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AGRICULTURAL IMPACT ASSESSMENT FOR PROPOSED KOEBERG ANKERLIG 132 KV TRANSMISSION POWERLINE WESTERN CAPE PROVINCE

BASIC ASSESSMENT REPORT

Report by
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1 INTRODUCTION

Eskom is proposing the ~~construction~~deviation of a 5km section of an ~~new~~existing 132kv transmission power line ~~of about 14 km in length~~ from Koeberg to Ankerlig in Atlantis (see Figure 1). The activities associated with the construction of the power line will include site clearance and construction of access roads to facilitate access to the site (where required, where existing access roads are not present). A servitude of 36m will be required along the length of the power line during operation.~~The development will include auxiliary works such as upgrade of substations, access roads, construction camps and equipment or material storage sites along the proposed power line servitude.~~

The development is currently in the Basic Assessment phase and this report identifies and assesses the potential impacts that the development may have on agricultural resources and production. Johann Lanz was appointed by Savannah Environmental as an independent specialist to conduct this Agricultural Impact Assessment.

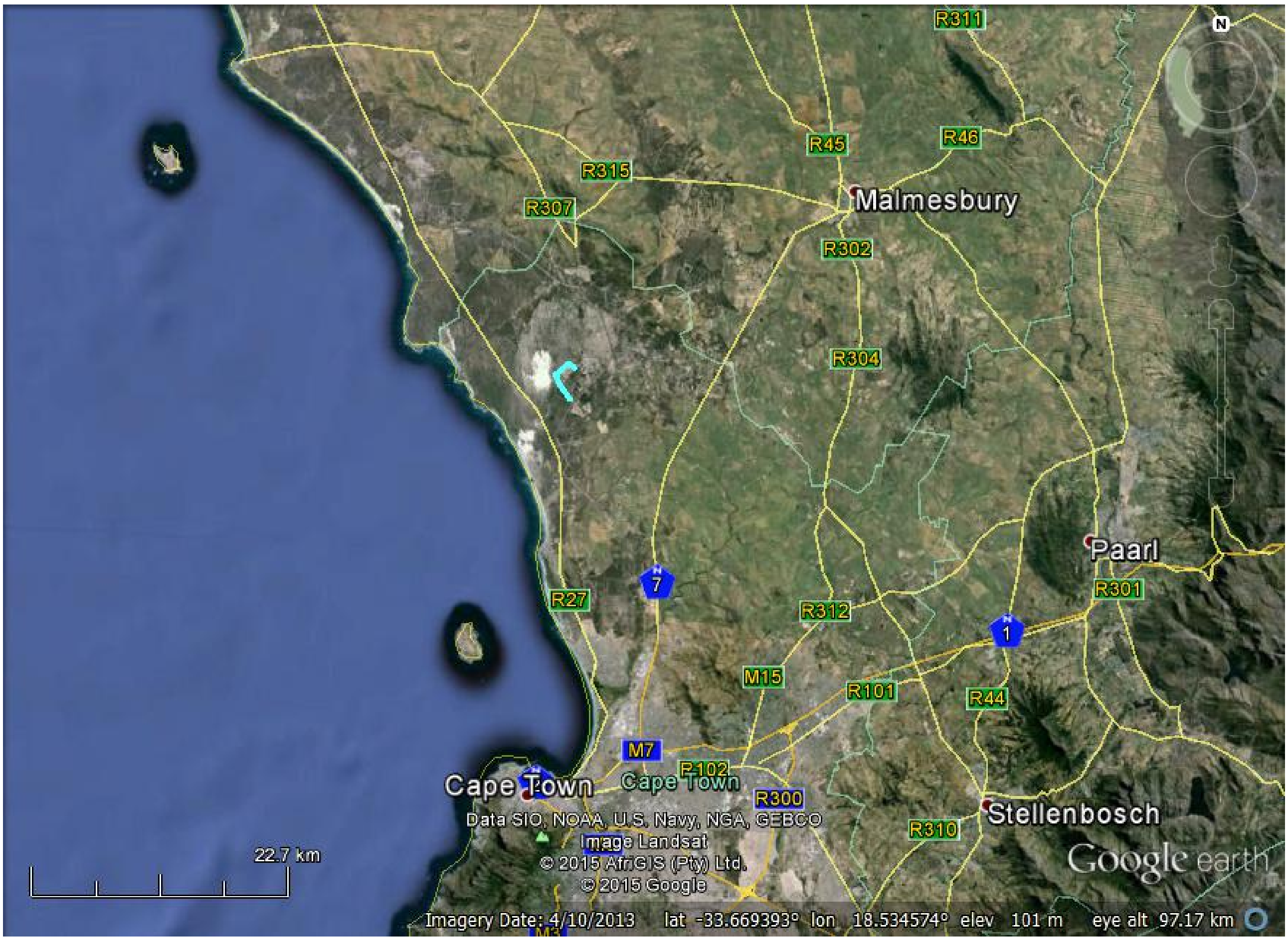

Figure 1. *Location map of the proposed power line deviation, shown in light blue.*

2 TERMS OF REFERENCE

The terms of reference for this study are:

- Describe and map the receiving environment in terms of agricultural parameters including climate, soils, land capability and land use.
- Identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on agricultural resources (including soils) and agricultural production.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

3 METHODOLOGY OF STUDY

3.1 Methodology for assessing soils and agricultural potential

The assessment was predominantly a desk top one based on existing soil and agricultural potential data for the study area. The source of this data was the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the study area was also used, particularly to evaluate current land use. Furthermore the soil scientist applied his knowledge and previous experience of agricultural conditions in the area.

The information was ground-truthed with a brief field investigation of the corridor, which was done on 8 April 2014. Soil and agricultural conditions were investigated at each road crossing along the proposed corridor.

3.2 Methodology for determining impact significance

All potential impacts were assessed in terms of the following criteria:

- The **extent**, wherein it was indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high);
- The **duration**, wherein it was indicated whether:
- the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
- medium-term (5–15 years) – assigned a score of 3;
- long term (> 15 years) - assigned a score of 4; or
- permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result

in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes;

- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures);
- The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;

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

