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ASSESSMENT OF AGRICULTURAL IMPACT OF PROPOSED CONSTRUCTION OF A 30 KM LONG 400KV ESKOM POWER LINE FROM ETNA SUBSTATION TO GLOCKNER SUBSTATION IN THE GAUTENG PROVINCE

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Table of contents

1.0 INTRODUCTION

1.1. Project Background

Numerous trade off emerges during agricultural and industrial development programmes in relation to environmental considerations. The ever-growing demand for energy by the consuming public requires that ESKOM increases its capacity to provide affordable electricity to newly developing areas within South Africa. Africa Geo-Environmental Services, Limpopo Province was appointed to assess the agricultural impact on the construction of a 30-km long double circuit 400 kV ESKOM Power Line. The power line will span from the Etna Substation, north of Ennerdale to Glokner Substation, close to Rothdene in the Gauteng Province (Fig. 1).

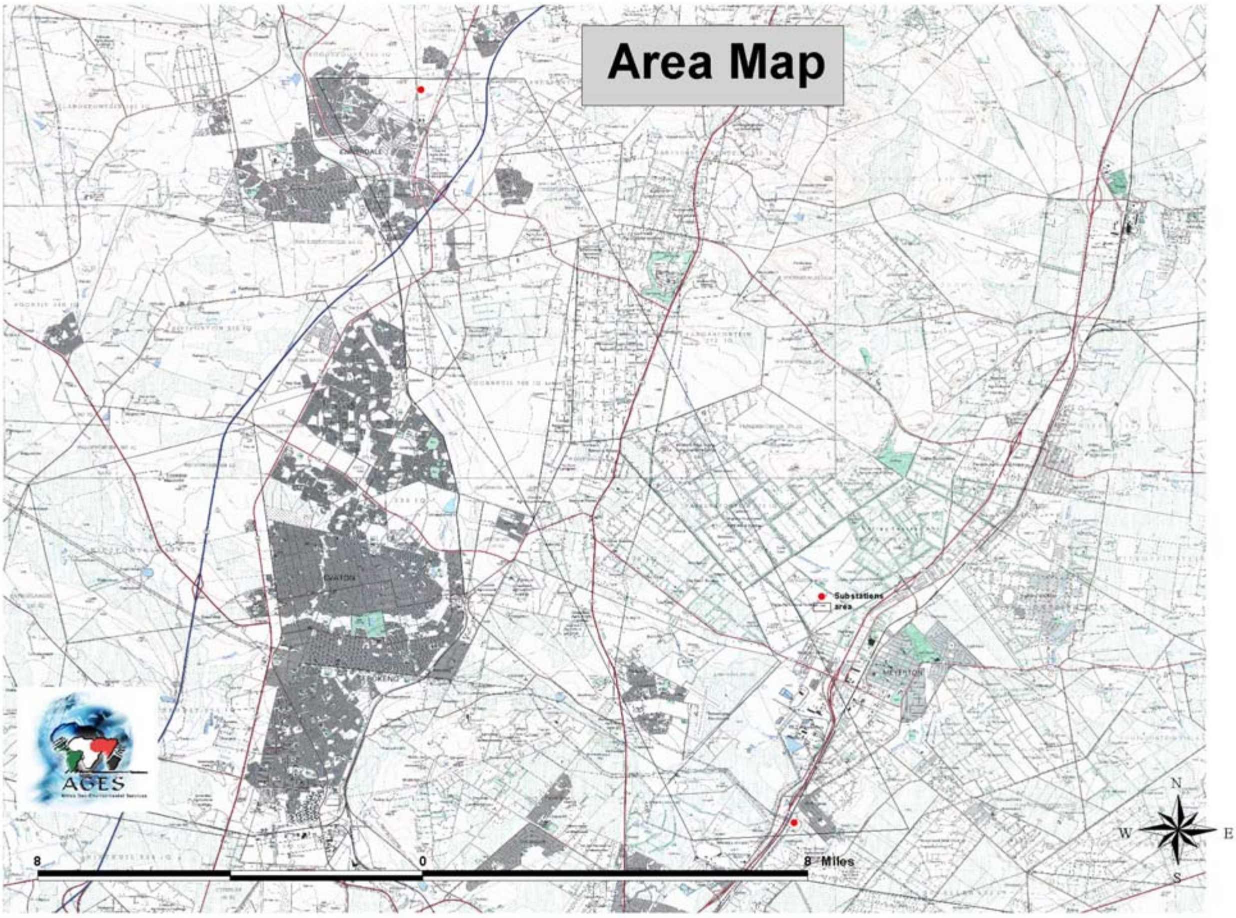

Fig. 1. Locality map of the project site.

The construction of a power line in this case to meet energy needs of communities will require land, which may put additional constraint on limited arable land available for agricultural development in South Africa. Several demands are currently placed on land as a result of local economic development programmes, ranging from landuse for Urbanization, Agriculture, Mining, Industries, Forestation, Eco-Tourism, Game Farming and protected areas for Conservation.

The rational for the current assessment is that, construction of the proposed power line between the two substations will traverse some agricultural lands. To minimize loss of prime agricultural lands during the proposed development, it is important to assess the agricultural impact of different routes to provide guidance in final decision making. Information generated from the present assessment will contribute to the requirements of the environmental regulations promulgated on 05 September 1997 (in terms of

Sections 21, 22 and 26 of the Environmental Conservation Act, Act 73 of 1989).

1.2. Current landuse

The proposed routes for the power line traverse urban and peri-urban areas, rangelands as well as fallow old croplands occurring between settlement areas. A significant proportion of the area is of human settlement with only isolated pockets of rangeland and very isolated pockets of farmlands.

