

**MERCURY SUBSTATION
ECOLOGICAL ASSESSMENT
EMP REPORT**



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*by
Francois de Wet*

*E-mail:
sedewet@iafrica.com
Fax: +27 17 811 3388
Cell: +27 82 462 8563*



*Postnet Suite 876
Private Bag X 9013
Ermelo 2350
Mpumalanga*

*Reg.nr: Ck98 / 46100 / 23
Sole member S.F. de Wet*

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MERCURY SUBSTATION EXPANSION – ECOLOGICAL REPORT:

EMP FOR THE CONSTRUCTIVE- AND OPERATIONAL PHASES

1. INTRODUCTION

The following ecological information is available for the area in the vicinity of Mercury substation:

Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).

Acocks' Veld Type: *Cymbopogon-Themeda* veld (Southern variation of VT48).

This is the moderately dense grassveld of the sandy parts of the wetter higher-lying portion of the Highveld in the Free State, undulating to flat country.

In the EIA phase of the study the following was broadly outlined:

Soils are relatively low in clay and chemically less erodable, but if vegetation cleared exposed to wind erosion.

- The location of construction camps needs to be identified before any construction commences to ensure that pristine grassland areas where *Cymbopogon-Themeda* veld is dominant are not directly impacted.
- Plinthic soils indicate a fluctuating water table. Provision need therefore be made for fluctuating water tables in the construction phase.
- These soils should be rehabilitated after disturbance.
- Specific grassland rehabilitation standards need to be followed immediately after disturbance to ensure that the Turpentine Grass - Red Grass character is not lost. This would need a site visit by Enviropulse CC and report with specific recommendations.
- A pre-agreed construction method by Enviropulse CC therefore needs to be followed.

Significance of expansion – **low to medium**

The purpose of this study is therefore to provide ecological information and recommendations including rehabilitation of disturbed grassland areas for both the construction and operational phases.

2. METHODOLOGY

Stratification of survey sites was based on ecological units represented by the variation shown from the topography, vegetation and the soils on the development area.

Soils were evaluated using a hand soil auger. The soil classification was carried out according to the Taxonomic System for South Africa (Macvicar, 1991).

Dominant herbaceous vegetation at the survey site was recorded together with veld condition and photos of the terrain. Veld condition was subjectively assessed.

A total of 6 survey sites were selected.

Photos of the terrain were taken at soil auger sites (See with appended site reports). The position of the survey sites were marked on a map of the study area (See appended map).

3. RESULTS

3.1 SOILS AND VEGETATION

Soils are sandy and on the flatter crest area. Yellow-brown apedal subsoils, underlain by a soft plinthic layer (Avalon soil form), are found at a depth of 800mm below soil surface. The water table at the gently sloped midslope area is closer to the surface indicated by the soft plinthic layer between 300mm and 500 mm (soil forms Avalon on midslope and Westleigh, found on midslope closer to wetland). Seasonal fluctuation of the water table can therefore be expected. The valley bottom on the western side of the substation and the footslope and ecotone towards the midslope are characterized by grey sandy subsoils with a sandy clay loam soft plinthic layer (the soil form is Longlands) between 300mm and 600mm from soil surface. These areas are more sensitive than the yellow-brown sandy soils found on the higher lying parts of the catena due to higher clay content of the subsoils.

Vegetation is typically overgrazed and disturbed grassland with invasion of Bankrotbos, *Stoebe vulgaris*, which is dominant in certain parts of the study area. Acocks' Veld Type, *Cymbopogon-Themeda* veld (Southern variation of VT48) is therefore not represented with this grassland due to the past disturbance and present overgrazing. Grasses such as *Cynodon dactylon*, *Eragrostis lehmanniana*, *Digitaria eriantha*, *Eragrostis curvula* and *Aristida spp* are abundant on the higher lying parts of the terrain with *Digitaria eriantha* and *Cynodon dactylon* as dominant species. *Andropogon eucomis* and *Cynodon dactylon* are dominant on the wetland ecotone areas. Grass cover is reasonable to poor on the crest and midslope areas (typically 4 to 5 cm tuft distance between grass tussocks).