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

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

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

4 CONSTRAINTS AND LIMITATIONS OF STUDY

Data on the spatial distribution of soil types is dependent on the resolution of sampling points. Investigations for different purposes will use different resolutions. These will record the degree of soil variation that occurs, at different levels of accuracy. The accuracy level of the land type data used in this study is considered completely adequate for achieving this study's aims. A more detailed soil investigation is not considered likely to have added anything significant for determining the impact of the development on agricultural resources and productivity, and the soil data used is not, therefore seem as a limitation.

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other specific constraints, uncertainties and gaps in knowledge for this study.

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT

All the information on soils and agricultural potential in this report has been obtained from the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

5.1 Climate and water availability

Rainfall for the site is given as 408 mm per annum, with a standard deviation of 78 mm, according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in Table 1. One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country (see Table 2). The proposed development site falls within class 3 which is described as a moderate limitation to agriculture.

Table 1. Average monthly rainfall for the site (33° 38' S 18° 27' E) in mm (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Tot**
9	10	17	31	56	69	69	55	38	26	16	11	**408**

Table 2. The classification of moisture availability climate classes for winter rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	**Moisture availability (Rainfall / 0.25 PET)**	**Description of agricultural limitation**
C1	>34	None to slight
C2	25-34	Slight
C3	15-24	Moderate
C4	10-14	Moderate to severe
C5	6-9	Severe
C6	<6	Very severe

5.2 Terrain and soils

The proposed power line is located entirely on a level coastal plain with some relief. Dune formations are responsible for most of the topography. Slopes are mostly ≤2% but in places go up to 5%. The geology of the study area is mainly Quaternary quartz sand of the Springfontein Formation as well as calcareous coastal dune sand of the Witzand Formation.

The land type classification is a nation-wide survey that groups areas of similar soil, terrain and climate conditions into different land types. The proposed power line ~~is predominantly~~

~~located on one~~ crosses three very similar land types, Ha9, ~~but also crosses two other very similar land types,~~ Ha10 and Ga17 (see Figure 2). Soils of these land types are almost entirely deep, unconsolidated grey to yellow sands predominantly of the Namib and Fernwood soil forms. These soils would fall into the Cumulic group, according to the classification of Fey (2010), which are described as young soils in unconsolidated sediments. A summary detailing soil data for the land types is provided in Table A1. The field investigation of soils confirmed the occurrence of deep, grey unconsolidated sands across the entire corridor area.

