POWERING POSSIBILITY

MARAPONG EXT 7 HOUSING PROJECT

ENGINEERING SERVICES REPORT

Prepared By

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REFERENCES :

Ref. 1 **:** GCS_RP_10_2016_Geotechnical Study Report Marapong Housing Extension project DRAFT v01 By Geotechnical Consult Services.

Ref. 2 **:** Agreement for the Marapong-Boikarabelo Effluent Transfer (MBET) Project

Ref. 3 **:** Lephalale Local Municipality Section 78(3) For Water And Sanitation Services Feasibility Study.

1 INTRODUCTION

1.1 Appointment

Dries De Ridder Town Planner on behalf of Exxaro contracted Tswella Engineering Projects (Pty) Ltd (TEP) as the Civil and Electrical Engineers to prepare an Engineering Services Scheme Report for the Marapong Ext 7 Housing Project for the purposes of township approval. The development falls within the jurisdiction of Lephalale Local Municipality.

1.2 Scope of Works

The scope of work entails the following:

- Engineering inputs to the Township Layout Plan
- Inputs to the Geotechnical and Stormwater Reports
- Investigations on Existing Bulk Engineering Services
- Preparation of Engineering Services Scheme Report for the proposed Marapong Ext 7 Housing Development

1.3 Key Assumptions

This report is submitted with the understanding that the bulk water and bulk sewer information provided by the Lephalale Local Municipality is correct.

1.4 Objective of this Report

The objective of this report is to identify the availability of bulk services required for the development of the proposed Marapong Ext 7 and to outline the preliminary design (level of service and design standards) of the internal engineering services.

1.5 Purpose of Report

This short report serves as the Engineering Services Report for the proposed development on a portion of the Remainder And Portion 1 Of The Farm Nelsonskop 464 LQ. The objectives of this Engineering Services Report is to provide information on the availability of Bulk Services for the full development as well as conceptual internal Engineering Services designs for Marapong Ext 7, to assist the local,

provincial and national authorities in their assessment in considering development approvals for this proposed development.

2 PROJECT DETAILS

2.1 Project Name

The project is referred to as Marapong Ext. 7 Housing Development and consists of approximately 718 residential stands measuring 320m^2 on average.

2.2 Locality

The site is located approximately 13 km due west of Lephalale, directly north of the Matimba Power station. The site is bounded on the south by the Provincial Road D2816 to Marapong, to the east by Marapong Township and north by the Remainder of the Farm Nelsonskop 464 LQ.

The location of the Marapong Ext 7 site is shown on **Fig 2.1** below.

Fig 2.1: Locality of Marapong Ext. 7 Site

3 SITE DESCRIPTION

3.1 Zoning

The site is currently zoned as agriculture and partly Residential 4.

3.2 Servitudes

The following servitudes affect the site:

- An overhead power line near the eastern boundary.
- A sewer pump station at the bottom centre of the site
- A sewer pipeline running in-between Areas 2 and 3
- A balancing dam at the bottom centre of the development for treated effluent from Matimba Power Station
- A conveyor belt traversing the site in-between Areas 3 and 4

3.3 Proposed Development

3.3.1 Town Planning

The proposed development plan for Marapong housing extension is shown on the drawing in **Annexure A**. This development will be phased and will comprise the 4 areas depicted as AREA 1 to AREA 4 covering a total of 220.58 hectares.

The township layout under consideration is for AREAs 1 and 2, now being referred to as Marapong Ext 7 covering a total of 86.8 hectares.

The proposed site layout for Marapong Ext 7 is included in **Annexure B.**

The Land use for Marapong Ext 7 is given in the table below.

USE ZONE	LAND USE	TOTAL NUMBER	AREA (Ha)	% OF WHOLE
Residential 1	Residential - Approx. 320m^2 stands	718 Stands	24.57	11.14
Business 1	Business - Coverage - 70%, storeys - 3	8 Stands	13.25	8.02
RSA	Crèche and Police Station - Coverage 80%, storeys-3, FAR-2.4	1 Stand	1.07	0.48
Educational	Coverage-60%, storeys-3, FAR-1.8	2 Stands	2.72	1.23
Special	Stormwater Dams	2 Stands	8.73	3.96
POS	Parks	8 Stands	16.01	7.26
Streets	Streets		28.72	15.06
TOTAL		739 Stands	**95.07**	**43.10**

The proposed land use for the future AREAs 3 and 4 are given in the table below

USE ZONE	LAND USE	TOTAL NUMBER	AREA (Ha)	% OF WHOLE DEVELOPMENT
Residential 4	Residential Flats - Approx. 1 unit per 125m^2	7904 Units	98.80	44.79
Residential 4 Sensitive areas	Parks/Gardens		15.50	7.03
Cemetery	Cemetery		5.01	2.27
Roads	Roads		6.20	2.81
TOTAL			**125.51**	**56.9**

3.3.2 Phasing of Development

The proposed development is going to be implemented in four (4) phases and the proposed phasing plan is depicted on drawing in **Annexure C.**

The time frames for completing the phases are as follows:-

- Phase 1 - 2019
- Phase 2 - 2020
- Phase 3 - 2021
- Phase 4 - 2022

3.4 Topography

The site is located in a relatively flat area, sloping at approximately 1% towards the north east of the site.

3.5 Geology

A geotechnical investigation was undertaken by Geotechnical Consult Services in May 2016 (Report No GCS-RP/010/2016).

The geology of the site consists of the following:-

3.5.1 Regional Geology

The site is underlain by a sandstone member of the Swartrand Formation (Ps) for most of the area and in the north-eastern corner by the Clarens Formation (Tre) which is a mostly massive, well sorted, fine grained sandstone separated by the Daarby Fault. (Refer to Figure 4). The area is covered by a blanket of unconsolidated

sand ranging from fine clayey sand reddish to fine grained yellowish sand up to 3m thick.

The Daarby Fault, which connects the Eenzaamheid and Zoetfontein Faults has a maximum throw of 300m and a plunges at 55° in a nor theastern direction in the vicinity of the site. The fault is however not active.

3.5.2 Engineering Geology

In general the sandstone of the Swartrand Formation is stable and no major engineering geological risks are expected, otherwise the Matimba Power station would not have been constructed at its current location.

3.5.3 Ground Water and Hydrology

The Karoo sediments are not a good aquifer and shallow groundwater occurrences is rare, Pans do occur where localized depressions occur and calcrete developed.

Information obtained from Exxaro's Geohydrologist indicated that the water level of the monitoring borehole located at the stormwater control dam is 10m below surface. This borehole is located close to the drainage and it can be regarded as the minimum water level for the study area.

4 LEVEL OF SERVICE AND DESIGN STANDARDS

4.1 Standards & Guidelines

All the services for the sub divisions in Nelsonskop Farm Housing Development will be designed in accordance with the "Guidelines for Human Settlement Planning and Design" as compiled under patronage of the Department of Housing in collaboration with the CSIR, the New Red Book, as amended in 2000. Cognizance will further be taken of the principles contained in the :

1. "Guidelines for the Provision of Engineering Services in Residential Townships" published by the Department of Community Development in 1983 (Blue Book),

   and

2. "Guidelines on the Planning and Design of Township Roads and Stormwater Design" of the SA institution of Civil Engineers, and

3. The Municipality's and Department of Housing's requirements.

4. CIBSE TM46:2008-Energy Benchmarks

5. NRS 034 (all parts)

6. Eskom Electrification Planning Guidelines

4.2 Water Supply

4.2.1 Proposed Design Standards

The internal services will be designed in accordance with the "Guidelines for Human Settlement Planning and Design" as compiled under the patronage of the Department of Housing in Collaboration with the CSIR (the "Red Book"), as amended in 2000.

The requirements of Lephalale Local Municipality will also be adhered to.

The following standards are proposed:

Average Daily Demand

- Residential (zone 1) : 600l/day/erf
- Residential (zone 4) : 600l/day/ residential unit (minimum)
- Business/Municipal : 400l/day/100m² of GFA
- Educational : 400l/day/100m² of GFA
- Community Facilities: 400l/day/100m² of GFA
- Parks (>2Ha<10Ha) : 12 500l/day
- (>10Ha) : 10 000l/day
- Cemetery (>2Ha<10Ha) : 12 500l/day

Instantaneous demand peak factor	:	4
Peak flow residual head	:	24m (minimum)
Fire Risk	:	Low risk
Fire hydrant delivery volume	:	15 litre/s at peak flow
Peak flow + fire residual head	:	15m (minimum)
Pipe material	:	uPVC class 12
Pipe size	:	90mm dia Min
Pipe cover	:	700mm minimum
Trenches	:	Widths to SABS 1200, class B bedding, Back-filling to 90% mod AASHTO, Back-filling to 93% mod AASHTO in road reserves
Valves	:	Waterworks type, Cast Iron, clockwise closing, opposite splay pegs, 'Davis & Deale' type plastic box – lid colour as specified.
Hydrant spacing	:	240m on 90mm dia min

4.2.2 Water Demand

Based on the proposed development outlined in Section 3.2 of this report, average annual daily demand (AADD) of the proposed development is estimated in the tables below.

Average Annual Water Demand for Marapong Ext 7

USE ZONE	LAND USE	QTY	Unit	Unit Water Demand (kℓ/day)	Total Water Demand (kℓ/day)
Residential 1	Residential - Approx. 320m^2 stands	718	stand	0.6	430.800
Business 1	Business - Coverage - 70%, storeys - 3, FAR-1.4	129 850	m^2	0.004	519.400
RSA	Crèche and Police Station - Coverage 80%, storeys-3, FAR-2.4	20 544	m^2	0.004	82.176
Educational	Coverage-60%, storeys-3, FAR-1.8	29 376	m^2	0.004	117.504
Parks	Parks	16Ha	Sum	10.00	10.00
	TOTAL				**1 159.88**

Average Annual Water Demand for Future AREAs 3 and 4

USE ZONE	LAND USE	QTY	Unit	Unit Water Demand (kℓ/day)	Total Water Demand (kℓ/day)
Residential 4	Residential Flats - Approx. 1 unit per 125m^2	7904	unit	0.6	4 742.40
Cemetery	Cemetery	5	Ha/Sum	12.5	12.50
Res 4 Sensitive Areas	Parks/Gardens	15.5	Ha/Sum	10.0	12.50
	SUB-TOTAL				**4 767.40**

The estimated water demand for the full development is **5 927kℓ/day (5.9Mℓ/day)**.

4.2.3 Internal Services

It is proposed for this development that the highest level of service be provided with house connections. All stands will be connected to a comprehensive piped water network to be installed in the street reserves.

The internal water reticulation for Marapong Ext 7 will be designed for an estimated peak flow of 54ℓ/s and for 144ℓ/s including fire demand .

A preliminary layout of the internal water reticulation system for Marapong Ext. 7 is detailed on drawing included as **Annexure D**. The pipe sizes, based on initial calculations, range between 90mm and 450mm in diameter. The bigger diameters being the distribution mains from the reservoir complex and the smaller diameters reticulating inside the proposed development.

4.3 Sanitation

4.3.1 Design Standards

The internal sewer network will be designed according to the same standard as listed in section 4.1, as well as the following:

Daily flow	:	540 litres/day/erf (Minimum)
Sewer Return Factor	:	0.90 of Water Demand
Peak factor	:	Sliding scale as per Red Book – 2,5 maximum
Pipe material	:	Solid Wall Class 34 uPVC. SABS approved
Pipe size	:	150mm minimum
Pipe cover	:	0,6m minimum at head, 1,0m generally
		1,2m under streets
Infiltration Factor	:	15%

Pipe slopes and minimum velocity	:	To attain minimum flow velocity of 0,7m/s as soon as possible starting with minimum 1:80 slope at head.
Trenches	:	Widths to SABS 1200 LB, class B bedding, back-filling to 90% mod AASHTO, back-filling to 93% mod AASHTO in road reserves. The selected granular material must extend at least over the full trench width and at least 100mm over the pipe
Manhole Spacing	:	90m maximum
Manhole Sizes	:	0m – 2,5m deep : 1,05m dia Chamber, no shaft 2,51m – 3,5m deep : 1,25 dia Chamber, shaft Deeper than 3,5m : 1,5m dia Chamber, shaft

4.3.2 Design Sewer Flows

Based on the proposed development outlined in Section 3.2 of this report the estimated daily flow from the development is as follows:-

- Marapong Ext 7 - 1 035 kℓ /day (1.04 M ℓ/day) with an estimated peak flow of 34l/s.
- Future AREAs 3 and 4 - 4 268 kℓ/day (4.27 Mℓ/day) with an estimated peak flow of 142 ℓ/s.

4.3.3 Internal Services

All stands in the proposed development will be connected to a gravitational pipe network draining into the proposed bulk sewer pipeline.

A preliminary layout of the internal sewer reticulation system for Marapong Ext. 7 is detailed on Drawing included as **Annexure E**. The pipe sizes are estimated to range between 160mm and 250mm in diameter.

4.4 Internal Roads

Structural Design

The structural design is based on the recommendations contained in the Draft TRH 4, Structural Design of Inter-Urban and Rural Road Pavements and UTG 2.