3.2 TABLE RESULTS

Survey point	GPS S	GPSE	Terrain Unit	Slope (1= 0-5%; 2=5-15, 3=>15 %)	Soil Form	Soil Texture (Sa = Sandy; Lm = Loamy; Cl = Clay)			Soil depth (mm)			Sensitivity (1 =Not Sensitive & 5 = Very sensitive)	Grass cover (cm)	Dominant Species	Distance to wetland	Comments
1	26.99947	26.82115	Crest	1	Avalon	A=Sa	B1 = Sa	B2 = LmSa	A= 250	B1 = 250-800	B2 = 800-900	2= Preferred area for construction	4.6	<i>Cynodon dactylon</i> & <i>Digitaria eriantha</i> – <i>Stoebe vulgaris</i>	1.1 km	Grassland severely overgrazed and disturbed
2	26.99707	26.82054	Crest	1	Avalon	A=Sa	B1 = Sa	B2 = LmSa	A = 250	B1 = 250-800	B2 = 800-1500 +	2= Preferred area for construction	5.0= poor	<i>Digitaria eriantha</i> & <i>Eragrostis lehmanniana</i>	0.860 km	Grassland moderately overgrazed
3	26.99708	26.81564	Crest / Midslope	1	Avalon	A=Sa	B1 = Sa	B2 = LmSa	A = 250	B1 = 250-500	B2 = 500-1500 +	3 = Subsoil seasonally wet = Take into account with construction	3.4	<i>Cynodon dactylon</i> & <i>E. lehmanniana</i>	0.400 km	Grassland severely overgrazed and disturbed
4	26.99730	26.81265	Midslope	2	Westleigh	A=Sa	n/a	B2 = SaClLm	A = 300	-	B = 300+	4= Seepage problematic – avoid area for construction or mitigate	4.0	<i>Digitaria eriantha</i> – <i>Stoebe vulgaris</i>	0.100 km	Grassland severely overgrazed and disturbed
5	26.9730	26.81265	Footslope/ Valley bottom	2	Longlands	A=Sa	B1 = Sa	B2 = SaClLm	A = 300	E (seep layer) = 300-600	B = 600+	4= Seepage problematic – avoid area for construction or mitigate	2.0 = good	<i>Cynodon dactylon</i> & <i>Andropogon eucomis</i>	0.080 km	Grassland severely overgrazed & disturbed
6	26.99945	26.81337	Midslope/ Crest ecotone	1	Avalon	A=Sa	B1 = Sa	B2 = SaClLm	A = 250	B1 = 250-600	B2 = 600-1500 +	3 = Subsoil seasonally wet = Take into account with construction	3.8	<i>Digitaria eriantha</i> & <i>E. curvula</i>	0.230-0.250 km	Grassland disturbed and overgrazed

3.3 DISCUSSION

The impact of the development envisaged is mostly low. The vegetation is not as sensitive as expected, with most of the area overgrazed and with the past disturbance the Veld Type 48 (*Themeda-Cymbopogon* grassland-) character was lost. Most of the area where construction is planned is underlain by deep yellow-brown sandy soils, with seasonal wetness between 500mm and 800mm below surface. Although the ecological assessment was done in winter, no rare or sensitive plant species are expected due to the topsoil disturbance. The midslope and footslope areas on the western part of the study area would be more problematic for construction, with moist conditions closer to the soil surface. Veld condition is also overgrazed and the area is also disturbed closer to the wetland.

4. RECOMMENDATION : CONSTRUCTION AND OPERATIONAL PHASES

4.1 CONSTRUCTION PHASE

Construction camp:

The construction camp may be located anywhere except within 100m from the wetland areas. Any permanent structures (if applicable) need to take into account the seasonal fluctuation in water table. A dry toilet system is recommended due to the poor drainage below 300m to 500mm from soil surface at the midslope or crest/midslope ecotone. Green water discharge should be monitored and controlled.

