REPORT

For

Savannah Environmental (Pty) Ltd

by the

INSTITUTE FOR SOIL CLIMATE AND WATER

AGRICULTURAL RESEARCH COUNCIL

SCOPING STUDY FOR THE PROPOSED SALDANHA NETWORK STRENGTHENING PROJECT, WESTERN CAPE PROVINCE: SOILS and AGRICULTURAL POTENTIAL

By

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Declaration of Independence

I, D.G. Paterson, hereby state that I am a registered Practicing Natural Scientist (*Soil Science* – Registration No. 400463/04) was responsible for supervising the compilation of this report in an impartial manner to acceptable scientific norms and standards.

Furthermore, I state that both myself and ARC-Institute for Soil, Climate and Water are independent of any of the parties involved in this study.

October 2015

1. TERMS OF REFERENCE

1.1 Background

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental (Pty Ltd to undertake an investigation into the soils and associated agricultural potential aspects for the Saldanha Bay Network Strengthening Project, Western Cape Province. The proposed Distribution substation and Transmission substation will be located in the Saldanha Bay area near the Blouwater substation with potential power line alternatives to the Aurora substation in the east.

1.2 Objectives of the report

The objectives of the study are;

- To identify the soil patterns occurring using 1:250 000 scale land type information, and
- To assess the broad agricultural potential.
- To describe and evaluate the potential impacts on soils and agricultural potential.

2. STUDY AREA CHARACTERISTICS

The study area is located approximately 10 km north-east of Langebaan (delineated by the yellow dotted line on the locality map in Appendix A). From reconnaissance information (Google Earth), it appears that the land use within the study area varies from natural vegetation to some fields, either cultivated pastures or possibly some areas of crops.

2.1 Terrain

The study area consists of a flat to slightly undulating topography derived from occasional rock outcrops. Altitude is between 20 and 80 m above sea level.

2.2 Climate

The long-term average annual rainfall in the area is 279 mm.

Table 1 shows that the annual rainfall is low, falling throughout the year with a maximum in the winter months. Temperatures may be high in summer, with cooler winter temperatures.

Table 1 Climate Data

Month	Rainfall (mm)	P60Rm	P80Rm
Jan	5.4	3.6	0.0
Feb	4.4	2.6	0.0
Mar	6.8	3.6	0.0
Apr	16.5	13.2	5.6
May	35.1	28.7	13.7
Jun	56.2	47.0	25.6
Jul	48.6	41.9	26.4
Aug	52.8	42.8	19.6
Sep	18.0	14.8	7.5
Oct	18.7	13.5	1.5
Nov	10.1	7.0	0.0
Dec	6.6	4.5	0.0
Year	**279.2 mm**		

2.3 Parent Material

The area comprises aeolian sands of the Springfontyn Formation, underlain by limestone and calcrete of the Langebaan Formation with occasional outcrops of granite of the Vredenburg and Langebaaan-Saldanha Plutons, Cape Granite Suite (Geological Survey, 1990).

3. METHODOLOGY

The study area falls within the map sheets 3218 Clanwilliam and 3318 Cape Town of the national land type mapping series, at scale 1:250 000 scale. The soils were classified, according to the Binomial System of the South African Soil Classification (MacVicar et al., 1977) and were grouped into map units called land types. Each land type is a unique combination of soil pattern, terrain and macroclimate.

The land type boundary lines are shown by the black lines on the map in Appendix B.

Note: Within any specific land type, the soil forms occurring have been summarized according to their dominance, but the locality or distribution of the various soils within a land type cannot be further determined at the scale of the survey.

4. SOILS

As indicated on the land type map in the Appendix, there are five separate land types occurring within the study area with no significant difference in the occurrence of the dominant soils in each land type except for the soil depth variation.

The area consists mainly of shallow to deep, greyish brown, fine to medium, non-calcareous to calcareous, sandy soils underlain by calcrete/limestone and occasional rock. When vegetation is disturbed, these soils are susceptible to wind erosion due to the low clay content of the soils.

A summary of the main soil characteristics is given in **Table 2**.

