PROPOSED RESIDENTIAL DEVELOPMENT:
BOSCHOEK 3345 NEWCASTLE

SEVICES REPORT

regarding the

ELECTRICAL SUPPLY NETWORK

Compiled by: S.A.M. Smit

Revision: **0**
Date: 20 June 2011

RPC
RAADGEWEND CONSULTING

PROPOSED RESIDENTIAL DEVELOPMENT: BOSCHHOEK 3345 NEW CASTLE:

SERVICES REPORT REGARDING THE ELECTRICAL SUPPLY NETWORK

Reference	:	1204
Date	:	June 2011
Author	:	S.A.M. Smit
Revision	:	0

PREPARED FOR:

Willoughby St Ledger Denny

PREPARED BY:

RPC Consulting
PO Box 813
Ifafi
0260

EXECUTIVE SUMMARY

The following are the most important conclusions of this report:

a) In a meeting with Council officials it was stated that there is adequate capacity on the existing Lennoxton substation transformers for the private development of appr. 2,800 stands.

b) The neighbouring Siyahlala development to be developed by the Council will have a separate electrical supply. The private and Council developments can thus run independently.

c) A unit demand of 2kVA was used to calculate a total demand for the private development of 5.6 MVA.

d) It is required to install 2 x 5.5km 240mm^2 aluminium 11kV cables from Lennoxton substation up to a central distribution point in the private development.

e) The total cost for the external electrical supply network is estimated to be in the region of R 8,680,000 (excl VAT).

TABLE OF CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

A new residential development is planned on portions the farm Boschhoek 3345 consisting of 216 Ha on the outskirts of New Castle.

New Castle Council will supply electrical services to the development, The electrical reticulation must conform to Council standards and requirements and will be handed over to New Castle Council after commissioning.

1.2 DEVELOPMENT OVERVIEW

Of the 216 Ha, 144 Ha is planned to be privately developed, while the land owner is in negotiations with New Castle Council to sell 72 Ha for incorporation into the council's neighbouring Siyahlala development.

The total private development will consist of approximately of 2,800 affordable residential stands with approximate average residential stand size of 250m^2. The neighbouring Siyahlala development - which is planned to be partially contained on a section of the farm – will initially consist of 1,200 residential stands, while possibly growing to 2,500 stands in future. The total number of new residential stands for the area is thus planned to start at 4,000 while growing to a final number of 5,300 stands.

The 2,800 private stands will be serviced in phases, but at this stage the various phases of development are not yet defined.

The following will have an impact on electrical services installation:

a) There are overhead rural power lines traversing the farm, which needs to be re-located when service installation commences.
b) An initial geotechnical survey of the ground formations indicate that the area is largely covered by shallow rock, which will make trenching difficult.
c) Due to the shallow rock formations electrical and civil services must be largely combined in single trenches.

1.3 AIM OF REPORT

The main aim of this report is to clarify the requirements for the electrical supply network to service the development adequately with electricity.

2. ELECTRICAL DEMAND CALCULATION

The following table shows a maximum demand calculation by using coincidental simultaneous demand estimates of household appliances for the worst case winter load:

Appliance	Quantity	Consumption / Unit (W)	Coincidence Factor	Load (W)
Geyser	1	3000	0.9	2700
Lighting (Rooms)	8	60	0.8	384
Heating	1	2000	0.8	1600
Television	1	120	0.8	96
Oven / Stove	1	2000	0.6	1200
Fridge	1	100	0.4	40
Hair dryer	1	600	0.2	120
Microwave	1	800	0.2	160
Washing machine	1	1000	0.2	200
Kettle	1	1800	0.2	360
TOTAL (W)				**6,860**
TOTAL 1ph (A)				**30**

This represents the maximum expected snapshot demand of a typical house. For domestic purposes the power factor is close to unity and we assume that kW demand is roughly equal to kVA for our purposes.

Since all the houses will not draw maximum power simultaneously the diversified demand per house will be lower than 6.86 kVA, typically at 30% of the maximum, namely 2.1 kVA.

Previous bulk measurements at distribution substation level for a supply to large townships with similar electrical consumption revealed a unit demand of anything between 1.5 and 3 kVA per unit.

For our purposes we propose an “after diversity maximum demand” (ADMD) of 2.8 kVA for this town to base bulk calculations on for the case where conventional geysers are used. With the use of solar assisted heating the geyser elements for 150L geysers can be reduced from 3kW to 1.5 kW and the ADMD can be lowered to about 2 kVA per unit, as measured at the distribution supply substation.

It must be noted that the diversity decreases the closer one measures to the point of consumption and the lower the number of connection points included in the measurement.