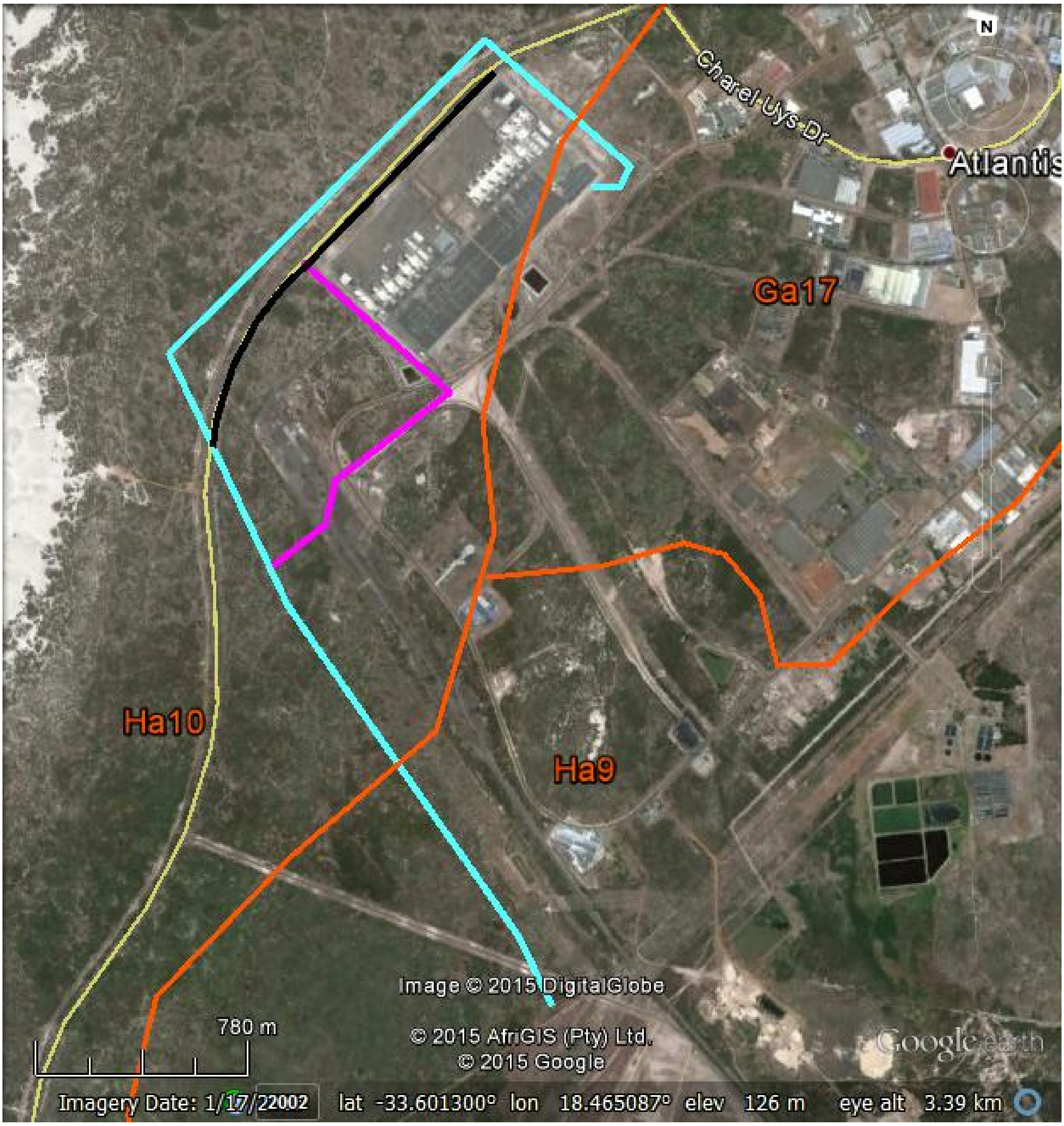

Figure 2. *Satellite image of proposed power line corridor, shown in blue, with ~~the~~ alternatives 2, shown in black and 3 shown in pink~~route shown in pink~~. Land type boundaries and labels are shown in orange.*

5.3 Agricultural capability

Land capability is the combination of soil suitability and climate factors and is an indication of agricultural potential. Land capability is classified into 8 categories across South Africa. The proposed power line route is on land that is classified on AGIS as class 3 - moderate potential arable lands. However, in the field, this land has a far lower agricultural capability because of its extremely sandy texture (low clay content) which severely limits the water and nutrient holding capacity of the soil. As a result the land is not suitable for dryland cropping.