Design Standards

See Table 4.4.1 below

Typical Road Cross Sections

Refer to **Annexure F**

TABLE 4.4.1

Marapong Ext. 7 : Roads & Streets : Design Standards

Road Class Function	3 District Distributor	4 Local Distributor a	 b	5a Residential Access Collector	5b Residential Access Loop	5c Residential Access Cul-de-sac
Max Dwelling Units Serviced	n.a.	1500	500	200	120	60
Desirable Maximum Length	n.a.	4km	2km	500m	500m	150m
Road Reserve Width	20m, 25m, 30m, 36m	25m	20m	15m	13m	13m
Residential Access	Nil	Nil	Yes	Yes	Yes	Yes
Design Speed	60km/h	50km/h	50km/h	40km/h	30km/h	20km/h
Min Stopping Distance	85km	60m	60m	45m	32m	20m
Intersection Sigh Distance	95m	90m	60m	45m	35m	n.a.
Minimum Centre Line Radius	150m	90m	50m	15m(30m if angle<60º)	12,5m(30m if angle<60º)	12,5m(30m if angle<60º)
Minimum Kerb Size	12m	12m	12m	10m	10m	10m
Minimum Splay Size	5mx20m	5,5m	5,5m	5,5m	5,5m	5,5m
Intersection Spacing Adjacent	90m	90m	50m	50m	40m	n.a.
Intersection Spacing Opposite	90m	90m	25m	25m	20m	n.a.
Favoured Max Gradient	7,00%	7,00%	7,00%	10,00%	12,00%	12,00%
Max Grade / Grade Length	10% 100m	10%/100m	12%/100m	12%/70m	16%/50m	12%/50m
Min Grade	0,30%	0,30%	0,30%	0,30%	0,30%	0,30%
Pavement : Roadway Width	8m, 7,4m	7m	6m	5m	4,5m	4,5m
Surface Type	30mm Asphalt	30mm Asphalt	25mm Asphalt	20mm Asphalt	20mm Asphalt	20mm Asphalt

Cross Fall	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Kerbs	Fig.7	Fig.7	Fig.8	Fig.8	Fig.8	Fig.8
Typical Base	150mmG2 100%Mod	125mm G4	98%Mod	200mmG5 95%Mod	200mmG5 95%Mod	200mmG5 95%Mod
Typical Subbase	150mmC3 96%Mod	150mm C4	96%Mod	150mm Rip & Recompact	150mm Rip & Recompact	150mm Rip & Recompact
Typical Subgrade	150mmG7 93%Mod	150mm G7	98%Mod			
Sidewalk (Gravel)	1m wide@ 4% slope	1m wide@ 4% slope		1m wide@ 4% slope	1m wide@ 4% slope	1m wide@ 4% slope
Stormwater Recurrence Interval	1:10 years	1:5 years		1:2years	1:2 years	1:2 years
Encroachment : Major	max depth 150mm	max depth 150mm		n.a.	n.a.	n.a.
Encroachment : Minor	No encroachment	40% of road width free		20% of road width free	max depth of 10mm at crown. No overtopping	Max depth of 10mm at crown. No overtopping
Roadside Channels	Min gradient 0,4% Max velocity 3m/s	Min gradient 0,4% Max velocity 3m/s		Min gradient of 0,4% Max velocity 3m/s	Min gradient 0,4% Max velocity 3m/s	Min gradient 0,4% Max velocity 3m/s

4.5 Stormwater

5.5.1 Internal Services

Stormwater runoff within the development will be managed by a conventional drainage system consisting of open side channels next to streets in conjunction with roadways. The street design will also allow for stormwater management for bigger floods.

The runoff shall be safely discharged into the natural stormwater channels.

5.5.2 Design Standards

The internal stormwater system will be designed based on runoffs calculated by using the Rational Method.

Standards:

Recurrence Internal	:	According to road classification in Table 4.4.1
Major Channels	:	Open lined with concrete to handle 1:10 year storm
Minor Channels	:	2,0m wide open lined to handle 1:2 year storm
Lined Side Drains	:	25MPa concrete on 100mm sub-base

A preliminary roads and stormwater layout is included in **Annexure G.**

4.6 Street lighting

Street lighting will be provided in all applicable streets according to City of Lephalale standards and per the details listed below.

These guidelines would be applied at the discretion of the designer given the actual layout and design requirements, and based on available funding levels. Reduced funding may imply reduced service levels and vice versa.

Table 4.6.1: Street Lighting

Description	Eskom	Poles	Light fittings
Fully Subsidised	Eskom does not include street lighting in their standard network design and will not install streetlights if Council does not take it over or pay a service fee	Fittings mounted on the network poles. ▪ 8m mounting height (m/h) for bus routes ▪ 5.5m m/h for residential roads	▪ 250W HPS for bus routes, ▪ 100W HPS for residential roads

4.7 Electrical Services

The electrical network will be overhead, with the service connections to the houses both overhead and underground. Due to the density of this development the partial installation of underground medium voltage cables will be investigated and if financially viable, will be done.

The network will consist of wooden poles, medium voltage ACSR Hare and Fox conductor, distribution class 11kV/415V transformers, and Low Voltage Aerial Bundled Conductor (35mm² and 70mm² sizes) incorporating streetlight conductors. The electrical network will be designed in accordance with the ESKOM Distribution Standards.

5 AVAILABILITY OF BULK SERVICES

5.1 Water

5.1.1 Bulk Water Services Provider

The bulk water supply to the proposed development will be provided by Exxaro from its bulk water network.

5.1.2 Bulk Water Demand

The average daily water demand for the whole development is calculated as 5925kℓ/day with a peak flow of 274ℓ/s.

5.1.3 Existing Bulk Water Infrastructure

The town of Lephalale is currently getting its bulk water supply from Zeeland WTW. Zeeland WTW has just been upgraded from 20Ml/d to 40Ml/d.

However, Marapong township within which Marapong Ext. 7 lies, gets its bulk water supply from the 1.6M ℓ /d Matimba Water Treatment Works located at Matimba Power Station through the 3.5ML and 8Mℓ Marapong Reservoirs in Marapong (refer to the bulk water supply schematic layout for Marapong included in **Annexure H**. However, Matimba WTW can no longer meet the water demand of the growing township of Marapong and hence cannot support the additional **1.2** Mℓ/day water demand from the proposed development of Marapong Ext. 7 or the 6Mℓ/day demand for the full development.

Furthermore, the two reservoirs in Marapong do not have adequate capacity for the areas under their command. The proposed Marapong cannot therefore be used to supply the proposed new Marapong Housing Extension Development.

5.1.4 Proposed Bulk Water Infrastructure

It has been established from the available reports that the upgraded 40Ml/d Zeeland WTW has additional capacity to support future developments in Marapong (which include Marapong Ext 7.) for the 20 year horizon. However, some bulk water pipeline upgrades to Marapong. The proposed bulk pipeline upgrade starts from Zeeland WTW (800mm in dia) and runs generally in the northerly direction to supply the proposed industrial development next to Matimba Power Station from where it will be pumped to Marapong Reservoirs via a 315mm diameter pipeline. The 315mm portion of the bulk pipeline traverses along the southern boundary of the proposed Marapong Housing Extension Development on its way to Marapong. The construction of this bulk pipe line is earmarked to commence in February 2017.

This proposed bulk pipe line is shown on the layout included in **Annexure I.**.

5.1.5 Storage For Marapong Development

It is clear from above that a dedicated storage will be required for the proposed development. A 2 day storage of 12Mℓ capacity is therefore being proposed to supply

the proposed Nelsonskop Farm Housing Development. This will be in the form of two (2) 6Ml reservoirs to be located at the highest elevation of the proposed development. Due to the flat nature of the terrain, an elevated water tank will be built to boost pressure to the proposed development. Initial indications are that a 1.2Mℓ elevated tank will be required. The storage infrastructure is shown on drawing in **Annexure J.**

5.1.6 Marapong Development Bulk Supply Pipeline

It is proposed that supply to the 12Ml storage facility for the proposed development be taped off the 350mm diameter bulk water pumping main discussed under Section 5.1.4 above. The tap off will be in the form of a 315mm diameter uPVC pipeline to convey a peak flow of 104ℓ/s which is equivalent to 1.5 x AADD. This internal bulk pipeline is shown on drawing in **Annexure J.**

5.2 Sewerage

4.2.1 Expected Sewage Flow

The average daily sewage flow from the whole development is calculated as 5303kℓ/day with a peak flow of 176ℓ/s (refer to section 4.3.2 of this report).

5.2.1 Bulk Sewer Services Provider

The bulk waste water provisions to the proposed Marapong Ext. 7 development will be provided by Lephalale Local Municipality who are overally responsible for bulk waste water functions.

5.2.2 Existing Bulk Sewer Infrastructure

Marapong Township currently discharges to two Waste Water Treatment Plants (WWTPs), Nelsonskop (2.4ML/d) and Zongezien (0.5Ml/d). This is achieved through pumping via a number of booster pump stations located around Marapong. Also discharging to Nelsonskop WWTP is Matimba Power Station.

Zongezien WWTP is currently being upgraded to 16Ml/d and will be able to accommodate the 5.30Mℓ/day sewage generation from the Nelsonskop Farm Housing Development.

The locations of the existing WWTPs are included on the schematic layout included in **Annexure K**.

5.2.3 Proposed Bulk Sewer Infrastructure

The Development of Marapong Ext. 7 currently does not have bulk sewer pipelines servicing it according to the available reports. A bulk sewer pipeline will therefore be required to support this development. The proposed bulk sewer pipeline which is approximately 4.6km long is shown on the layouts included in **Annexure E**.

The bulk sewer pipeline will be designed for a peak flow of 176ℓ/s from the full development and it is estimated that this bulk sewer pipeline will vary in size ranging from 400mm to 500mm in diameter and laid at an average slope of 0.5%. The indications from the preliminary modelling are that the bulk sewer pipeline will be

2.5m deep when it gets to Zongezien WWTP. A lifting pump will probably be required at the WWTW and its assumed at this stage that this will be the municipality's responsibility.

5.3 Access

5.3.1 Existing Road Access

Marapong Ext. 7 can be accessed via the Provincial Road D2816 (to Marapong), which runs along the southern boundary of the development as shown on the layout included in **Annexure L**.

5.3.2 Future Road Access

A second access road is earmarked in future for the proposed Marapong Ext.7 development in the form of a tarred road, which is going to come off the Provincial Road D2001 to Lephalale and will run along the northern boundary (also shown on layout included in **Annexure L**).

The future access road will be constructed as part of phase 1 to prevent congestion on the existing Road D2816 to Marapong. More accurate information regarding the extent of phase 1 construction will be guided by the Traffic Impact Studies which will be conducted in due course.

5.4 Bulk Stormwater Infrastructure

Non-perennial stormwater channels transects almost diagonally from the south western corner of the site to the north eastern corner of the site. The site is relatively flat. These channels have been established to have additional capacity to convey stormwater that's going to be generated from the proposed site.

The existing stormwater channels are shown on the layout included in **Annexure M**.

5.5 Electricity

5.5.1 Power Demand Calculation Assumptions

Eskom Electrification Planning Guideline, the CSIR Red Book and NRS 034 give an average power consumption of 2.7kVA per household for low income households, and an average annual energy consumption of 165kWh/sq.m[1] is assumed for the Commercial centres, assuming a power factor of 0.9 and load factor of 0.35.

[1] CIBSE TM 46: Energy Benchmarks

Phases 1 -4(Marapong Ext 7) Demand Estimate

Land Use	Stand Area (m^2) and Classification as per CSIR Red Book Volume 2	Number of Stands	Average ADMD (kVA)	Total ADMD (kVA)
Residential 1	320sq.m	7944	2.7kVA[2]	21 448.8
Residential 4	>320sq.m	4	6kVA	12
Business 1	1.66ha	8	60W[3]/sq.m	7950.0
RSA	1.07ha	1	40W/sq.m[4]	428.0
Educational	2.72ha	2	40W/sq.m[5]	1088.0
Total for Marapong Phases 1-4				**30 926.8**

Total demand for the full development is 30.926MVA.
Allowing for 25% spare capacity, the total load that needs to be catered for is 38.66MVA for the full development.
Currently the area where the development will take place has 22kV lines which traverse the area.

Phases 1 to 4 will be developed from 2019 and completed in 2022.

1. **BULK POWER SUPPLY OPTIONS**
Given the amount of power that will be required, 3 power supply options have been put forward. These options will need to be discussed with Eskom, to determine which the preferred power supply option for the development is.

a. Extend the existing 22kV Lines to cover the whole development
This option entails extending the existing 22kV lines to cover the whole development.

This option however has the following disadvantages:

- This option will result in a network with under-voltage problems due to the long lines and might necessitate the need for compensation in the form of capacitor banks;
- Possibility of line overloading. Existing lines might need to be uprated, and this might mean rebuilding the lines completely.
- Power System studies need to be done to assess the technical feasibility of this option before it is costed.

b. Extend the existing 132/22kV substations and build new lines to cover the whole development and uprate the 132/22kV transformers.

This option entails extending the existing 132/22kV substations and build new 22kV lines to cover the whole development.

This option however has the following disadvantages:

[2] CSIR Human Settlements Planning Guideline Vol 2
[3] CIBSE TM 46: Energy benchmarks
[4] CIBSE TM 46; Energy Benchmarks
[5] CIBSE TM 46: Energy Benchmarks

- This option will require a full Environmental Impact Assessment as the construction activities are considered as listed activities;
- The area around Lephalale has of late been involved in land disputes due to the high demand for land for building infrastructure such as Transmission and Distribution lines. Land issues might delay the implementation of this option.
- New servitude will be required for the new 22kV lines.

However this option will result in less system losses than Option a.

c. Extend the existing 132kV line network into the new development and create a new 132/22kV substation and build new 22kV lines to cover the whole development.

This option however has the following disadvantages:

- This option will require a full Environmental Impact Assessment as the construction activities are considered as listed activities;
- The area around Lephalale has of late been involved in land disputes due to the high demand for land for building infrastructure such as Transmission and Distribution lines. Land issues might delay the implementation of this option.
- New servitude will be required for the new 132kV and 22kV lines.

5.5.2 Way Forward

The purpose of this report is to propose solutions that can be looked at further before a quotation can be submitted. A meeting was held with Eskom to discuss the 3 options. Eskom will carry out network studies to confirm the technical feasibility of each of the 3 options as well as select the least life cycle cost option of providing power to the proposed development.

The 22kV lines which traverse residential stands will require to be rerouted to run along road servitudes. It is proposed that overhead line be used for the diversion rather than underground cables. Underground cables are prone to cable theft, especially in an area that is going to densely populated.

Eskom will do the costing for the technically feasible options as well as the design development for the selected power supply option.

Tswella Projects have commenced discussions with Eskom, and Eskom has made the following requests:

- The developer needs to complete an application for after confirming the number of properties. An application fee needs to accompany the application and the application fee is dependent on the electrical load. It is thus important to have a correct estimate of the number of properties
- Eskom has given 2 options: either Eskom constructs the lines and substations, or the developer opts for the “Self Build option” in which the developer constructs the Electrical infrastructure, which is handed over to Eskom after construction. Eskom is currently facing funding challenges, so if time is of the essence, the “Self build” option is recommended.

The conceptual drawing layouts of a 132/22kV substation are attached to **Annexure N**.

6 PROJECT COST ESTIMATES

6.1 Civil Engineering Services Cost Estimates

The Civil Engineering services costs are estimated at **R151million excluding VAT and contingencies** for the bulk infrastructure for the full development as well as well as internal Engineering services for Marapong Ext 7.

The detailed BOQ for the civil engineering infrastructure is included in **Annexure O**.