2.0 PROJECT OBJECTIVES

The main objective of the study was to assess the agricultural impact on the **three** alternative routes for the construction of a power line between Etna Substation and Glockner Substation in the Gauteng Province and recommend the route that will result in minimal impact.

3.0 METHODOLOGY

The assessment was based on a combination of desktop studies, GIS information and site visits to gather information on the following:

i. Definition of parameters of land as stipulated by the Subdivision of Agricultural Land Act, No. 70 of 1970 and the Amended Regulation of Conservation of Agricultural Resources Act No. 43 of 1983.
ii. Classification of high potential agricultural land in South Africa compiled by the Agricultural Research Council ((Schoeman, 2004) for the National Department of Agriculture.
iii. Long-term climatic data record of or around the farm, obtained from Weather SA.
iv. Geophysical features of the site using Geographical Information System.
v. Moisture availability class, determined through seasonal rainfall and fraction of the potential evapo-transpiration (ARC, 2002).
vi. Field visitations to the project site for general observation, survey of the farm in terms of vegetation, soils, water resources, terrain type and infrastructural profile.
vii. Previous and current landuse of the farm and that of the neighbourhood.
viii. Other agro-ecological factors prevailing in the area.
ix. Agricultural potential of the property
x. Possible crop productivity and income projection

4.0 AGRICULTURAL POTENTIAL

4.1 National assessment criteria

The essence of identifying high potential agricultural land in South Africa is to retain prime area for agricultural development and to retain as much productive areas for the future. In line with this goal, the Department of Agriculture has developed a set of criteria to define potential and prime areas for agricultural development in South Africa, as listed below:

- By definition, based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983, an agricultural land in the Gauteng Province and specifically around the project site is considered high potential if the land:

    i. Is under permanent irrigation, or

ii. Can be classified into <u>one</u> of the following soil forms; Avalon, Bainsvlei, Bloemdal, Clovelly, Glencoe, Hutton, Oakleaf, Pinedene, Shortlands and Tukulu.
iii. Has a minimum effective depth of **800**mm
iv. An average topsoil clay content of **10 to 35%**.

High potential here means prime or unique. Prime refers to the best available land, mainly from the national perspective, suited to and capable of consistently producing acceptable yields of a wide range of crops (food, feed, forage, fibre and oilseeds), with acceptable expenditure of energy and economic resources and minimal damage to the environment (and is available for their use). Unique agricultural land means land that is or can be used for producing specific high value crops.

Permanent irrigation means the availability for, and regular artificial application of, water to the soil for the benefit of growing crops. The application may be seasonal.

4.2 Additional assessment criteria from provincial department

In addition to the necessary legislations relating to land classification in term of its potential in South Africa, the assessment of agricultural potential at the project site in Gauteng Province took into consideration, the following requirements from the Department of Agriculture, Conservation and Environment, Gauteng Province:

- Soil assessment at scale of 1:10 000 size,
- Possible crop types according to the soil and climate,
- Possible yields,
- Irrigation potential
- Cost benefit analysis
- Water availability
- Surrounding developments and activities
- Current status of the land and landuse options

5.0 AGRO-ECOLOGICAL CHARACTERISZATION

5.1 SOIL DISTRIBUTION

5.1.1 Land type distribution

Three different land types are found on the farm, namely: Land types *Ba1, Ba29 and Fb5 (*Fig 2).

