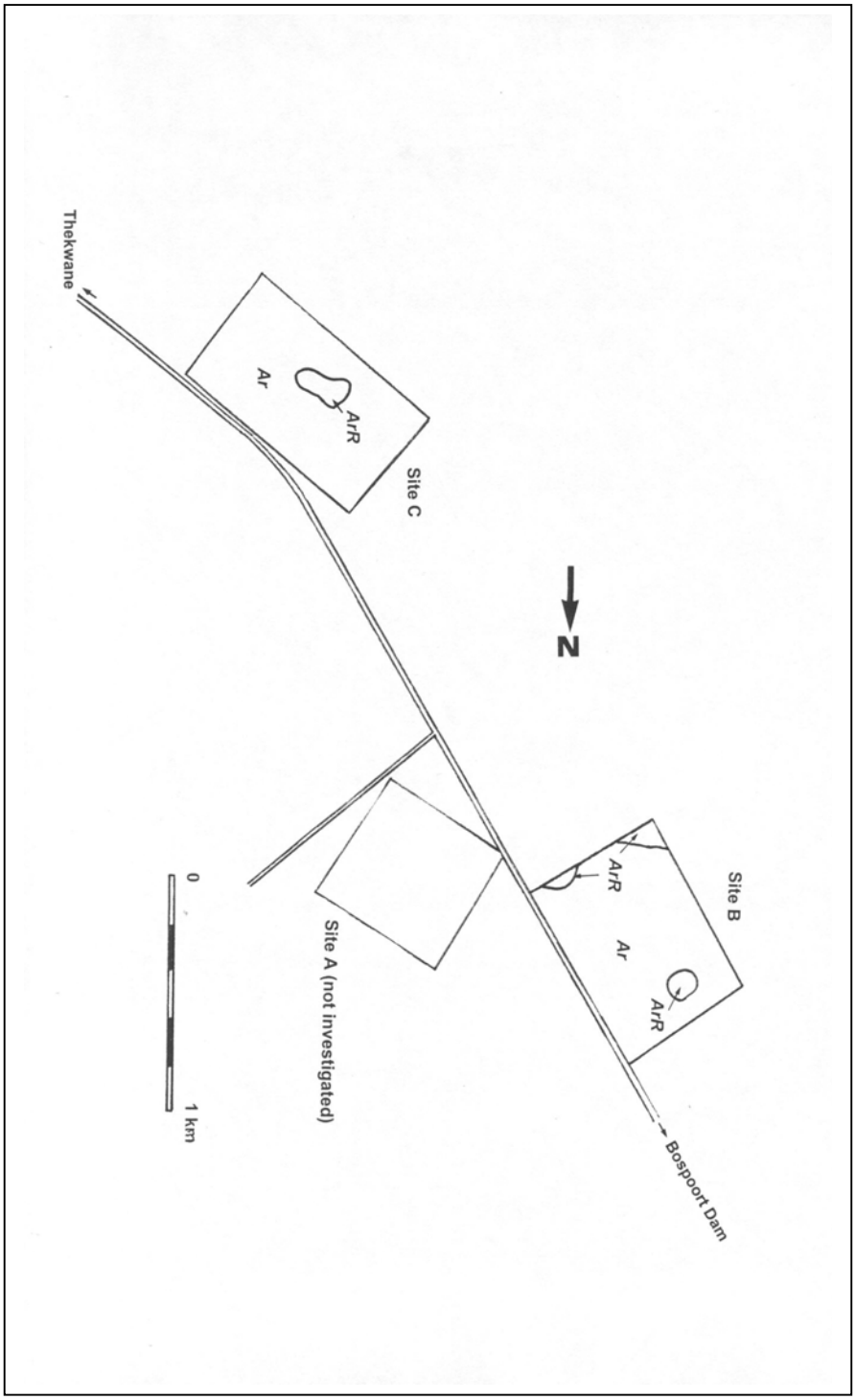

Figure 4.2: Land types recorded at the identified Ikaros Substation sites B and C

4.5.1. Recommendations

In order to assist contractors in the identification of any sensitive flora and fauna species which may be encountered during the construction phase, the following generic mitigation measures are proposed:

- Prior to the commencement of construction, a detailed survey of the final substation site should be undertaken in order to confirm the absence of Red Data and/or protected species.
- Special environmental provisions should be included in construction agreements. This should include:
    - Penalties for removal and/or destruction of threatened species for any reason (firewood, medicinal use, collectors value etc) should be agreed upon beforehand.
    - A protocol describing the actions to be followed if a threatened species is found should be in place.
- A baseline data set (list of probable rare, endangered or threatened) that could be encountered by the construction team should be drawn up.
- Rare/endangered/protected species which are found on the site may be relocated (to a similar location not more than 300 m from original location) before construction proceeds. The contractor must be assisted by an experienced person or organisation to ensure that the best option is exercised (i.e. relocation of the species individuals if possible or even removal for genetic propagation by an established institution such as the NBI, Pretoria).
- Mitigation measures, including pre-arranged agreements with specialist institutions/persons to deal with any threatened species found during construction, should be included in the Environmental Management Plan (EMP).
- Methods of eradication and control of alien and invader plant species should be included within the EMP.

4.6. Potential Impacts on Avifauna

No significant new impacts are expected to occur as a result of the construction of the Ikaros Substation, due to the heavy permanent impacts that are already evident in the area. However, impacts are expected to occur during the construction period due to localised disturbance of the area. This impact is anticipated to be of a short-term nature and of low significance. This is due to the absence of Red Data species in the area as a result of the vast historic disturbance.

Table 4.6: Potential impacts on avifauna associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
During construction	Local	Short-term	Likely	Low	Negative
During operation	None	-	None	-	-

4.7. Potential Impacts on Land Use

4.7.1. Possible Restriction of Access

The proposed Ikaros Substation may restrict access of the Boitekong residents to other settlements and the Bospoort Dam. These areas are currently accessible.

4.7.2. Possible Impact on Planning Policies and Future Development

The proposed Ikaros Substation is deemed to be generally consistent with the existing LDO/IDP directives for the area under consideration, and amendment of these policies will, therefore, not be necessary.

4.7.3. Potential Impacts on Agricultural Land

The proposed Ikaros Substation site may impact on a large portion of land that is currently used for grazing by residents of Boitekong. However, approximately 36 ha will effectively be utilised by Eskom. The proposed substation site is located in an area characteristic of turf soil with moderate agricultural potential (as discussed in Section 4.4). The substation development will effectively reduce the size of available land in the area for agricultural purposes.

Table 4.7: Potential impacts on land use associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Restriction of access	Local	Permanent	Highly probable	Moderate	Negative
Impact on planning policies & future development	Regional and Local	Short	Probable	None	Neutral
Sterilisation of agricultural land	Local	Permanent	Highly probable	Moderate	Negative

4.7.4. Recommendations

The following mitigation measures are proposed in order to minimise the potential impacts on land use as a result of the establishment of the Ikaros Substation:

- It is proposed that the Ikaros Substation be developed in the central or eastern portion of the proposed site, in the vicinity of the existing Trident-Bighorn Transmission line in order to create a buffer zone of open land between the existing township of Boitekong and the proposed substation. The south eastern section of the proposed substation site is located in close proximity to Thekwane and, therefore, this portion of the site is not favoured for the positioning of the substation infrastructure, but that it should also serve as a buffer zone.
- The proposed Ikaros Substation site may impact on land that is currently used for cattle grazing purposes by residents of the Boitekong area. This area is also identified to be of moderate potential turf-soil. It is suggested that negotiations take place with the relevant persons who manage the land to investigate alternative grazing options for the community.

4.8. Potential Impacts on Archaeological, Cultural and Historical Sites

The substation site is considered to be of low archaeological significance. Five pottery clusters mark 16th century Sotho-Tswana settlements on the south side of a small stream flowing into the Bospoort Dam. These are indicated on Figure 4.3 as sites 4 – 8.