Water point:

There is a dam in the wetland (400m from survey point 4), presently used to provide water to the cattle grazing in the area. The quantity of water required or available was not investigated in this study.

Access road:

The access road should preferably on the east, extending north from the existing access road to substation. The soils are deeper and the water table deeper than on the west, therefore further away from the wetland. Sufficient provision should be made for water drainage away from the road into the wetland in case a road is envisaged on the west. Seepage under the road, from the crest to the wetland, should also be taken into account.

Rehabilitation:

Vegetation cover needs to be restored as quickly as possible due to the potential risk of wind erosion. A realistic target would be to restore grass tuft distance to a minimum of 3cm.

The soil needs to be prepared and the grassland rehabilitated afterwards.

800 to 900 grams of topsoil needs to be sampled each, on the crest, gentle midslope and steeper midslope and wetland ecotones. These should be analysed chemically, in order to follow specific amelioration guidelines for the restoration of grass cover and its production potential. The next stage would be to prepare the soil, in order to initiate the amelioration process. This would involve the physical ripping and mixing of the soil material with organic and inorganic substances. The chemical and physical soil properties will therefore be addressed by enriching the soil. Prescribed quantities of organic material and inorganic substances need to be worked into the soil. Sowing of grass seed will be the next stage. Grass seed should be planted in not deeper than 1 cm layer of soil. Once sown the grass seed can be covered by sweeping a brush or branch of a tree over the sown area. The timing of the sowing process should co-inside with the rainy season. Grass seed should preferably not be *Eragrostis curvula*. This species becomes moribund if not regularly grazed or burned and will become a fire hazard in the long run. Tall grass species such as *Hyparrhenia hirta* invade in follow up successional stages and also pose a fire risk and also negatively impact grass cover and on plant diversity in the long run. This tall Thatching Grass is very stable and once established needs physical interference to allow other grasses to establish. Weeping Love Grass (*E. curvula*) is similar in this respect. Grass species that are shorter and provides better cover will also enhance plant species diversity in the long term. *Digitaria eriantha* and *Cynodon dactylon* are recommended, together with the annual *Eragrostis tef*.

4.2 OPERATIONAL PHASE

Grassland monitoring at areas where it was disturbed (and rehabilitated afterwards) through the construction phase would need to be done yearly for the first three years. Grass cover and composition needs to be evaluated.

Grass fuel load or volume of grass also needs to be monitored on a regular basis. If no grazing occurs the grass would need to be burned at levels exceeding 3000 kg/ha. A disk pasture meter is recommended as a rapid method to establish grass volume. Burning should be preferably at night time to minimize fire risk.