Table 2	General Soil Description			
Land Type	**Soil form/series**	**%**	**Effective depth (mm)**	**General description of dominant soils**
Fc108	Kalkbank Ms22, Loskop Ms12 Langebaan Fw21, Motopi Fw20, Fernwood Fw11, Maputa Fw10	60 19	20 – 300 600 – 1200+	Mainly very shallow to shallow, greyish-brown, fine- to medium- grained, neutral to alkaline, sandy soils underlain by calcrete/ limestone
Ha13	Fernwood Fw11, Maputa Fw10 Tokai Ct11, Strombolis Ct10 Kalkbank Ms22, Loskop Ms12	50 21 15	600 – 1200+ 1200+ 200 – 400	Moderately deep to deep, greyish brown to brown, fine- to medium- grained, acid, sandy soils underlain by calcrete/limestone in some places
Hb14	Loskop Ms12, Kalkbank Ms22 Maputa Fw10, Motopi Fw20 Maputa Fw10, Motopi Fw20, Sunbury Cv30, Bleskop Cv40	48 24 25	100 – 400 400 – 600 600 - 1200	Mainly shallow, greyish-brown, fine-grained, neutral to alkaline, sandy soils underlain by calcrete/limestone
Hb22	Loskop Ms12, Kalkbank Ms22 Maputa Fw10, Motopi Fw20, Fw21 Maputa Fw10, Motopi Fw20, Fw21 Sunbary Cv30, Sandspruit Cv31	45 20 20 13	100 – 400 400 – 600 600 – 1200 400 – 600	Mainly shallow, greyish to greyish-brown, fine- to medium-grained, neutral to alkaline, sandy soils underlain by calcrete/limestone
Hb23	Fernwood Fw11, Maputa Fw10 Kalkbank Ms22, Loskop Ms12, Mispah Ms10, Malgas Gs20 Langebaan Fw21, Motopi Fw20	56 21 18	600 – 1200+ 150 – 400 1200+	Moderately deep to deep, greyish-brown, fine-to medium-grained, neutral to alkaline, sandy soils underlain by calcrete/limestone and occasional rock.

4.1 Soil limitations

The suitability of soils for the production of crops in a specific locality depends mainly on the inherent chemical, physical and morphological properties of the soils, combined with prevailing climate and crop requirements.

The soil limitations that were noted are mainly:

- ***Restricted soil depth*** to hardpan carbonate horizon or rock
- ***Low clay content*** of top- and upper subsoils giving rise to low water-holding capacity, wind erosion susceptibility
- ***Presence of free carbonates*** indicates a low degree of leaching, giving rise to high pH values and low trace element status, associated with low levels of natural fertility.

4.2 Agricultural potential

Annual crops such as small grain (wheat and oats), medics and lupine with lucerne as a perennial pasture was taken into consideration (Jacobs, 1999). The average annual rainfall for this area is around 280 mm, giving rise to a low production potential (rainfall 200 – 300 mm/year, if <20% in summer) according to the annual rainfall criteria (Jacobs, 1999). The main limiting factor that influences the agricultural potential rating is the soil with above-mentioned limitations.

Taking all the above-mentioned factors into account, a general agricultural potential rating for the study area varies from **low** to **medium–low** as noted in **Table 3**

Table 3 Agricultural potential

Map unit	Soil form/series	%	Effective depth (mm)	Annual crop	Perennial crop
Fc 108	Ms22, Ms12	60	20 – 300	L	L
	Fw21,Fw20, Fw11, Fw10	19	600 – 1200+	L-ML	M-L
Ha 13	Fw11, Fw10	50	600 – 1200+	L-ML	M-L
	Ct11, Ct10	21	1200+	ML	M-L
	Ms22, Ms12	15	200 – 400	L	L
Hb14	Ms12, Ms22	48	100 – 400	L	L
	Fw10, Fw20	24	400 – 600	L	L
	Fw10, Fw20, Cv30, Cv40	25	600 - 1200	L-ML	M-L
Hb22	Ms12, Ms22	45	100 – 400	L	L
	Fw10, Fw20, Fw21	20	400 – 600	L	L
	Fw10, Fw20, Fw21	20	600 – 1200	L-ML	M-L
	Cv30, Cv31	13	400 – 600	L	L
Hb23	Fw11, Fw10	56	600 – 1200+	L-ML	M-L
	Ms22, Ms12, Ms10, Gs20	21	150 – 400	L	L
	Fw21, Fw20 (Dunes)	18	1200+	L	L

Potential classes: High – H; Medium – M; Low – L

5 IMPACTS

Impact 1: In most environmental investigations, the major impact on the natural resources of the study area would be the loss of potentially agricultural land due to the construction of the specific infrastructure. However, this impact would be of limited significance and would be local in extent.