6.2 Electrical Engineering Services Costs

The electrical engineering services costs are estimated at **R378milion excluding VAT and Contingencies**.

These costs cover the bulk infrastructure and the internal reticulation infrastructure including street lighting for the full Development.

The detailed BOQ for the electrical infrastructure is included in **Annexure P.**

7 CONCLUSIONS

The Municipality is in the process of upgrading the water supply to Marapong and the bulk water pipeline will have sufficient capacity to support the proposed development. Construction of this bulk pipeline is earmarked to commence early next year and will be completed well before the first phase of the development is complete.

Lephalale Municipality is also commencing works on the Zongezien WWTW in February and the first phase of the upgrades will be completed well ahead of the proposed development. The sewage flows from the proposed development can be accommodated by the Zongezien WWTW once the upgrading works are completed.

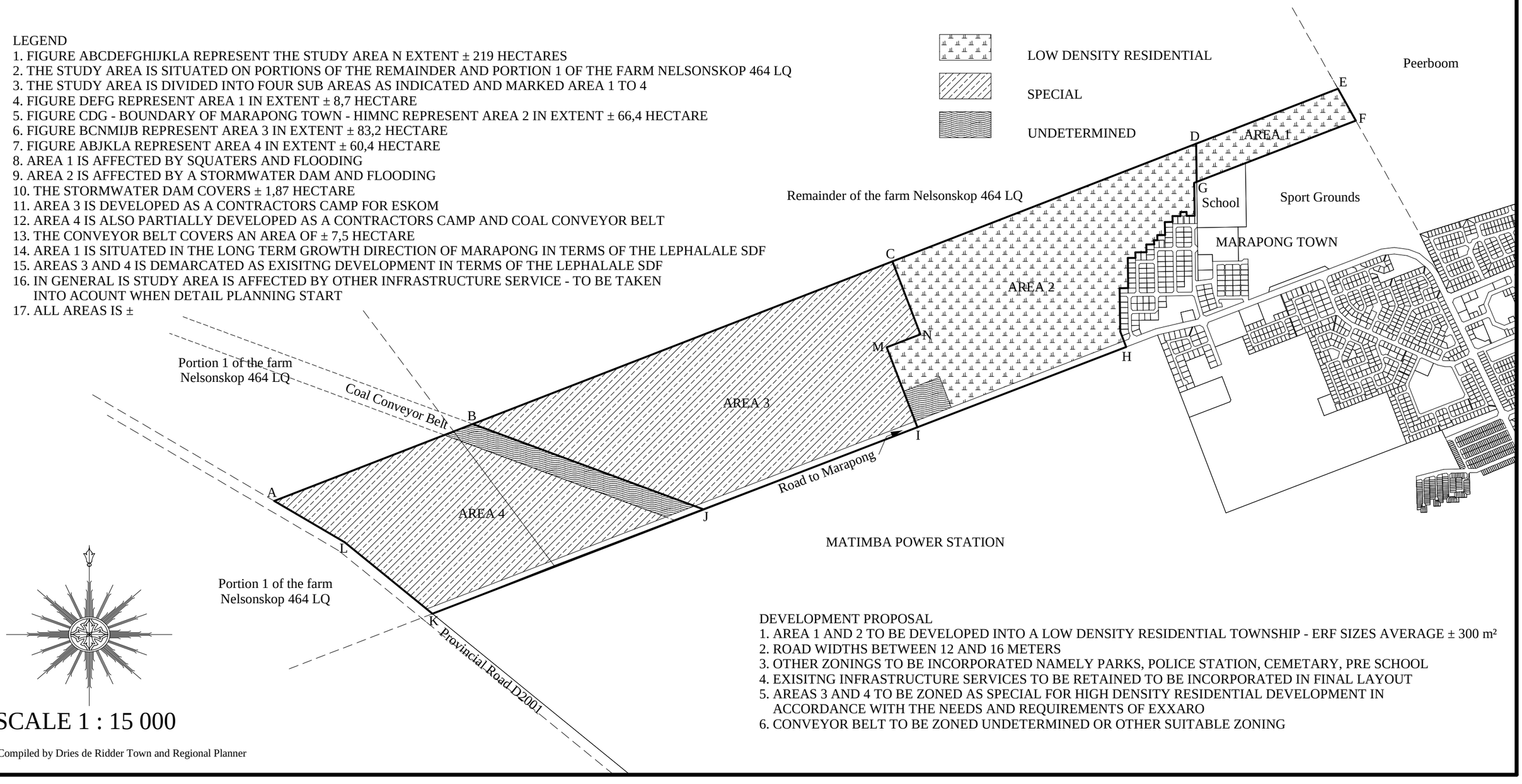
The development traffic can be accommodated on the existing road network together with the proposed future access. However. upgrades to the intersections will be required and these shall be done in line with the Traffic Impact Study to be undertaken.

ANNEXURE A

PROPOSED DEVELOPMENT PLAN FOR MARAPONG HOUSING EXTENSION

DEVELOPMENT PLAN MARAPONG HOUSING EXTENSION PROJECT

LEGEND
1. FIGURE ABCDEFGHIJKLA REPRESENT THE STUDY AREA N EXTENT ± 219 HECTARES
2. THE STUDY AREA IS SITUATED ON PORTIONS OF THE REMAINDER AND PORTION 1 OF THE FARM NELSONSKOP 464 LQ
3. THE STUDY AREA IS DIVIDED INTO FOUR SUB AREAS AS INDICATED AND MARKED AREA 1 TO 4
4. FIGURE DEFG REPRESENT AREA 1 IN EXTENT ± 8,7 HECTARE
5. FIGURE CDG - BOUNDARY OF MARAPONG TOWN - HIMNC REPRESENT AREA 2 IN EXTENT ± 66,4 HECTARE
6. FIGURE BCNMIJB REPRESENT AREA 3 IN EXTENT ± 83,2 HECTARE
7. FIGURE ABJKLA REPRESENT AREA 4 IN EXTENT ± 60,4 HECTARE
8. AREA 1 IS AFFECTED BY SQUATERS AND FLOODING
9. AREA 2 IS AFFECTED BY A STORMWATER DAM AND FLOODING
10. THE STORMWATER DAM COVERS ± 1,87 HECTARE
11. AREA 3 IS DEVELOPED AS A CONTRACTORS CAMP FOR ESKOM
12. AREA 4 IS ALSO PARTIALLY DEVELOPED AS A CONTRACTORS CAMP AND COAL CONVEYOR BELT
13. THE CONVEYOR BELT COVERS AN AREA OF ± 7,5 HECTARE
14. AREA 1 IS SITUATED IN THE LONG TERM GROWTH DIRECTION OF MARAPONG IN TERMS OF THE LEPHALALE SDF
15. AREAS 3 AND 4 IS DEMARCATED AS EXISITNG DEVELOPMENT IN TERMS OF THE LEPHALALE SDF
16. IN GENERAL IS STUDY AREA IS AFFECTED BY OTHER INFRASTRUCTURE SERVICE - TO BE TAKEN INTO ACOUNT WHEN DETAIL PLANNING START
17. ALL AREAS IS ±



SCALE 1 : 15 000

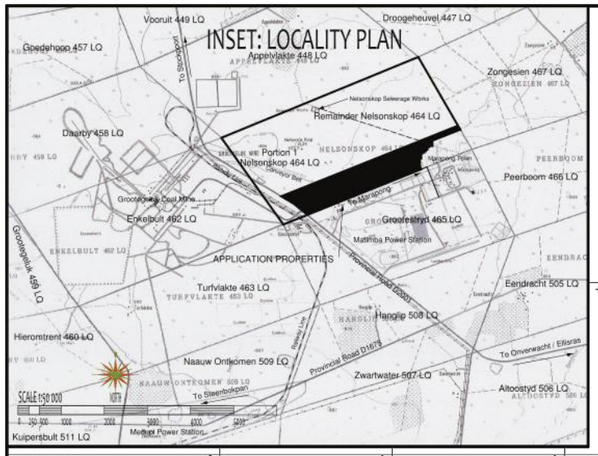
Compiled by Dries de Ridder Town and Regional Planner

DEVELOPMENT PROPOSAL
1. AREA 1 AND 2 TO BE DEVELOPED INTO A LOW DENSITY RESIDENTIAL TOWNSHIP - ERF SIZES AVERAGE ± 300 m²
2. ROAD WIDTHS BETWEEN 12 AND 16 METERS
3. OTHER ZONINGS TO BE INCORPORATED NAMELY PARKS, POLICE STATION, CEMETARY, PRE SCHOOL
4. EXISITNG INFRASTRUCTURE SERVICES TO BE RETAINED TO BE INCORPORATED IN FINAL LAYOUT
5. AREAS 3 AND 4 TO BE ZONED AS SPECIAL FOR HIGH DENSITY RESIDENTIAL DEVELOPMENT IN ACCORDANCE WITH THE NEEDS AND REQUIREMENTS OF EXXARO
6. CONVEYOR BELT TO BE ZONED UNDETERMINED OR OTHER SUITABLE ZONING

ANNEXURE B

MARAPONG EXT. 7 PROPOSED LAYOUT PLAN

PROPOSED TOWNSHIP: MARAPONG EXTENSION 7 SITUATED ON A PORTION OF THE REMAINDER AND A PORTION OF PORTION 1 OF THE FARM NELSONSKOP 464 LQ



SCALE 1:5000

NORTH

GENERAL NOTES
CONTOUR SURVEY DONE BY AZUR
GEOTECHNICAL SURVEY DONE BY GEOTECHNICAL CONSULT SERVICES
COPYRIGHT RESERVED
DATE: 19 OCTOBER 2016
PLAN VERSION: DRAFT 3
DESIGN BY DRIES DE RIDDER
ERVEN NUMBERED 1 TO 744
RESIDENTIAL 1 ERVEN VARIES IN SIZE: 300m² TO 1451m²
AVERAGE SIZE OF RESIDENTIAL 1 ERVEN: 315m²
MINIMUM GRADIENT OF ROADS: 1 TO 180
MAXIMUM GRADIENT OF ROADS: 1 TO 800
EXISTING POWER LINE MUST BE REROUTED AS INDICATED ON THE PLAN
ALL SERVITUDES AS INDICATED TO BE TAKEN UP IN THE GENERAL PLAN

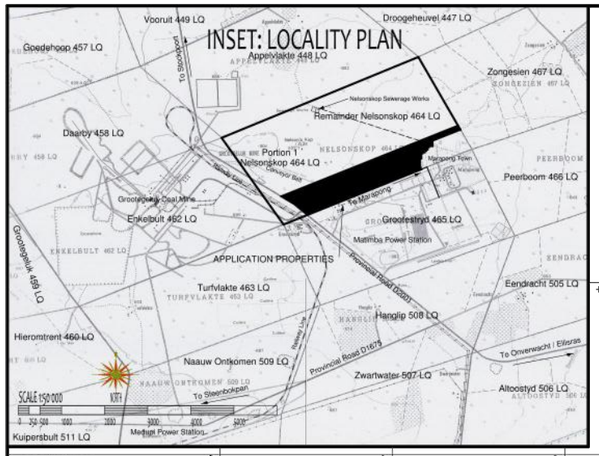
ZONING	NO	REF	AREA	%
RESIDENTIAL 1: Numbered 10-426 and 438-738	718		24.568	11.14
RESIDENTIAL 4: Numbered 2, 4 and 7-9	4		114.3018	51.82
BUSINESS 1: Numbered 3, 429, 430, 432, 433 and 435 to 437	8		13.2518	6.01
PSA: Numbered 431	1		1.0680	0.48
EDUCATIONAL: Numbered 428 and 434	2		2.7244	1.23
SPECIAL: Numbered 5 and 9	2		8.7255	3.96
PUBLIC OPEN SPACE: Numbered 1, 427, 739 to 744	8		16.0101	7.26
CEMETERY: Numbered 6	1		5.0078	2.27
ROADS			34.9126	15.83
TOTAL (see general notes)	744		220.5751	100
TOTAL LENGTH OF ROADS			16.1 KM	
COORDINATE SYSTEM: WGS84				
CONTOUR INTERVALS: 0.5 METER				
SENSITIVE AREAS - TO BE RESPECTED IN DEVELOPMENT	5		16.5	7.52

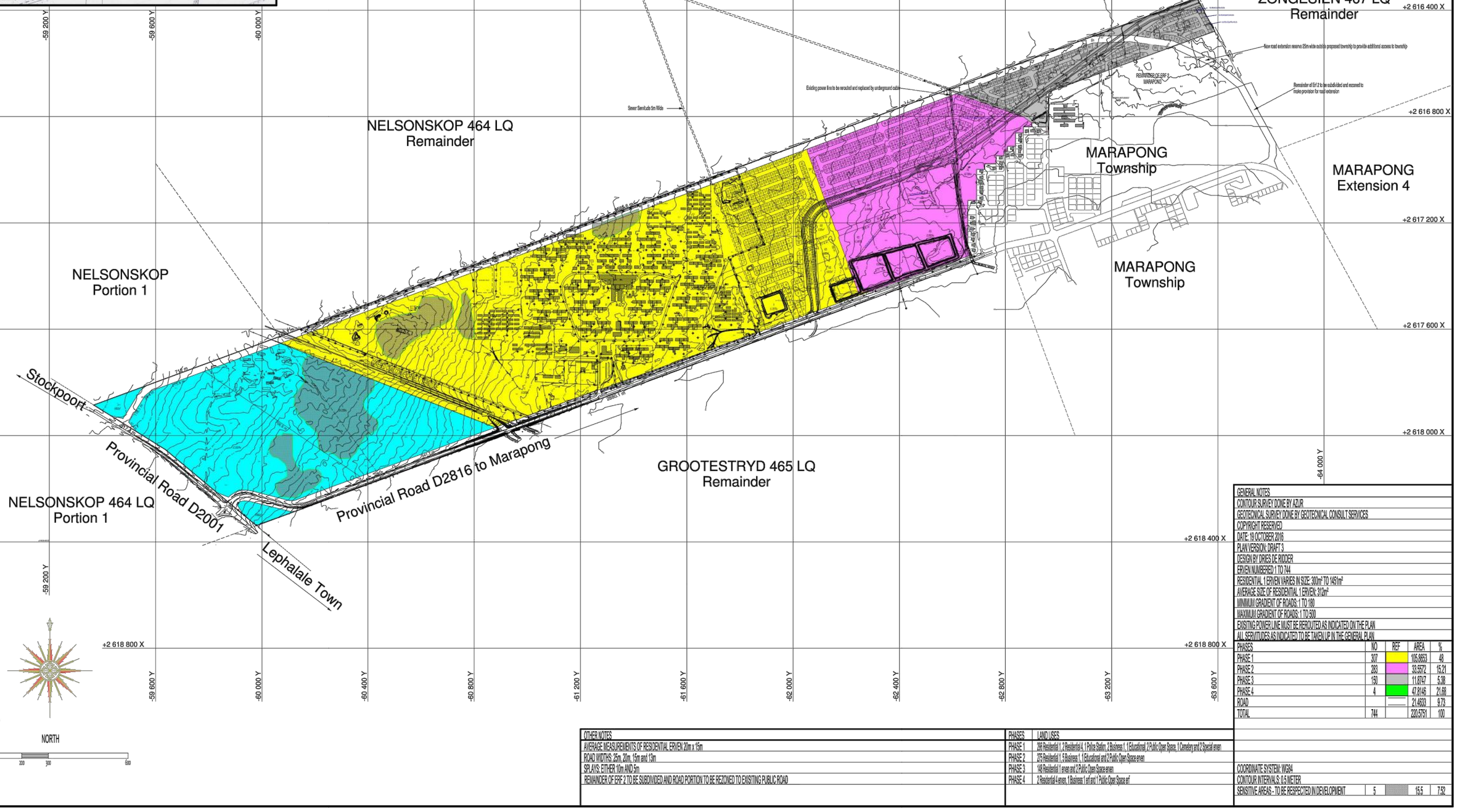
OTHER NOTES
AVERAGE MEASUREMENTS OF RESIDENTIAL ERVEN 20m x 15m
ROAD WIDTHS: 25m, 20m, 15m and 13m
SPLAYS: EITHER 10m AND 5m
REMAINDER OF ERF 2 TO BE SUBDIVIDED AND ROAD PORTION TO BE REZONED TO EXISTING PUBLIC ROAD