For this reason we propose the use of 3.5 kVA as standard ADMD for internal reticulation design purposes

2. ELECTRICAL DEMAND CALCULATION

In summary, the following ADMD's are proposed to be used:

- For calculations on the total bulk supply (assuming solar geysers): 2 kVA
- For calculations at mini-sub and low voltage feeder level: 3.5 kVA

The total load as measured for the Council supply network for the private and neighbouring developments can then be calculated as follows:

Area of Development	Number of Connections	Total Demand (kVA)
Private	2,800	5,600
Siyahlala Ph1	1,200	2,400
SUBTOTAL : INITIAL DEVELOPMENT		**8,000**
Siyahlala Ph2	1,300	2,600
TOTAL : FINAL DEVELOPMENT		**10,600**

The non-residential load, i.e. schools, businesses etc. is not listed separately for now, but the unit load assumption for the residential connections allows sufficiently for the marginal additional non-residential load.

3. BULK ELECTRICAL SUPPLY

The development will be supplied from the Council's Lennox 132/11kV distribution station off Hathorn street in Lennoxton suburb. In a meeting with Council officials it was indicated that there is adequate capacity on the Lennox substation transformers for this development.

It was furthermore indicated that the combined final load of 10.6 MVA for both private and Council developments would in the long run necessitate a new 132kV substation infeed. It was indicated that the process for this new future 132kV substation infeed may be a Council budgeting process independent of the private development. There is a possibility that the private developer may be approached for provision of space for this new substation.

It is envisaged that two supply cables must be installed from Lennox substation up to a central point in the private development. The supply to the 2,800 stand, 5,6 MVA private development will be separate from the supply to the neighbouring Siyahlala development. A separate set of cables will in future need to be installed for the Siyahlala neighbouring development. The internal reticulation of the private and Council developments will also be independent.

There is adequate space for an additional 2 x 11kV rackable panels in the Lennox substation 11kV switchgear building. This may serve the private development or the Council development supply. The building will need to be extended, however, by the developer – whether Council or private – who installs their supply after the neighbouring developer.

The supply cable must be of type 11kV 240mm^2 3c Aluminium PILC and may be of length 5.5km x 2, depending on the final cable route.

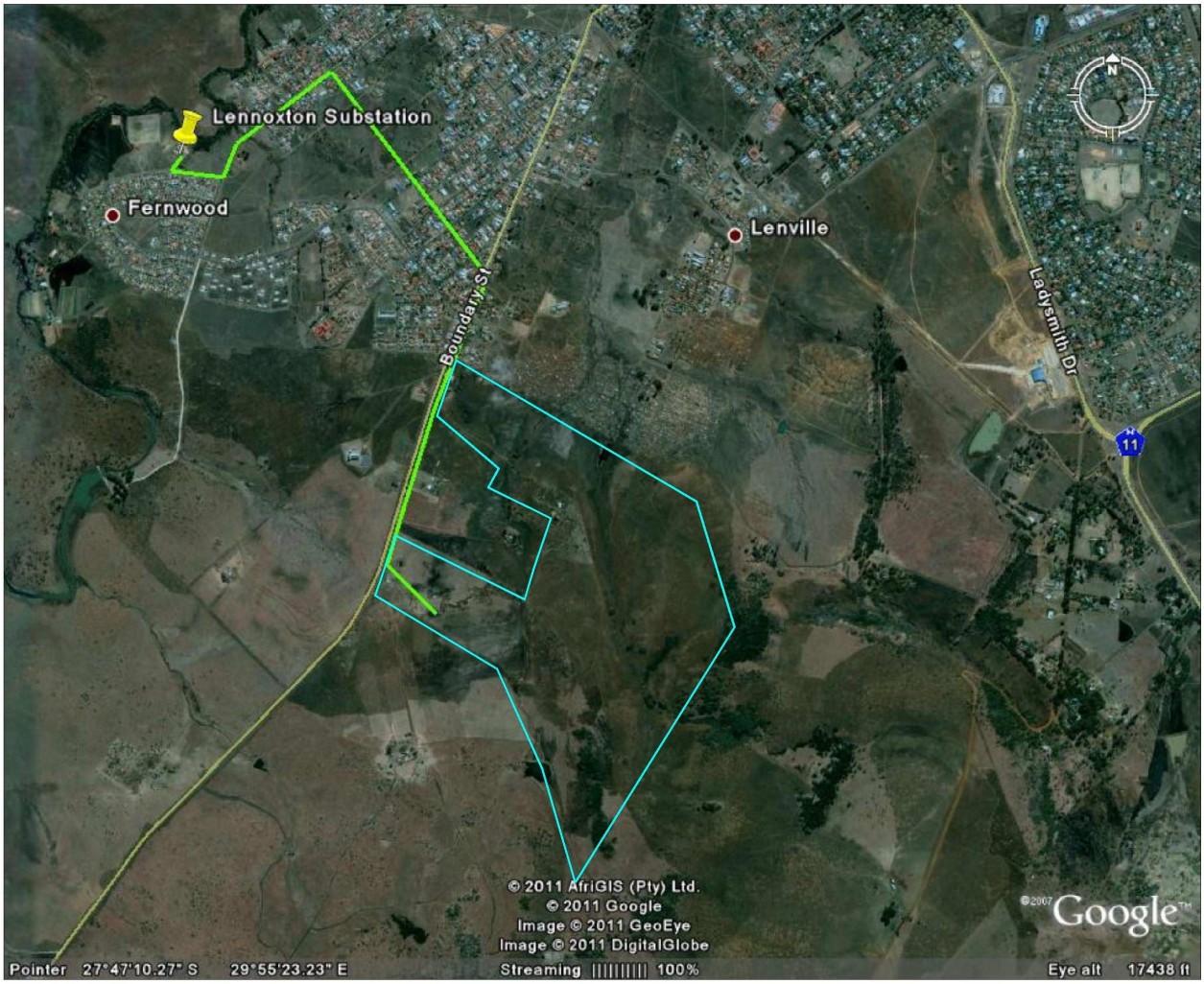
Council officials indicated that the private developer will be given an opportunity to supply and install the external supply network to Council standards.