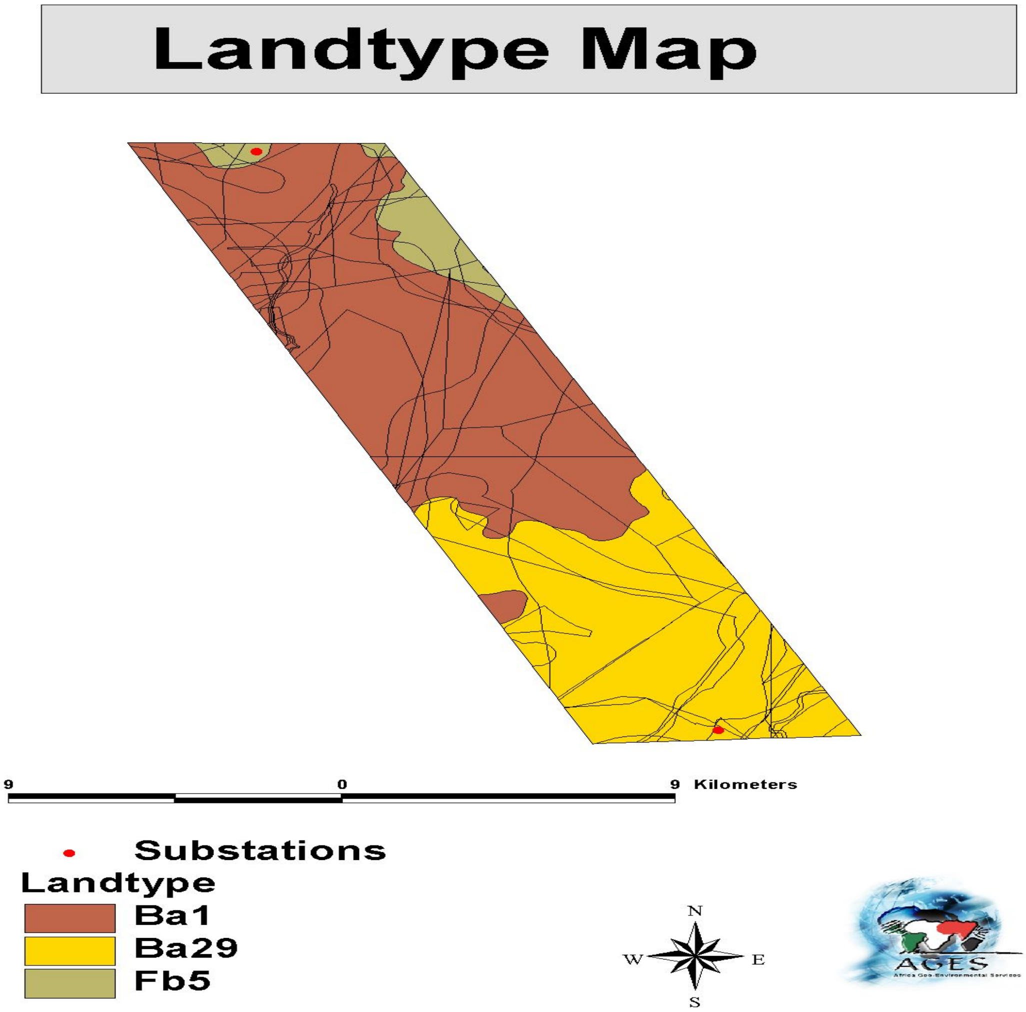

Fig. 2. Land type occurring between Etna and Glockner Substations.

The characteristics of these land types (Soil Classification Working Group, 1991) and their potential for agriculture (Schoeman, 2004) is presented as follows:

Land type Ba1

The land type *Ba1* encompasses the area about 1 km from the Etna substation, stretching from the north-western portion to the south-eastern portion beyond the centre of the land. It constitutes more then half of the Landtype present.

This Landtype is composed predominantly of Hutton soil form. In addition to the Hutton soil forms are localized pockets of exposed rock and Mispah soil forms and then highly localised pockets of Glenrosa, Glencoe, Clovelly and Avalon soil forms. The exposed rocks are found close to the Edna substation. The characteristics of the soil forms under this Landtype are presented in table 1.

Table 1. Soil form under land type ***Ba1*** and its degree of potentiality for agriculture.

Terrain Position	**Soil form**	**Soil form characteristics and potential for agriculture**
Midslope	Significant proportion of *Hutton (Msinga, Shorrocks, Doveton, Makatini)*	• Succession of red-coloured sandy material that exhibits little or no structure and is deemed freely draining. The topsoil horizon is Orthic A, with clay content of 15 to 35 %. This material is generally easy till mechanically with implements. The soil depth at the site is variable, including **600 to over 1200 mm, 400 to 600 mm** and then **400 to 900 mm**. *Hutton* soil generally exhibits moderately low to low permeability. • *The soil form has high potential for agriculture but can be limited by shallow depth or high concentration of undesirable clay type, such as Montmorillonite.*
	Localised pockets of Mispah	▪ The presence of relatively hard weathered bedrock outcrop or at shallow depth, 0 to 400 mm. ▪ The upper layers of *Mispah* soil generally exhibit moderate to low permeability. The weathered bedrock may be only very slightly permeable. ▪ *The soil form has low potential for agriculture due to the relatively shallow bedrock.*
	Highly localized pockets of *Glenrosa*	▪ This soil type is defined as a thin topsoil cover overlying a dishomogeneous mixture of soil and weathered bedrock. *Glenrosa* soil is generally difficult to excavate by hand or tillage implements due to the presence of shallow bedrock. ▪ It has a depth of 200 to 400 mm. ▪ The upper layers of *Glenrosa* soil generally exhibit moderate to low permeability allowing the lateral movement of liquids in the upper soil layers. ▪ *Has low potential for agricultural, primarily due to shallow bedrock.*
	Highly localized pockets of *Glencoe*	This soil type is defined as a succession of yellow-coloured sandy material underlain by hardpan ferricrete, and is indicative of the seasonal occurrence of perched water tables at relatively shallow depth. Poor drainage will occur under moderate to heavy rains. The hardpan will restrict root movement and retard plant growth. The depth ranges from 500 to 750 mm. Its ferruginized nature also indicates the possible lateral movement of liquids within the sandy topsoil layers. • *Has moderate potential for agriculture*
	Highly localized pockets of Clovelly	• This soil type is defined as a succession of yellow-coloured sandy material that exhibits little or no structure and is deemed freely draining. The soil form has low

		moisture holding capacity which could cause frequent moisture deficits for plant growth and development. • It has a depth of 600 to 900 mm. • *Has moderate potential for agriculture.*
	Highly localized pockets of *Avalon*	• Weak to moderate structure. The soil form is defined as a succession of yellow-coloured sandy material underlain by soft ferricrete. The upper layer is easily tilled by mechanical implements. It has a depth range of 750 to 900 and a clay percentage of 20 to 30. • *Has moderate to high potential for agriculture.*

Land type Ba29

The land type *Ba29* comprises less than 50 % of the area and it is composed of predominantly Hutton soil form with depth between 600 to over 1200 mm. There are also localized pockets of Mispah and highly localized pockets of Glencoe, Clovelly, and Glenrosa. The characteristics of this soil forms is similar to that presented in table 1.

Land type Fb5

The land type *Fb5* comprises exposed bedrock, Mispah and Glenrosa soil forms. There is also localised pocket of Hutton and highly localised pockets of Clovelly within this landtype. The Mispah and Glenrosa soils forms have effective rooting depth of 100 to 350 mm. This landtype is classified as low potential for agriculture.

All the three alternative power line routes traverses the landtypes present at the project site.