ANNEXURE C

PROPOSED PHASING PLAN FOR MARAPONG HOUSING EXTENSION

PROPOSED PHASING: MARAPONG EXTENSION 7 SITUATED ON A PORTION OF THE REMAINDER AND PORTION 1 OF THE FARM NELSONSKOP 464 LQ





SCALE 1:5000

NORTH

GENERAL NOTES
CONTOUR SURVEY DONE BY AZUR
GEOTECHNICAL SURVEY DONE BY GEOTECHNICAL CONSULT SERVICES
COPYRIGHT RESERVED
DATE: 19 OCTOBER 2016
PLAN VERSION: DRAFT 3
DESIGN BY: DRIES DE RIDDER
ERVEN NUMBERED 1 TO 744
RESIDENTIAL 1 ERVEN VARIES IN SIZE: 300m² TO 1451m²
AVERAGE SIZE OF RESIDENTIAL 1 ERVEN: 312m²
MINIMUM GRADIENT OF ROADS: 1 TO 180
MAXIMUM GRADIENT OF ROADS: 1 TO 500
EXISTING POWER LINE MUST BE REROUTED AS INDICATED ON THE PLAN
ALL SERVITUDES AS INDICATED TO BE TAKEN UP IN THE GENERAL PLAN

PHASES	NO	REF	AREA	%
PHASE 1	307		105.6653	48
PHASE 2	283		33.5572	15.21
PHASE 3	150		11.8747	5.38
PHASE 4	4		47.8146	21.68
ROAD			21.4833	9.73
TOTAL	744		220.5791	100

COORDINATE SYSTEM: WGS84
CONTOUR INTERVALS: 0.5 METER

SENSITIVE AREAS - TO BE RESPECTED IN DEVELOPMENT	5		16.5	7.52

OTHER NOTES
AVERAGE MEASUREMENTS OF RESIDENTIAL ERVEN 20m x 15m
ROAD WIDTHS: 25m, 20m, 15m and 13m
SPLAYS: EITHER 10m AND 5m
REMAINDER OF ERF 2 TO BE SUBDIVIDED AND ROAD PORTION TO BE REZONED TO EXISTING PUBLIC ROAD

PHASES	LAND USES
PHASE 1	298 Residential 1, 2 Residential 4, 1 Police Station, 2 Business 1, 1 Educational, 2 Public Open Space, 1 Cemetery and 2 Special erven
PHASE 2	275 Residential 1, 5 Business 1, 1 Educational and 2 Public Open Space erven
PHASE 3	148 Residential 1 erven and 2 Public Open Space erven
PHASE 4	2 Residential 4 erven, 1 Business 1 erf and 1 Public Open Space erf

ANNEXURE D

PRELIMINARY INTERNAL WATER RETICULATION LAYOUTS

ervitude 5m Wide

160# uPVC Cl.12
90# uPVC Cl.12
200# uPVC Cl.12
400# uPVC Cl.12
110# uPVC Cl.12
55m WIDE STORMWATER CHANNEL
103.6 m
MINI-SUB
EB
EB'S

PROPOSED WATER LAYOUT PLAN
SCALE : NTS

NOTES:

1.

LEGEND

- PROPOSED WATER RETICULATION
- PROPOSED BULK PUMPING MAIN
- WATER END CAP
- 110# uPVC Cl.12 — PIPE SIZE AND MATERIAL

REVISIONS

LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA

FUNDER:

CLIENT

exxaro POWERING POSSIBILITY

GROOTEGELUK MINE
LEPHALALE

CONSULTANT

TEP
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14 JACARANDA STR. HERNNOPSPARK
CENTURION
0157

Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
PROPOSED WATER LAYOUT PLAN
SHEET 1 OF 2

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.
TEP1601-WAT-LAY-02

Revision
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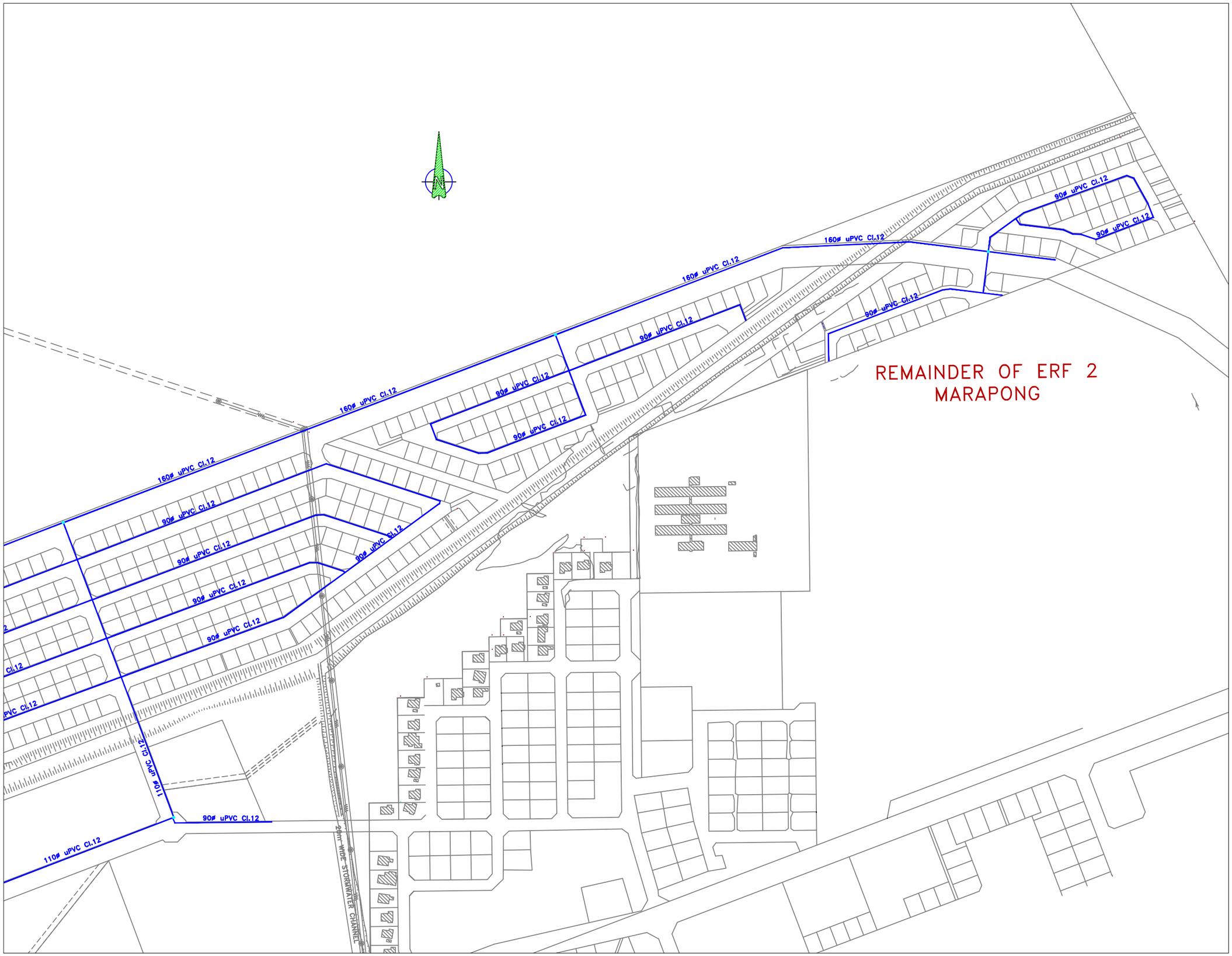

PROPOSED WATER LAYOUT PLAN
SCALE : NTS

NOTES:

1.

LEGEND

- PROPOSED WATER RETICULATION
- PROPOSED BULK PUMPING MAIN
- WATER END CAP
- 110ø uPVC Cl.12 — PIPE SIZE AND MATERIAL

REVISIONS

LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY
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FUNDER:

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0157

Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
PROPOSED WATER LAYOUT PLAN
SHEET 2 OF 2

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.
TEP1601-WAT-LAY-03

Revision
A

ANNEXURE E

PRELIMINARY INTERNAL SEWER RETICULATION LAYOUTS

PROPOSED SEWER LAYOUT PLAN
SCALE: NTS

NOTES:

1.All dimensions are in mm.

LEGEND

PROPOSED INTERNAL SEWER
PROPOSED BULK SEWER
PROPOSED SEWER MANHOLE

REVISIONS				
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY

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LEPHALALE

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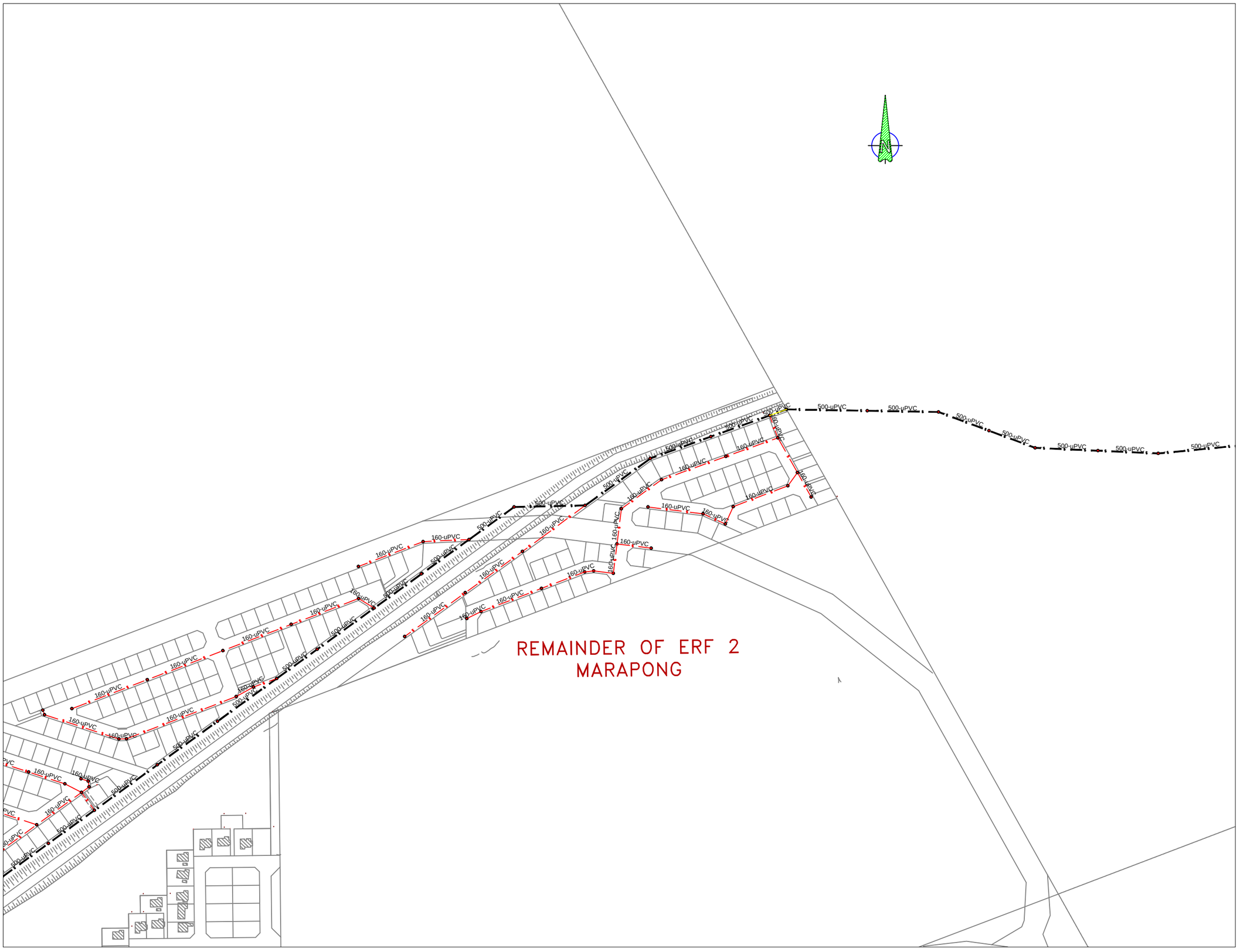
Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
PROPOSED SEWER LAYOUT PLAN FOR MARAPONG EXT 7 - SHEET 1 OF 3

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.	Revision
TEP1601-SEW-LAY-01	A



PROPOSED WATER LAYOUT PLAN-TOWNSHIP 2
SCALE 1:1 000

NOTES:

1.All dimensions are in mm.