- Site 4: 25° 36' 44,5" S 27° 20' 55,0" E
- Site 5: 25° 36' 42,0" S 27° 20' 47,0" E
- Site 6: 25° 36' 35,0" S 27° 20' 44,5" E
- Site 7: 25° 36' 48,0" S 27° 20' 45,5" E
- Site 8: 25° 37' 08,5" S 27° 20' 39,5" E

All of these open sites have low significance, as they are abundant in the area and have been weathered over time. Therefore, potential impacts are anticipated to be of low significance.

Table 4.8: Potential impacts on archaeological, cultural and historical sites associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Impacts on pottery clusters	Local	Long-term	Probable	Low	Negative

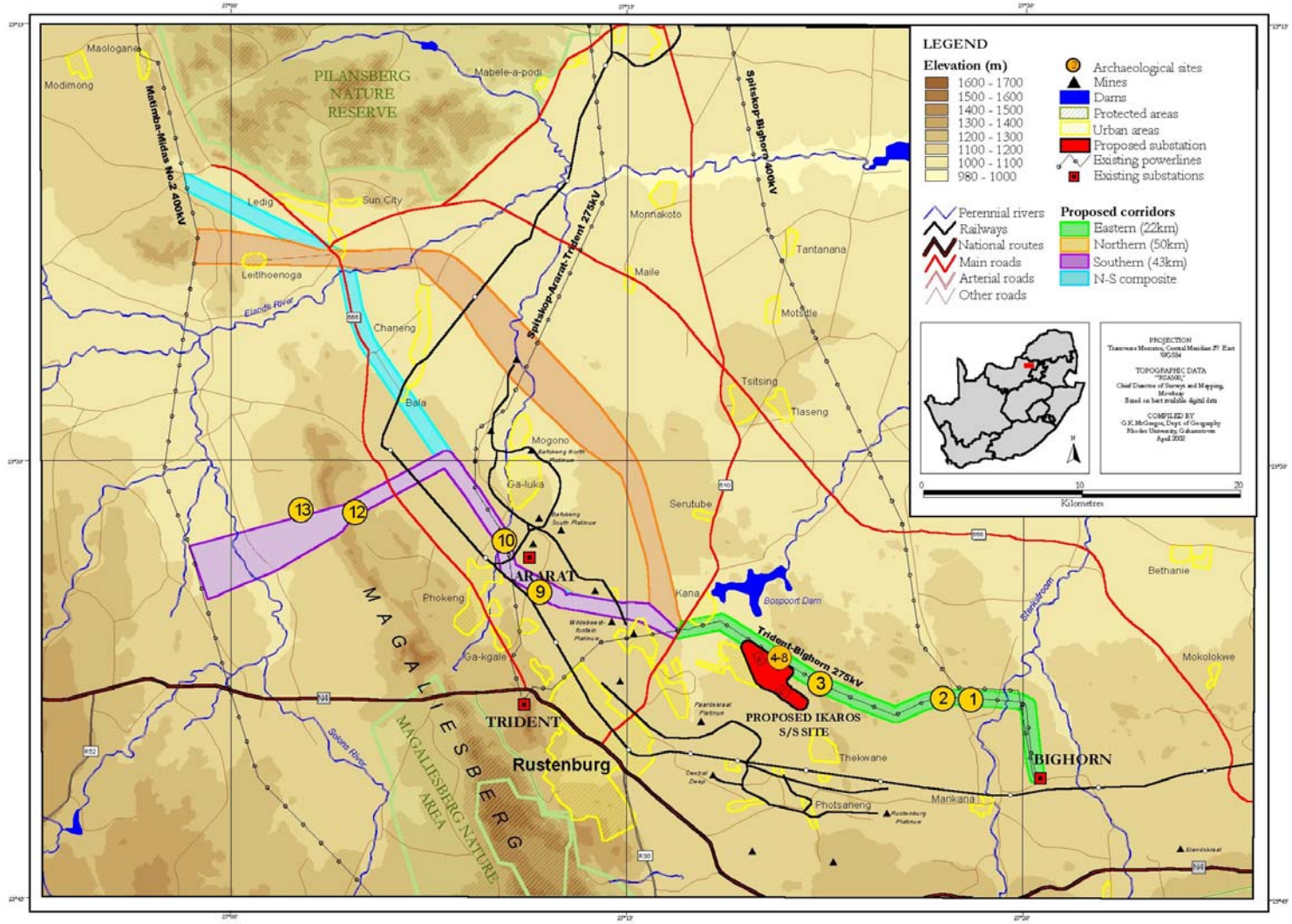

Figure 4.3: Archaeological sites identified within the study area

4.8.1. Recommendations

Open pottery sites will not require further recording unless burnt daga structures are also found to be present. If such sites are encountered, a qualified archaeologist should be altered to allow for the excavation and recording of the site.