Soil depth analysis

Soil depth was randomly assessed at the project site during sampling for soil fertility analysis. The result of the analysis is presented in table 2.

Table 2. Soil depth at different points .

Sample	Depth (mm)	Limiting material
S1	200	Bedrock
S2	>1500	Not limited, old cropland
S3	300	Bedrock
S4	450	Bedrock
S5	1200	Hard clay
S6	<750	Bedrock
S7	<450	Bedrock
S8	750	Hard clay and rock
S9	300	Bedrock
S10	750	Hard clay

Figure 2 indicate the spots within the project site where soil depth was assessed. The soil depth analysis revealed that 80.0 % of the sampling areas exhibit depth below **800 mm**. The 800 mm depth is the minimum depth that characterises a prime agricultural land within the project site (Schoeman, 2004). Thus, with regard to soil depth, a larger proportion of the site is not considered prime. The predominance of shallower depth at the project site will restrict effective agricultural production.

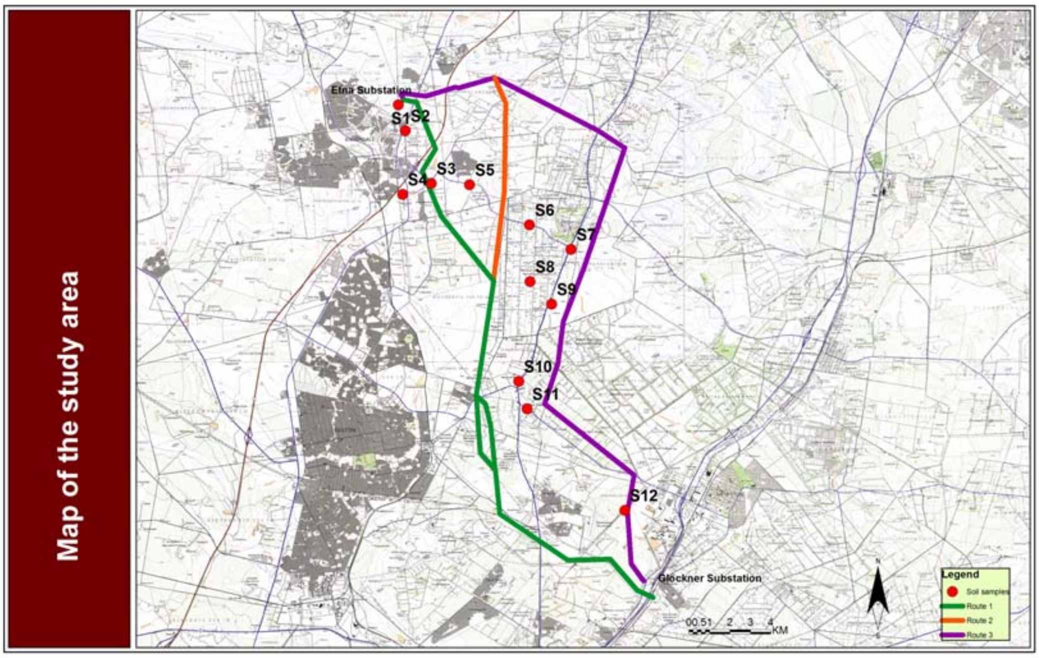

Fig. 2. Soil sampling spots between Etna and Glockner substaions.

An area with a relatively deeper soil depth as found in an exposed profile and an area with extensive rock outcrop is presented in figure 3.

A. Exposed soil profile. **B: Shallow soils with rock outcrop**

Figure 3. An area with relatively deeper depth in an exposed profile (A) and that of a shallow soil (B).

Current Soil fertility

Soil is an important resource in maintaining plant growth and yields, as it is the major source of plant nutrients. It also influences pasture and veld conditions and thus, indirectly determines the potential of livestock productivity in a locality. Analysis of eleven topsoil samples (0 - 300 mm) taken from representative sites on the farm (Fig 2) produced the following results (Appendix 1):

Soil acidity

The soil acidity ($pH_{(H2O)}$) at the project site ranged from 4.18 to 6.26. Three samples had pH less than 5.0 and only one sample had pH value above 6.0. Thus, the topsoil at the project site can be described as moderate to strongly acidic (Peverill, et al., 1999). Soil acidification is a serious production constraint as it can limit the availability of most plant nutrients. Corrective measures such as liming will be required if the soil at the project site is going to be used productively.

Nitrogen

The plant available nitrogen levels in the topsoil ranged from 1 to 5 $mg\ N\ kg^{-1}$ across samples. This is equivalent to 4 to 20 $kg\ N\ ha^{-1}$. A cereal crop such as maize will require between 50 and 100 $kg\ ha^{-1}$ to produce satisfactory yields in soils with low organic matter. An amount of 50 $kg\ ha^{-1}$ will produce marginal to satisfactory yields.

The available nitrogen status of the soil is thus low and this implies that external sources need to be applied either through organic or inorganic nitrogen fertilizers for crop production.

Phosphorous

The topsoil phosphorous concentration on the farm ranges from 1 $mg\ kg^{-1}\ P$ to 9 $mg\ kg^{-1}\ P$, with only one out of the eleven samples was above 5 $mg\ kg^{-1}\ P$. seven samples were either one o two 10 $mg\ kg^{-1}\ P$. A minimum phosphorous concentration of 20 $mg\ kg^{-1}$ is adequate to establish a good stand and yield of most crops.

The soil phosphorous concentration at the project site is thus, very low. Phosphorous fertilization will be required to establish good crop stand, growth and development at the project site. An application of excess phosphorous will lead to long-term improvement in soil fertility on those sections.