LEGEND

PROPOSED INTERNAL SEWER
PROPOSED BULK SEWER
PROPOSED SEWER MANHOLE

REVISIONS				
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY

FUNDER:

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POWERING POSSIBILITY

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LEPHALALE

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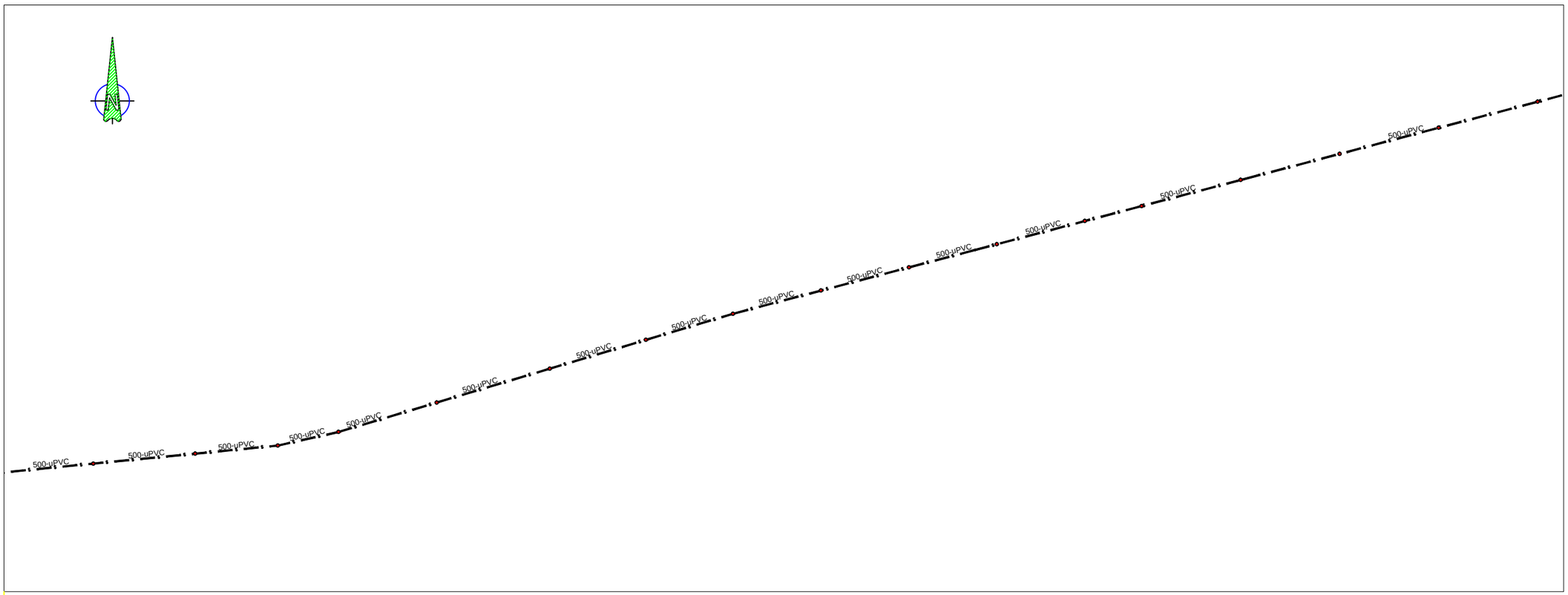
Discipline
CIVIL ENGINEERING

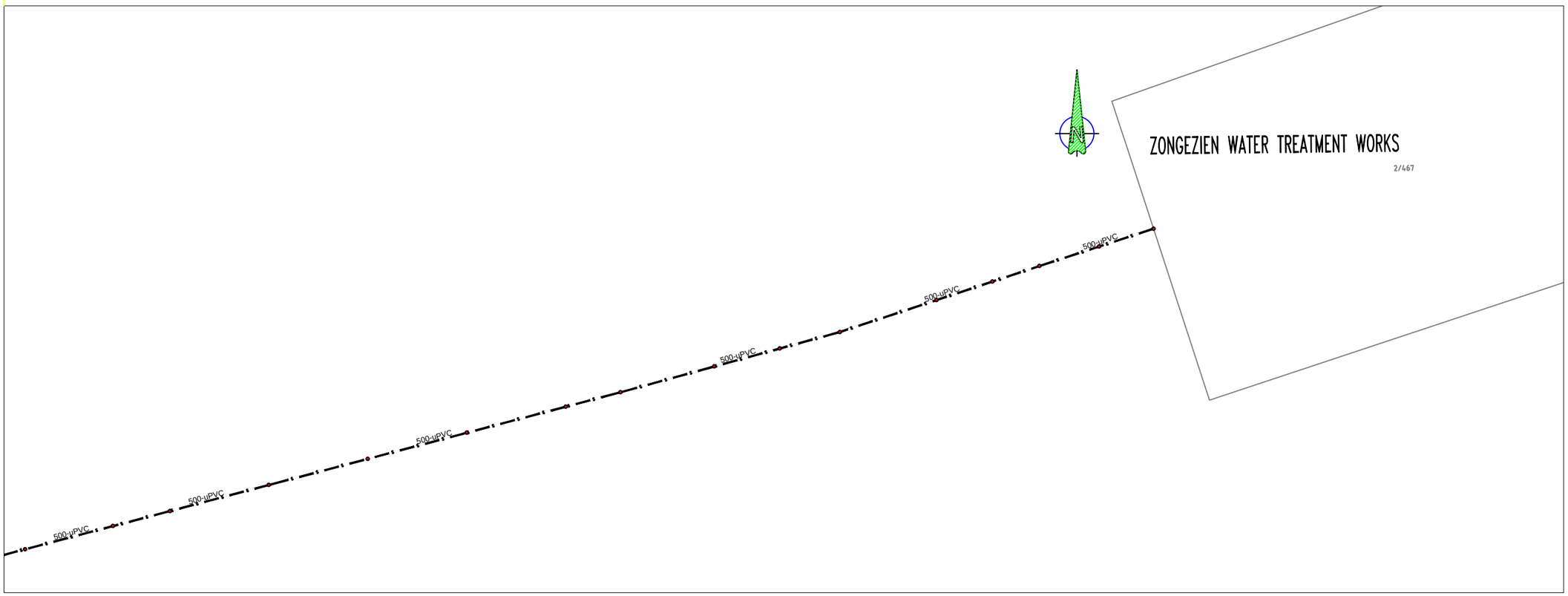
Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
PROPOSED SEWER LAYOUT PLAN FOR MARAPONG EXT 7 - SHEET 2 OF 3

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.	Revision
TEP1601-SEW-LAY-02	A





PROPOSED WATER LAYOUT PLAN-TOWNSHIP 2
SCALE 1:1 000

NOTES:

1.All dimensions are in mm.

LEGEND

PROPOSED INTERNAL SEWER
PROPOSED BULK SEWER
PROPOSED SEWER MANHOLE

REVISIONS				
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
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FUNDER:

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GROOTEGELUK MINE
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Discipline
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Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

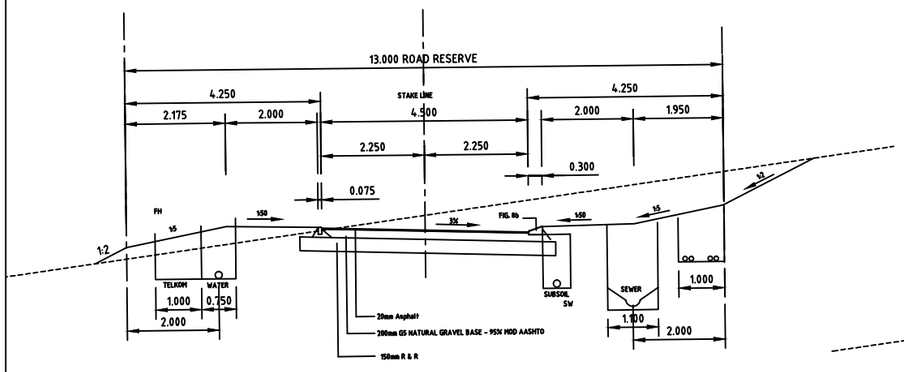
Description
PROPOSED SEWER LAYOUT PLAN FOR MARAPONG EXT 7 - SHEET 3 OF 3

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.	Revision
TEP1601-SEW-LAY-03	A

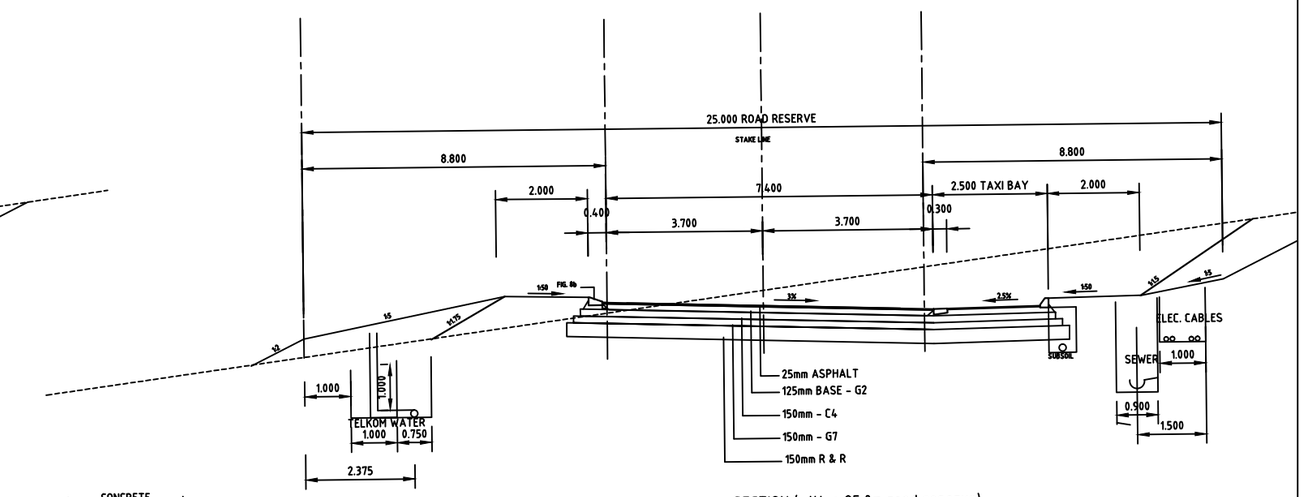
ANNEXURE F

TYPICAL INTERNAL ROAD CROSS SECTIONS

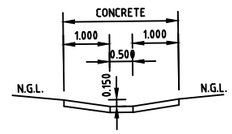


TYPICAL SECTION 13.0m road reserve

SCALE 1:100



SECTION (with a 25.0m road reserve).

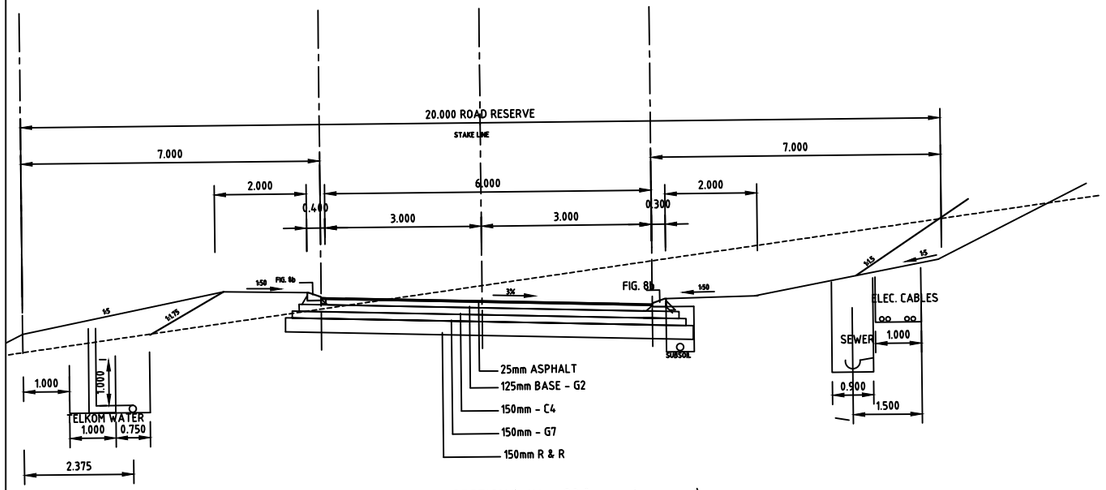


CHANNEL-SECTION DETAIL - SERVITUDES

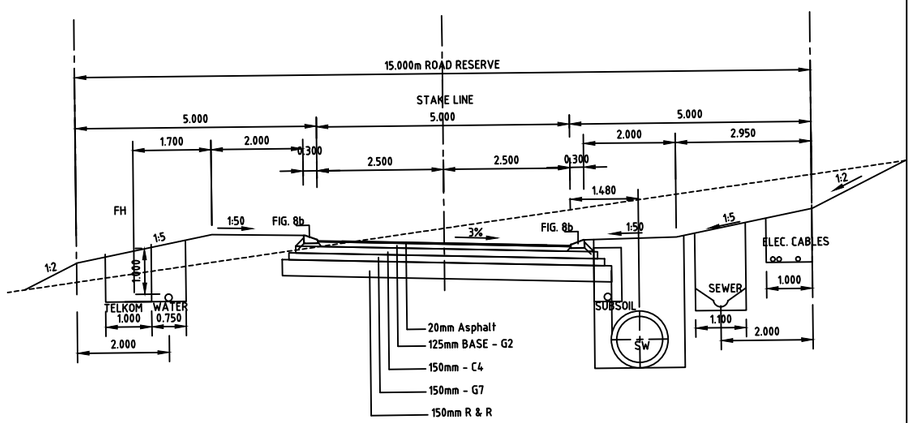
SCALE 1:100

TYPICAL CROSS-SECTION DETAIL

SCALE 1:100



SECTION (with a 20.0m road reserve).



TYPICAL SECTION 15.0m road reserve

TYPICAL CROSS-SECTION DETAIL

SCALE 1:100

NOTES:

1.All dimensions are in mm.

REVISIONS

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FUNDER:

CLIENT

exxaro GROOTEGELUK MINE

LEPHALALE

POWERING POSSIBILITY

CONSULTANT

TEP

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UNIT 1 DIRK SMIT INDUSTRIAL PARK
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CENTURION
0157

Discipline

CIVIL ENGINEERING

Project

PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description

TYPICAL ROAD CROSS SECTIONS
SHEET 1 OF 1

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.