4.9. Potential Impacts on Aesthetics/Visual Quality

Any change in a local view through the introduction of a new development in the line-of-sight can be considered as a visual impact. The significance of this visual impact is influenced by the nature or "quality" of the affected landscape, the degree of change in the landscape which occurs as a result of the development, as well as by the landscape's capacity to absorb the impact. The assessment of a visual impact is highly subjective, and depends largely on the views of the individual and the aesthetic value of the view. Visual impacts are usually considered most significant when the development is not of a similar nature to other developments in the area, or is readily viewed from areas of public access, paths, roads and view points, or in areas which are characterised by significant natural features (refer to Appendix K for details of visual assessment methodology).

The area in and around Rustenburg is highly developed and includes many developments with height, such as shafts and headgear, tailings dumps, existing powerlines and substations, etc. These developments have an existing impact on the visual quality of the general area.

It is anticipated that visibility of the proposed Ikaros Substation will mostly be restricted to the area immediately surrounding the substation site (refer to Figure 4.4). The general area surrounding the substation site has little relief, which may increase the viewing distance of the substation due to it's size. However, no areas within nature reserves or conservation areas will be visually affected by the substation, due to these areas being more than 15 km away from the site.

The visibility of the substation from the majority of study area is low to negligible. Those areas from where the substation may be visible include Boitekong, Kana, Paardekraal Platinum Mine and the northern portion of Thekwane township. The significance of the impact within the visibility zone is considered to be low due to the occurrence of infrastructure associated with various mining operations, townships and other urban developments in the immediate vicinity.