Potassium

The topsoil potassium concentration at the project site ranges from 23 to 358 $mg\ kg^{-1}\ K$. Five of the samples had potassium concentration less than 80 $mg\ kg^{-1}\ K$, the minimum concentration required in most crop plants to establish good stand and growth. Potassium application will thus be required on significant portions at the site for crop production.

Organic carbon

Soil organic carbon provides an indication of organic matter content in a soil. The soil organic carbon content of the topsoil on the farm, up to a depth of 300 *mm* ranged from 0.75 to 2.37 % across the entire project site. This range is relatively low. Building up higher organic matter in soils is difficult in areas with high temperatures, such as that experienced on the site. High temperatures tend to break rapidly down any organic matter that had accumulated over time. The inherent supply of nutrient from organic sources from the soils on the farm will therefore be marginal and as such, external nutrient input sources will be required where deficiency occurs.

Calcium and Magnesium

Both calcium and magnesium concentrations in the topsoil are generally adequate for cereal and legume production as well as other broadleaves and pastures. There were only few spots where their concentrations were slightly lower. The two nutrient ions are thus not limiting at the project site. The calcium–magnesium ratio is also good, with calcium being dominant.

Sodium and chloride

Sodium and chloride levels of the topsoil form the farm are very low and are at tolerable levels to plant growth and development. Sodium and chloride levels of more than 200 and 50 $mg\ kg^{-1}$ respectively will be of concern.

Iron, Copper, Zinc and Magnesium

The range of micronutrients concentration of the topsoil and their adequacy for crop production from the topsoil samples are presented in table 3.

Table 3. Range of micronutrient concentration.

Micronutrient	Range ($mg\ kg^{-1}$)	Critical Concentration ($mg\ kg^{-1}$)	Comments
Iron	3.44 – 18	4 – 6	Three samples had iron concentration of less than 4 $mg\ kg^{-1}$. The iron concentration in the soil is moderate to adequate for crop production
Copper	1.44 – 5.60	0.3 – 0.9	The copper concentration in the topsoil is adequate for field and pasture crops production
Zinc	0.28 – 8.92	0.13 – 0.8	The zinc concentration is adequate for both field and pasture crop production.
Manganese	11 – 95	Not clearly defined. Varies from <10 to <20	Only one sample was below 20 ($mg\ kg^{-1}$). The magnesium concentration is generally adequate for crop production.

Micronutrient concentration however will have to be monitored through leaf analysis especially if tree crops are planted to avoid deficiencies.

1.1.1 Soil Texture

The particle size distribution of the topsoil of the farm was classed into the percentages of sand, silt and clay present. The sand fraction ranges from 53 to 82 %; silt, from 8 to 13 % and clay from 10 to 34 %. There is enough clay in the soil under all three routes for crop production. A minimum of 10 % clay content is required to produce satisfactory crop yields (Ref……). Higher clay content of up to 40 % will improve moisture holding capacity of soils and minimise irrigation requirements.

The topsoil on the farm can be described as texturally variable, containing a mixture of sandy clay loam, clay loam and loam (Soil Classification Working Group, 1991). The topsoil physical property is suitable for crop production.

A summary of current topsoil fertility status under the three power lines at the project site is presented in table 4.

Table 4. Soil fertility summary at the project site.

Analysis	**Line 1**			**Line 2**			**Line 3**		
	S1, S2, S3, S4			S1, S5, S6, S8, S10, S11			S1, S7, S9, S10, S11, S12		
	Low	Moderate	Adequate / Suitable	Low	Moderate	Adequate / Suitable	Low	Moderate	Adequate / Suitable
pH	x	x		x	X		x	x	
Nitrogen	x			x			x		
Phosphorous (Bray)	x			x			x		
Potassium	x	x		x				x	x
Calcium			x			x			x
Magnesium			x			x			x
Sodium	x			x			x		
Chloride	x			x			x		
Iron			x		x	x		x	x
Copper			x			x			x
Zinc			x			x			x
Manganese			x		x	x			x
Organic carbon	x			x			x		

S: Sampling spots (Fig….)

Generally, the current topsoil fertility at the project site is fairly similar across the three proposed power line routes.

5.2 CLIMATE

In this report, climate refers to the summation of the daily, weekly and monthly changes in weather over a long period and it is influenced by latitude, altitude, direction and intensity of wind and the presence of large bodies of water such as the ocean, lakes, dams and rivers. The main climatic factors available from stations close to the project site were long-term monthly average precipitation and temperature (Table 5).

Table 5. Long term climatic information around Meyerton and Vereeniging depicting weather station reference and duration of data collection.

Climatic parameter	Station number	Years of data collection
Precipitation (rainfall & fog)	0439003 2 - Meyerton	37 (1969 – 2006)
Ambient temperature	0438731 1 - Vereeniging - RWB	29 (1961 – 1990)

5.2.1 Precipitation

The project site is situated in a summer rainfall region. Long-term rainfall records indicate that the sites could receive a mean annual total precipitation (rainfall and fog) of **679 mm,** of which approximately **87.5%** is expected to fall from October to March, which signifies the summer growing season (Fig. 4).