The following scope of works and cost estimate for the external electrical supply network is preliminary subject to the Council's official cost and scope indication:

➢ Installing 2 x 11kV rackable panels in Lennox substation:	R 400,000
➢ Excavating and re-instating sidewalks for the supply cables:	R 280,000
➢ Install 5.5km of optical fibre pilot wire contained in sleeves:	R 700,000
➢ Supplying and installing 11km x 240mm^2 11kV Al cables:	R 7,300,000
➢ TOTAL ESTIMATE – External Electrical Supply (excl VAT):	**R 8,680,000**

3. BULK ELECTRICAL SUPPLY

The following picture shows a possible cable route from Lennox substation to the development:



4. LOAD FLOW PARAMETERS

The maximum voltage drop apportionment for the different system components is as follows:

- 11kV network:	-3.0%
- Transformers (inherent boost):	0.0%
- LV Network:	-5.5%
- Service cables:	-1.5%
- Maximum design voltage drop:	-10.0%

Transformer loading will be limited to 100% (inclusive of losses).The design loading on all MV and LV cables will not exceed 90%.

5. ELECTRICAL RETICULATION EQUIPMENT STANDARDS

5.1 GENERAL

Council officials indicated that all electrical services will be underground.

Provision must be made for a central building housing 7 x 11kV rackable panels from where the development can be served with two 11kV cable rings.

Electrical services must be installed appr. 750mm from the stand boundaries in the road servitudes. A minimum distance of 500mm will be maintained between water and electrical services running parallel.

5.2 MINIATURE SUBSTATIONS

It is proposed that miniature substations be standardized on 500kVA and 315 kVA, 11kV/400V, with the following overall characteristics:

- Type B with HT, LT, transformer and street light compartments
- Vacuum insulated 11kV ring main unit – breaker type with relay
- Mild steel powder coated avocado green
- Main circuit breaker rated for 120% capacity
- Provision for K-clamp termination of LV cables

Not SF6 or oil insulated 11kV ring main units are allowed by the Council.

5.3 MV CABLES

The internal MV cable rings will consist of 11kV, 3 core 150mm^2 aluminium PILC DSTA cables to Table 18 of SANS 97.

5.4 LV NETWORKS AND SERVICES

Power may be reticulated to the stands by means of 95, 120 and 185mm^2 4-core, aluminium, PVC Insulated PVC bedded SWA PVC served cables.

Multi-way metering kiosks will be installed with the following characteristics:

- Planted
- 3CR12
- 1-pole 40A, 5kA, slow curve circuit breakers for residential connections
- Space provision for smart meters

The aim will be to standardize on 9-way metering kiosks.

The services will consist of: 3 core, 10 mm^2 and 16 mm^2 copper cables.

Smart Meters will be installed by Council in the metering kiosks with a wireless split system to the controller in the houses. No pilot wires will be required.

5.5 OTHER CONSIDERATIONS

STREET LIGHTING

The use of normal 7, 9 and 11m galvanized pole street lighting may be discussed with Council.

CONSTRUCTION SUPPLY

The building contractor may initially obtain a construction supply directly from the existing 11kV overhead lines on the farm to be repositioned.

BULK SERVICES CONTRIBUTION

It is expected that the electrical bulk contribution should be covered by the actual work to be undertaken to install the supply network. Council should indicate if any additional electrical bulk services will be applicable above the costs for the actual word to be undertaken by the private developer.

TELECOMMUNICATION

At this stage no provision of Telkom ducts and draw boxes is foreseen.