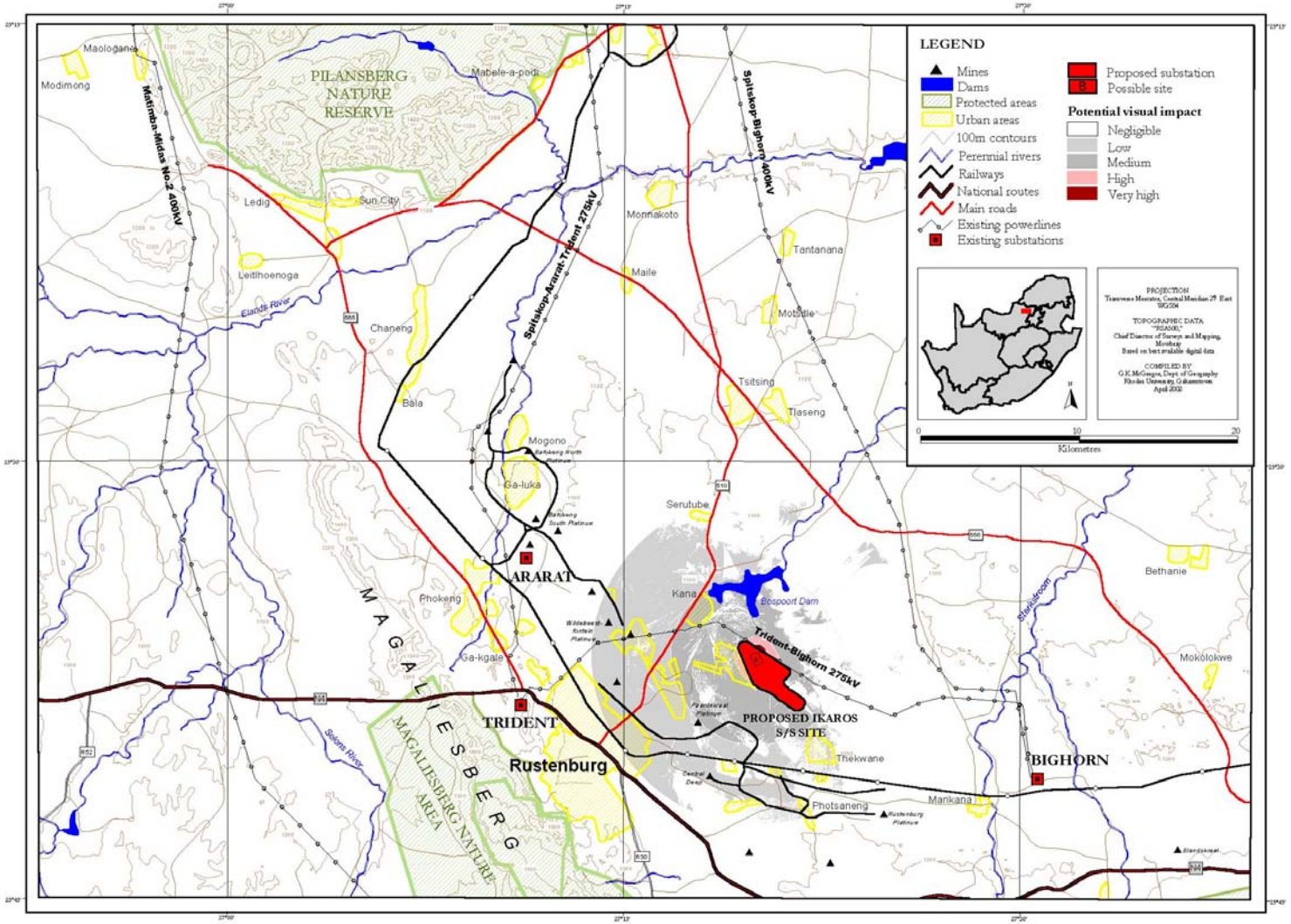

Figure 4.4: Potential visual impact associated with the establishment of the proposed Ikaros Substation

Kana, Boitekong and Thekwane townships and sections of Bospoort Dam will have moderate to low views of the substation, depending on a number of factors (including vegetation type, existing infrastructure, etc) since they are less than 5 km away from the proposed site. Where the substation is in clear view, this impact is anticipated to be of a long-term nature. Due to the extent of existing development in the area, the significance of this impact is anticipated to be moderate to low.

Table 4.9: Potential impacts on visual/aesthetic quality associated with the establishment of the Ikaros Substation

Nature	Extent	Duration	Probability	Significance	Status
Sun City and Pilanesberg National Park	None	-	-	None	-
Magaliesberg	None	-	-	None	-
Kana, Boitekong and Thekwane Townships and sections of Bospoort Dam	Local	Long-term	Probable	Moderate to low (where substation is in clear view)	Negative

4.10. Potential Social Impacts

The social impact assessment (SIA) variables associated with the construction of a new substation site include the following:

- Impacts on the local population
- Infrastructure, farming and industrial activity-related impacts
- Public health, safety and security impacts
- Land use and the direct intrusion of the project on communities
- Aesthetic and tourism-related impacts
- Archaeological, cultural or historical sites impacts.

Those variables considered to be relevant to this component of the study are assessed as potential social impacts. The assessment considers the probability of the impact occurring and the actual (not perceived) impact, in respect of the construction and operation phases of the proposed Ikaros Substation. The SIA is outlined in the tables overleaf, together with an indication of potential mitigation measures, as well as the significance of impacts with mitigation in place.

4.10.1. Recommendations

The impacts associated with the establishment of substation infrastructure within the area are of a local nature. The receiving social environment determines the actual intensity and significance of the impact. It is considered feasible for the construction and operation of the substation site to be undertaken without considerable impact to the social environment, due to the nature of the site, the area in general, and the local mining developments already in place.

In order to minimise potential impacts associated with the establishment of the proposed Ikaros Substation on the social environment, it is recommended that the substation be developed in the central or eastern portion of the proposed site, in the vicinity of the existing Trident-Bighorn Transmission line (i.e. either Sites A or B). This will effectively create a buffer zone of open land between the existing township of Boitekong and the proposed substation. The south-eastern section of the proposed substation site (Site C) is located in close proximity to Thekwane and, therefore, this portion of the site would also require a buffer zone should substation infrastructure development occur in this area.