5. CONCLUSION

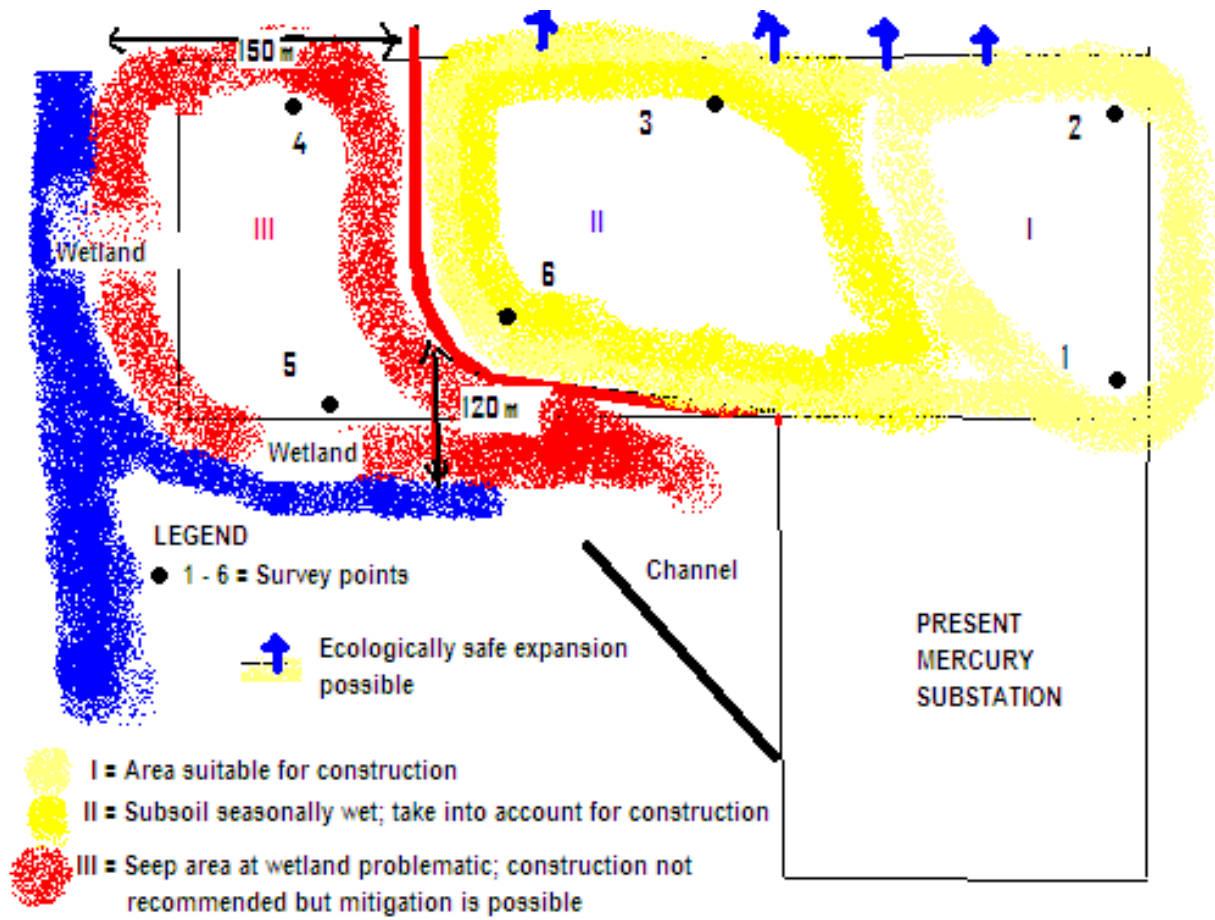
The ecological impact envisaged is low on most parts, but medium on lower lying areas close to the wetland system on the west of the study area. Mitigations on midslope or wetland ecotone areas are necessary to allow natural underground seepage towards the drainage lines and the seasonal vertical fluctuation of water between 300mm and 500mm at the midslope below soil surface closer to the wetland and 500-800mm on higher lying crest and midslope/crest areas of the study area. If it requires construction to be closer than 100m to the wetland the ecological impact would be higher. It is recommended, as a safe ecological alternative, that the construction plan then includes an extension to areas further north instead (the areas north would include more crests).

6. REFERENCES


ACOCKS, J.P.H. 1988. Veld Types of South Africa (2nd Edt.) Mem. Bot. Surv. S. Afr. No. 40.


MACVICAR, C.N. 1991. Soil classification: A classification: A taxonomic system for South Africa. Memoirs of the Agricultural Resources of S.A. No 15. Dept. Agriculture Mining activities. Pretoria. 257 pp.


7. APPENDIX A – MAP OF SUBSTATION AND CONSTRUCTION AREA





8. APPENDIX B – SITE REPORTS


Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themedra</i> veld (Southern variation of VT48).
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).
Site number		Site 1
Latitude (S)		S 25. 99947°
Longitude (E)		E 25. 82115°
Date visited	23/05/2007	
Land terrain Unit	Crest	
Slope of Terrain (degrees °)	0-5	
Soil form	Avalon	
Soil description	Orthic A underlain by a yellow-brown apedal B1 on a soft plinthic B2	
Soil texture A-horizon	0-10% Clay	
Soil texture B1-horizon	0-10% Clay	
Soil texture B2-horizon	10-15% Clay	
Soil depth A-horizon	250 mm	
Soil subsoil depth of B-horizon to limiting layer	800mm	
Soil erodability	Low (water) ; High (wind)	
Dominant Species	<ul style="list-style-type: none"> • <i>Cynodon dactylon</i> • <i>Digitaria eriantha</i> 	
Notes	<ul style="list-style-type: none"> • The nearest water from this site is a dam in a wetland, 1.1 km away. • Little seasonal wetness is present, between 800 and 900 mm below soil surface. • <i>Stoebe vulgaris</i> present. 	
Red Data Plant Species Recorded	None observed	Recommendation <ul style="list-style-type: none"> • Suitable for construction, but make provision for moist soils from below 800mm.

Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themeda</i> veld (Southern variation of VT48).	
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).	
Site number		Site 2	
Latitude (S)		S 26.99707°	
Longitude (E)		E 26.82054°	
Date visited	23/05/2007		
Land terrain Unit	Crest		
Slope of Terrain (degrees °)	0-5		
Soil form	Avalon		
Soil description	Orthic A underlain by a yellow-brown apedal B1 on a soft plinthic B2		
Soil texture A-horizon	0-10% Clay		
Soil texture B1-horizon	0-10% Clay		
Soil texture B2-horizon	10-15% Clay		
Soil depth A-horizon	250 mm		
Soil subsoil depth of B-horizon to limiting layer	800mm		
Soil erodability	Low (water) ; High (wind)		Veld Condition = Moderately overgrazed
Dominant Species	<ul style="list-style-type: none"> • <i>Eragrostis lehmanniana</i> • <i>Digitaria eriantha</i> 		
Notes	<ul style="list-style-type: none"> • The nearest water from this site is a dam in a wetland, 0.880 km away. • Little seasonal wetness is present, between 800 and 1500 mm below soil surface. 		
Red Data Plant Species Recorded	None observed	Recommendation <ul style="list-style-type: none"> • Construction possible, but make provision for moist soils below 800mm. 	

Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themeda</i> veld (Southern variation of VT48).	
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).	
Site number		Site 3	
Latitude (S)		S 26.99708°	
Longitude (E)		E 26.81564°	
Date visited	23/05/2007		
Land terrain Unit	Crest / Midslope ecotone		
Slope of Terrain (degrees °)	0-5		
Soil form	Avalon		
Soil description	Orthic A underlain by a yellow-brown apedal B1 on a soft plinthic B2		
Soil texture A-horizon	0-10% Clay		
Soil texture B1-horizon	0-10% Clay		
Soil texture B2-horizon	15-20% Clay		
Soil depth A-horizon	250 mm		
Soil subsoil depth of B-horizon to limiting layer	500mm		
Soil erodability	Low if not exposed (water); High (wind)		Veld Condition = Severely overgrazed / disturbed
Dominant Species	<ul style="list-style-type: none"> • <i>Cynodon dactylon</i> • <i>Eragrostis lehmanniana</i> • <i>Digitaria eriantha</i> 		
Notes	<ul style="list-style-type: none"> • The nearest water from this site is a dam in a wetland, 0.4 km away. • Signs of seasonal wetness are noted, between 500 and 1500 mm below soil surface. 		
Red Data Plant Species Recorded	None observed	Recommendation <ul style="list-style-type: none"> • Suitable for construction, but special measures are needed to make provision for moist soils from below 500 mm from soil surface. 	

Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themeda</i> veld (Southern variation of VT48).
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).
Site number		Site 4
Latitude (S)		S 26.99730°
Longitude (E)		E 26.81265°
Date visited	23/05/2007	
Land terrain Unit	Midslope	
Slope of Terrain (degrees °)	5-15	
Soil form	Westleigh	
Soil description	Orthic A underlain by soft plinthic B	
Soil texture A-horizon	0-10% Clay	
Soil texture B-horizon	15-20% Clay	
Soil depth A-horizon	300 mm	
Soil subsoil depth of B-horizon to limiting layer	300mm+	
Soil erodability	Moderate (water) ; High (wind)	
Dominant Species	<ul style="list-style-type: none"> • <i>Digitaria eriantha</i> 	
Notes	<ul style="list-style-type: none"> • The nearest water from this site is a dam in a wetland, 0.1 km away. • Seasonal wetness is present, from 300 mm below soil surface. • <i>Stoebe vulgaris</i> dominant. 	
Red Data Plant Species Recorded	None observed	Recommendation <ul style="list-style-type: none"> • Refrain from construction on this terrain unit if closer than 100 m from adjacent wetland. • Special measures for construction in this area, with shallow water table, are needed.

Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themeda</i> veld (Southern variation of VT48).
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).
Site number		Site 5
Latitude (S)		S 26.99730°
Longitude (E)		E 26.81265°
Date visited	23/05/2007	
Land terrain Unit	Footslope / Valley bottom	
Slope of Terrain (degrees °)	5-15	
Soil form	Longlands	
Soil description	Orthic A underlain by an E horizon on soft plinthic B2	
Soil texture A-horizon	0-10% Clay	
Soil texture E-horizon	0-10% Clay	
Soil texture B-horizon	25-30% Clay	
Soil depth A-horizon	300 mm	
Soil subsoil depth of B-horizon to limiting layer	600mm+	
Soil erodability	Moderate (water) ; High (wind)	
Dominant Species	<ul style="list-style-type: none"> • <i>Cynodon dactylon</i> & <i>Andropogon eucomis</i> 	
Notes	<ul style="list-style-type: none"> • The nearest wetland is 0.08 km away. • Soil is wet, from 300 mm below soil surface. • This is a wetland ecotone. 	
Red Data Plant Species Recorded	None observed	Recommendation
		<ul style="list-style-type: none"> • Construction problematic on these wet soils, with significant ecological risk unless mitigated for. • Refrain from developing in the wetland ecotone zone.

Veld Type (Acocks, 1988)		Acocks' Veld Type: <i>Cymbopogon-Themeda</i> veld (Southern variation of VT48).
Land Type Description		Land Type Bd (Plinthic soils with red soils not widespread, 6-15% clay).
Site number		Site 6
Latitude (S)		S 25. 99947°
Longitude (E)		E 25. 82115°
Date visited	23/05/2007	
Land terrain Unit	Crest	
Slope of Terrain (degrees °)	0-5	
Soil form	Avalon	
Soil description	Orthic A underlain by a yellow-brown apedal B1 on a soft plinthic B2	
Soil texture A-horizon	0-10% Clay	
Soil texture B1-horizon	0-10% Clay	
Soil texture B2-horizon	10-15% Clay	
Soil depth A-horizon	250 mm	
Soil subsoil depth of B-horizon to limiting layer	800mm	
Soil erodability	Low (water) ; High (wind)	
Dominant Species	<ul style="list-style-type: none"> • <i>Cynodon dactylon</i> • <i>Digitaria eriantha</i> 	
Notes	<ul style="list-style-type: none"> • The nearest water from this site is a dam in a wetland, 1.1 km away. • Little seasonal wetness is present, between 800 and 900 mm below soil surface. • <i>Stoebe vulgaris</i> present. 	
Red Data Plant Species Recorded	None observed	Recommendation
		<ul style="list-style-type: none"> • Construction possible on these sandy soils, with little ecological risk. • Little mitigation is needed, for seasonal wet conditions below 800 mm.