TEP1601-RDS-DET-01

Revision

A

ANNEXURE G

ROADS LAYOUT

PROPOSED ROAD LAYOUT PLAN
SCALE : NTS

NOTES:

1.All dimensions are in mm.

LEGEND

Proposed Stormwater Cut-off Trapezoidal unlined drain

Proposed Stormwater Channel Trapezoidal drain

REVISIONS				
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY

FUNDER:

CLIENT

exxaro
POWERING POSSIBILITY

GROOTEGELUK MINE
LEPHALALE

CONSULTANT

TSWELLA ENGINEERING PROJECTS (PTY) LTD

UNIT 1 DIRK SMIT INDUSTRIAL PARK
14 JACARANDA STR, HERNNOPSPARK
CENTURION
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Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
PROPOSED ROAD LAYOUT PLAN
SHEET 1 OF 2

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
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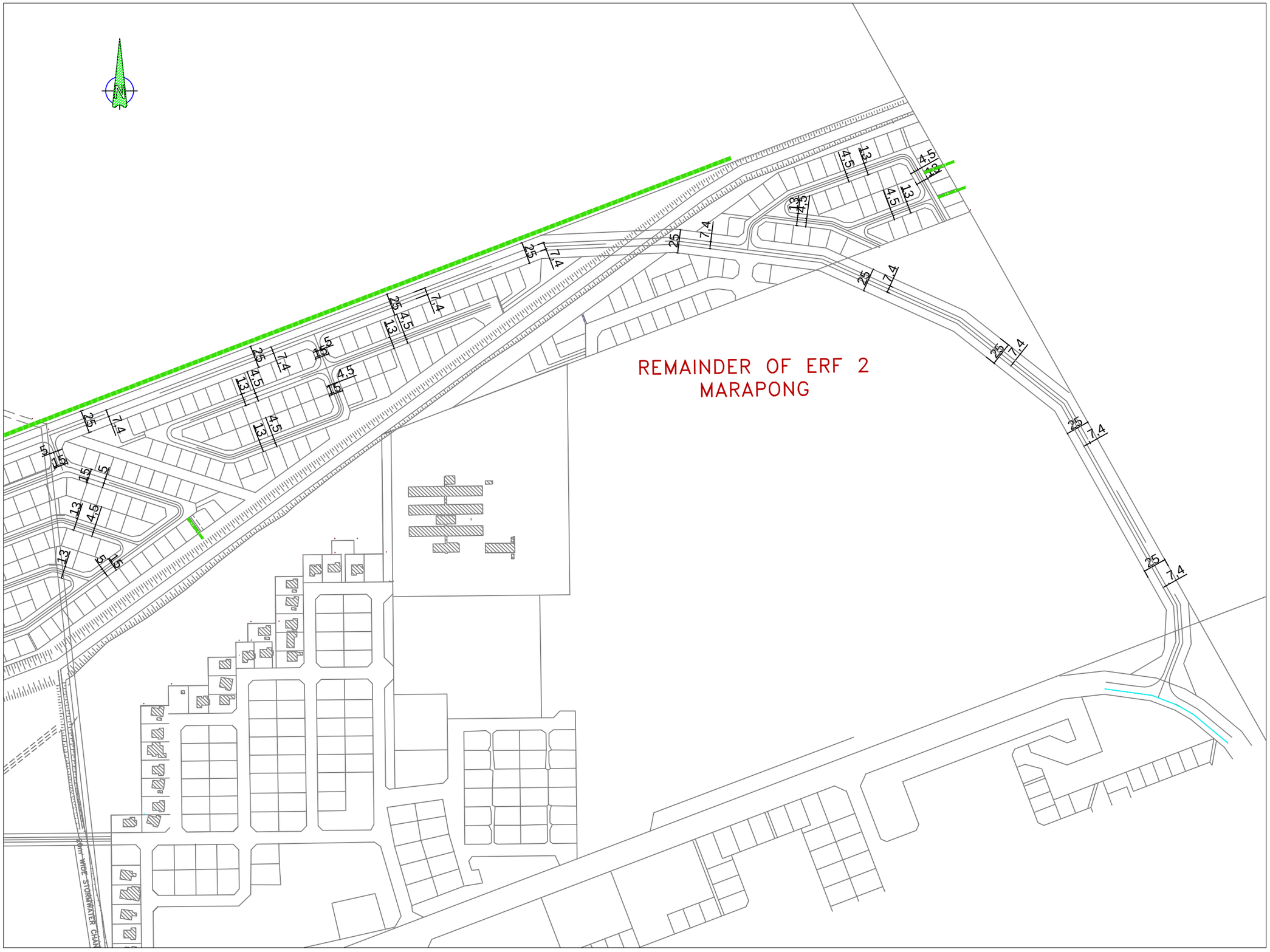
DWG No.	Revision
TEP1601-RDS-LAY-01	A



PROPOSED ROAD LAYOUT PLAN
SCALE : NTS

NOTES:

1.All dimensions are in mm.

LEGEND

Proposed Stormwater Cut-
Trapezoidal unlined drain

Proposed Stormwater Chan
Trapezoidal drain

REVISIONS				
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY

FUNDER:

CLIENT

exxaro
POWERING POSSIBILITY

GROOTEGELUK MINE
LEPHALALE

CONSULTANT

TEP
TSWELLA ENGINEERING PROJECTS (PTY) LTD

UNIT 1 DIRK SMIT INDUSTRIAL PARK
14 JACARANDA STR, HERNNOPSPARK
CENTURION
0157

Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

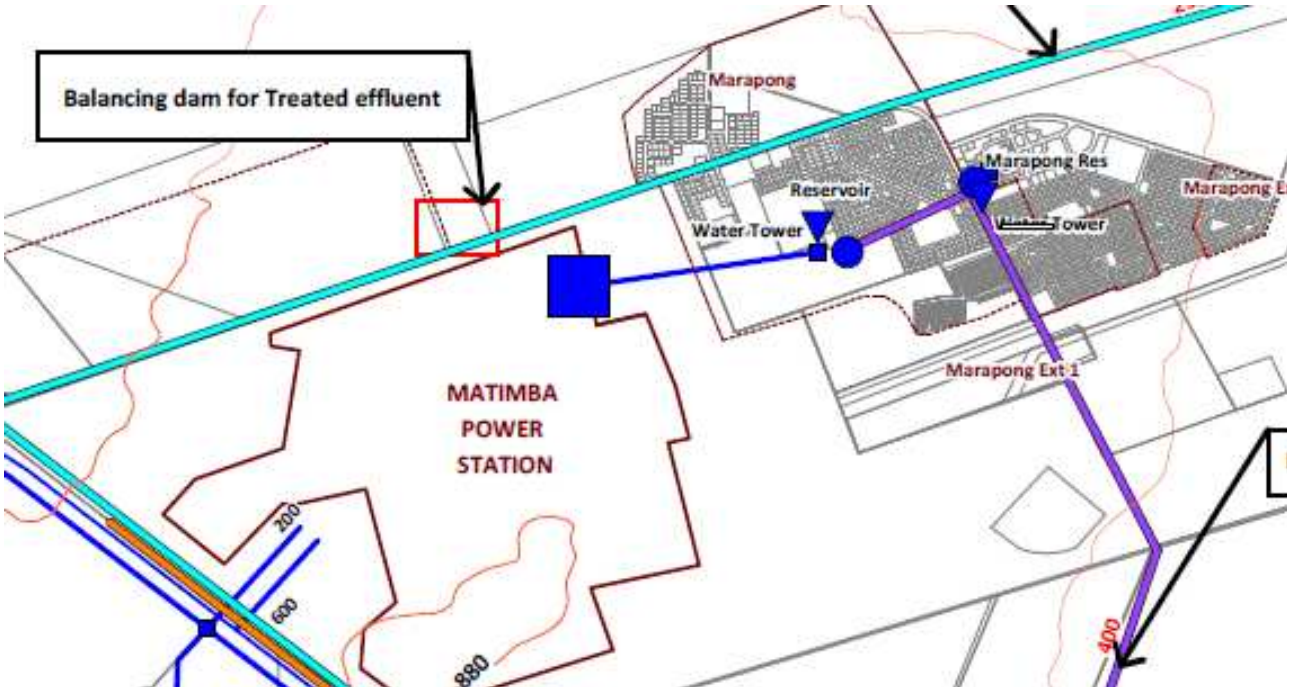
Description
PROPOSED ROAD LAYOUT PLAN
SHEET 2 OF 2

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.	Revision
TEP1601-RDS-LAY-02	A

ANNEXURE H

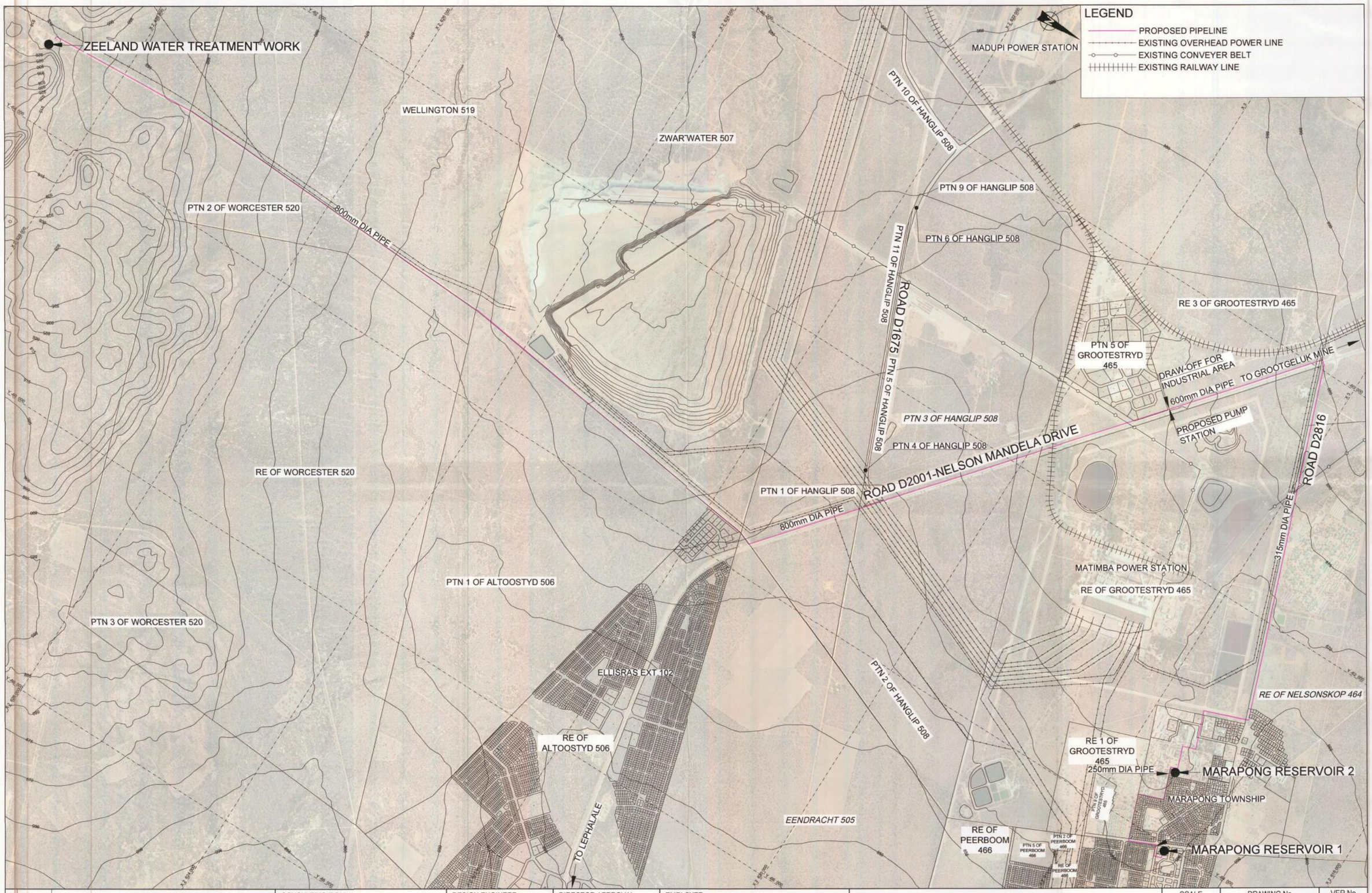
SCHEMATIC LAYOUT OF EXISTING BULK WATER SUPPLY FOR MARAPONG TOWNSHIP



Existing Bulk Water Infrastructure for Marapong

ANNEXURE I

PROPOSED BULK WATER SUPPLY PIPELINE TO MARAPONG



No.	DATE	AMENDMENTS
V1	03-08-2016	PRELIMINARY DESIGN FOR COMMENTS

CONSULTING FIRM:
NEMORANGO CONSULTING ENGINEERS
NEMORANGO
POLOKWANE, LIMPOPO
10A HANS VAN RENSBURG STREET,
POLOKWANE, 0699
TEL: 27 15 295 3023 FAX: +27 15 295 2024

DESIGN ENGINEER:
NAME: LEON HUGO
Pr No: 980413
SIGNATURE:
DATE:

DIRECTOR APPROVAL:
NAME: T RAPHALALANI
SIGNATURE:
DATE:

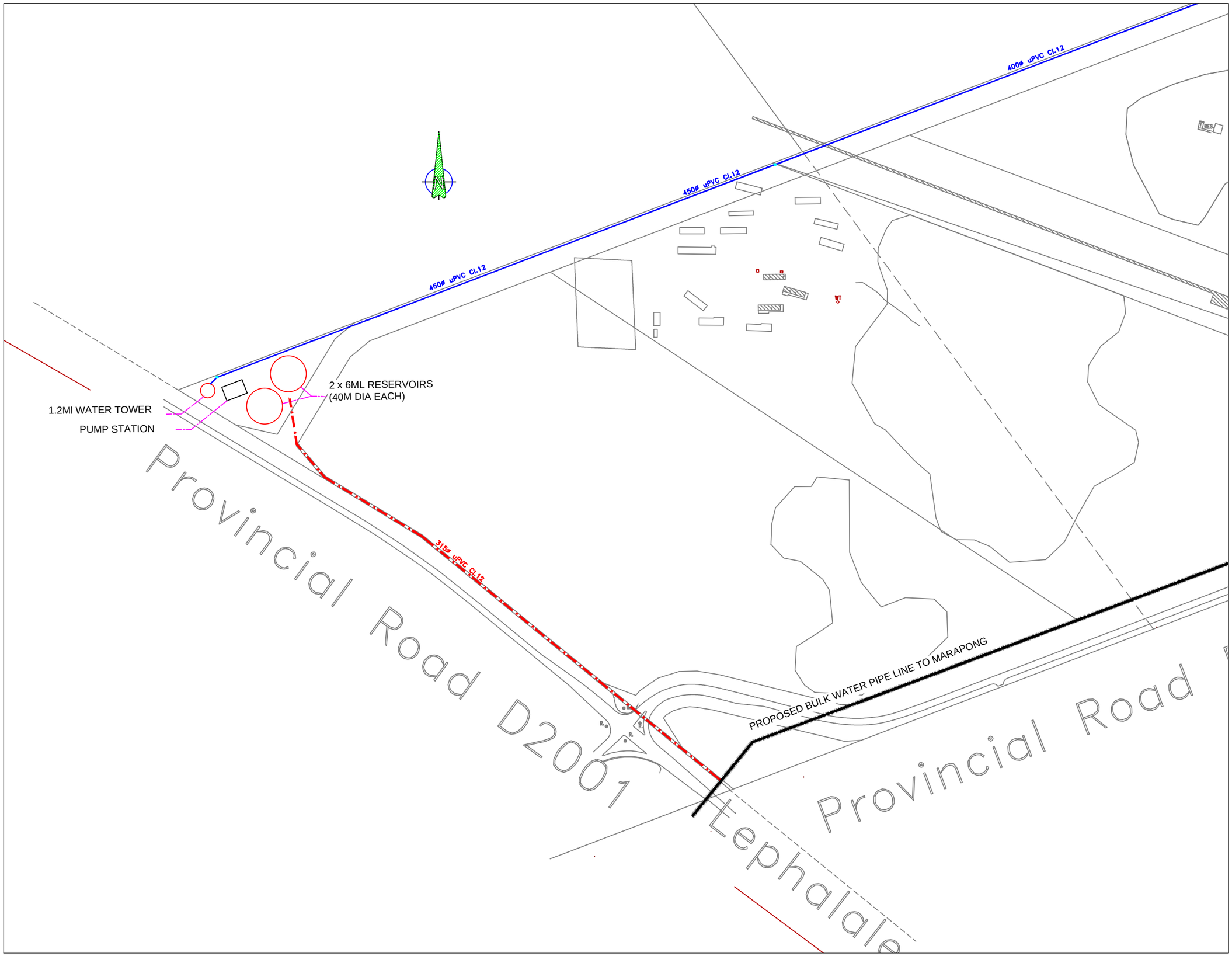
EMPLOYER:
LEPHALALE LOCAL MUNICIPALITY
CIVIL CENTRE
JOE SLOVO AVENUE
LEPHALALE 0555
TEL: (014) 762 1474 FAX: (011) 762 1510

MARAPONG BULK WATER SUPPLY PIPELINES
KEY PLAN
ALTERNATIVE 5

SCALE	DRAWING No	VER No
1:10 000 ON A0	0343-07K05	V1
		SHEET 1 OF 1

ANNEXURE J

PROPOSED BULK WATER INFRASTRUCTURE FOR MARAPONG EXT 7



PROPOSED BULK WATER INFRASTRUCTURE
SCALE : NTS

NOTES:

1.

LEGEND

- PROPOSED WATER RETICULATION
- PROPOSED BULK PUMPING MAIN
- WATER END CAP
- 110ø uPVC Cl.12 — PIPE SIZE AND MATERIAL

REVISIONS

A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA
LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY

FUNDER:

CLIENT

exxaro
POWERING POSSIBILITY

GROOTEGELUK MINE
LEPHALALE

CONSULTANT

TEP
TSWELLA ENGINEERING PROJECTS (PTY) LTD

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CENTURION
0157

Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

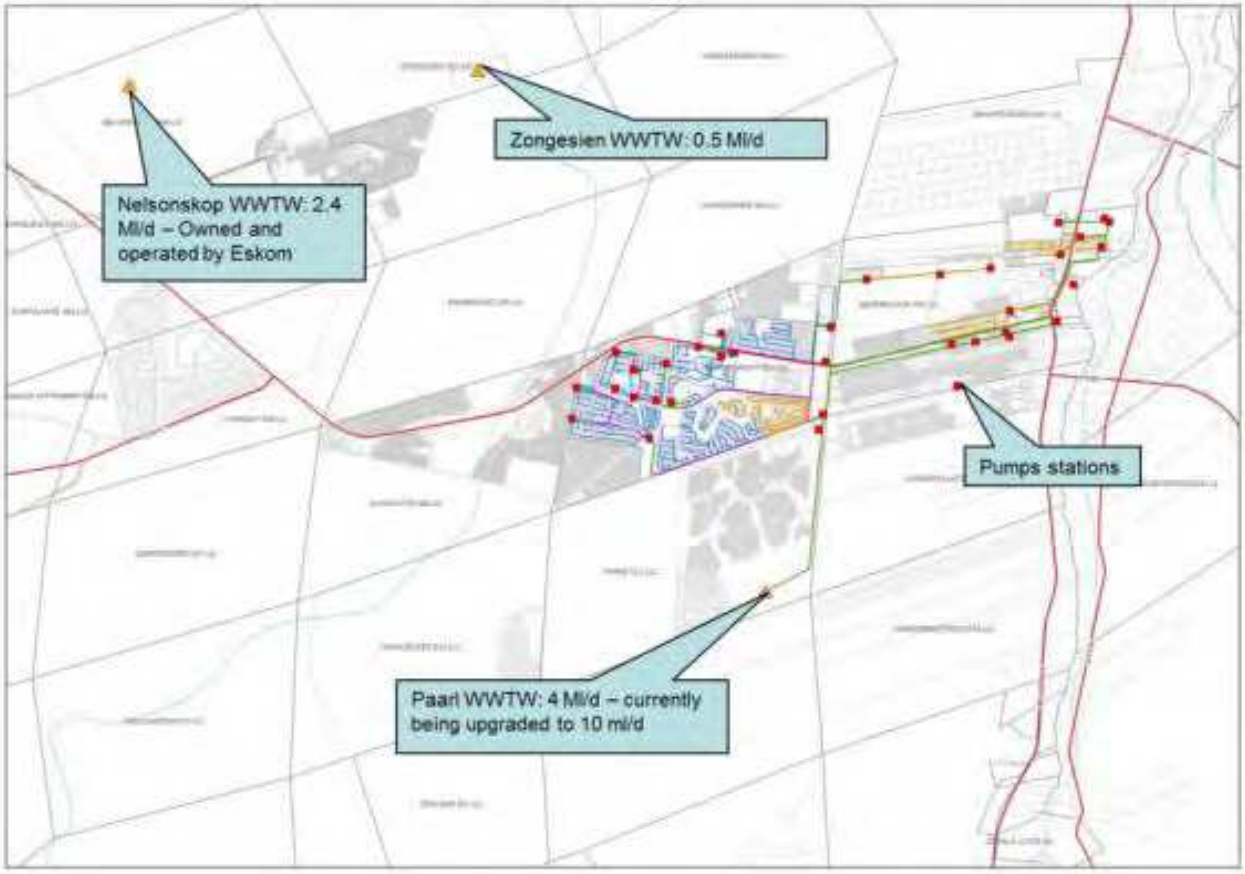
Description
PROPOSED BULK WATER INFRASTRUCTURE
SHEET 1 OF 1

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No.	Revision
TEP1601-WAT-LAY-01	A

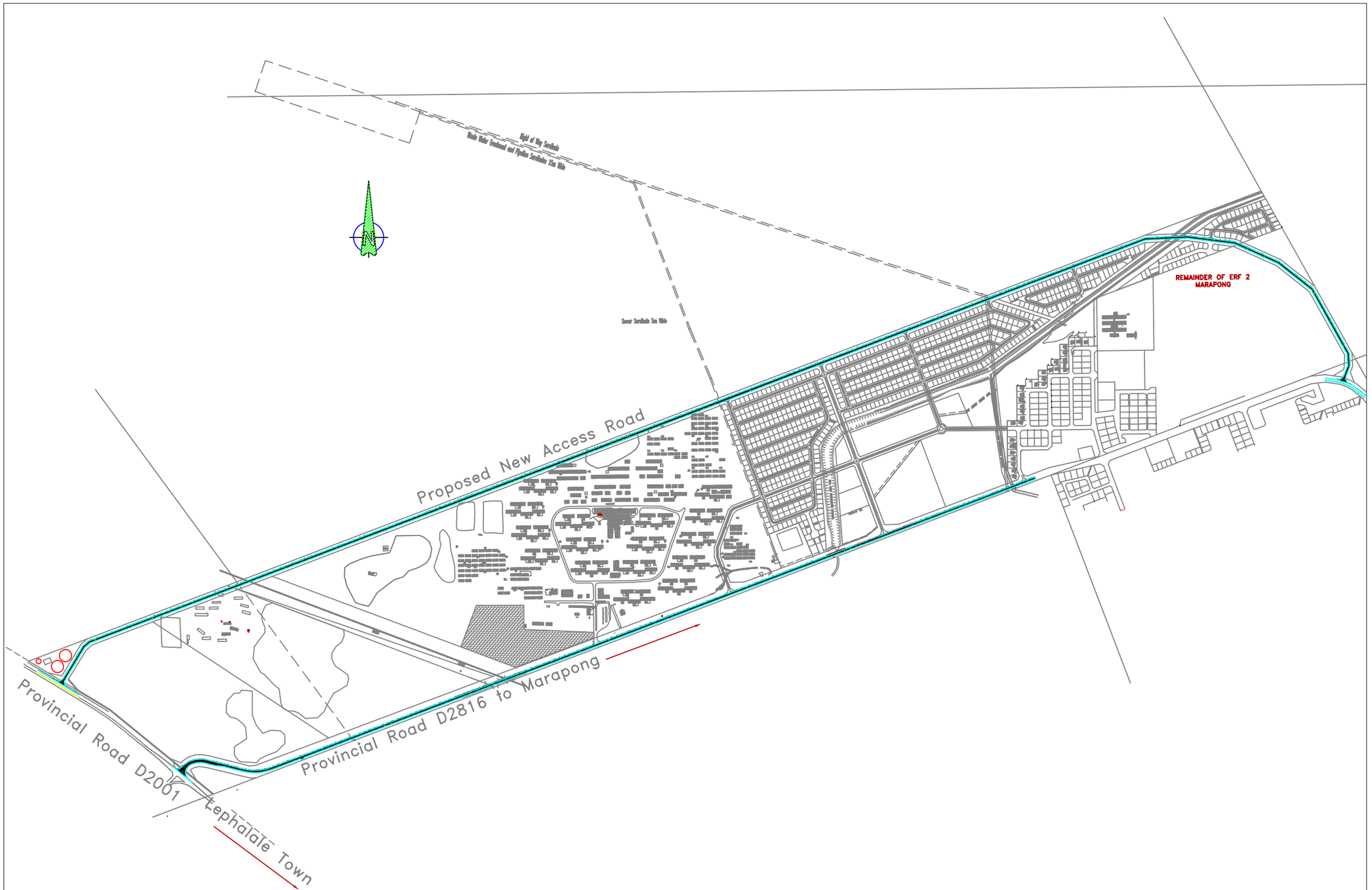
ANNEXURE K

EXISTING BULK SEWER INFRASTRUCTURE SCHEMATIC LAYOUT


Zongesien WWTW: 0.5 Ml/d
Nelsonskop WWTW: 2.4 Ml/d – Owned and operated by Eskom
Pumps stations
Paarl WWTW: 4 Ml/d – currently being upgraded to 10 ml/d

ANNEXURE L

EXISTING AND FUTURE ROAD ACCESSES TO MARAPONG EXT 7



EXISTING AND PROPOSED ACCESS ROADS
SCALE : NTS

NOTES:

1.All dimensions are in mm.

REVISIONS

LTTR	DATE	AMMENDMENT DESCRIPTION	DRAWN BY	CHECKED BY
A	18 -NOV -16	ISSUED FOR TOWNSHIP APPROVAL	P.T.N. MARUNGA	A. MARUNGA

FUNDER:

CLIENT

exxaro
POWERING POSSIBILITY

GROOTEGELUK MINE
LEPHALALE

CONSULTANT

TEP
TSWELLA ENGINEERING PROJECTS (PTY) LTD

UNIT 1 DIRK SMIT INDUSTRIAL PARK
14 JACARANDA STR, HERNNOPSPARK
CENTURION
0157

Discipline
CIVIL ENGINEERING

Project
PROPOSED NELSONSKOP HOUSING DEVELOPMENT

Description
EXISTING AND PROPOSED ACCESS ROADS
SHEET 1 OF 1

Date	18 - NOV - 16	Designed	A.M.
Def No.	TEP/2016	Drawn	P.T.N. M
Scale	AS SHOWN	Checked	A. MARUNGA