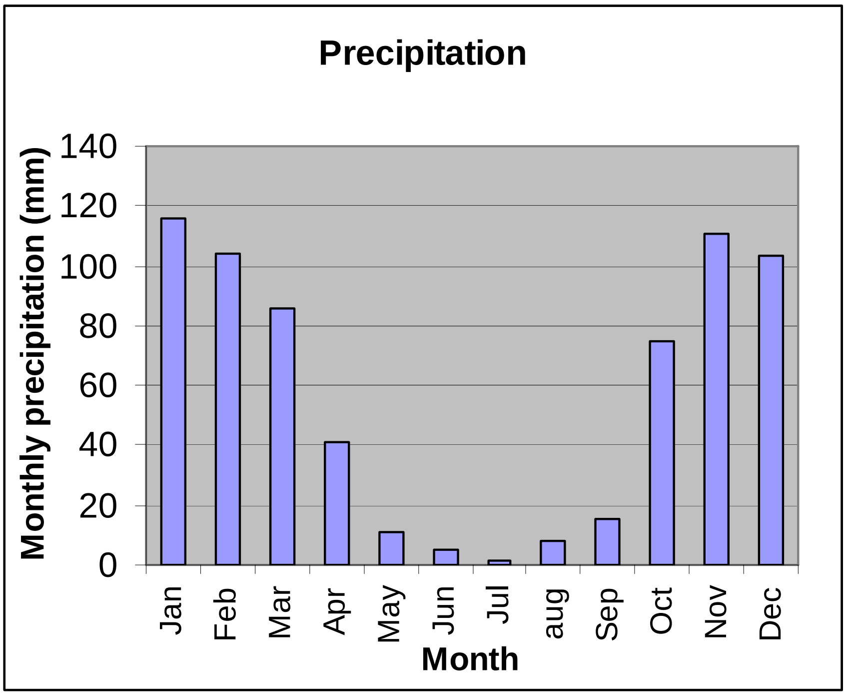

Fig. 4. Long-term mean monthly total precipitation expected between Edna and Glockner power stations.

Each of the remaining six months of the year however receives trace amounts of precipitation, indicating that the winter months are generally dry. The mean annual total rainfall expected at the project is moderate and can support satisfactory arable crop production.

5.2.2 Temperature

The project site should expect mild summer maximum temperatures, at a range of 26.0 to 29.9 ^{o}C and a minimum of 7.8 to 15.9 ^{o}C (Fig. 5). These temperatures will not significantly restrict crop growth.

The minimum temperature ranges from 11.8 to **13.6 ^{o}C** in summer months and 0.2 to 9.6 ^{o}C in winter months. Temperatures are expected to fall below **4 ^{o}C**, during June and July, which signifies that the project site could experience frost during this period. Careful consideration must be given to the selection of winter crops for production.

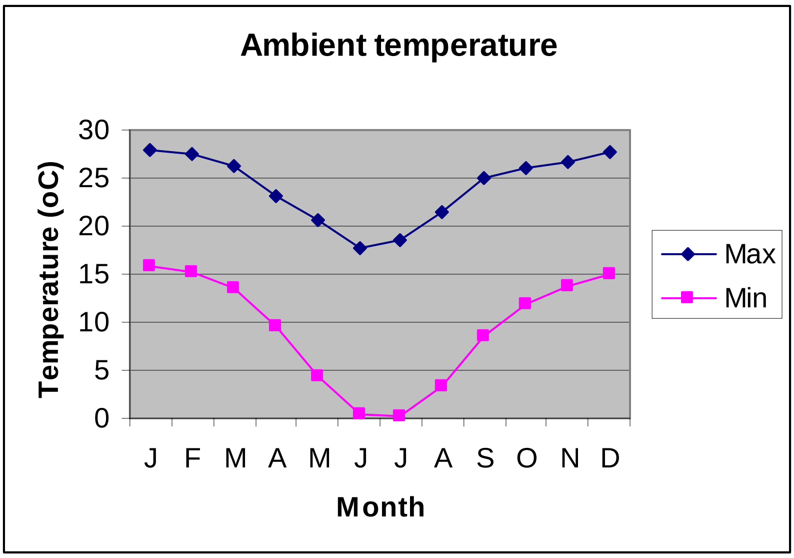

Fig. 5. Long-term mean monthly temperatures expected between Edna and Glockner power stations.

The variation between the maximum and minimum temperatures increases significantly from summer to winter. This is typical of continental type of climate, which is experienced at the project site. Continental climate occurs when an area lacks large bodies of water such as the ocean and large lakes and rivers or dams.

TOPOGRAPHY

The assessment of slope class in an area is an important determinant in land evaluation for crop production. Slope impact the use of mechanical traction and together with soil textural classes, influences the rate of soil erosion. Field topography can also have a direct effect on crop growth and yield by redirecting and hanging soil water availability and an indirect effect through the distribution of certain chemical and physical properties such as organic matter content, base saturation, soil temperature, and particle size distribution (Franzmeier et al., 1969; Stone et al., 1985; Jiang, and Thelen, 2004).

The topography of the site is a combination of terrains including flat lands, hill crest, ridge crest plateau, and plateau crest. Analysis of contours at the project site revealed the natural slope classes ranges from 0 to 15 % with few exceptionally higher slopes. The elevation at different spots at the site is presented in table 6.

Similar to the land type, all the three alternative routes traverse over the mixed terrain. The favourable slopes for arable cropping (below 12 %) occur in relatively smaller localized pockets at the project site.

Table 6. The elevation, randomly taken at different points at the projects site.

Sample	Elevation (m)
S1	1676
S2	1629
S3	1589
S4	1579
S5	1652
S6	1595
S7	1593

S8	1567
S9	1593
S10	1567

The elevation at the project site taking from the north toward the south indicated a range of 1567 to 1676. This is quite variable indicating the non-uniformity of slope at the site.