Impact 2: In this area, the relatively sandy topsoil and dry climate means that a possible impact would be the increased danger of erosion of the topsoil when vegetation cover is removed by the action of the prevailing winds. This would be especially relevant for the construction of access roads, substations and other associated infrastructure.

The impacts can be summarized as follows:

Table 1 Impact significance

Impact Phase (Construction and Operation)							
<u>Possible</u> Impact or Risk : **Impact 1. Loss of agricultural land**							
ANTICIPATED SCOPING IMPACTS TO BE SCOPED OUT OR INVESTIGATED FURTHER							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**L-**	**negative**	**L-**	**High**	**High**
With Mitigation	**L**	**L**	**L-**	**neutral**	**L-**	**High**	**High**
Can the impact be reversed?	**YES** – very little land will be affected and soil can be replaced						
Will impact cause irreplaceable loss or resources?		**NO** – soil potential in vicinity is low, so no agricultural soils will be affected					
Can impact be avoided, managed or mitigated?	**YES**						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Avoid areas under cultivation (if any)							
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	**NO** – considered to be insignificant due to very restricted occurrence of agricultural soils						

Table 2 Impact significance

Impact Phase (Construction and Operation)							
<u>Possible</u> Impact or Risk : **Impact 2. Increased soil erosion hazard by wind**							
ANTICIPATED SCOPING IMPACTS TO BE SCOPED OUT OR INVESTIGATED FURTHER							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M-**	**negative**	**M-**	**High**	**High**
With Mitigation	**L**	**L**	**L-**	**neutral**	**L-**	**High**	**High**
Can the impact be reversed?	**YES** – topsoil coverage can be replaced and affected sites re-vegetated and stabilized						
Will impact cause irreplaceable loss or resources?		**NO** – soil potential in vicinity is low, so no agricultural soils will be affected					
Can impact be avoided, managed or mitigated?	**YES** – soil conservation measures should be implemented						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Minimize vegetation removal to smallest possible footprint 2) Store any removed topsoil for later use (contains indigenous seeds etc) and re-vegetate as soon as possible 3) Once specific infrastructure sites are known, site-specific measures can be devised for implementation and any potentially high risk sites can be identified. These measures might include windbreaks or other structures to diffuse the wind strength.							

Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	**NO**	

6 CONCLUSIONS

Most of the study area consists mainly of sandy soils underlain by calcrete/limestone at varying depths ranging from <300 mm to >1 200 mm. According to the average annual rainfall for this area (280 mm), the dryland crop production potential is low, combined with the marginal crop production potential of the soil, due to the low moisture-holding capacity of the sandy soils and soil depth. The overall agricultural potential is therefore low to medium-low.

The main aspect that will have to be managed in this area if vegetation is removed will involve an increased wind erosion susceptibility due to the sandy nature of the soils.

There is no significant difference regarding the various power line alternatives, as they traverse largely similar soils, so at the scale of this investigation, clear differences cannot be identified.

Regarding the three proposed sites for the Blouwater substation, they all fall in the same land type (Hb22), so a field survey investigation would be required to look at the soils at each site in more detail and to make recommendations regarding the relative suitability of the three alternative sites.