DWG No. TEP1601-RDS-LAY-03

Revision A

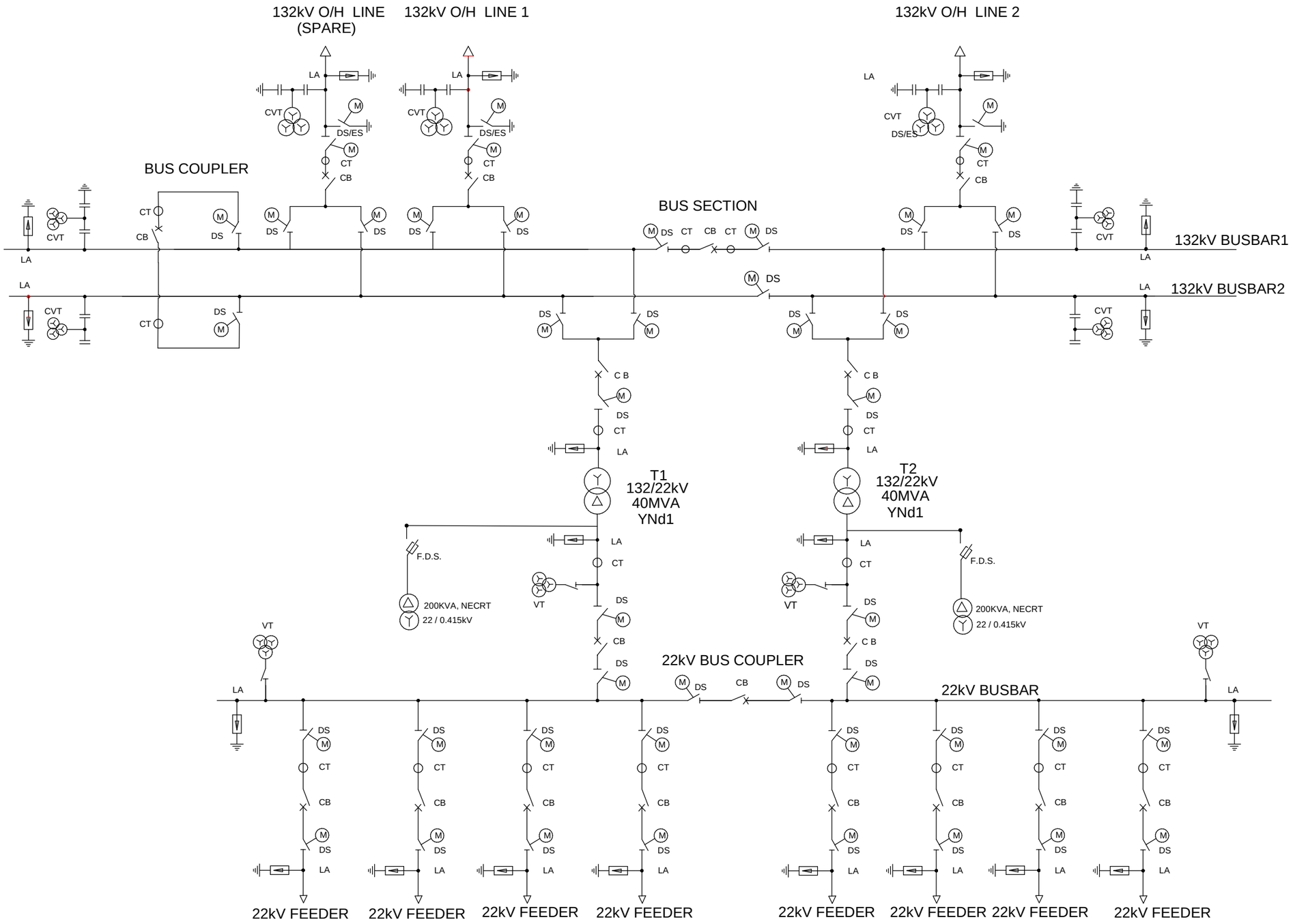
ANNEXURE M

EXISTING NATURAL STORMWATER CHANNELS


MARAPONG EXT 7
Mosehla St
Mosehla St
Marapong
Image © 2016 CNES / Astrium
© 2016 Google
© 2016 AfriGIS (Pty) Ltd.
Google earth

ANNEXURE N

CONCEPTUAL 132/22kV SUBSTATION LAYOUTS



LEGEND

CB - CIRCUIT BREAKER

CT - CURRENT TRANSFORMER

CVT - CAPACITIVE VOLTAGE TRANSFORMER

DS - DISCONNECTING SWICTH

LA - LIGHTNING ARRESTER

ES - EARTH SWITCH

T - TRANSFORMER

(M) - MOTORISED

NOTES

SPARE BAYS HAVE BEEN PROVIDED FOR FUTURE USE:
ONLY SPACES WILL BE INCLUDED IN THIS PROJECT.

Rev	Revision	Approved	Date

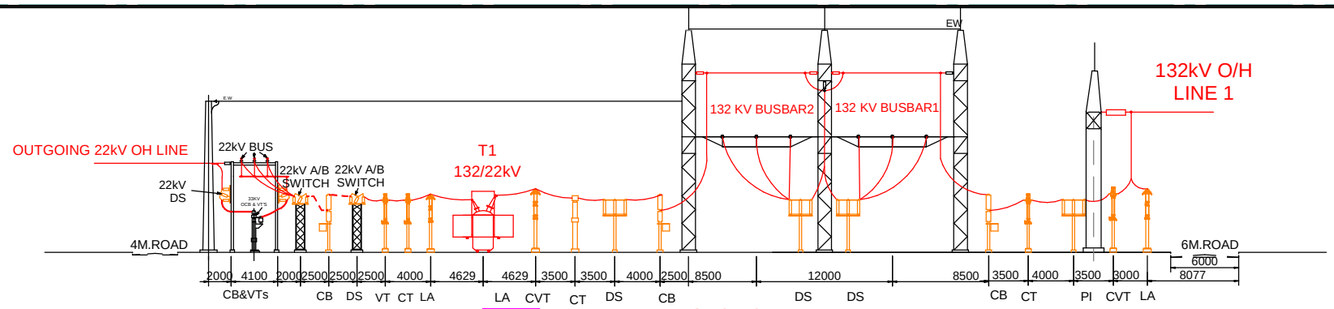
CLIENT:

CONSULTANT:

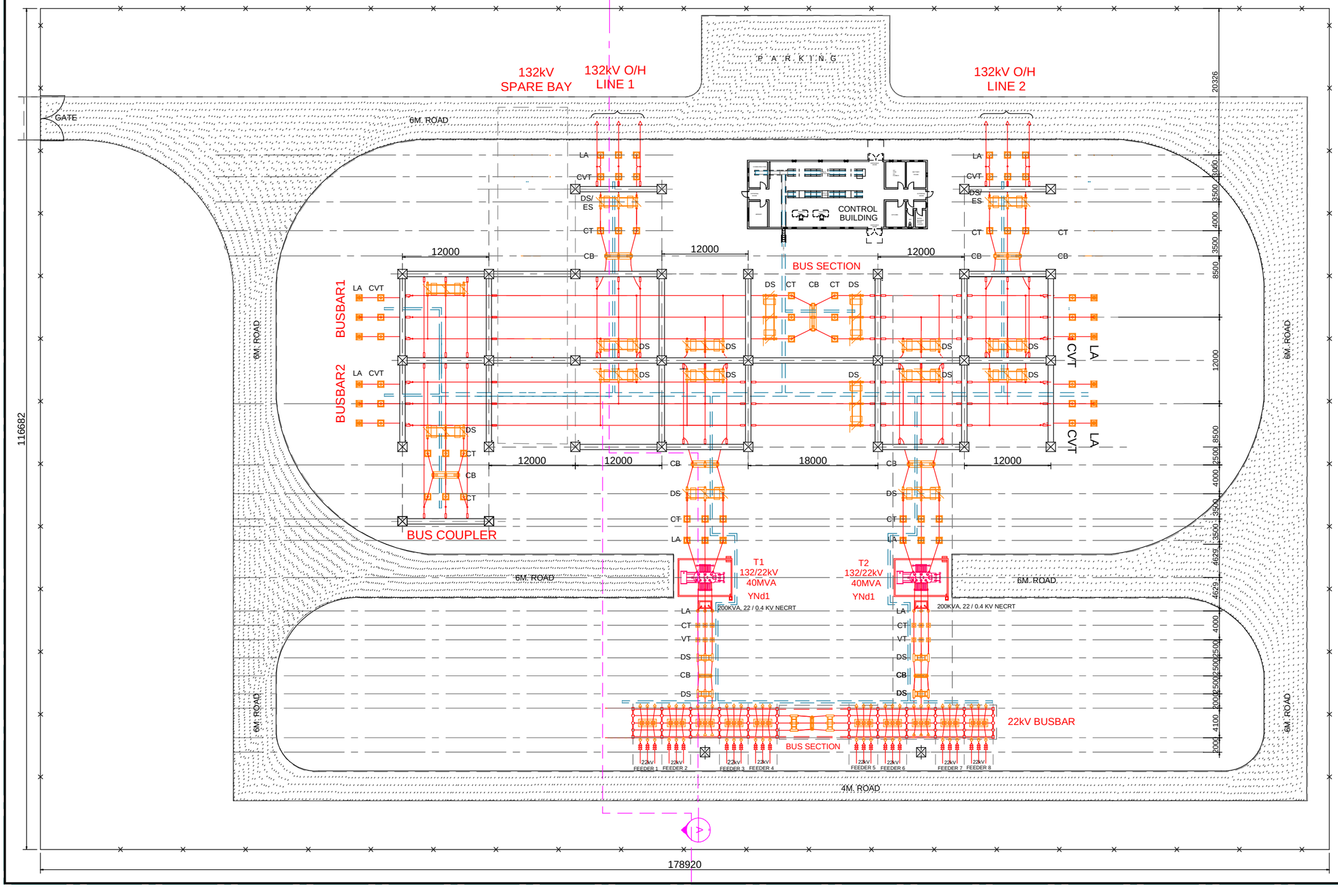
Project: EXXARO HOUSING DEVELOPMENT
ESTABLISHMENT OF 132 / 22 KV SUBSTATION

Title: BASIC SINGLE LINE DIAGRAM

Drawn:	Date:
Designed:	Date:
Checked:	Date:
Approved:	Date:
Drawing No.	Revision.
Drawing Scale:	Sheet Size. A1
Drawing Status:	



SECTION A - A



LEGEND

- CB - CIRCUIT BREAKER
- CT - CURRENT TRANSFORMER
- CVT - CAPACITIVE VOLTAGE TRANSFORMER
- DS - DISCONNECTING SWICTH
- ES - EARTH SWITCH
- LA - LIGHTNING ARRESTER
- T - TRANSFORMER
- CABLE TRENCH
- SPARE BAY

NOTES

SPARE BAYS HAVE BEEN PROVIDED FOR FUTURE USE:
ONLY SPACES WILL BE INCLUDED IN THIS PROJECT.

Rev	Revision	Approved	Date

CLIENT:

CONSULTANT:

Project:
EXXARO HOUSING DEVELOPMENT
ESTABLISHMENT OF 132 / 22 KV SUBSTATION

Title:
BASIC SUBSTATION GENERAL ARRANGEMENT

Drawn:	Date:
Designed:	Date:
Checked:	Date:
Approved:	Date:
Drawing No.	Revision.
Drawing Scale:	Sheet Size. A1
Drawing Status:	

ANNEXURE O

CIVIL ENGINEERING SERVICES BILL OF QUANTITIES

MARAPONG EXT 7 INTERNAL AND BULK COST ESTIMATES

Item Description	Unit	QTY	Rate	Amount
Water Reticulation				
90mm dia uPVC Class 12 Z-lock	m	6900	R 649.82	R 4 483 736.39
110mm dia uPVC Class 12 Z-lock	m	1140	R 706.32	R 805 207.86
160Ø Class 12 uPVC Z-lock	m	1710	R 902.68	R 1 543 577.05
200Ø Class 12 uPVC Z-lock	m	670	R 1 163.78	R 779 734.79
400mm dia uPVC Class 12 Z-lock	m	1770	R 3 956.86	R 7 003 647.74
450Ø Class 12 uPVC Z-lock	m	1160	R 4 510.82	R 5 232 555.80
Erf connections	no.	718	R 931.03	R 668 477.11
				R 20 516 936.75
Internal Sewer				
160 mm dia uPVC class 34 sewer pipe	m	1948	R 1 164.62	R 2 268 682.95
200 mm dia uPVC class 34 sewer pipe	m	311	R 1 343.15	R 417 719.43
250Ø uPVC class 34 sewer pipe	m	410	R 1 674.74	R 686 645.37
Erf connections	no	718	R 1 488.44	R 1 068 703.18
				R 4 441 750.94
Bulk Water Mains				
315mm dia uPVC Class 12 Z-lock	m	658	R 2 583.60	R 1 700 008.06
				R 1 700 008.06
Bulk Sewer				
400 mm dia uPVC class 34 sewer pipe	m	606	R 4 566.71	R 2 767 424.82
500 mm dia uPVC class 34 sewer pipe	m	4014	R 6 530.39	R 26 212 993.13
				R 28 980 417.95
Reservoirs				
Reservoirs	Ml	12	R 1 300 000.00	R 15 600 000.00
Water Tower	Ml	1.2	R 2 500 000.00	R 3 000 000.00
Pump Station	Sum	1.0	R 5 500 000.00	R 5 500 000.00
				R 24 100 000.00
Internal Roads				
13m road reserves	m	3650	R 2 295.39	R 8 378 156.00
15m road reserves	m	3374	R 3 858.77	R 13 019 473.78
20m road reserves (6m carriageway)	m	634	R 4 914.66	R 3 115 891.97
25m road reserve (7.4m carriageway)	m	4895	R 8 190.90	R 40 094 467.70
25m road reserve (6.0m carriageway)	m	587	R 4 914.66	R 2 884 903.13
				R 67 492 892.58
Internal Stormwater				
V-drain 2.5m wide,0.15 deep	m	200	R 1 274.10	R 254 819.76
Stormwater Cut-off trench	m	4000	R 783.84	R 3 135 360.00
				R 3 390 179.76
Cable Ducts				
uPVC pipe 1*110mm dia Telkom	m	550	R 506.33	R 278 480.65
uPVC pipe 1*110mm dia Eskom	m	550	R 506.33	R 278 480.65
				R 556 961.30
			TOTAL	**R 151 179 147.34**

ANNEXURE P

ELECTRICAL ENGINEERING SERVICES BILL OF QUANTITIES

Marapong Ext 7 Development Electrical BoQ

ID	Item Decsription	Quantity	Unit	Rate	Total
1	**132kV Infrastructure**				
a	132/22kV Substation with 2x40MVA 132/22kV transformers, 2x132kV feeder bays, 6x22kV feeders, control room etc	1	Sum	R 45 000 000.00	R 45 000 000.00
b	2x132kV feeder bays at Groootgeluk and Matimba Substations	2	No	R 1 000 000.00	R 2 000 000.00
c	132kV overhead lines	8	**km**	R 2 000 000.00	R 16 000 000.00
2	**22kV Infrastructure**				
a	22kV Overhead lines	60	**km**	R 300 000.00	R 18 000 000.00
b	200kVA 22/0.4kV Pole mounted substations	150	No	R 300 000.00	R 45 000 000.00
3	**Low Voltage Infrastructure**				
a	400V overhead lines	120	**km**	R 200 000.00	R 24 000 000.00
b	Internal electfification to individual prlperties	1	**Sum**	R 25 000 000.00	R 25 000 000.00
c	LV connections to properties	8120	**No**	R 25 000.00	R 203 000 000.00
					R 378 000 000.00