Another indication of agricultural capability is the potential wheat yield which is given on AGIS as 0.6 to 1.4 tons per hectare, and is therefore below economic viability. Grazing capacity is given as fairly high between 11 and 13 hectares per animal unit over most of the corridor and between 8 and 10 in some places.

The majority of the corridor is severely invaded by Australian wattle, which lowers the agricultural usability and grazing capacity of the land.

5.4 Land use and development at the site

The site falls within a grain producing agricultural region, but as stated above, is not suitable for dryland cultivation. There is no cultivation or agricultural development along the corridor. At most the land is used for grazing, but due to the wattle invasion is of poor quality. The proposed power line runs adjacent to existing power lines ~~for 65% of its route~~.

6 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The components of the project that can impact on agricultural resources and productivity are:

- Occupation of the land by the footprint of the development, which includes pylon bases, access roads, and during the construction phase, construction and storage camps.
- Construction activities that disturb the soil profile and vegetation, for example for excavations, levelling, bush clearing, etc.
- height restrictions below the cables.

The following are identified as potential impacts of the development on agricultural resources and productivity, and assessed in the table formats below. There are three factors that influence the significance of all agricultural impacts. The first is that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land. The second is that agricultural potential and activity on the site is very limited. The third is that the proposed power line largely runs adjacent to existing power lines, and so does not introduce a new disturbance to the land.

6.1 Impacts associated with all phases of the development

1. Nature: Loss of agricultural land use Caused by: direct occupation of land by footprint of power line infrastructure; And having the effect of: taking affected portions of land out of agricultural production.		
	Without mitigation	
Extent	Low (1) - Site	
Duration	Long term (4)	
Magnitude	Small (0)	
Probability	Definite (5)	
Significance	25 (Low)	
Status	Negative	
Reversibility	Low	
Irreplaceable loss of resources?	Low	
Can impacts be mitigated?	No	
Cumulative impacts: The overall loss of agricultural land in the region due to other developments. The significance is low due to the limited agricultural potential of the land in the area, and due to the small footprint of impact associated with this development.		
Residual impacts: No mitigation possible or necessary so same as impacts without mitigation		

2. Nature: Soil Erosion Caused by: alteration of surface characteristics due to vegetation removal and surface disturbance; And having the effect of: loss and deterioration of soil resources.		
Comment: There is a low risk of water erosion due to the very gentle slopes and high permeability of the soil. There is some risk of wind erosion, but due to deep sands the risk has low consequence.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Improbable (2)
Significance	**21 (Low)**	**12 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Low	Low

Can impacts be mitigated?	Yes
Mitigation: Limit the surface area that is cleared of vegetation at any one time (particularly during construction) to reduce wind erosion.	
Cumulative impacts: None	
Residual impacts: None	

3. Nature: Loss of topsoil Caused by: poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) And having the effect of: loss of soil fertility on disturbed areas after rehabilitation.		
Comment: Because of the deep, sandy nature of the soil and the dune-like environment, the loss of topsoil is much less critical than in other environments.		
	Without mitigation	**With mitigation**
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Small (1)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	**12 (Low)**	**10 (Low)**
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
Mitigation: 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.		
Cumulative impacts: None		
Residual impacts: None		

6.2 Comparative assessment of alternatives

Alternative 2, shown in Figure 2, does not differ from alternative 1 in terms of agricultural impact. The 'do nothing' alternative has zero impact on agriculture, compared to the low impact for the development.

7 MEASURES FOR INCLUSION IN THE DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

OBJECTIVE: Ensure prevention of erosion through maintenance of vegetation cover.

Project components	All (all project components will alter surface and/or disturb vegetation cover).
Potential Impact	Erosion will cause loss and degradation of soil resources.
Activity / risk source	All activities on site will will alter surface and/or disturb vegetation cover.
Mitigation: Target / Objective	To have no wind erosion on the site.

Mitigation: Action / control	**Responsibility**	**Timefra**
Keep the surface area of cleared vegetation at any one time to a minimum. Maintain as much vegetation cover as possible throughout the site.	Construction managers / Environmental manager	Project life time

Performance Indicator	That no erosion occurs on site.
Monitoring	Include periodical site inspection in environmental performance reporting that records vegetation cover across the site.

OBJECTIVE: Ensure effective topsoil covering to conserve soil fertility on all disturbed areas.

Project components	All constructional activities that disturb the soil below surface, such as levelling, excavations etc.
Potential Impact	Lack of topsoil, resulting in decrease in soil fertility.
Activity / risk source	All constructional activities that disturb the soil below surface, such as levelling, excavations etc.
Mitigation: Target / Objective	Ensure effective topsoil covering on all disturbed areas.

Mitigation: Action / control	**Responsibility**	**Timeframe**
If an activity will mechanically disturb below surface in any way, then the upper 40 cm of topsoil should first be stripped from the entire disturbed surface and	Construction managers / Environmental officer	Duration of the construction phase

stockpiled for re-spreading during rehabilitation.		
Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.	Construction managers / Environmental officer	Duration of the construction phase
Dispose of all subsurface spoils from excavations where they will not impact on agricultural land (for example on road surfaces) or where they can be effectively covered with topsoil.	Construction managers / Environmental officer	Duration of the construction phase
The stockpiled topsoil must be evenly spread over the entire disturbed surface.	Construction managers / Environmental officer	During rehabilitation after construction / operation.
Utilise Erosion Control measures, where required	Contractor	Construction
Rehabilitate disturbed areas and stabilise soils after construction	Contractor	Post-Constructions

Performance Indicator	That no disturbed areas are left without an effective covering of topsoil, and potential for re-vegetation.
Monitoring	Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below. • Record the GPS coordinates of each area. • Record the date of topsoil stripping. • Record the GPS coordinates of where the topsoil is stockpiled. • Record the date of cessation of constructional (or operational) activities at the particular site. Photograph the area on cessation of constructional activities. Record date and depth of re-spreading of topsoil. Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.

8 CONCLUSION: ENVIRONMENTAL IMPACT STATEMENT

The key findings of this study are:

- There are three factors that influence the significance of all agricultural impacts. The first is that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land. The second is that agricultural potential and activity on the site is very limited. The third is that the proposed power line largely runs adjacent to existing power lines and so a disturbing impact already exists along most of the corridor.

- Because of these factors, there will be a low overall impact of the development on agricultural production and livelihoods.
- Soils along the corridor are almost entirely deep, unconsolidated grey to yellow sands predominantly of the Namib and Fernwood soil forms. Soils are limited by their extremely sandy texture (low clay content) which severely limits their water and nutrient holding capacity. As a result the land is not suitable for dryland cropping.
- The majority of the corridor is severely invaded by Australian wattle, which lowers the agricultural usability and grazing capacity of the land.
- There is no cultivation or agricultural development along the corridor. At most the land is used for grazing, but due to the wattle invasion is of poor quality.
- Three potential negative impacts of the development on agricultural resources and productivity were identified as:

    - Loss of agricultural land use caused by direct occupation of land by the footprint of the power line infrastructure (low significance, no mitigation possible).
    - Soil Erosion caused by alteration of surface characteristics due to vegetation removal and surface disturbance (low significance with and without mitigation).
    - Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).

- The conclusion of this assessment is that from an agricultural impact perspective there are no fatal flaws associated with the development and it can proceed as proposed, subject to the recommended mitigation measures provided.
- There are no differences between the ~~two~~three alternative power line routes in terms of the agricultural impact.

9 REFERENCES

Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.

Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.

Water Research Commission. Undated. South African Rain Atlas available at http://134.76.173.220/rainfall/index.html.

APPENDIX 1: SOIL DATA

Table A1. Land type soil data for site.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ha9	3	Fernwood	>120	0-6			59
		Constantia	>120	0-6			26
		Kroonstad	90-120	0-6	15-24	gc	11
		Lamotte	90-120	0-6		pd	4
		Clovelly	>120	0-6			1
Ha10	3	Fernwood (dunes)	>120	0-5			49
		Fernwood	>120	0-5			46
		Kroonstad	90-120	5-10	10-25	gc	5
		Mispah	30	0-5		ca	1
Ga17	3	Fernwood	>120	0-6			43
		Lamotte	90-120	0-6		pd	36
		Constantia	90-120	0-6	8-14		11
		Kroonstad	60-90	0-6	15-24	gc	10

Depth limiting layers: ca = hardpan carbonate; gc = dense clay horizon that is frequently saturated; pd = podzol horizon.