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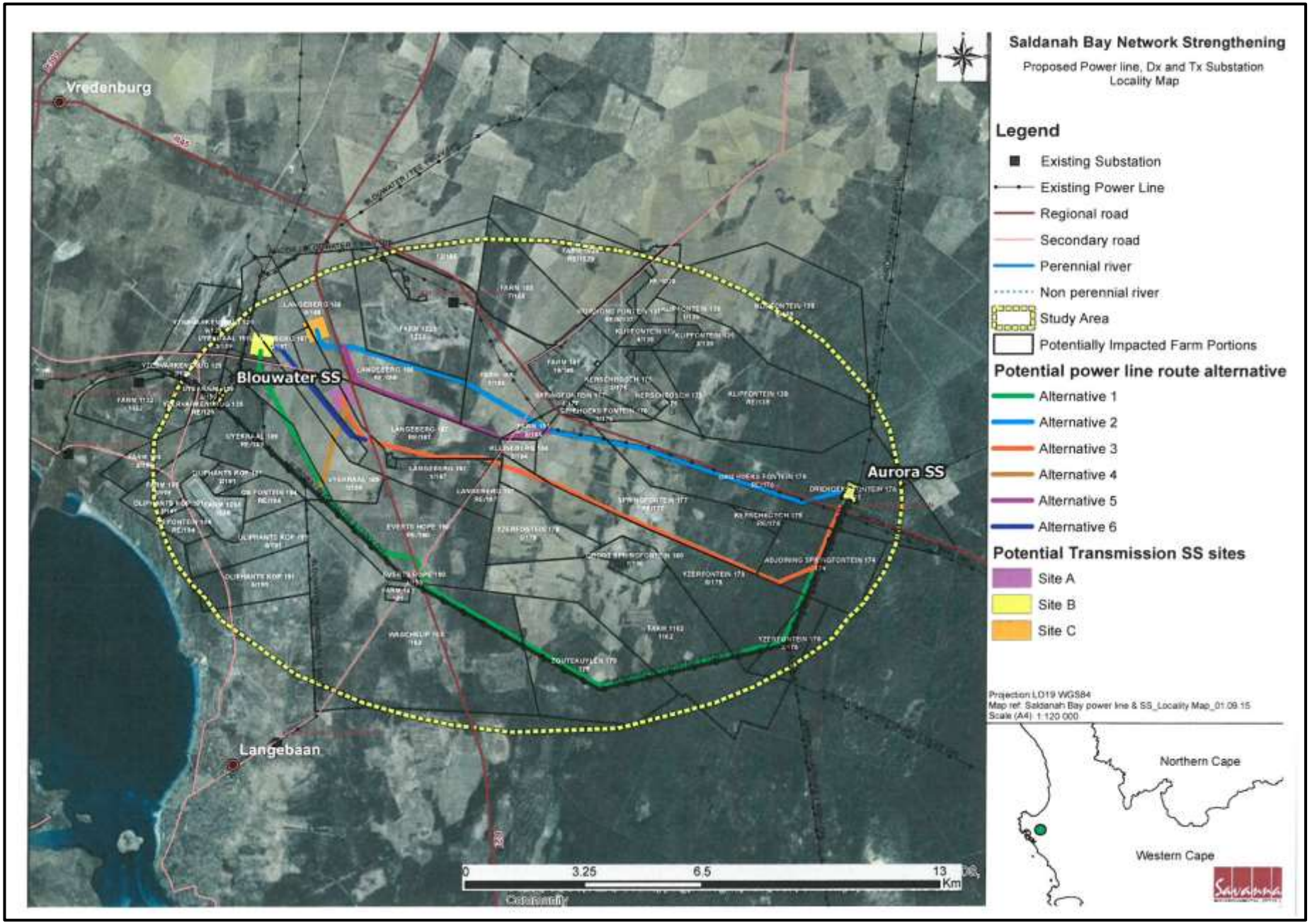
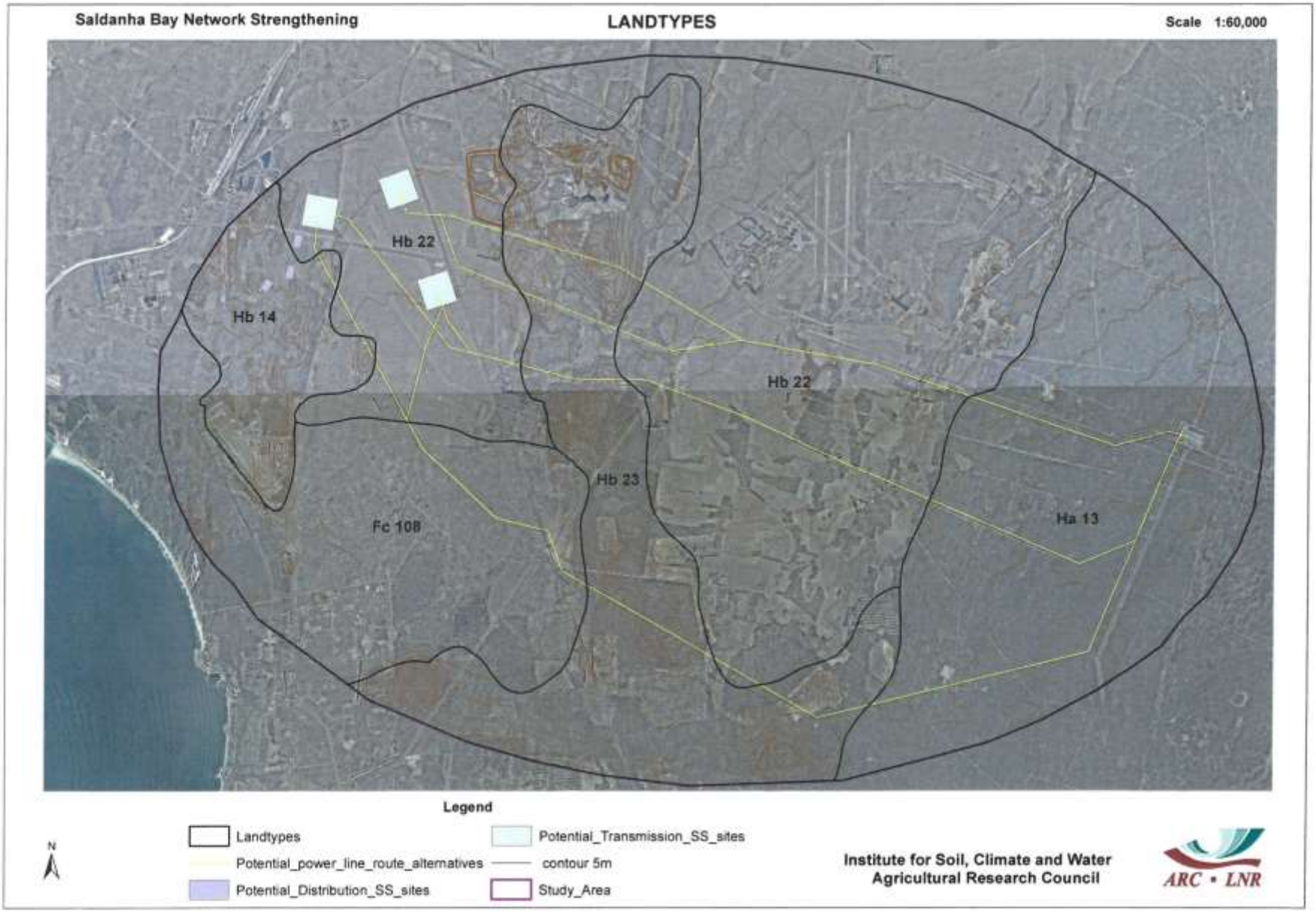
APPENDIX

A. LOCALITY MAP


Saldanah Bay Network Strengthening
Proposed Power line, Dx and Tx Substation
Locality Map
Legend
Existing Substation
Existing Power Line
Regional road
Secondary road
Perennial river
Non perennial river
Study Area
Potentially Impacted Farm Portions
Potential power line route alternative
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Alternative 6
Potential Transmission SS sites
Site A
Site B
Site C
Vredenburg
Blouwater SS
Aurora SS
Langebaan
0
3.25
6.5
13
Km
Projection LO19 WGS84
Map ref: Saldanah Bay power line & SS_Locality Map_01.09.15
Scale (A4): 1:120 000
Northern Cape
Western Cape

B. LAND TYPE MAP


Saldanha Bay Network Strengthening
LANDTYPES
Scale 1:60,000
Hb 22
Hb 14
Hb 22
Hb 23
Fc 108
Ha 13
Legend
Landtypes
Potential_power_line_route_alternatives
Potential_Distribution_SS_sites
Potential_Transmission_SS_sites
contour 5m
Study_Area
N
Institute for Soil, Climate and Water
Agricultural Research Council
ARC • LNR