Vegetation

The project site is characterized by highly disturbed vegetation due to expansive urbanization. Three main grass species are however dominant namely, Red grass (*Themadra triandra*), Narrow curly leaf (*Eragrostis chloromelos*) and Common thatching grass (*Hypartenia hirta*).

The palatability of these grasses for grazing is presented in table 7.

Table 7. List of grass species found on portions 654 and 519 of the farm Loskop Noord 12-JS Marble Hall Golf Course.

Grass species	**Palatability for grazing**			**Comments**
	Low	**Medium**	**High**	
Red grass (*Themadra triandra)*			*X*	Climax grass
Narrow curly leaf (*Eragrostis chloromelos)*		*X*		Semi-climax
Common thatching grass (*Hypartenia hirta)*	*X*			Indicator species of human disturbance

The common thatching grass (*Hypartenia hirta)* is quite dominant across the landscape. Its unpalatable nature for grazing will restrict effective livestock production.

7.0 WATER RESOURCE

The Riet River traverse portions of the project site in addition highly localised pockets of wetlands. There are two small dams on the golf course. Under the moisture availability classification, the area falls under classes 3, which is interpreted as conducive for rainfed arable agriculture (ARC, 2002). With the expected annual rainfall of 679 mm, the area should be able to support satisfactory rainfed agriculture provided soil conditions and other factors such as topography, extent and infrastructure are not limiting.

8.0 INFRASTRUCTURE

The project site is situated within urban and peri-urban areas with several accessible roads. The existing available lands occur in pockets within buildings, which could be a major limitation to successful agricultural productivity.

9.0 AGRO-ENTERPRISE

Agricultural activities on the farm could be classified into crop cultivation and livestock production. The production of crops will include vegetable, field crops, pasture crops, fruit crop and ornamental crop production. The potential of successful agricultural productivity of any given area is a function of several natural or biological factors of the target area, socio-economic conditions as well as prevailing legislations impacting agriculture in the country.

The main natural factors are: climate; terrain form, and soil type. Biological factors encompass prevailing diseases, pests and selection of plant and animal species to be cultured and their ability to adapt and withstand the growing and developmental conditions prevailing in the particular area. Socio-economic considerations will include factors such as level of education, managerial skills and technical experience of the prospective farmer or group of farmers as well as market availability. The interactive effects of these factors determine the potential of an area for agricultural activity. The management skills are those production and non-production practices that are directly within the control of the farmer, such as site selection; land or soil preparation; choice of cultivar; planting; fertilization programming; irrigation scheduling; diseases and pest control; crop rotation; harvesting and storage; marketing, etc.

In South Africa, water availability, temperature and soil characteristics are major determinants of agricultural productivity. The project site is dominated by Hutton soil form and localised pockets of Mispah, Glenrosa, Clovelly and Avalon. The soil depth under this forms are generally below 800m, which could limit arable cropping. The topsoil and subsoil clay percent range from 10 to 34 % which is suitable for crop production. There is a minimum of 10 % clay content to produce satisfactory crop yields

The farm moderate rainfall and is considered to be located in a conducive area for rainfed arable crop production. The high variability in rainfall distribution within the area and the relatively shallower soil depths could however render dryland farming a risky venture.

9.1 Crop production

Based on the assessment of the productive potential of the farm, the prevailing soil condition and rainfall availability, the arable portions of the farm can support the cultivation of diverse range of field crops, without irrigation. However, a large proportion of this area is restricted by shallow rock emanating from rock outcrop, bedrock or hard clays.

The margins of selected dryland crop enterprises at the proposed project site were estimated using the information generated on the farm and guidelines from Combud, Department of Agriculture (2005). The projections are presented in table 8 below:

Table 8. Summarised Cost-Benefit of Selected dryland Field Crop Enterprises per ha.

Crop	Unit	Projected Selling Price (R/ha)	Projected Yield (ton/ha)	Gross Income (R/ha)	Variable Cost (R/ha)	Margin above Cost (R/ha)
				Per ha		Per Ha
Cotton Dryland	kg	3.00	900	2700	2576	124
Maize Dryland	ton	1400	2.5	3500	2450	1050
Sunflower	ton	2230	1.5	3345	2085	1260
Sugarbean		4000	1.5	6000	4510	1490
Grain sorghum Dryland	ton	1600	1.9	3040	1943	1097

The cost-benefit analysis shows marginal positive returns for most of the crops. The risk of not realizing these returns however still remains high due to unpredictable rainfall, shallow soil depth, inadequate land area for cultivation and theft from the neighbourhood. The localised pocket of good agricultural land could be an impediment to successful crop production.

Livestock production

Livestock grazing can occur on portions of the site as it contains significant proportion of *Theme da triandria*, a medium to high palatable species. The significance proportion of common thatch grass could mask the contribution of the palatable species for effective livestock production. The size of the farm may also be a limitation to economically viable production.

10.0 SUMMARY AND CONCLUSIONS

By definition, based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983, the land occurring at the project site can be classified as moderate to high potential for agriculture due to the following reasons:

Moderate potential

1) Eight out of ten spots assessed for soil depth were found to be below 800 mm, which is the minimum depth required for a land to be considered prime at the project site. The depth was limited by either rock or hard clay.
2) There are localised pockets of undesirable soil forms such as Rock outcrop, Mispah and Glenrosa, making it difficult to get a large stretch of land with desirable soil form and depth.
3) The abundance of *Themida triandria* will support good livestock grazing but the size of the available area could be a hindrance to an economically viable production.
4) Low pH and sub-optimal concentrations of some minerals and organic matter.

