SCOPING OF ISSUES ASSOCIATED WITH THE PROPOSED OF STEELPOORT INTEGRATION PROJECT CHAPTER 5

This Environmental Scoping Study identifies the potential positive and negative environmental (biophysical and social) impacts associated with the proposed Steelpoort Integration Project. A number of issues for consideration were identified by the environmental team and/or raised by I&APs during the consultation process. This section serves to evaluate the potential environmental impacts associated with the proposed project and to make recommendations for further studies required within the EIA phase.

5.1. Potential Impacts on Topography

The study area comprises part of the valley of the Steelpoort River system, which varies in width from approximately 1 km to 8 km. The topography of the study area varies from 1 600 m above sea level within the higher areas to below 850 m in the lower lying areas.

Disruption or modification of physical landforms to some degree is the most readily noticeable impact associated with the construction of any infrastructure. The direct impact on landforms with the establishment of a substation and transmission power lines is mainly one of disruption of surface soils and vegetation.

5.1.1. Evaluation of the Proposed Substation Site

The area earmarked for the construction of the substation is generally flat, with a slight slope to the south east. The broader area will be developed for the PSS (including the establishment of the lower dam, associated buildings and access roads), which will result in an alteration of the local topography. Potential impacts on topography associated with the establishment of the proposed substation at the identified site are anticipated to be localised and restricted to foundation areas associated with the proposed Steelpoort Substation site. Substation sites are required to be on level terrain and, therefore, these sites typically have minimal impact on the local topography, apart from the substation foundations.

Potential impacts on topography are, therefore, anticipated to be limited the construction phase and construction areas and of low significance as no major changes on the landscape are required.

5.1.2. Comparison of Transmission Power Line Alternatives

Potential impacts on topography associated with the construction of the transmission power lines are anticipated to be localised and restricted to foundation areas associated with the transmission power line towers. The potential impact associated with towers is anticipated to be negligible as technical constraints require Eskom to select transmission power line corridors which avoid areas which are impassable, thus minimising the need to disrupt the local topography. Potential impacts on topography are, therefore, anticipated to be limited the construction phase and construction areas and of low significance as no major changes on the landscape are required.

The slopes associated with the proposed turn-in line are steep where the line ascends the escarpment. Potential impacts on topography are anticipated to be more significant with the construction of two lines in parallel (requiring a servitude of 110 m in total) when compared to a single double-circuit line (requiring a servitude of 55 m). Therefore, the option of constructing a double-circuit line for the entire length of the turn-in line is considered to be the preferred option.

The slopes associated with the western alternative, the R555 sub-alternative, the southern sub-alternative and the northern sub-alternative proposed for the Steelpoort-Merensky 400kV line are less significant than those associated with the proposed eastern alternative. Therefore, the impacts on topography as a result of the construction of the line along the eastern alternative are anticipated to be of higher significance. Therefore, this alternative is the least favoured in this regard.

5.1.3. Conclusions

The identified substation site is relatively flat and is located in close proximity to the PSS, the establishment of which will have a limited impact on the local topography of the area. The proposed site is therefore considered to be acceptable in this regard.

The option of constructing a single double circuit transmission power line is nominated as the preferred option for the proposed turn-in line between the Steelpoort Substation and the Duvha-Leseding 400kV transmission power line, as this option will minimise local impacts on topography.

The eastern alternative proposed for the Steelpoort-Merensky 400kV line is considered to be the least favoured in terms of potential impacts on topography. The western alternative, the R555 sub-alternative, the southern sub-alternative and the northern sub-alternative are all considered to be similar in terms of impacts in this regard.

5.1.4. Recommendations

No additional studies are required to be undertaken within the EIA with regards to potential impacts on topography, as primary impacts associated with substation and transmission power line construction are associated with the disruption of the soil surface. However, appropriate mitigation and management measures should be developed within the EIA phase for inclusion in the project EMP.

5.2. Potential Impacts on Transmission Infrastructure associated with Climate and Atmospheric Conditions

The local climate is anticipated to have very little impact on the transmission power line and substation components, but may cause small variations in the transmission of electricity. Extreme phenomena are unlikely to pose a threat to the substation, although secondary effects such as flood conditions associated with high rainfall may present problems to the operation of the substation and transmission power lines. Such events are, however, rare within the study area as a result of the generally arid nature of the region and, therefore, the risk associated with this potential impact is anticipated to be of low significance.

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. Pollution levels may be elevated as a result of the extensive mining in the area and dust from gravel roads. Oxidation and subsequent corrosion of metallic components associated with the substation may occur with time. This potential impact is dependent on the levels of pollution in the area, and may vary with time. There do not appear to be any impacts on the existing transmission infrastructure in the area as a result of pollution, and therefore the impacts on the proposed new infrastructure is expected to be of low significance. However, with the implementation of appropriate mitigation measures, this impact is expected to be of low significance.

5.2.1. Conclusions and Recommendations

As the identified corridors are located in close proximity to each other, it is anticipated that the same climatic conditions would be experienced. Therefore, the impacts associated with climate would not differ between the corridors.

An assessment of the potential impacts of climate and atmospheric conditions (e.g. potential impacts associated with lightening, precipitation and pollution levels) on the proposed transmission infrastructure should be undertaken by Eskom during the design phase. This is to provide an indication of what conditions are required to be accounted for by the design team to extend the life and reliability of the new infrastructure.

As the potential impacts associated with climate and atmospheric conditions are anticipated to be of low significance, no additional environmental studies are required to be undertaken in this regard.

5.3. Potential Impacts Associated with Geology and Soils

The construction of the transmission power lines and the substation requires foundations to be constructed in order to increase the stability of the structures. The depth of the foundations will be determined by the underlying geology of an area.

The greatest impact on the geology and soil associated with the construction of any structures is the potential for soil erosion. This impact depends on the soil erosion potential of the overlying soils. The potential soil erosion rate of the area is considered to be high due to the nature of the soils in the area, and numerous eroded areas present within the study area.

5.3.1. Evaluation of the Proposed Substation Site

Erosion potential is anticipated to increase during the site clearance and construction activities of the proposed substation. The predicted impact is anticipated to be short-term construction impact on site, and may be of moderate to high significance unless appropriate mitigation measures are implemented.

5.3.2. Comparison of Transmission Power Line Alternatives

The slopes associated with the proposed turn-in line are steep where the line ascends the escarpment. The potential for soil erosion will increase significantly where vegetation is required to be cleared for the servitude. Potential soil erosion impacts are anticipated to be more significant with the construction of two lines in parallel (requiring a servitude of 110 m in total) when compared to a single double-circuit line (requiring a servitude of 55 m). Therefore, the option of constructing a double-circuit line for the entire length of the turn-in line is considered to be the preferred option.

The slopes associated with the western alternative, the R555 sub-alternative, the southern sub-alternative and the northern sub-alternative of the Steelpoort-

Merensky 400kV line are less significant than those associated with the proposed eastern alternative. Therefore, the potential for soil erosion impacts as a result of the construction of the line along the eastern alternative are anticipated to be of higher significance. Therefore, this alternative is the least favoured in this regard.

5.3.3. Conclusions

With the implementation of appropriate mitigation measures, the impacts on geology and soils associated with establishment of the proposed substation at the identified site are expected to be of low significance. The proposed site is therefore considered to be acceptable in this regard.

The option of constructing a single double circuit transmission power line is nominated as the preferred option for the proposed turn-in line between the Steelpoort Substation and the Duvha-Leseding 400kV transmission power line, as this option will minimise the potential for soils erosion impacts.

The eastern alternative proposed for the Steelpoort-Merensky 400kV line is considered to be the least favoured in terms of potential impacts on topography. The western alternative, the R555 sub-alternative, the southern sub-alternative and the northern sub-alternative are all considered to be similar in terms of impacts in this regard.

5.3.4. Recommendations

A detailed geotechnical survey of the proposed substation site and transmission line tower positions should be undertaken by Eskom during the design phase of the project in order to fully understand the soils in terms of founding conditions and erosion potential. This information is required to be used as part of the planning and design phase of the Steelpoort Substation.

Detailed mitigation measures should be developed for the proposed site as part of the EIA phase of this project for inclusion in the draft Environmental Management Plan (EMP).

5.4. Potential Impacts on Agricultural Potential

The soils of the study area are covered by a total of eleven land types (refer to Figure 4.6), namely:

» **Ae26, Ae27** (red, high base status soils, usually deep)
» **Bc7** (red, high base status soils with plinthic subsoils, usually deep)
» **Dc31** (varied duplex and clay soils)

» **Ea88** (structured, swelling clay soils)
» **Ib30, Ib31, Ib38, Ib39, Ib192** (shallow soils with rock)
» **Ic154** (rocky areas with little soil).

Soils vary from moderate to deep, to shallow, and have limited agricultural potential for the most part (refer to Table 5.1). As a result, irrigation agriculture is practiced in the study area, mainly along the Steelpoort River.

5.4.1. Evaluation of the Proposed Substation Site

The area around the proposed site of the substation was investigated in another report (Paterson, 2007). In that report, it was established that the site, lying as it does in the foothills of the escarpment (land type Ib25 as detailed in Table 5.1 and illustrated in Figure 4.6) contains shallow soils (generally <300 mm deep) on to rock, with much rock outcropping on the surface. These soils have a low to very low potential for agriculture, and therefore impacts associated with the construction of the substation are expected to be of low to very low significance. The proposed site is therefore considered to be acceptable in this regard.

5.4.2. Comparison of Transmission Power Line Alternatives

As can be seen from the information contained in Table 5.1, only land type Dc31 (and, to a lesser extent Ae26/Ae27) has any significant proportion of high potential soils. All of the various Ib and Ic land types are predominantly steep and rocky.

In terms of this analysis of land types, it is clear that the eastern alternative for the proposed Steelpoort-Merensky line crosses areas which are mainly rocky in the central portion of the study area with some high potential soils in places. The western alternative and the northern sub-alternative cross areas of mixed, low to medium potential soils for most of route. As the western alternative potentially crosses areas with fewer high potential soils, and would thus minimise impacts on agricultural potential, this is considered to be the preferred alternative.

From the Duvha-Leseding line to the Steelpoort Substation, the turn-in line crosses steep rocky areas, and then mixed, low to medium potential soils closer to the substation site. As the construction of a single double-circuit line would limit the amount of space required for the establishment of the powerline (i.e. 55 m vs 110 m), it is expected that this option would minimise any impacts on agricultural potential. Therefore, the option of the double-circuit line is nominated as the preferred option.

Table 5.1: Land types occurring (with soils in order of dominance)

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agricultural Potential
Ae26	Hu36/46 Va/Sw21/41 Lithosols & Rock	450-1200 300-800 100-350	39% 30% 11%	Red, loamy, structureless soils, occasionally calcareous Red & brown, structured clay soils, usually calcareous Brown, loamy topsoils on rock	High: 13.3% **Medium: 69.6%** Low: 17.1%
Ae27	Hu36/46 Va/Sw21/41 Lithosols & Rock	450-1200 300-800 100-350	39% 30% 11%	Red, loamy, structureless soils, occasionally calcareous Red & brown, structured clay soils, usually calcareous Brown, loamy topsoils on rock	High: 13.3% **Medium: 69.6%** Low: 17.1%
Bc7	Hu36 Gs16/17, Ms10/11 Rock	450-800 200-450	39% 30% 10%	Red, loamy, structureless soils Brown, loamy topsoils on rock, occasionally calcareous	High: 10.5% **Medium: 49.5%** Low: 40.0%
Dc31	Va/Sw21/41 Hu36/46 Sd21/31	600-1200 300-1200 600-1200	29% 26% 11%	Red & brown, structured clay soils, usually calcareous Red, loamy, structureless soils, occasionally calcareous Red, clayey, structured soils	**High: 38.5%** Medium: 27.5% Low: 34.0%
Ea88	Ar40/Rg20 Bo41 Ms10/Gs26	500-800 600-1000 150-300	62% 11% 8%	Black, swelling clay soils, usually calcareous Dark, non-swelling clay soils, usually calcareous Brown, loamy topsoils on rock, occasionally calcareous	High: 5.0% **Medium: 71.1%** Low: 24.4%
Ib30	Rock Hu36/37 My10/Mw10	 450-1200 300-450	59% 11% 11%	 Red, loamy, structureless soils Dark, non-swelling clay soils, usually calcareous	High: 0.0% Medium: 15.0% **Low: 85.0%**
Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agricultural Potential
Ib31	Rock Ms10/Gs26	 100-450	67% 31%	 Brown, loamy topsoils on rock, occasionally calcareous	High: 0.0% Medium: 2.0% **Low: 98.0%**

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agricultural Potential
Ib38	Rock Ms10/Gs26	 100-450	60% 40%	 Brown, sandy clay loam topsoils on rock, occasionally calcareous	High: 0.0% Medium: 0.0% **Low: 100.0%**
Ib39	Rock Ms10/Gs26	 100-450	70% 30%	 Brown, sandy clay loam topsoils on rock, occasionally calcareous	High: 0.0% Medium: 0.0% **Low: 100.0%**
Ib192	Rock Ms10/Gs26	 100-450	64% 25%	 Brown, loamy topsoils on rock, occasionally calcareous	High: 0.0% Medium: 0.6% **Low: 99.4%**
Ic154	Rock Ms10/Gs26	 100-450	85% 9%	 Brown, loamy topsoils on rock, occasionally calcareous	High: 0.0% Medium: 0.4% **Low: 99.6%**

Note: Since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the national Land Type Survey may also occur.

5.4.3. Conclusions

Impacts on agricultural potential associated with the construction of the substation are expected to be of low to very low significance. The proposed site is therefore considered to be acceptable in this regard.

The option of constructing a single double circuit transmission power line is nominated as the preferred option for the proposed turn-in line between the Steelpoort Substation and the Duvha-Leseding 400kV transmission power line, as this option will minimise the potential impacts on agricultural potential in the area.

The western alternative proposed for the Steelpoort-Merensky 400kV line is nominated as the preferred alternative, as this option potentially crosses areas with fewer high potential soils.

5.4.4. Recommendations

As the potential impacts on agricultural potential are anticipated to be of low to very low significance, no additional environmental studies are required to be undertaken in this regard. It is therefore not considered necessary to carry out a detailed survey for the proposed substation site.

5.5. Potential Impacts on Water Resources

The study area is located in arid area. The Steelpoort River passes through the centre of the study area and is a major feature within the area. Tributaries of this river include the Klip, Dwars, Waterval and Spekboom Rivers, which are located to the south of the study area. The proposed substation site is located approximately 200 m west of one of these non-perennial tributaries. The western alternative for the Steelpoort-Merensky line passes in close proximity to the Steelpoort River on a number of occasions. The eastern alternative crosses two of the tributaries to the east of the study area.

The construction of structures close to rivers can potentially impact on water resources through sedimentation and pollution during the construction phase. These potential impacts can be minimised through the implementation of appropriate mitigation and management measures. It is not considered technically feasible by Eskom to locate tower positions or substations within a floodplain. Therefore, the impact on surface water as a result of the construction and operation of the transmission power line is anticipated to be negligible. Potential impacts on the surface water are, therefore, expected to be of low significance and limited to the construction phase.

Potential pollution of surface and groundwater is possible during operation of the substation as a result of stormwater runoff or other potential contamination sources. This impact is potentially of moderate to high significance (depending on the severity of the pollution), as many people within the study area obtain their water from natural sources such as rivers, streams and groundwater. This impact can, however, be significantly reduced through the implementation of appropriate mitigation measures.

5.5.1. Conclusions and Recommendations

Both corridor alternatives for the Steelpoort-Merensky line traverse rivers and impacts on the surface are, therefore, considered to be similar.

Potential impacts associated with the construction and operation of the substation can be significantly minimised through the implementation of appropriate management measures. The proposed site is therefore considered to be acceptable in this regard.

In order to reduce potential impacts on surface and groundwater during the construction and operational phases, detailed mitigation measures should be developed for the proposed site as part of the EIA phase of this project for inclusion in the draft Environmental Management Plan (EMP).

5.6. Potential Impacts on Ecology

Potential ecological impacts associated with the construction of the proposed transmission infrastructure include the following:

» **Destruction or disturbance to sensitive ecosystems:** This will lead to localised or more extensive reduction in the overall extent of a particular habitat. Consequences of this may include:
  * increased vulnerability of remaining portions to future disturbance,
  * negative change in conservation status of habitat,
  * general loss of habitat for sensitive species,
  * loss in variation within sensitive habitats due to loss of portions of it,
  * general reduction in biodiversity,
  * increased fragmentation (depending on location of impact),
  * disturbance to processes maintaining biodiversity and ecosystem goods and services.

  <u>*Potential extent:*</u> at the scale of the entire power line or individual structures or infrastructure: local to regional

» **Destruction of vegetation in the footprint of tower position and substation:** This will lead to localised reduction in the overall extent of a

particular habitat. This may only be an issue if the power line tower or substation is situated within a sensitive habitat or upon a population of a species of special concern.
Potential extent: at the scale of individual structures: local

» **Fragmentation of sensitive habitats:** The possibility of this impact occurring depends on whether the servitude is cleared and whether continuous service roads are constructed. It may, therefore, arise due to destruction of habitat in such a way as to divide areas of habitat partially or fully into smaller parts. Consequences of this may include:
- impaired gene flow within fragmented populations,
- breakdown of ecological relationships, e.g. pollinator-plant
- breakdown of migration routes,
- reduced functional use, e.g. grazing.

Potential extent: at the scale of the entire power line or individual structures or infrastructure: local to regional

» **Destruction/permanent loss of individuals of rare, endangered, endemic and/or protected species during the construction and/or operational phase:** This may arise if the proposed infrastructure is located where it will impact on such individuals. Consequences of this may include:
- negative change in conservation status of affected species,
- fragmentation of populations of affected species,
- reduction in area of occupancy of affected species,
- loss of genetic variation within affected species.

Potential extent: depending on the impact on the species, the impact may occur at the scale of the entire power line servitude/substation site, but lead to a global impact (e.g. change in global conservation status).

» **Disturbance of natural vegetation through trampling, compaction by motor vehicles etc.:** This may occur around construction sites and in order to access infrastructure. Consequences of this may include:
- destruction of vegetation or habitat,
- degradation of vegetation or habitat,
- loss of sensitive habitats,
- loss or disturbance to individuals of rare, endangered, endemic and/or protected species,
- fragmentation of sensitive habitats.

Potential extent: at the scale of the entire substation site: local to regional

» **Impacts on the movement and migration of animal species:** This will occur if the infrastructure imposes an insurmountable barrier to movement. Consequences of this may include:
- impaired gene flow within fragmented populations,

* breakdown of ecological relationships, e.g. pollinator-plant
* breakdown of migration routes,

Potential extent: at the scale of the entire power line (localised structures are unlikely to cause this impact): regional

» **Increased soil erosion, increase in silt loads and sedimentation:** This will occur due to soil disturbance, increased run-off from compacted areas etc. Consequences of this may include:

* loss of or disturbance to indigenous vegetation,
* loss of sensitive habitats,
* loss or disturbance to individuals of rare, endangered, endemic and/or protected species,
* fragmentation of sensitive habitats,
* impairment of wetland function.

Potential extent: most likely to occur at the scale of individual structures or infrastructure, but consequences may have a more regional effect: local to regional

» **Establishment and spread of declared weeds and alien invader plants:** This may occur in disturbed areas and/or where propagules of these plants are readily available. Consequences of this may include:

* loss of indigenous vegetation,
* change in vegetation structure leading to change in various habitat characteristics,
* change in plant species composition,
* change in soil chemical properties,
* loss of sensitive habitats,
* loss or disturbance to individuals of rare, endangered, endemic and/or protected species,
* fragmentation of sensitive habitats,
* change in flammability of vegetation, depending on alien species
* hydrological impacts due to increased transpiration,
* impairment of wetland function.

Potential extent: at the scale of any disturbance: local to regional

» **Damage to wetland and riparian areas:** This may occur if wetlands are directly affected by the construction of infrastructure. Consequences of this may include:

* impairment of wetland function,
* reduction in water quality, potentially leading to impacts on wetland flora and fauna
* change in hydrological regime, usually increased runoff

Potential extent: the impact is likely to occur at the scale of individual structures or infrastructure, but the impact may have a more widespread effect: local to regional

» **Increased dust during construction:** This may affect animals and vegetation in the vicinity. Consequences of this may include:
- will cause stress in individuals of various animal species, which may result in them moving away or cause changes in behaviour,
- will cause some territorial animals to be displaced,
- will result in deposition of dust on vegetation leading to impaired photosynthesis and respiration, potentially causing damage to individual plants.

Potential extent: at the scale of individual structures, infrastructure or activities: local

» **Increased noise pollution during construction:** This may affect animals in the vicinity. Consequences of this may include:
- will cause stress in individuals of various animal species, which may result in them moving away or cause changes in behaviour,
- will cause some territorial animals to be displaced

Potential extent: at the scale of individual structures, infrastructure or activities: local

» **Increased risk of veld fires:** There is a higher risk of veld fires around construction sites due to the use of fires for cooking, warmth, etc. by construction workers. Consequences of this may include:
- damage to sensitive habitats,
- damage to populations of sensitive plant species,
- loss of vegetation production leading to reduction in available grazing/browsing for wild or domestic animals

Potential extent: at the scale of individual structures, infrastructure or activities, but may spread further: local to immediate surroundings

5.6.1. Evaluation of the Proposed Substation Site

The proposed substation site occurs within *Kirkia wilmsii-Acacia caffra* Mountain Bushveld in a part that is classified as having HIGH sensitivity (purple star in Figure 5.1). The site is located adjacent to steep mountain slopes classified as having VERY HIGH sensitivity and near to a non-perennial drainage line (200 m away) containing *Acacia gerrardii* woodland. The site is on a moderately steeply sloping landscape and the vegetation is an open woodland. Signs of agricultural activities were observed nearby the site, and indications of heavy grazing and browsing on the site were evident. In the context of the generally high sensitivity of the remaining areas of natural vegetation in the SCPE, this site has a lower sensitivity score and the development thereof is, therefore, unlikely to have significant impacts on sensitive habitats or species.

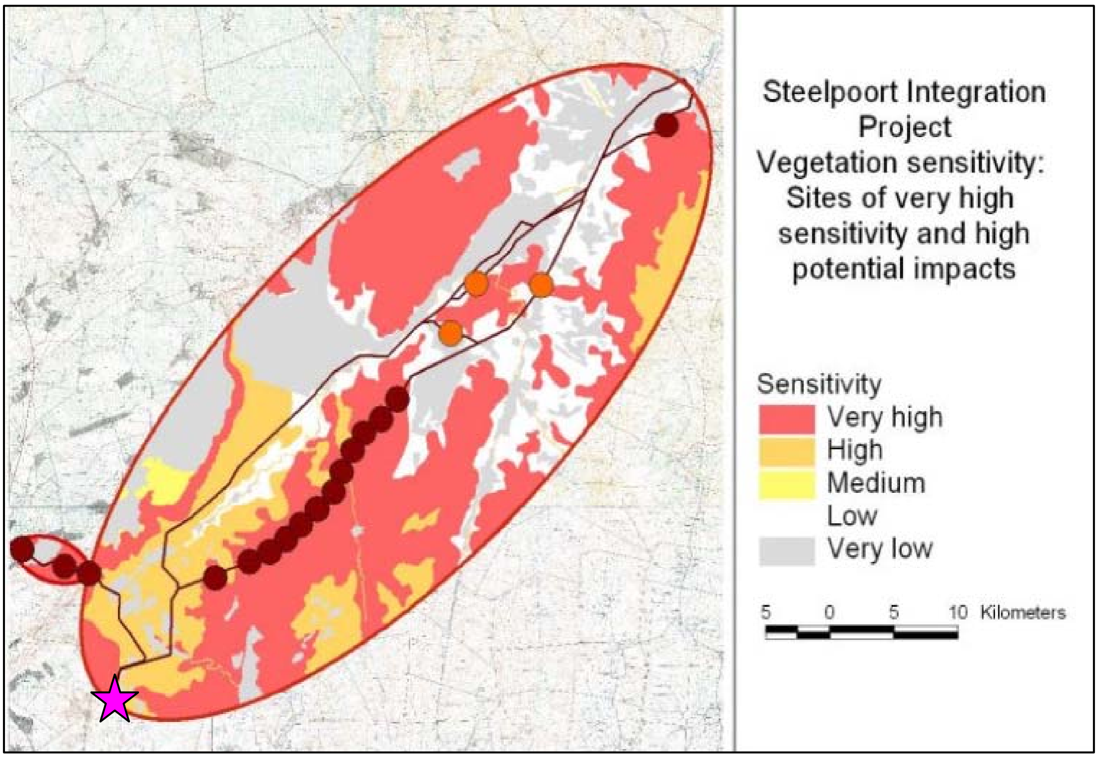

Figure 5.1: Habitat sensitivity / conservation value of the study area showing sites where proposed alignment crosses Very High sensitivity areas and the proposed substation site

An evaluation of the possible ecological impacts associated with the development of the substation site is provided in Table 5.2. This evaluation was undertaken by categorising impacts as Very High, High, Medium, Low or Very Low for each development scenario. From this it was possible to make a conclusion regarding the preferred development option for consideration in the EIA phase and also to identify those impacts that should be evaluated in the EIA phase.

Table 5.2: Evaluation of potential ecological impacts associated with the establishment of the proposed substation at the identified site

Nature of Impact	Potential significance
Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a particular habitat	M
Destruction of vegetation in the footprint of substation leading to reduction in the overall extent of a particular habitat	n/a
Fragmentation of sensitive habitats	L
Destruction/permanent loss of individuals of rare, endangered, endemic and/or protected species	M
Disturbance of natural vegetation through trampling, compaction by	M

Nature of Impact	Potential significance
motor vehicles etc. leading to degradation or destruction of vegetation or habitat or loss of individuals of rare, endangered, endemic and/or protected species	
Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts	L
Increased soil erosion, increase in silt loads and sedimentation	M
Establishment and spread of declared weeds and alien invader plants	M
Damage to wetland and riparian areas	M
Increased dust during construction leading to potential damage of habitat or displacement of animals	M
Increased noise pollution during construction leading to potential displacement of individuals	M
Increased risk of veld fires leading to damage to habitats or loss of individuals of species of concern or loss of vegetation production	M
OVERALL	**M**

The proposed substation site occurs within an area classified as having HIGH sensitivity as a result of much of the vegetation being still in a natural state. Establishment of the substation at this site is less likely to have significant negative impacts on sensitive habitats and species than if it were situated within habitat classified as having Very High sensitivity. Overall, potential impacts on ecology at the identified site are evaluated as being of moderate significance.

5.6.2. Comparison of Transmission Power Line Alternatives

From a sensitivity analysis undertaken (refer to Appendix H for details), it was determined that the western alternative proposed for the Steelpoort-Merensky line crosses approximately 27 km of natural area classified as being of High or Very High sensitivity. This includes approximately 4 km of Very High sensitivity area in the extreme northern end of the study area (refer to Figure 5.1). The 23 km of High sensitivity area is alongside the north-western side of the De Hoop Dam and road re-alignment on the undulating lowlands.

The eastern alternative proposed for the Steelpoort-Merensky line crosses approximately 42 km of natural area classified as being of High or Very High sensitivity. This includes approximately 26 km of Very High sensitivity area along the southern half of the alignment in the rocky hills. The 16 km of High sensitivity area is in the southern end of the study area on the undulating lowlands. This alternative also crosses the proclaimed offsite mitigation area for the OWRDP Phase 2A.

The southern sub-alternative proposed for the Steelpoort-Merensky line crosses approximately 1 km of natural area classified as being of High or Very High sensitivity. This is at the base of some hills next to an existing road and cultivated area and most of the sensitive portions are where the alignment touches the hills.

The R555 sub-alternative proposed for the Steelpoort-Merensky line crosses approximately 1 km of natural area classified as being of High or Very High sensitivity. This is at the base of some hills next to an existing road and cultivated area overlooking the Steelpoort River and most of the sensitive portions are where the alignment touches the hills.

The northern sub-alternative proposed for the Steelpoort-Merensky line does not cross any areas of natural area classified as being of High or Very High sensitivity.

The proposed turn-in line crosses approximately 18 km of natural area classified as being of High or Very High sensitivity. This includes approximately 10.5 km of Very High sensitivity area at the top of the escarpment. The 7.5 km of High sensitivity area is located in the southern end of the study area on the lowlands.

Sites where the proposed alignments cross habitats classified as having Very High sensitivity are shown in Figure 5.1. Areas highlighted in dark brown represent sites with impacts of potentially high significance. It is evident that this area of high sensitivity correlates largely to the proclaimed offsite mitigation area for the OWRDP Phase 2A (refer to Figure 4.11). Areas highlighted in orange represent sites where the impacts are not likely to be as significant.

An evaluation of the possible ecological impacts associated with the development of the transmission power lines is provided in Table 5.3. This evaluation was undertaken by categorising impacts as Very High, High, Medium, Low or Very Low for each development scenario. From this it was possible to make a conclusion regarding the preferred development option for consideration in the EIA phase and also to identify those impacts that should be evaluated in the EIA phase.

Table 5.3: Evaluation of potential ecological impacts associated with the establishment of the proposed transmission power lines for each development alternative, as follows: W=Western alternative, E=Eastern alternative, S=Southern sub-alternative, R=R555 sub-alternative, N=Northern sub-alternative, T=Turn-in line

Nature of Impact	Potential significance					
	W	E	S	R	N	T
Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a particular habitat	M	VH	L	L	L	M
Destruction of vegetation in the footprint of tower structures	M	M	VL	VL	VL	M

Nature of Impact	Potential significance					
	W	E	S	R	N	T
leading to reduction in the overall extent of a particular habitat						
Fragmentation of sensitive habitats	M	H	VL	VL	VL	M
Destruction/permanent loss of individuals of rare, endangered, endemic and/or protected species	M	H	VL	VL	VL	M
Disturbance of natural vegetation through trampling, compaction by motor vehicles etc. leading to degradation or destruction of vegetation or habitat or loss of individuals of rare, endangered, endemic and/or protected species	M	H	L	L	L	M
Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts	L	M	VL	VL	VL	M
Increased soil erosion, increase in silt loads and sedimentation	M	M	L	L	L	M
Establishment and spread of declared weeds and alien invader plants	M	M	M	M	M	M
Damage to wetland and riparian areas	H	M	VL	M	VL	M
Increased dust during construction leading to potential damage of habitat or displacement of animals	M	M	M	M	M	M
Increased noise pollution during construction leading to potential displacement of individuals	M	M	M	M	M	M
Increased risk of veld fires leading to damage to habitats or loss of individuals of species of concern or loss of vegetation production	M	M	M	M	M	M
OVERALL	**M**	**MH**	**L**	**L**	**L**	**M**

There are large parts of the study area that are classified as having Very High sensitivity due to the following factors:

» the vegetation has a high conservation value due to low rates of conservation and high rates of transformation as well as due to the location of the study area within the Sekhukhuneland Centre of Plant Endemism,
» there is a strong possibility of encountering threatened, endemic, protected or rare species (plants and animals),
» the vegetation has high local species richness, structural variation and high turnover from one site to another due to high habitat diversity,
» the topography is complex and moderately steep thus promoting high habitat diversity, and
» there are important ecological processes operating in these areas.

There are also areas classified as having High sensitivity where these factors do not operate as strongly, but where the vegetation is still in a natural state.

The proposed transmission power line alternatives cross different proportions of habitats in different sensitivity classes. Some of the proposed alignments may have significant impacts on sensitive habitats, whereas other alignments are less likely to do so. For example, the eastern alternative crosses a much greater area of habitat classified as having Very High sensitivity than any other alignment.

Ideally, all areas of Very High sensitivity should be avoided. This makes the eastern alternative a very poor one from an ecological point of view. Selection of this alternative introduces four of the five impacts of high significance. This conclusion is supported by the fact that the proclaimed offsite mitigation area for the ORWDP (referred to as the DWAF Conservation Area) is considered to be sensitive and is protected in terms of the National Forests Act (No 84 of 1998). Any activities which may cause deforestation (such as the establishment and maintenance of a power line servitude) in this area are prohibited in order to minimise impacts on vegetation and habitats. This is considered to be a fatal flaw to the establishment of a transmission power line on this section of the eastern alternative alignment.

As a result of ecological sensitivity, the northern sub-alternative is preferred to the proposed western alignment. The southern and R555 sub-alternatives are both acceptable, although there may be localised impacts on sensitive habitats. The preferred alternative from an ecological perspective for the proposed Steelpoort-Merensky line is the western alternative, with the northern sub-alternative to reach the Merensky substation.

The proposed turn-in lines cross some areas of high to very high sensitivity (refer to Figure 5.1). As the construction of a single double-circuit line would limit the amount of space required for the establishment of the power line (i.e. 55 m vs 110 m), it is expected that this option would minimise any impacts on local ecology. Therefore, the option of the double-circuit line is nominated as the preferred option.

5.6.3. Conclusions

The proposed substation site occurs within an area classified as having HIGH sensitivity as a result of much of the vegetation being still in a natural state. Overall, potential impacts on ecology at the identified site are evaluated as being of moderate significance. No fatal flaws were identified to be associated with the proposed substation site and it is therefore considered to be acceptable from an ecological perspective.

The preferred alternative from an ecological perspective for the proposed Steelpoort-Merensky line is the western alternative, with the northern sub-alternative to reach the Merensky substation. The southern and R555 sub-

alternatives are both acceptable, although there may be localised impacts on sensitive habitats. These alternatives would require further investigation in order to fully assess these potential impacts.
The section of the eastern alternative which passes through the DWAF Conservation Area is considered to be fatally flawed for the establishment of a transmission power line due to the fact that the area is considered to be very sensitive and activities which would result in deforestation are prohibited.

The option of the double-circuit line for the turn-in lines between the Steelpoort Substation and the Duvha-Leseding 400kV line is nominated as the preferred option.

5.6.4. Recommendations

A detailed survey of the substation site and preferred transmission power line alternatives should be undertaken as part of the EIA phase of the study in order to establish the likelihood of any species of concern occurring on this site and to determine appropriate mitigation measures for inclusion in the EMP. The detailed survey must concentrate on habitats classified as having High or Very High sensitivity. This should be undertaken during the summer in order to be able to assess the floristics of the habitat properly as well as to have a higher probability of detecting species of special concern.

A walk-though survey of the entire preferred route will be undertaken during the site-specific EMP phase, should a positive Authorisation be given for the project.

5.7. Potential Impacts on Avifauna

As a result of their size and prominence, electrical infrastructure constitutes an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds (and other animals) and birds colliding with power lines (Ledger and Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs and Ledger 1986a; Hobbs and Ledger 1986b; Ledger, Hobbs and Smith, 1992; Verdoorn 1996; Kruger and Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen and Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities. A number of Red Data species which are sensitive to interactions with power line infrastructure could potentially occur within the broader study area.

Potential ecological impacts associated with the construction of the proposed transmission infrastructure include the following:

» **Electrocutions:** Electrocution of birds on overhead lines refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Due to the large size of the clearances on most overhead lines of above 132kV, electrocutions on overhead lines above 132kV, electrocutions are not a major issue. Therefore, electrocutions are not envisaged as an impact on these proposed lines.

» **Collisions:** Collisions are the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). The Red Data species vulnerable to power line collisions are generally long-lived, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. Therefore, power lines can be a major cause of avian mortality among power line sensitive species, especially Red Data species. In the context of the current study, the risk of collisions will be highest where an alignment crosses the Steelpoort River and in close proximity to agricultural activity, specifically irrigated crops. In addition, the De Hoop dam will have a major influence on the birdlife and will increase the likelihood of birds commuting up and down the Steelpoort River to and from the dam. This will in turn increase the risk of collisions with the power line where it crosses the river, due to higher avian traffic. Overall the extent of the collision impacts will be local for most species, for example waterbirds and Secretarybirds, although in the case of migrant species such as the White and Abdim's Stork, the impacts could be regarded as international as these birds are international and intra-African migrants respectively. If the De Hoop Dam attracts species such as flamingos and pelicans, the potential collision impacts will be regional, as these species wander widely in southern Africa in search of suitable conditions. African Crowned Eagles could potentially be threatened by the turn-in lines where this line crosses a slope next to a valley. The significance of the collision impacts will depend largely on the species that will be affected. This requires further study within the EIA phase.

» **Habitat destruction and disturbance:** During the construction phase and maintenance of power lines and substations, some habitat destruction and transformation inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes and substation footprints. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. Similarly, the above-mentioned construction and maintenance activities impact on bird through disturbance, particularly during breeding activities. This could lead to breeding failure if the disturbance happens during a critical part of the breeding season.

5.7.1. Evaluation of the Proposed Substation Site

Potential impacts on bird species present in the area associated with the construction of a substation include the removal and destruction of vegetation, and disturbance during the construction and maintenance of substations. The destruction of vegetation inevitably results in the loss of suitable habitats for several bird species. The construction of substation infrastructure results in the permanent loss of vegetation and, therefore, can result in a permanent loss of some habitats.

During the construction and maintenance phases of substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads and the clearing of the substation site. Regular maintenance of the substation site is required in order to prevent interference of vegetation with the operations of the substation. These activities could have an impact on birds breeding, foraging and roosting in, or in close proximity of the servitude, through destruction of habitat. The potential of bird species habitat occurrence within the proposed substation site exists.

The construction of a substation can result in disturbance to birds breeding in the vicinity of the construction activities. Should this disturbance take place during a critical time in the breeding cycle (e.g. prior to eggs hatching, or just prior to the chick fledging), it could lead to temporary or permanent abandonment of the nest or premature fledging, resulting in fatality for the eggs or the fledgling. Such a sequence of events can impact on certain large, rare species that only breed once a year or once every two years.

Potential impacts on bird species resulting from the construction of the substation are anticipated to be localised and restricted to the substation site and access route/s. The habitat at the current proposed substation site is not uniquely sensitive as far as birdlife is concerned, therefore the impact on the resident species should be low.

5.7.2. Comparison of Transmission Power Line Alternatives

Usually the following factors are taken into account in determining a preferred transmission power line corridor:

» Red Data species diversity in the study area.
» Red Data species density in the study area.

» The distance of each corridor in each quarter degree square that comprises the study area.

In this instance this method could not be used as the alternative corridors for the proposed Steelpoort-Merensky line are basically equal in length and run through the same quarter degree squares. An additional method had to be designed to measure the relative risk associated with the two corridors, which is detailed below.

» *Relevant factors in selecting a preferred corridor:*
The following factors were incorporated in the formula, using the CSIR Land Cover Database and high resolution Google satellite imagery as the main source of data:

* *Wetlands and dams:* Wetlands and dams are of particular importance for birds in the study area, as the area is relatively arid. Currently the study area does not contain many large wetlands and dams, but a few have been identified from the satellite imagery. This will of course change with the construction of the large De Hoop Dam. The presence of wetlands and dams is therefore and indicator of a higher collision risk.
* *Rivers:* The study area contains the important Steelpoort River and tributaries. Rivers are obviously important for birds and many waterbird species occur only along the rivers. The rivers are particularly important for stork species such as Black Stork and Yellow-billed Stork and are an indication of a higher collision risk.
* *Other transmission power lines:* It is a proven fact that placing a new line next to an existing line reduces the risk of collisions to birds. The reasons for that are two-fold namely it creates a more visible obstacle to birds and the resident birds, particularly breeding adults, are used to an obstacle in that geographic location and have learnt to avoid it (APLIC 1994; Chundar & Choudhury 2005). Other transmission power lines running parallel to the proposed alignments were therefore treated as a risk reducing factor.
* *Roads:* These were taken as an indication of human activity and particularly vehicle and pedestrian traffic. It was assumed that the birds will avoid the immediate vicinity of roads due to the presence of traffic and pedestrians, and therefore it will reduce the risk of collision with lines running next to roads.
* *Towns:* Towns are obvious centres of human activity and are generally avoided by large power line sensitive species. The presence of towns and settlements is therefore a risk reducing factor.
* *Irrigation:* Irrigation crops, especially lucerne, are important draw cards for species such as cranes and storks, especially in an arid landscape and increase the risk of collisions.

* *Fallow lands:* Fallow lands create artificial open areas in woodland, which are much favoured by species such as Kori Bustards and Secretarybirds.

» *Designing an index to calculate the collision risk in each corridor*
The factors mentioned above were incorporated into a formula to arrive at a risk rating for each corridor. The formula was designed as follows:

* : The length of alignment running within 500 m of a dam or wetland was measured.
* The number of rivers crossed by each alignment was counted.
* The total length of primary and secondary roads within 500 m of an alignment was measured in kilometres.
* The number of settlements/mining activity located within 1 km of each alignment was counted.
* The distance that the proposed alignments are directly parallel to other lines was measured.
* The length of alignment running parallel with or across irrigated crops and fallow lands was measured in kilometres.

In order to facilitate the analysis, the alignments were further divided into sections (refer to Figure 5.2 below).

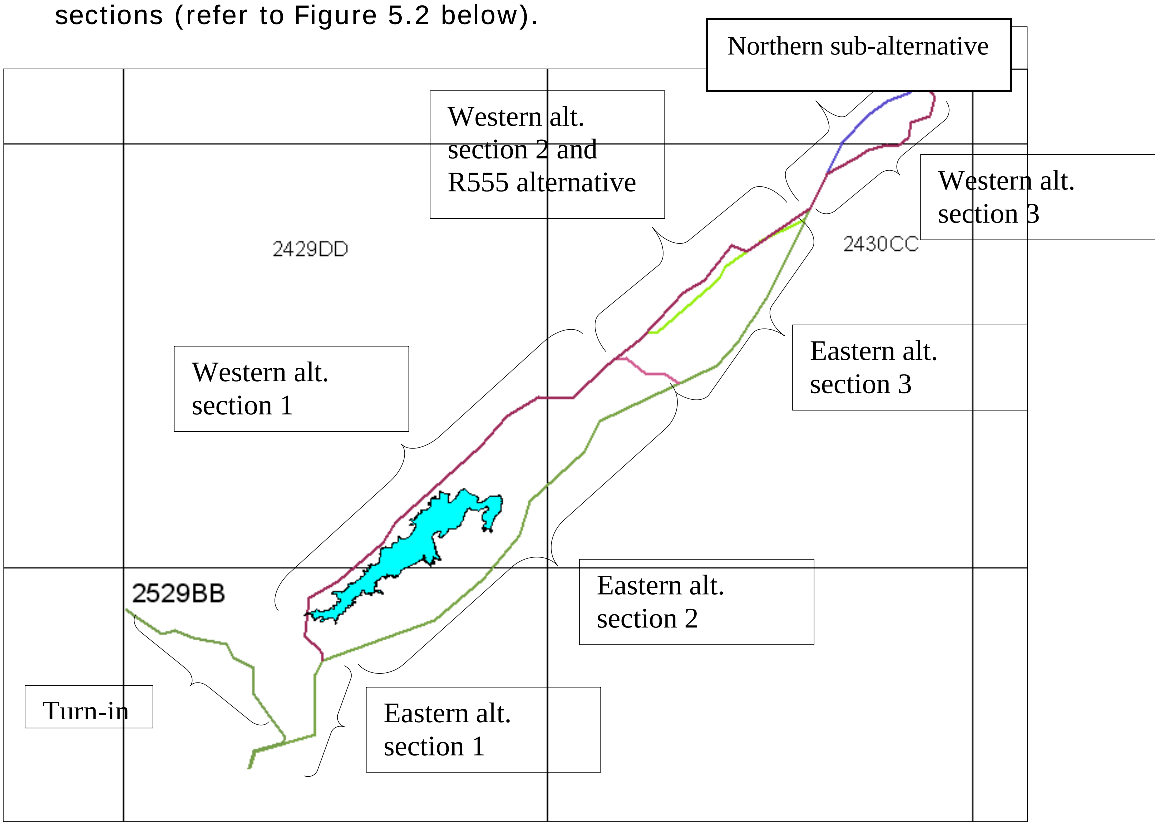

Figure 5.2: Division of the proposed Steelpoort-Merensky alignments for purposes of the analysis below

The results of measurements and counts for all alternatives considered are as follows:

Table 5.4: Results of measurements and counts for all alternatives considered for the Steelpoort-Merensky line

Risk Factor	Eastern alt. S1	Eastern alt. S2	Eastern alt. S3	West alt. S3	North sub-alt.	West alt. S2	R555 sub-alt	West alt. S1	South sub-alt.
Dams/wetlands	0.35	1.1	4			1.71	2.34	23.3	0.6
River crossings	15		9			3	3	6	
Existing Tx lines	-1.18		-10.27	-8.68		-1.82	-0.89		
Roads	-9.84			-10.04	-11.56	-14.52	-24.3	-35.9	-8.74
Suburban/industrial				-15	-15	-5	-5	-10	
Irrigation/fallow lands	4.72		1.04	2.14		13.06	4.72	10.48	
Total	**9.05**	**1.1**	**3.77**	**-31.58**	**-26.56**	**-3.57**	**-20.13**	**-6.12**	**-8.14**

Obviously all these factors do not have an equal impact on the size of the risk, and therefore a weighting was assigned to each factor, based on the specialist's judgment on how important the factor is within the total equation.

The following weights were assigned. Risk reducing factors were assigned a negative weight:

Risk factor	Weighting
Dams/wetlands	5
River crossings	3
Existing TX lines	-1
Roads	-2
Sub-urban/industrial	-5
Irrigation/fallow lands	2

The final risk score for a **factor** was calculated as follows: measurements/counts x weighting. The final risk rating for an **alignment** was calculated as the sum the risk scores of the individual factors:

Alternatives	Score
Eastern alt. 1,2,3 + western alt.3	-17.66
Eastern alt. 1,2,3+northern sub-alt	-12.64
Eastern alt.1+western 1,2,3	-32.22
Eastern alt.1+western 1+R555 sub-alt.+ Western 3	-48.78
Eastern alt.1+western 1,2,+ Northern sub-alt.	-27.2
Eastern alt.1+western 1+ R555 sub-alt.+ Northern sub-alt.	-43.76

Alternatives	Score
Eastern alt.1+ western 1+southern sub+eastern 3 +western 3	-33.02
Eastern alt.1+ western 1+southern sub+eastern 3 + northern sub-alt	-28

From the analysis it is clear that the combination of the **eastern alternative section 1 + western alternative section 1 + R555 sub-alternative + western alternative section 3** (i.e. the R555 sub-alternative) probably holds the least risk of bird interactions, and it is therefore recommended as the preferred alternative from a bird interaction perspective. The prevalence of roads and sub-urban development in the proximity of the western alignment played a major role in the outcome of the scores, despite the relatively large amount of wetlands and fallow lands.

As far as the turn-ins are concerned, only one alignment is proposed, but the alternative of considering a double-circuit line (rather than 2 lines in parallel) needs to be considered. On top of the escarpment, the alignment goes through heavily degraded grassland with dense human and livestock populations, which means fewer birds all round. Below the escarpment the proposed alignment goes through relatively intact woodland.

The question whether two lines or one double-circuit line will be used is not of material importance, as neither of the two options will pose a significantly bigger or smaller risk of collisions to birds. Both options might result in some risk to large soaring birds such as vultures and storks along the escarpment. However, if self-supporting double circuit towers are used, it will result in more perching space for birds on the towers. This in turn could result in a bigger risk of streamer-induced faulting on these towers. Vultures and other large raptors might use towers along the escarpment as roosting substrate as they often choose such towers for roosting, presumably due to the good visibility all round and the constant presence of wind along the escarpment, which facilitates take-off and soaring. These potential impacts will need to be further investigated in the next phase of the study.

Lastly it must be mentioned that there is a significant urban development planned to the north of Steelpoort (basically in the area where the northern sub-alternative is proposed). If this is approved and implemented, it will have a negative impact on birds occurring along the northern sub-alternative. This might influence the outcome of the analysis of the different alternatives above, but it should not materially influence the overall conclusion, namely that western alternative (with the R555 sub-alternative) is more preferred from bird impact perspective then the eastern alternative.

5.7.3. Conclusions

Potential impacts on bird species resulting from the construction of the substation are anticipated to be localised and restricted to the substation site and access route/s and of moderate significance. No fatal flaws in terms of avifauna were identified to be associated with the proposed substation site.

From the analysis undertaken, it appears that the R555 sub-alternative probably holds the least risk of bird interactions, and it is therefore recommended as the preferred alternative from a bird interaction perspective.

Both options proposed for the turn-in lines (i.e. two lines in parallel or one double-circuit line) might result in some risk to large soaring birds along the escarpment. However, if self-supporting double circuit towers are used, it will result in more perching space for birds on the towers, which could result in a bigger risk of streamer-induced faulting on these towers. These potential impacts will need to be further investigated in the next phase of the study.

5.7.4. Recommendations

A detailed survey of the proposed substation site and preferred transmission power line corridors should be undertaken within the EIA in order to assess the potential impacts of the proposed project on avifauna and to recommend appropriate mitigation measures for significant impacts, where required.

Issues which should be investigated in the next phase of the study, include:

- » Collisions
- » Habitat destruction and disturbance
- » Impacts associated with streamer-induced faulting on the proposed double-circuit line

5.8. Potential Impacts on Visual/Aesthetic Aspects

5.8.1. Evaluation of the Proposed Substation Site

Figure 5.3 provides the results of an initial viewshed analysis of the proposed substation, at an offset of 30m above average ground level. This map indicates the potential visibility of the substation within the study area.

The visual exposure of the substation is greatly contained within the remote valley of its location. Occasional short distance observations may occur from the R555.

Site-specific issues related to the visual exposure of the substation include:

» Potential observation from the R555.
» Potential observation from individual landowners residing in the area.
» The potential visual impact of lighting (both security and operational lighting) within the area.

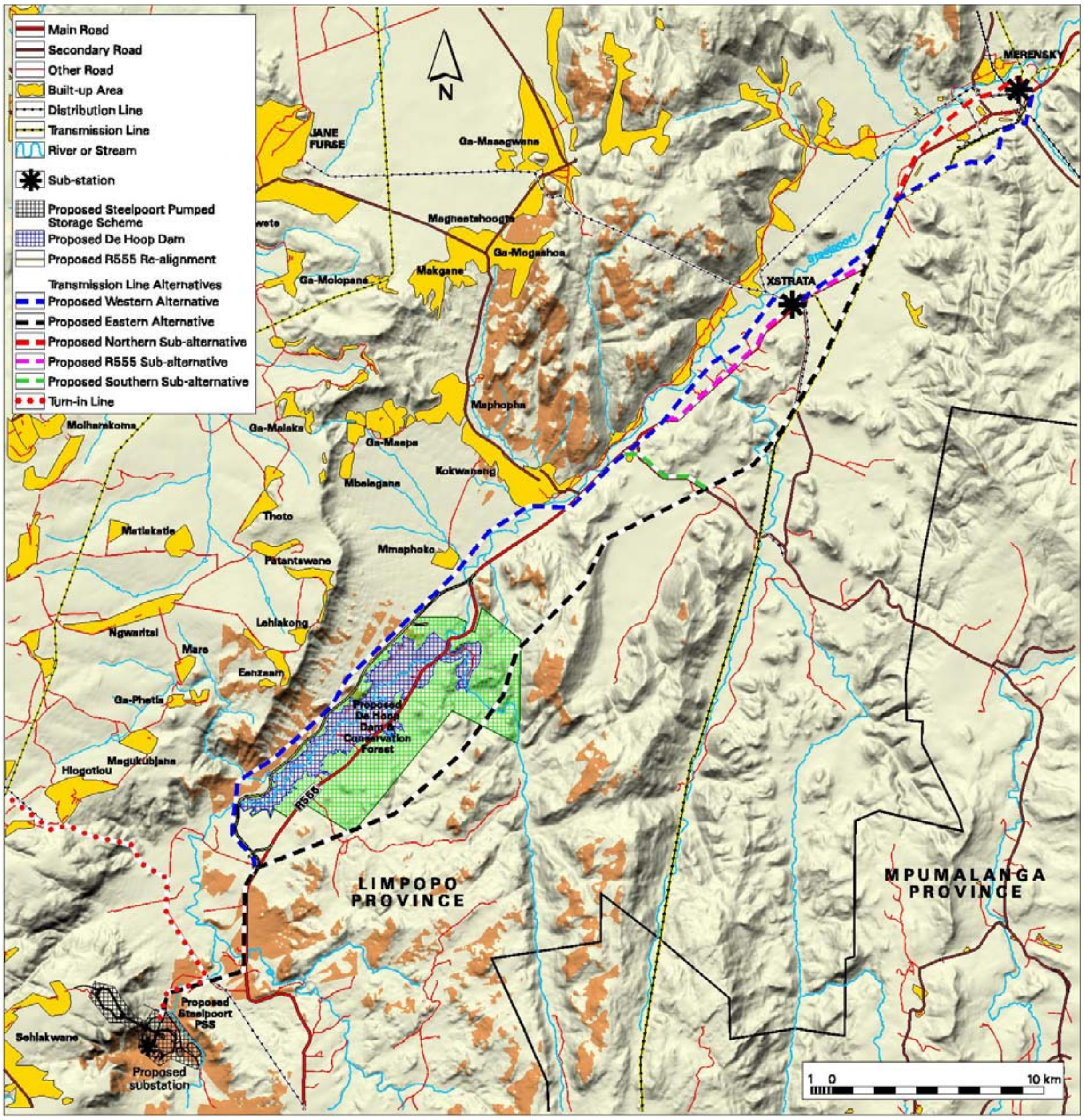

Figure 5.3: Potential visual exposure: proposed Steelpoort Substation (potentially exposed areas indicated in brown)

5.8.2. Comparison of Transmission Power Line Alternatives

Initial viewshed analyses of the proposed transmission power line alternatives, based on a 20 m contour interval digital terrain model of the study area, were undertaken and indicate the visibility of the various components of the Steelpoort Integration Project. The results of the viewshed analyses are displayed in Figures 5.4 – 5.10 and discussed following each figure. The initial results of the viewshed analyses broadly indicate that the western transmission line alternative proposed for the Steelpoort-Merensky line would be highly visible within the Steelpoort River valley and the eastern alternative to a lesser degree as it leaves the valley near Steelpoort Park. The various sub-alternatives and the turn-in line also display fairly exposed viewshed patterns.

» *Steelpoort-Merensky Transmission Power Line Alternatives:*

<u>Western Alternative:</u>

The viewshed analysis was undertaken along the entire proposed western alignment (from the PSS to Merensky) at 500 m intervals at an offset of 30 m above average ground level (i.e. the approximate height of the powerline towers).

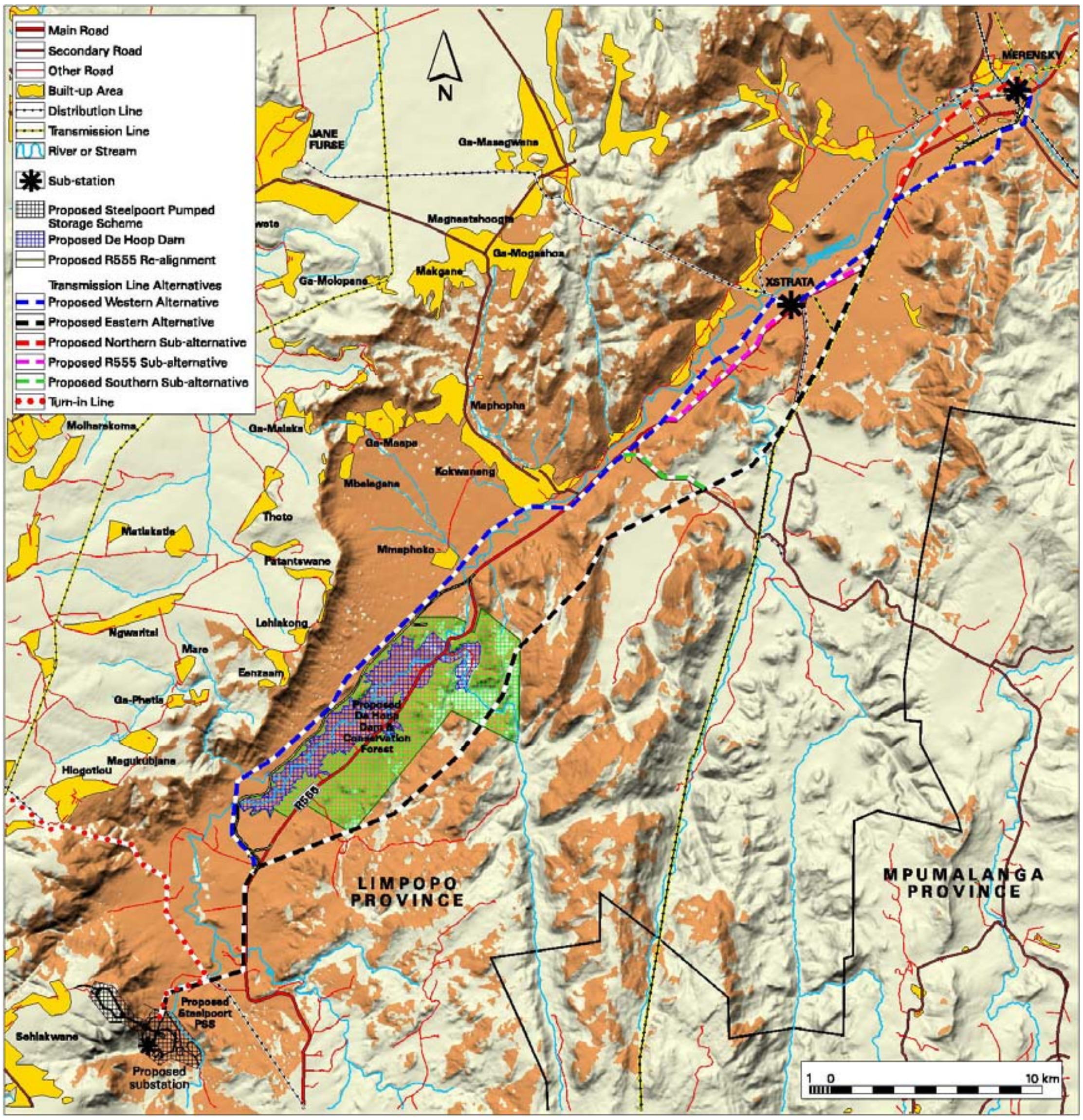

Figure 5.4: Potential visual exposure: Steelpoort-Merensky western alternative (potentially exposed areas indicated in brown)

This alternative transmission power line corridor follows the R555 (including the R555 re-alignment) for virtually the entire length of the alignment, and only deviates form this road significantly near the Merensky Substation where mining-related and agricultural activities restrict its passage. The exposure of this alignment is greatly restricted to the visual catchment of the Steelpoort River Valley within which it will be highly visible.

Site-specific issues related to this alignment option include:

* The high level of (and frequent) exposure to a great number of observers travelling along the R555, considered to be a scenic route.
* The passing of the transmission line in close proximity of the De Hoop Dam and Conservation Area possibly visually impacting on the future tourism/conservation potential of the dam.
* Crossing (or traversing near) the Steelpoort River (a visually sensitive feature) at regular intervals.
* The alignment enters a relatively densely populated area from the residential areas of Mmaphoko, Kokwaneng and beyond and will be exposed to residents of these areas.

<u>Eastern Alternative:</u>
The viewshed analysis was undertaken along the entire proposed eastern alignment (from the PSS to Merensky) at 500 m intervals at an offset of 30 m above average ground level (i.e. the approximate height of the powerline towers).

From the Steelpoort Substation, the eastern alignment follows the R555 for approximately 10 km before turning east and passing south of the De Hoop Dam and DWAF Conservation Area. It traverses the conservation forest and numerous elevated topographical units (hills and mountains) before it eventually joins the alignment of an existing 275 kV and 400 kV line. It follows the existing lines past the Xstrata Substation before joining the R555 road alignment for approximately 3.5 km whereafter it turns off east in order to avoid the mining activities south of the Merensky Substation.

Site-specific issues related to this alignment option include:

* Exposure to observers travelling along the R555 (for approximately 13.5 km), considered to be a scenic route.
* Traversing visually sensitive elevated and exposed topographical units.
* Traversing visually sensitive areas with undisturbed natural vegetation.
* Traversing a Gazetted conservation area prohibiting the deforestation and removal of endemic plant species from any area (including for the clearing of transmission line servitudes).

* Crossing the Steelpoort, Dwars and Klip Rivers (visually sensitive features).

An initial scanning level assessment of the above issues (specifically bullet 4) revealed a potential fatal flaw in this section of the proposed eastern alignment of the transmission power line.

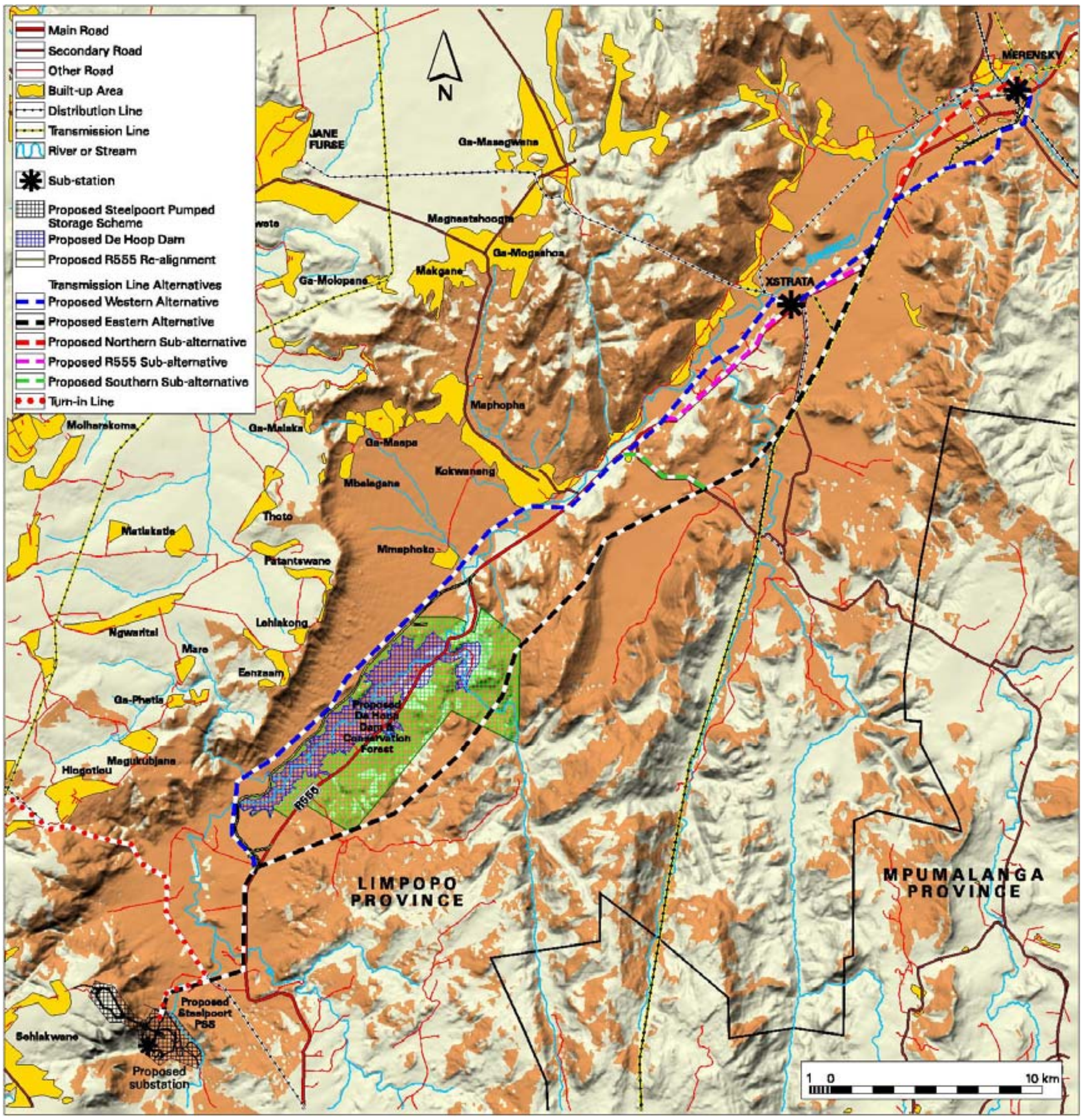

Figure 5.5: Potential visual exposure: Steelpoort-Merensky eastern alternative (potentially exposed areas indicated in brown)

<u>Northern Sub-Alternative:</u>

The viewshed analysis was undertaken for the northern sub-alternative alone at 500 m intervals at an offset of 30m above average ground level.

The northern sub-alternative deviates from the eastern and western alternatives where the latter two alternatives veer east of the R555 to avoid mining activities. The northern sub-alternative continues along the R555 towards the Steelpoort River where it runs adjacent to the river (potentially within the floodplain) towards the Merensky Substation.

Site-specific issues related to this alignment option include:

* Exposure to a number of observers travelling along the R555 (for approximately 2.3 km).
* Traversing near the Steelpoort River (a visually sensitive feature).

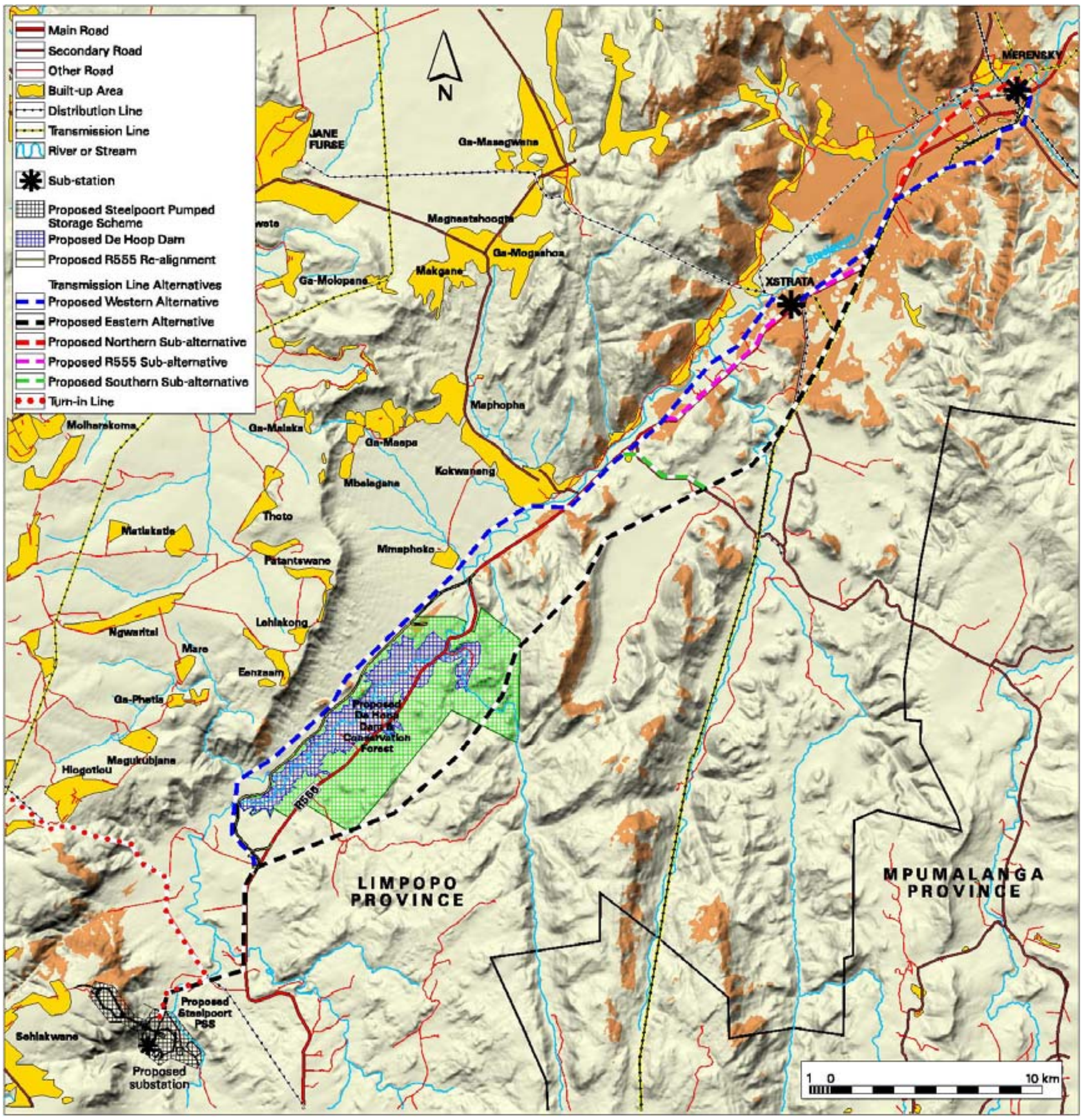

Figure 5.6: Potential visual exposure: Steelpoort-Merensky northern sub-alternative (potentially exposed areas indicated in brown)

<u>R555 Sub-Alternative:</u>

The viewshed analysis was undertaken for the R555 sub-alternative alone at 500 m intervals at an offset of 30m above average ground level.

This proposed sub-alternative deviates slightly from the western alternative by closely following the R555 for a distance of approximately 12 km past the Xstrata Substation. The visual exposure of this sub-alternative is similar to this section of the proposed western alternative with the exception being that it is in closer proximity to the R555.

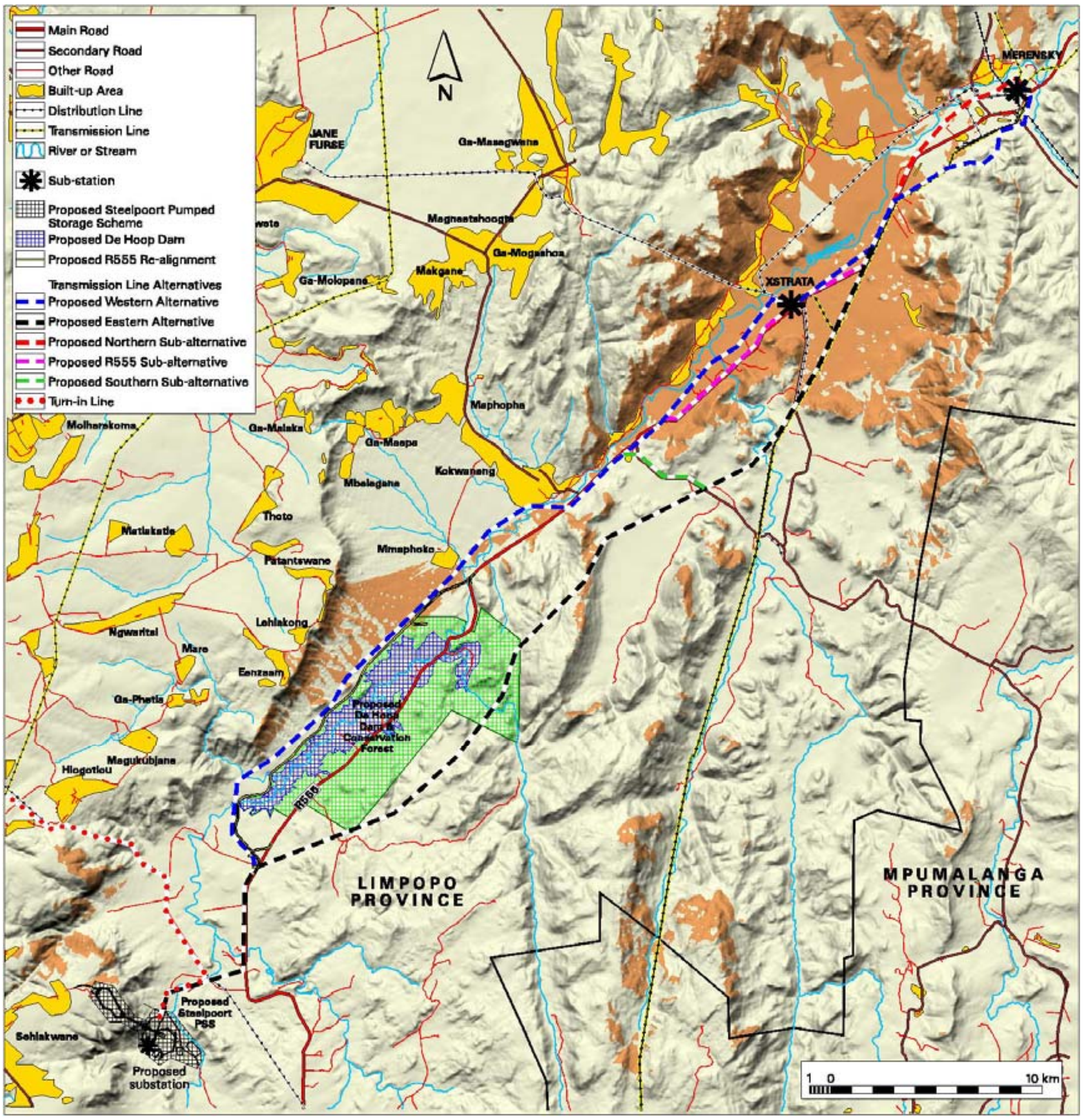

Figure 5.7: Potential visual exposure: Steelpoort-Merensky R555 sub-alternative (potentially exposed areas indicated in brown)

Site-specific issues related to this alignment option include:

* The high level of (and frequent) exposure to a great number of observers travelling along the R555.
* The alignment transverses a densely populated residential area and will be exposed to residents.

Southern Sub-Alternative:

The viewshed analysis was undertaken for the southern sub-alternative alone at 500 m intervals at an offset of 30m above average ground level.

This alignment option links the western and eastern alternatives where it runs alongside the Steelpoort/Lydenburg secondary road for approximately 4.4 km. Its close distance visual exposure is almost entirely contained within a less-populated secondary valley.

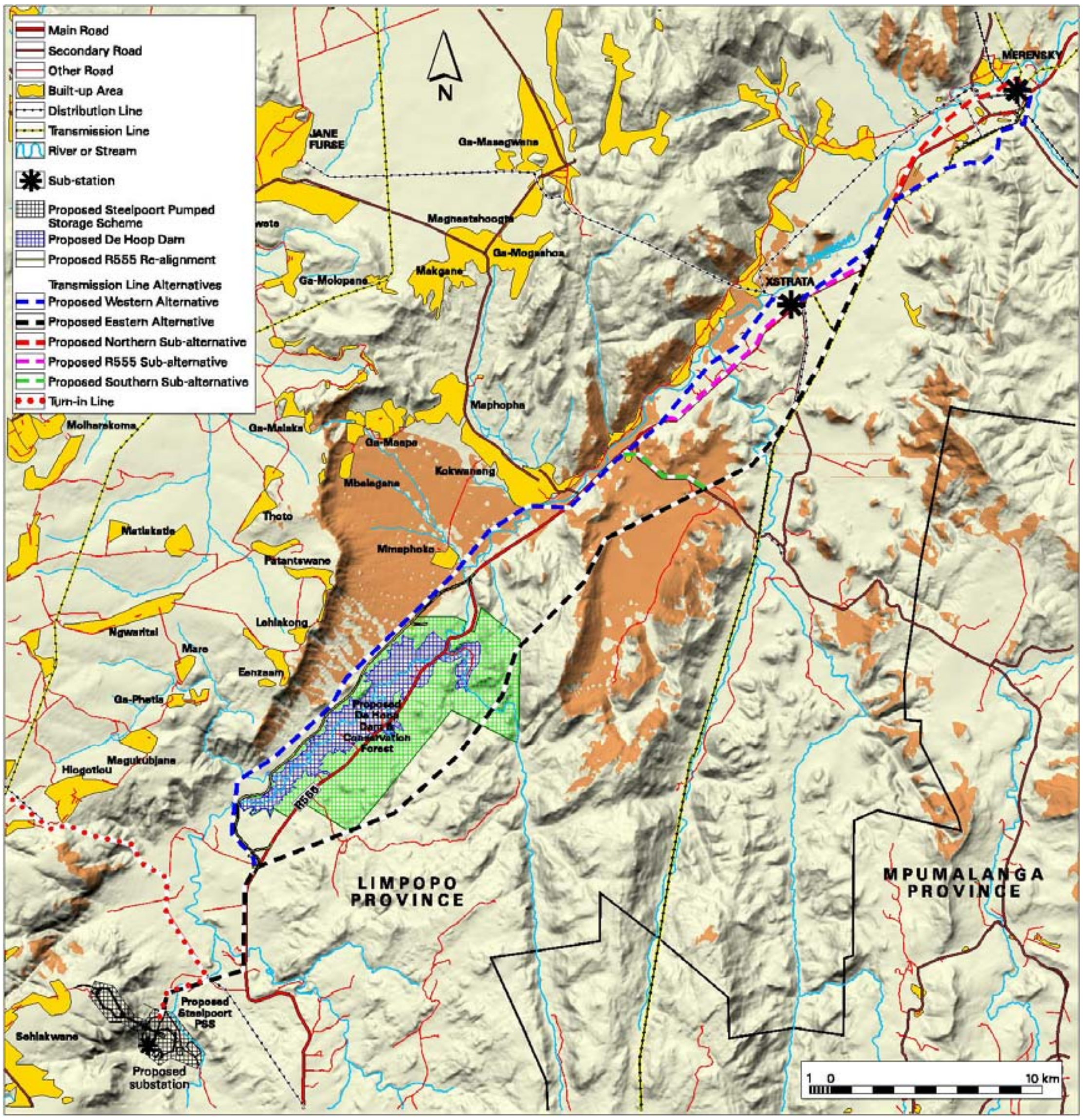

Figure 5.8: Potential visual exposure: Steelpoort-Merensky southern sub-alternative (potentially exposed areas indicated in brown)

Site-specific issues related to this alignment option include:

- The high level of exposure to a number of observers travelling along the secondary road.
- Exposure to residents living adjacent to the Lydenburg/Steelpoort road.

Based on the identified issues listed above, Sections of eastern alternative were eliminated as feasible from a visual perspective where the alignment traverses sensitive topographical, vegetative and conservation areas east and north-east of the De Hoop Dam and the DWAF Conservation Area. This elimination practically ensures that the only alternative option would be the western alternative up to Steelpoort Park.

On this basis, the southern sub-alternative option on the western alignment is nominated as the preferred option. The continuation of the western alternative (and the proposed R555 sub-alternative) was deemed to be less favourable than the southern sub-alternative due to the high number of observers, both along the R555 and from the residential settlements in the area. The crowded nature of these alternatives (being wedged between the R555 and the Steelpoort River), and the relatively secluded nature of the northern section of the eastern alternative, suggested that the southern sub-alternative would provide a good link between the two alternatives. The northern section of the eastern alternative also had the added advantage of following at least 16 km of existing transmission line servitudes, thus consolidating impacts.

The northern sub-alternative was not preferred above the proposed eastern/western alternative due to the fact that this alignment would unnecessarily encroach on the Steelpoort River floodplain and would be more exposed from the R555.

» *Turn-in lines between the Steelpoort Substation and the Duvha-Leseding 400 kV line:*
The viewshed analysis was undertaken for the turn-in line at 500 m intervals at an offset of 50 m above average ground level (i.e. the approximate height of a double-circuit powerline tower – Figure 5.9) and 30 m above average ground level (i.e. the approximate height of a powerline tower – Figure 5.10).

The turn-in line follows the eastern/western alignment options for approximately 3.3 km before joining an existing distribution line (across the farm Tigerhoek) up the scarp face until it joins with the Duvha-Leseding transmission line. The location of the line within the Steelpoort River Valley is relatively remote (removed from observers) until it crests the escarpment and traverses through the Hlogotlou village.