Nature of impact	**Relocation of individuals or families**	
Stage	Construction	Operation & Maintenance
Extent	None	-
Duration	-	-
Probability of occurrence	None	-
Status of impact	-	-
Significance	-	-
Mitigation measure	In order to minimise present and future potential impacts on the community, the substation needs to be constructed in the central or eastern portion of the broader area.	-
Significance after mitigation	-	-
Discussion	The sites identified for the establishment of the substation infrastructure does not require the relocation of any individuals, or dwellings.	

Nature of impact	**Population impacts – inflow of temporary workers**	
Stage	Construction	Operation
Extent	Regional – but mostly confined to construction camps	
Duration	For the duration of the construction phase	
Probability of occurrence	Highly probable, as construction for Eskom requires skilled labour	
Status of impact	Negative	
Significance	Moderate	
Mitigation measure	The conduct of on-site workers must be specified to the Contractor. Specification are to include sanitation, water and waste (litter) as well as informal trading, and interfering in local community/cultural affairs.	
Significance after mitigation	Moderate - Low	

Nature of impact	**Population impacts – inflow of temporary workers**
Discussion	Substation construction is specialist in nature, and specialist contractor teams be will be required to be employed. The nature, extent and impact of this variable will depend on possible disruptions/intrusion/environmental impacts due to the presence of contractors (whether local or not) as well as potential clashes due to differences in racial and ethnic composition between locals and outside contractors. Historically, the introduction of contractors and construction camps is associated with a number of social and environmental problems. Such problems can include the erection of informal dwellings and associated problems such as lack of water, sanitation and waste disposal infrastructure, with concomitant health, environmental pollution and aesthetic impacts. These problems can be exacerbated in the event of an in- migration of job-seekers from elsewhere, who may set-up informal dwellings in the vicinity of the construction camps. The probability of this occurring is, however, slight, given the limited potential for employment at the site, and the more abundant opportunity for employment at the local mines. Moreover, it is common practice for local informal vendors (notably women providing cooked food) to enter the area, given the new business opportunity provided by the construction workers. Mitigation measures are required to be specified within the EMP provided to the appointed Contractors..

Nature of impact	**Disruption of farming activities**	
Stage	Construction	Operation
Extent	Local	No farming in substation site
Duration	Permanent (grazing)	-
Probability of occurrence	Probable (grazing)	-
Status of impact	Negative	-
Significance	Moderate to low (due to size of area)	-
Mitigation measure	Undertake with the relevant persons who manage the land to investigate alternative grazing options for the community	-
Significance after mitigation	Low	-
Discussion	Only a portion of the total site will be inaccessible to local communities for grazing purposes.	

Nature of impact	**Management of access routes, fences and gates**	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term; temporary	Long-term; permanent
Probability of occurrence	Definite	Definite
Status of impact	Negative	Potentially High
Significance	Moderate	Moderate
Mitigation measure	Discussions with affected parties (local authority (roads), property owners, community leaders, etc) must take place before construction to inform them regarding the construction schedule and activities. Appointed contractor(s) to ensure that access to communities, property owners and public areas are provided and clearly marked (direction to which community / public place / public place).	Fences and gates being installed must be of high quality to ensure durability. Eskom must ensure that: • access roads for maintenance purposes are kept in good travelling conditions and cleared of any obstructions; • fences are regularly inspected for any damages. Should any damages occur, repairs need to be done immediately. • gates to access roads must be closed after entering and exiting properties and locked. When access are not required, gates must be permanently closed and locked.
Significance after mitigation	Low	Low
Discussion	The restriction access to the substation site is necessary to prevent both individuals and livestock from entering the area, so as to avoid potential injury. Limited access also minimises the opportunities for equipment tampering, and loss of operation of the substation.	

Nature of impact	**Electro-magnetic field health risks (role of proximity to source)**	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term	Permanent
Probability of occurrence	Improbable	Probable
Status of impact	None	Negative

Nature of impact	**Electro-magnetic field health risks (role of proximity to source)**	
Significance	None	Perception of affected parties: High
Mitigation measure	-	Strict adherence to existing national or international safety standards, and compliance with Eskom Safety Standards by constructing the substation to the correct specifications. Incorporation of simple protective measures, such as the restriction of access around strong electromagnetic field sources to eliminate unauthorised access to areas where exposure limits may be elevated. Consultation with local authorities and the public in siting new infrastructure, which will consider perceived fears and sensitivities, and assist in allaying fears. Open communication and transparency with regards to known facts.
Significance after mitigation	-	Potentially Low
Discussion	The proximity of the source to local residents impacts on the severity of the concerns raised. The substation will not be constructed in close proximity to existing township developments, in accordance with Eskom's requirements, and therefore, the true impact is to be rated as low. Magnetic fields naturally emanate from sources such as substations and Transmission lines. According to the World Health Organisation (WHO, 2001) it has become increasingly unlikely (based on the existing body of research) that exposure to EMFs constitutes a serious health hazard, although some uncertainty remains. The WHO's statement derives from a study by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) (June 2001), which, using the standard IARC classification that weighs human, animal and laboratory evidence, classified ELF magnetic fields as possibly carcinogenic to humans based on epidemiological studies of childhood leukaemia. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e. static fields and ELF electric fields) was considered not classifiable either due to insufficient or inconsistent scientific information.	

Nature of impact	**Health (Ambient conditions and HIV/AIDS)**	
Stage	Construction	Operation
Extent	Local, or regional	-
Duration	Short term – length of construction period	-

Probability of occurrence	Probable	-

Nature of impact	**Health (Ambient conditions and HIV/AIDS)**	
Status of impact	Negative	-
Significance	Moderate	-
Mitigation measure	Ambient environmental conditions during construction activities to be monitored by contractor. Appointed contractor to ensure that dust is kept to a minimum by implementing appropriate dust-suppression techniques. Oblige contractor to ensure that workers are educated on HIV/AIDS and that condoms are readily distributed. The local health services to participate to ensure education/condom distribution programmes.	-
Significance after mitigation	Low to uncertain	-
	Construction activities result in unnatural increases in local ambient pollution levels. An increase in the number of sex-trade workers and the spread of sexually transmitted infections (STIs) and HIV/ AIDS is increasingly being recognised as a risk associated with construction camps. Workers are separated from their families, and it is not uncommon for construction camps are frequented by local sex workers. This promotes the spread of STIs.	

Nature of impact	**Safety & security**	
Stage	Construction	Operation
Extent	Local, regional	Local
Duration	Short term – for the duration of the construction phase	Permanent
Probability of occurrence	Probable	Probable
Status of impact	Negative	High
Significance	Moderate	Low

Nature of impact	**Safety & security**	
Mitigation measure	All construction areas to be fenced off before any construction activities take place, access control to construction sites to be in place, and signage to be displayed indicating dangerous areas, etc. All construction materials and equipment to be safely stored. Construction materials to be guarded during operation. Road network to and from construction sites to be clearly marked. Construction company to have security on site at all times. Community safety concerns to be identified by Contractor (or identify from the PPP). Workers employed and vehicles used should be readily identifable as Eskom construction staff. Workers may be obligated to wear identity cards or corporate clothing to assist the community in identifying them as construction workers.	As per Construction Phase. Proper signage to be displayed indicating danger. Eskom to educate communities (minors and adults) regarding the danger of electricity and electricity infrastructure.
Significance after mitigation	None	None
Discussion	Safety consideration are of particular importance: Construction worker safety: Are a number of occupational safety risks associated with substation site construction, including the risk of electrocution. Compliance with the OH&S Act would be required in terms of. Community safety: Potential risk of electrocution (people and livestock) if access to the site is not controlled. Safety and security threats posed by the presence of the construction camps/workers. Locals readily attribute increases in theft and other crimes to the presence of construction workers, particularly if these workers are from outside their area.	

Nature of impact	**Noise pollution**	
Stage	Construction	Operation
Extent	Local	Local
Duration	Short term – the length of the construction period	-
Probability of occurrence	Probable	-
Status of impact	Negative	-

Nature of impact	**Noise pollution**	
Significance	Low	-
Mitigation measure	Any drilling and other construction activities should be limited to daylight hours. No construction activities on weekends, especially when close to communities. Ensure that all machinery is in good order and complies with generally accepted noise levels. Any high impact activity (such as the use of dynamite to blast rocky outcrops) would require prior warning to adjacent landowners. The impact of blasting activities is considered to be low, due to the extensive quarrying which is undertaken north-east of the substation site..	-
Significance after mitigation	None	None
Discussion	Construction and blasting activities are not anticipated to have a significant impact on ambient nose levels due to the nature of the activities (mining and quarrying) in the local vicinity.	

Nature of impact	**Aesthetic quality**	
Stage	Construction	Operation
Extent	Local	Regional
Duration	Short term	Permanent
Probability of occurrence	Highly probable	Highly probable
Status of impact	Moderate	Moderate
Significance	Moderate	Moderate
Mitigation measure	Construction site to be kept clean, and number and geographical "spread" of construction camps to be kept to a minimum..	Indigenous trees or shrubs to be planted around the substation area to shield the view. Mitigation to be applied at the design stage.
Significance after mitigation	Low	None
Discussion	Aesthetic quality and visual impact of an area is required to be considered in terms of the local community/inhabitants perceived views. The Rustenburg area has been subject to the on-going increase of light-industrial (mining) developments, and the generally perceived view is one of a mining hub. However, there are remote outlying areas which are perceived to be natural and undisturbed. This area is currently highly developed, and concerns are that inhabitants of the area will soon become super-saturated.	

Nature of impact	**Sites of cultural, religious, historical or archaeological significance**	
Stage	Construction	Operation
Extent	Local	Regional
Duration	-	Not applicable
Probability of occurrence	Probable	Improbable
Status of impact	Low	Low
Significance	Low	Low
Mitigation measure	A list of sites of archaeological, cultural and historic importance must be compiled. If a site is uncovered during construction, a qualified archaeologist must be alerted prior to construction continuing such that the site can be excavated and recorded. Required permits are to be obtained.	None
Significance after mitigation	Low - To be determined by the specialist post-construction.	None
Discussion	Archaeological sites are protected by the National Heritage Resources Act (No 25 of 1999). It is an offence to destroy, damage, excavate, alter or remove from its original position, or collect and archaeological material without a permit issued by the South African Heritage Resource Agency. Note must also be taken of the National Heritage Council Act (No 11 of 1999).	

4.11. Conclusions and Recommendations

Table 4.10 below provides a summary of the recommendations made regarding the proposed Ikaros Substation site.

Table 4.10: Summary of findings regarding the proposed Ikaros Substation site

Issue	Anticipated Impacts and Recommendations	Preferred site
Climate and atmospheric conditions	Minimal impact on substation components.	Not applicable
Geology and soils	Site C will require large amounts of fill. Sites B and A are considered the most suitable for the construction of the substation. Site B is recommended.	A or B
Agricultural potential	Moderate agricultural potential at all sites. Impact at all three sites considered similar.	A, B or C
Flora and fauna	Habitat disturbed; site specific (EMP) input required. Impact at all three sites considered similar.	A, B or C
Avifauna	Area disturbed; potential for impact on Red Data species minimal.	A, B or C
Land use	No land use issues at sites B and C. Planned mining activities at Site A. The proximity of the sites to township developments is a concern for sites B and C. Preference for a site some distance from a township development to allow for a buffer zone.	B or C
Archaeological, cultural and historical sites	Site contains some scattered pottery remains only. Impact at all three sites considered similar.	A, B or C
Visual	Visual impact at all 3 sites; impact heightened if adjacent to a township development. Prefer a site away from township developments to allow for a buffer zone.	A, B or C
Social environment	Close proximity of site to township developments to be avoided; health and safety issues. Prefer a site away from township developments. Planned mining activities at Site A.	B or C

Considering the findings of all the detailed studies undertaken, the order of preference for the Ikaros Substation site is rated as follows:

- Site B is recommended as the first option, provided that a buffer zone with Boitekong is allowed for.
- Site A is recommended the second option, although this site may not be available due to the potential future expansion of the mines in the area.
- Site C is the least preferred option.