High potential

1) A large proportion of the farm contains Hutton soil forms in addition to localised pockets of Clovelly an Avalon are considered to be prime soil forms for the area.
2) The average topsoil clay content range from 10 to 32 %, which qualifies is to be prime.
3) The project site is expected to receive moderate rainfall and is classed as 3, which is considered to be conducive for rainfed agriculture.

11.0 RECOMMENDATION

There is no distinct difference in the potential of land occurring under the three proposed routes. However route 1 appears to traverse an area with less old croplands and relatively levelled terrain which might be suitable for arable crop production. It could therefore be considered as relatively better with respect to negative impact on prime agricultural land. The construction of the power line along route 1 should however need to consider the necessary environmental legislations required.

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13.0 APPENDIX

1. Soil fertility analysis results

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Grp No: L397
Lab No: L3358-L3368
Att: Dr K Ayisi

SOIL ANALYSIS REPORT

Methods: (pH & Resistance= Saturated water paste);(N - NH4+NO3 = 1:5 Ext-0.1N K2SO4); (P = 1:7.5 Ext. Bray 2); (Cl=1:2 Ext 0.1N KNO3);(Ca, Mg, K, Na = 1:10 Ext Amm.Acetate-1N, pH7);(Zn=1:4 Ext. - 0.1N HCl);(Org.C=Walkley-Black);(Ext.Acidity & Al=1:10 Ext 1N KCl);(Texture-Hydrometer)
*** S-value = Sum of extractable Ca, Mg K and Na (c.mol(+)/kg)(me%)**

Lab.No:	L3358	L3359	L3360	L3361	L3362	L3363	L3364	L3365
Particulars of	ESKOM							
samples:	1	2	3	4	5	6	7	8A
pH	4.18	5.51	5.50	5.46	4.90	4.72	5.87	6.26
Resistance (ohms)	3250	3100	1780	1850	3460	2550	1640	925
milligram/kilogram								
N	1	1	1	5	1	1	1	1
P (Bray1)	1	1	2	4	9	5	1	4
K	28	68	180	185	40	23	238	160
Ca	38	455	835	483	313	295	583	1580
Mg	13	125	213	185	68	93	205	1050
Na	20	13	18	8	15	8	20	18
Cl	1	1	1	1	1	1	1	1
Fe	9.36	6.92	7.32	14	18	7.36	3.84	3.68
Cu	1.44	5.60	3.20	1.92	1.80	1.80	2.84	1.68
Zn	1.52	8.92	1.76	1.40	1.52	2.20	1.28	2.48
Mn	26	21	54	33	11	32	32	28
S- SO4	141	8	16	10	18	40	22	10
% C	0.75	1.52	1.81	1.01	0.85	0.93	1.28	1.69
*** S-value**	**0.456**	**3.539**	**6.475**	**4.453**	**2.295**	**2.337**	**5.306**	**17.066**
Ca %	41.6	64.3	64.5	54.2	68.2	63.1	54.9	46.3
Mg %	23.6	29.2	27.2	34.3	24.5	32.9	31.9	50.8
K %	15.7	4.9	7.1	10.7	4.5	2.5	11.5	2.4
Na %	19.1	1.6	1.2	0.8	2.8	1.5	1.6	0.5
Ext.acidity (me%)	1.322	0.084	0.056	0.086	0.432	0.651	0.030	0.030
Ext. Al (me%)	1.003	0.028	0.020	0.025	0.296	0.449	0.009	0.001
Al (mg/kg)	90.17	2.52	1.80	2.25	26.61	40.37	0.81	0.09
% Sand	76	82	70	74	72	72	76	53
% Silt	8	8	12	10	10	10	10	11
% Clay	16	10	18	16	18	18	14	36

Page 2/.............

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Page 2 2007.03.30

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SOIL ANALYSIS REPORT

Methods: (pH & Resistance= Saturated water paste);(N - NH4+NO3 = 1:5 Ext-0.1N K2SO4); (P = 1:7.5 Ext. Bray 2); (Cl=1:2 Ext 0.1N KNO3);(Ca, Mg, K, Na = 1:10 Ext Amm.Acetate-1N, pH7);(Zn=1:4 Ext. - 0.1N HCl);(Org.C=Walkley-Black);(Ext.Acidity & Al=1:10 Ext 1N KCl);(Texture-Hydrometer)

*** S-value = Sum of extractable Ca, Mg K and Na (c.mol(+)/kg)(me%)**

Lab.No:	L3366	L3367	L3368					
Particulars of samples:	ESKOM							
	8B	10	11					
pH	5.33	5.47	5.25					
Resistance (ohms)	1210	1500	2400					
milligram/kilogram								
N	2	2	1					
P (Bray1)	2	1	2					
K	113	358	60					
Ca	1150	643	308					
Mg	433	245	100					
Na	23	23	20					
Cl	1	1	1					
Fe	6.72	3.44	6.00					
Cu	2.20	4.60	2.68					
Zn	2.52	2.08	2.24					
Mn	46	58	95					
S- SO4	16	23	45					
% C	2.37	2.16	1.13					
*** S-value**	**9.718**	**6.258**	**2.607**					
Ca %	59.2	51.4	59.1					
Mg %	36.8	32.4	31.7					
K %	3.0	14.7	5.9					
Na %	1.0	1.6	3.3					
Ext.acidity (me%)	0.070	0.082	0.165					
Ext. Al (me%)	0.022	0.037	0.096					
Al (mg/kg)	1.98	3.33	8.63					
% Sand	53	76	76					
% Silt	13	8	8					
% Clay	34	16	16					

for R&T Manager: