



**BIGEN
AFRICA**

TSANTSABANE LOCAL MUNICIPALITY



Postmasburg Housing Development

Tsantsabane Mixed Typology and Integrated Infrastructure Project in
Postmasburg

OUTLINE SCHEME REPORT

MAY 2017

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Tsantsabane Local Municipality

POSTMASBURG HOUSING DEVELOPMENT

OUTLINE SCHEME REPORT: CIVIL ENGINEERING SERVICES

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Tsantsabane Local Municipality

POSTMASBURG HOUSING DEVELOPMENT

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Part A General Matters

Section A1 Background

The National Upgrading Support Programme (NUSP) is an initiative of the Department of Human Settlements, designed to support the National Department in its implementation of the Upgrading Informal Settlements Programme (UISP), with the objective of eventually upgrading all informal settlements in the country.

The Tsantsabane Municipality ("the Municipality") is located in the Z.F. Mgcawe District Municipality of the Northern Cape in South Africa. As part of the NUSP, a number of informal settlements were identified within the borders of the Tsantsabane Local Municipality, these included the following informal settlements:

- Newtown 1 & 2
- Newtown 3 & 4
- Postdene 1 & 2
- Boichoko 1, 2 & 3.

The Municipality recognized that economic activity associated with mining, agriculture and manufacturing has increased the demand for sustainable and adequate housing in their area of jurisdiction. Furthermore, the Municipality faces multiple challenges including demand and supply imbalances, aging infrastructure, services backlogs, cost recovery insufficiencies and an overall lack in funding.

Upon this background, a 3,500 unit integrated mixed housing typology was approved by the Municipality for implementation. The estimated number of beneficiaries has since increased to 4,460 units.

The Postmasburg Housing Development is aimed at addressing the challenges and inadequacies previously identified specifically for the provision of housing opportunities.

Bigen Africa Services (Pty) Ltd was appointed by the Municipality through a competitive procurement process for the rendering of professional services associated with the project. A Service Level Agreement (SLA) was also signed between the parties detailing Bigen Africa's role and responsibilities.

Consequently, Bigen Africa Services (Pty) Ltd has been appointed for the preparation of the Civil Engineering Services Outline Scheme Report for the township establishment application for the proposed townships of Boichoko/ Koppie and Carnation Greenfields.

The scope of this report is to present findings of the investigation into the presence and capacity of bulk civil engineering services infrastructure within the vicinity of the proposed township as determined by the municipality's master planning consultants (GLS), as well as propose the upgrades required to support the proposed development.

Section A2 Project Brief

The Postmasburg Housing Development ("the Project") will be developed utilizing the Informal Settlement Upgrading Programme (ISUP) for the planning and installation of services to existing informal settlements, as well as the Integrated Residential Development Programme (IRDP) for the construction of subsidised top structures.

The project will cater for various tenure models and income categories e.g. fully subsidized units, partly subsidized units, rental units and non-subsidized bonded erven. Commercial and supportive land-use erven will also be provided. The project will involve the formalizing of existing informal settlements and the development of greenfields areas where space constraints or geotechnical/geological constraints require this. Several development areas are included in the project scope, these are illustrated in Annexure A1, and discussed in further detail below.

The Informal Settlement Upgrading programme will be used as a basis to provide basic services to the following informal settlements:

- Phase 1: Newtown
- Phase 2: Postdene 1 & 2

The Integrated Residential Development will be used as a basis to provide basic services and top structure implementation to the following areas:

- Phase 3: Koppie/Boichoko
- Phase 4: Carnation & Greenfields

The proposed land uses contained in the layouts of Koppie-Riemvasmaak Boichoko and Carnation and Greenfields are as summarise in Table A2.1 and A2.2, below.

Table A2.1 – Koppie/Riemvasmaak Boichoko: Proposed Land Uses

Land Use	No of Stands	Extent (ha)	% of Area
<i>Residential</i>	2823	105.66	53.44
<i>Business</i>	6	3.04	1.54
<i>Bus Stop/Taxi Rank</i>	3	1.39	0.70
<i>Educational</i>	1	6.03	3.05
<i>Primary School</i>	1	3.66	1.85
<i>Day-care/Crèche</i>	2	0.98	0.49
<i>Church</i>	2	0.78	0.39
<i>Community Facility</i>	4	2.06	1.04
<i>Clinic</i>	2	0.97	0.49
<i>Municipal</i>	3	1.65	0.83
<i>Open Spaces</i>	18	24.57	12.42
<i>Sports Fields and Related Infrastructure</i>	2	3.81	1.93
<i>Streets</i>		36.99	18.71
<i>30m Road</i>		6.15	3.11
TOTAL	2867	197.74	100.00

Table A2.2 – Carnation/Greenfields: Proposed Land Uses

Land Use	No of Stands	Extent (ha)	% of Area
<i>Residential</i>	2476	85.41	52.68
<i>Business</i>	2	2.01	1.24
<i>Bus Stop/Taxi Rank</i>	2	0.89	0.55
<i>Secondary School</i>	1	3.95	2.44
<i>Primary/Secondary School</i>	1	6.69	4.13
<i>Primary School</i>	1	3.32	2.05
<i>Day-care/Crèche</i>	3	1.31	0.81
<i>Church</i>	3	1.53	0.94
<i>Community Facility</i>	3	2.46	1.51
<i>Community Facility/Clinic</i>	1	1.30	0.80
<i>Municipal</i>	1	1.20	0.74
<i>Open Spaces</i>	20	2.69	1.66
<i>Sports Fields and Related Infrastructure</i>	1	1.59	0.98
<i>Streets</i>		42.33	26.11
<i>30m Road</i>		5.47	3.37
TOTAL	2515	162.14	100.00

The land use plans for the Koppie-Boichoko and Carnation-Greenfields developments are attached as Annexure A2.

The formalization/development of these areas will be accompanied by the provision of bulk water and sanitation services, as well as road and stormwater infrastructure development.

Part B Natural Environment

Section B1 Locality

The proposed residential development of Postmasburg is located in the Tsantsabane Local Municipality, Northern Cape, approximately 170km from Kimberley. The area is comprised of six land portions including Greenfields (174ha), Carnation (35ha), Postdene 1 and 2 (26ha), Newtown-Marateng (63ha), Koppies-Riemvasmaak (140ha) and Boichoko (68ha). The locality plan is attached as Annexure A1 and indicates these areas.

Section B2 Topography and Vegetation

The Postmasburg area is generally flat. The Langberg and Koranaberg naturally divide the Tsantsabane Municipal jurisdiction area in a western and eastern area. The Asbesberg is nearly on the eastern side of the Municipal area. On the western side of the Langberg the ground falls in a western direction and the natural drainage is towards the Orange River.

The mean annual temperature for the majority of the Tsantsabane Municipality ranges between 18 and 20°C, towards the eastern side between 16 and 18°C and towards the western side between 20 and 22°C.

The mean annual rainfall for the area ranges between 100 and 400mm, the rainfall increases from the western side to the eastern side.

The topography of the overall area falls from 1340m a.s.l. in the north to 1300m a.s.l. in the south. Surface water runoff takes place through sheet wash along natural gradient towards the south and by four prominent north to south aligned drainage features.

Section B3 Geological and Geotechnical Aspects

VGI Consult was appointed to conduct Geotechnical Site Investigations (GFSH-2 Phase 1 Report) and Dolomitic Stability Investigations on 26 February 2016 and 30 September 2016, respectively.

The GFSH-2 Phase 1 Report has been completed and was submitted to the Department of Geoscience where after a letter was issued stating that the Department is in support of the report.

The entire project is underlain by dolomite land.

The areas are divided into the following Soil Zones that are linked to Dolomite Area Designations:

- Soil Zone 1, 2, 3, 4, 5, 6, 7 (D2 classification)
- Soil Zone 8, 9, 10, 11, 12, 13, 14, 15 (D3 classification)

For areas specified as D2 designations, general precautionary measures, in accordance with the requirements of SANS 1936-3, that are intended to prevent the concentrated ingress of water into the ground, are required.

For areas specified as D3 designations, precautionary measures, in addition to those pertaining to the prevention of concentrated ingress of water into the ground (in accordance with the relevant requirements of SANS 1936-3), are required.

Annexure B1 indicates the dolomite hazard zonation.

Section B4 Environmental Aspects

A "Preliminary Environmental Assessment of Informal Settlement Areas in Postmasburg" was prepared by Marguerite Cronje Environmental Assessment Practitioners in April 2016.

As indicated in the Preliminary report, a Basic Assessment would be required for bulk water and sanitation infrastructure in excess of 1km in length and with either an internal diameter of 0.36m or more or a peak of 120 l/s or more. Although there are bulk supply pipelines planned that would exceed 1km and 0.36m diameter, these would only require Environmental Authorisation if located outside of Postmasburg (urban area) or not within a road reserve.

An Environmental Impact Assessment Report was recently approved by the Environmental Authority for a new 10 MI Waste Water Treatment Works (WWTW).

A draft EMP was attached to the EIA.

Section B5 Heritage Aspects

Several grave sites have been discovered on the Boichoko 1 site. The existing cemetery has however been excluded from the proposed township application.

Part C Water Supply

Section C1 Authority and Provider Arrangements

The proposed development area falls within the Tsantsabane Municipality's area of jurisdiction and the Municipality serves as both the Water Service Authority as well as the Water Service Provider.

The content of this section is based on information obtained from a GLS Water Master Plan, titled "Computer Analysis and Master Planning: Postmasburg Water Distribution System", dated August 2014.

Section C2 Regional Supply

Current Regional Supply

The water demand for the entire Postmasburg area is supplied from 12 boreholes within a 10km radius and three connections to the Vaal Gamagara (VGG) pipeline. Some of the boreholes feed directly into the network, while others supply the reservoirs. The supply from the VGG pipeline was intended for emergency purposes and act as a secondary supply to the system.

Currently there are four (4) distribution zones distinguished in the Master Plan: Boichoko Reservoir, Postmasburg/Newtown Reservoir, Airfield Tower and Postdene Reservoir.

There are no water treatment plants, nor any bulk or town meters in the Greater Postmasburg system.

Future Regional Supply

In the Master Plan, the Postmasburg area was divided into six (6) distribution zones. Each zone is supplied by a reservoir and/or an elevated storage tank. The distribution zones are: Postdene Tower, Airfield Tower, Newtown Tower, Newtown Reservoir, Koppies Reservoir and Koppies Tower. The new development of Koppies and Greenfields will fall into the Koppies Tower and Reservoir- and Postdene Tower supply zones, respectively. Due to insufficient capacity in the existing infrastructure to cater for both current and forecasted demands, proposals for upgrades to the existing infrastructure were made.

A dedicated link pipeline will run from the Beeshoek Reservoir through to the Postdene Reservoir, supplying the Newtown and Koppies Reservoirs along the way.

The storage capacity of the municipal reservoirs and towers will have to be upgraded in order to accommodate the future demand, since a number of the reservoirs already fail to meet the minimum requirements for storage capacity with the current demand. The Koppies development will require a new reservoir and tower, which will supply the development as well as Boichoko and a portion of Newtown. The Boichoko reservoir will thus be abandoned.

The Master Plan further recommends using isolating valves to separate the different distribution zones from each other. This will make the monitoring of water usage easier for the municipality.

Section C3 Design norms and standards

The design norms and standards that have been utilized for this report are the:

1. "Guidelines for Human Settlement, Planning and Design", published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
2. Any relevant published SANS documents.

Additions and amendments where necessary, were made to the above design standards during the preparation of this report. The proposed water design guidelines and unit water demands are attached as Annexure C1.

Section C4 Water Demands

The peak water demand (excluding fire flow) was calculated in the Master Plan and during the preliminary designs. The land uses and land use demands given in the Master Plan was used for all existing areas in Postmasburg. For the new developments, Greenfields and Koppie, the land use demands given in Annexure C1 were used. The summarised AADD and peak flows calculated during the preliminary designs are summarised in Table C4.1, below.

Table C4.1: Postmasburg Housing Development – Summary of Peak Water Demands

Supply Zone	AADD (kl/day)	Peak flow (l/s)
Newtown Reservoir	1509.27	69.87
Newtown Tower	2622.50	121.41
Postdene and Greenfields	6733.16	297.27
Koppie Reservoir	5297.29	245.24
Koppie Tower	405.72	18.78
Airfields	1211.50	56.09

Section C5 Proposed Internal Water Supply

Preliminary designs for the internal networks of each development area are in final stages.

The scope of internal water services will include the Koppie and Greenfields developments as well as a significant portion of the Postdene 1&2. The provision of services will include full HDPE water reticulation networks with metered connections to each individual erf.

Section C6 Standard Details

SANS 1200 (together with other applicable details) details will be used to prepare project-specific details and be submitted to Tsantsabane Municipality for their approval.

The provision of SANS 1936 is also applicable to this project.

Section C7 Proposed link upgrades

The upgrading of link infrastructure will be required for the project. MIG and RBIG grant funding as well as own funding will be used to fund these works.

The Master Plan was used for the cost estimation of the storage capacity with new cost estimates done for the pipelines using the to-date preliminary designs.

Phase 1: Newtown

The first phase will require a link line running from the Beeshoek Reservoir to the Newtown Reservoir. Upgrading of the storage capacity will also be required. The pump station might require upgrading but this will have to be confirmed.

Phase 2: Postdene

The second phase will require the extension of the link water supply line to the Postdene Reservoir as well as the upgrading of storage capacity at the Postdene Reservoir.

Phase 3: Koppie/Boichoko

The third phase will require the link to branch off from the Beeshoek main pipeline to the Koppies area. A new reservoir along with an elevated tower will need to be constructed for the Koppies area.

Phase 4: Greenfields

Following the Phase 2 link water supply upgrades, no further pipeline or storage capacity upgrades will have to be undertaken for Phase 4 of the project. Two bulk water meters will be provided for the Greenfields development.

A layout of the water distribution zones can be found in Annexure C2.

Part D Sanitation

Section D1 Authority and Provider Arrangements

The proposed development of the Postmasburg area falls within the area of jurisdiction of the Tsantsabane Local Municipality and the Municipality serves as both the Water Service Authority as well as the water service provider.

The content of this section is based on the information obtained from the master planning exercise conducted by Messrs BVI Consulting Engineers in October 2014, hereinafter referred to as the "2014 Masterplan".

The 2014 Masterplan highlighted the modelling/capacity and operational issues related to existing and additional land uses within Postmasburg and the new developments proposed in the area. The upgrades and the new development will include both the internal, bulk sewer, outfall sewer and the waste water treatment plant.

Section D2 Existing Outfall and Wastewater Treatment Capacity

According to the 2014 Masterplan, the Postmasburg existing sewerage system consists of 118km sewage pipes and 6 (six) pump stations that ultimately conveys all the flow to an existing 4.8 ML/day waste water treatment plant. The sewage system has operational and capacity/modelling issues that include; regular spillage, damaged pipes, insufficient capacity of pipes, flooding of the pump station and blockage of the system amongst others. The existing waste water treatment plant has insufficient capacity to cater for the additional flow from the upgrades as well as the new developments.

Section D3 Design norms and standards

The design norms and standards that have been utilized for this report are the:

1. "Guidelines for Human Settlement, Planning and Design", published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
2. Any relevant published SANS documents.

Additions and amendments where necessary, were made to the above design standards during the preparation of this report. The proposed sanitation design guidelines and unit sewer demands are attached as Annexure D1.

Section D4 Sewage Flows

The total sanitation demand calculated for both the new development and upgrades is approximately 56.64l/s.

Section D5 Proposed Internal Sanitation Drainage

The proposed internal sanitation system provides waterborne HDPE sanitation networks for the Koppie/Boichoko, Carnation/Greenfields and Newtown and Postdene areas.

Section D6 Standard Details

SANS 1200 (together with other applicable details) details will be used to prepare project-specific details and be submitted to Tsantsabane Municipality for their approval.

The provision of SANS 1936 is also applicable to this project.

Section D7 Proposed upgrades

In order to cater for the sewage flow from the first phase of the upgrades, a temporary 1 ML wastewater treatment package plant will be constructed at the location of the existing wastewater treatment plant. In addition, a new 10ML/day waste water treatment plant is planned in the area south west of the CDB.

The proposed bulk sewer works are as follows:

- Wastewater Treatment Package Plant - 1Mℓ
- New Wastewater Treatment Plant - 10Mℓ
- 800 mm diameter bulk HDPE Pipeline.

Both the existing and the temporary waste water treatment plants will be abandoned and all the future flows will be accommodated at the new 10ML/day waste water treatment plant. All the pump stations in the area will be decommissioned and the sewage system will drain under gravity.

The scope of link sewer infrastructure is as follows:

Phase 1

Bulk

- Construction of a 1ML temporary WWTP
- Construction of a 10ML new WWTP

Link

- Upgrade of a 845m × 300mm diameter clay pipe
- Replacement of four sewer lines with a 267m × 315mm diameter pipe
- Upgrade of a 81m × 400mm diameter clay pipe
- 65m × 450mm diameter pipe installation
- 2000m × 800mm diameter pipe installation
- Upgrade of a 254m x 160mm pipe

Phase 2

Link

- Repair of a 9m × 315mm diameter clay pipe

Phase 3

Link

- 144m × 200mm diameter pipe installation
- 1740m × 315mm diameter pipe installation
- 420m × 355mm diameter pipe installation
- 54m × 400mm diameter pipe installation
- 1753m × 500mm diameter pipe installation
- 433m × 560mm diameter pipe installation

Phase 4

Link

- 60m × 200mm diameter pipe installation
- 4131m × 250mm diameter pipe installation
- 716m × 315mm diameter pipe installation
- 3592m × 450mm diameter pipe installation

The proposed bulk/link sewer scheme plan is illustrated in Annexure D2.

Part E Roads

Section E1 Authority and Provider Arrangements

The Tsantsabane Local Municipality is responsible for the provision and maintenance of roads and stormwater infrastructure in its area of jurisdiction.

Section E2 Traffic Impact Study

A traffic impact assessment was conducted by ITS Engineers in March 2017. The existing 2017 scenario, the future 2022 scenario on the existing geometry and the 2022 future scenario on the upgraded geometry were analysed.

Section E3 Access

The existing road network in close proximity of the project is summarized in Table E1.1 below.

Table E1.1 – Postmasburg Housing Development: Existing Surrounding Road Network

Road Name	Class	Description
R385	2 and 3	East-West arterial linking Postmasburg with Danielskuil and Kimberley to the east and the N14 to the west.
		Classified as a Class 2 road in the area outside the Postmasburg township and as a Class 3 road in the urban areas of Postmasburg.
R325	2 and 3	North-south link connecting Postmasburg with Kathu to the north and the N8 to the south.
		Classified as a Class 2 road in the area outside the Postmasburg township and as a Class 3 road in the urban areas of Postmasburg.
Gravel Road	3	North-south connector road that serves as a link road in between Postmasburg and Jenn-Haven
Shone Street	4	Link between the R385 with the Postmasburg CBD in an east-westerly direction.
End Street	4	East-west link located on the northern boundary of the Koppie/Boichoko development.
Cam Street	4	North-south link between the proposed Greenfields development and the R385

The Newtown and Koppie developments will gain access to the north from the existing Stasie and Dolomiet Streets. These access routes lead to the R385 north of the proposed development. End Street provides access to the development in an east-west direction.

The existing Plein Street is an east-west link in between Postdene and the R385, and serves as an access route.

Cam Street will serve as the primary access route to the Greenfields development from the R385. The extension of the link north-south link load is proposed on the eastern boundary of the township provide

Section E5 Design Standards

The design norms and standards that have been utilized for this report are the:

1. "Guidelines for Human Settlement, Planning and Design", published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
2. Any relevant published SANS documents.

Additions and amendments where necessary, were made to the above design standards during the preparation of this report. The proposed geometric design guidelines are attached as Annexure E1.

Section E4 External Road and Intersection Upgrades Required

Several external road and intersection upgrades have been proposed to accommodate the current background traffic and the development traffic generated.

The following link road upgrades are required for each of the development phases (also seen in Annexure E2):

Phase 1: Newtown

No external road and intersection upgrades are required.

Phase 2: Postdene

No external road and intersection upgrades are required.

Phase 3: Koppie and Boichoko

Construction of External Bulk Roads Required:

- An east-west bulk road of length 2074m running along the southern boundary of the development towards the R325.
- A north-south bulk road (653m) tying into the abovementioned road south of the development.

Refurbishment of External Link Roads Required:

- The refurbishment of the existing Dolomiet Street, 1880m in length.
- The refurbishment of the existing Stasie Street, 952m in length.

Construction of Internal Link Roads

- A total length of 807m at a road reserve width of 20m.
- A total length of 1804m at a road reserve width of 30m.

Phase 4: Carnation and Greenfields

Construction of External Bulk Roads Required:

- A bulk road extending from the south-western portion of the proposed Greenfields site to the R385, with a total length of 1320m is proposed to accommodate future traffic demands.
- A bulk road, with a length of 1532m, extending from the south-eastern portion of Greenfields to Shone Street is additionally proposed.

Refurbishment of External Link Roads Required:

- The refurbishment of the portion of Cam Street leading to the Carnation/Greenfields area, 593m, is proposed.

Construction of Internal Link Roads

- A total length of 6010m at a road reserve width of 20m.
- A total length of 2092m at a road reserve width of 30m.

Section E6 Internal Roads

Internal road networks will be provided to all the development areas. A B-grade level of service will be provided which will be comprised of graded/gravel-surfaced roads subject to the subsidy quantum.

Section E7 Public Transport & Non-motorised Transport (NMT)

Section E7.1 Existing Public Transport and NMT Facilities

There is one taxi rank in the existing Postmasburg town, situated on the corner of the R325 and Shone Street, approximately 2.5km for the proposed Greenfields development and 1.5km from the Koppie development. Public transport lay-bys are located at the Stasie/End Street intersection. There are limited formal pedestrian sidewalks located along the R325 and the R385 outside the established Postmasburg Township and pedestrians currently use the gravel shoulders along the R325 and the R385 to walk to and from their destinations.

Section E7.2 Proposed Public Transport and NMT Facilities

Taxi ranks have been proposed for inclusion in the layout plans for both the Koppie and Greenfields developments. These have been included in the layout plans by the town planner.

The construction of pedestrian sidewalks are proposed along the internal Class 4 roads in both developments to ensure pedestrian safety and to provide connectivity with the proposed PT lay-bys. The sidewalks should be at least 2.5m wide and should be such that both pedestrians and cyclists can use them safely.

Additionally, a pedestrian bridge has been proposed to the north of the Greenfields development, to ensure pedestrian traverse the railway line safely.

Part F Stormwater Management

Section F1 Natural River System and Flood lines

There are a number of natural low points (drainage areas) dividing the town of Postmasburg into different natural drainage areas. The most prominent of these drainage corridors drains in a south western direction and split Postmasburg mainly into two (2) drainage areas, north and south. All the planned developments are situated to the north of this prominent drainage corridor.

Natural drainage flow directions were retained in the preliminary design of the stormwater infrastructure.

The following developments were confirmed to be impacted by 1:100 year recurrence flood lines:

- Carnation / Greenfields

No developments are allowed to within these flood lines. For the other developments areas, no flood line determination were done.

Section F2 Design Norms and Standards

The design criteria are derived from the Guidelines for Human Settlement Planning and Design (Red Book) and the SANRAL Drainage Manual 5th Edition.

The Rational Method will be used to calculate the stormwater runoff for this site.

The stormwater will be drained along the road reserve, mainly in open, unlined V-drain channels, with underground / piped systems only where surface drainage are not possible or deemed to be impractical. This has been incorporated into the typical cross-sections.

Designs will be such that the canals can accommodate the 1:2 year minor storm and the 1:25 year major storm is accommodated in the road structure without overtopping.

The stormwater design standards and guidelines are attached as Annexure F1.

Section F3 Existing Stormwater Drainage Zones

There is currently very little information available regarding existing stormwater infrastructure on existing areas adjacent to the planned developments. Some of the planned developments are situated upstream from existing developments, with stormwater from the new developments draining into the existing areas. In order to tie in to these existing systems, the positions, levels and capacities of these existing systems need to be confirmed in order to confirm functional designs.

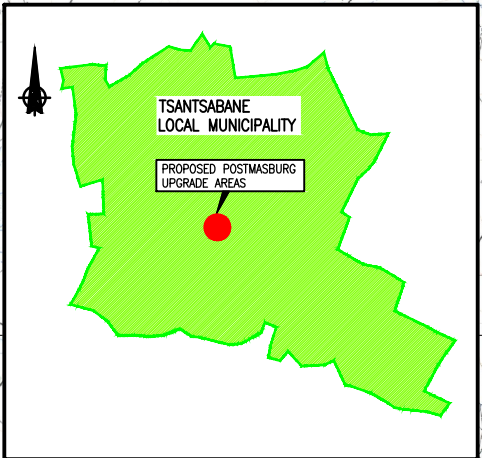
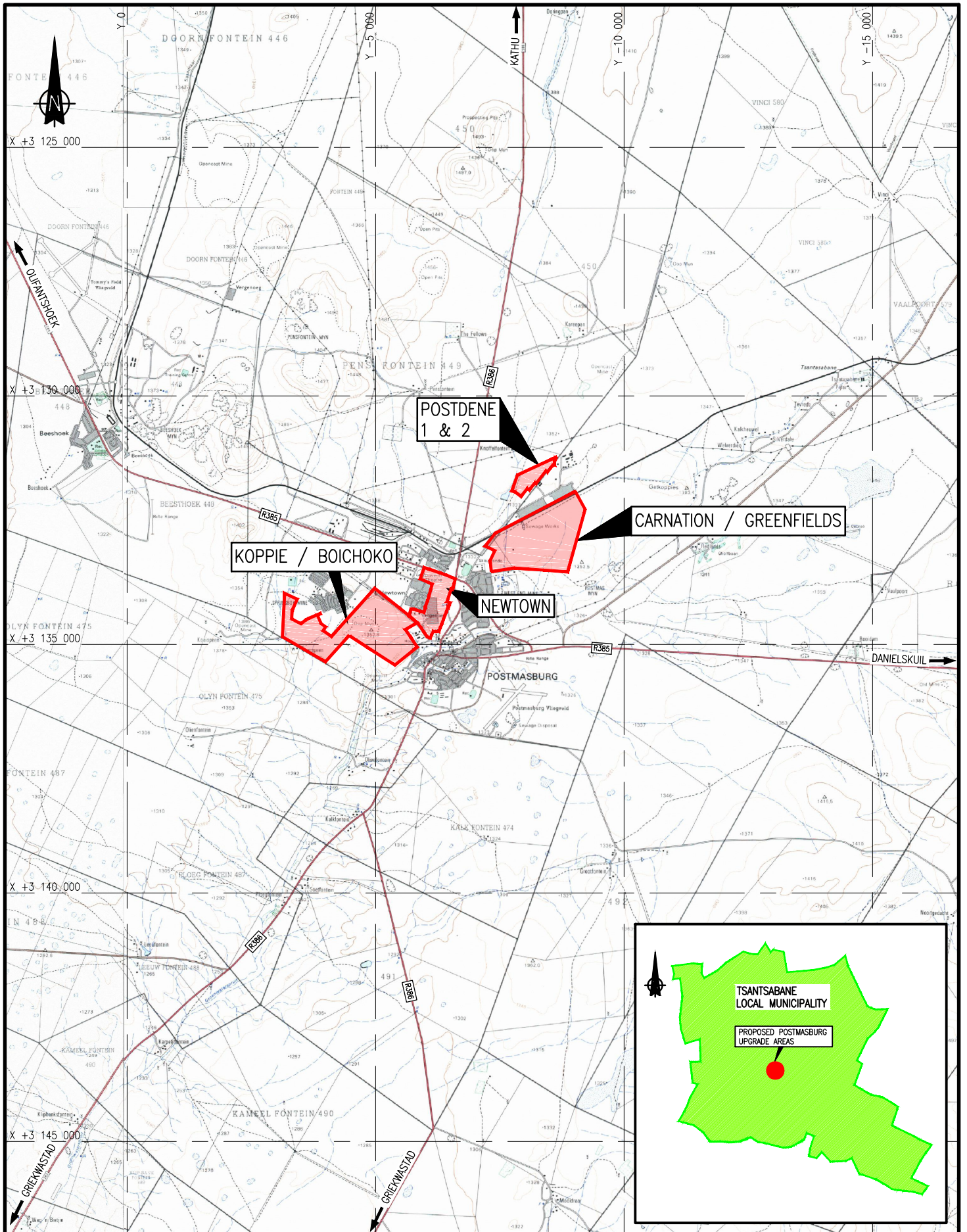
Section F4 Proposed Internal Stormwater

No existing internal stormwater exists within the proposed development areas. This will be designed in accordance with the design criteria as described in Section F2.

No link and bulk stormwater infrastructure is required for Phases 1 & 2 (Newtown and Postdene). All the stormwater generated in Phases 1 & 2 development has been classified as internal and will only be discussed in the preliminary design stages of the project.

The proposed link and bulk stormwater drainage solution for Phases 3 & 4 (Koppie/Boichoko and Carnation/Greenfields) areas includes the introduction of lined open-channels along road reserves as well as the construction of dish crossings (splash-drains) for the accommodation of stormwater traversing intersections. Culvert crossings are proposed in areas where natural streams traverse certain roads.

ANNEXURE A1



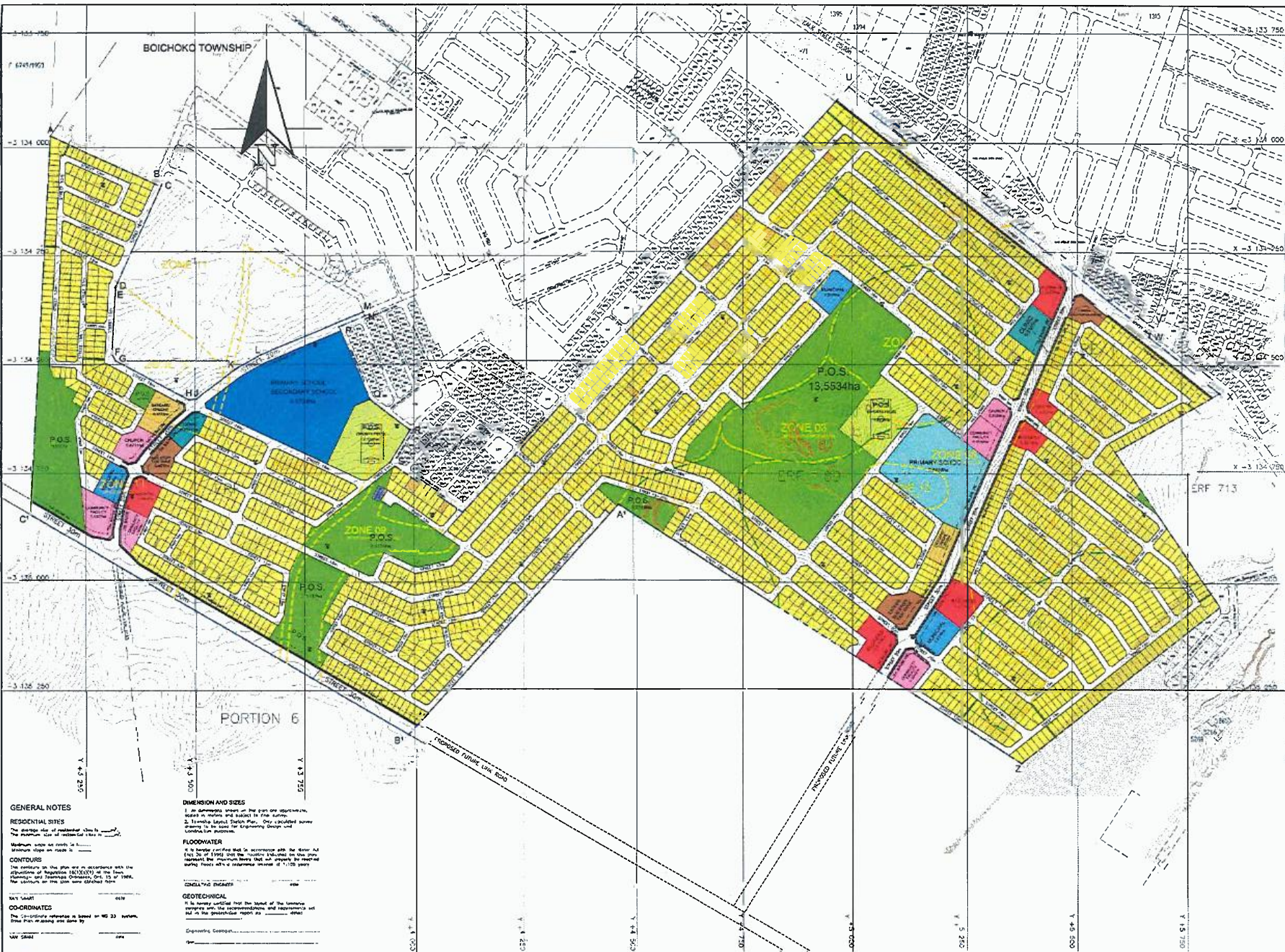
Engineering Services	Management Consulting Services	BIGEN AFRICA Engineering solutions
Project Finance Services	Infrastructure Development Services	
BIGEN AFRICA Services (PTY) LTD Allan Cormack Street The Innovation Hub Perseus Pretoria PO Box 29 The Innovation Hub Pretoria 0087 Tel: +27 (0) 12 842 8700 Fax: +27 (0) 12 843 9000/9001 E-mail: pretoria@bigenafrica.com www.bigenafrica.com		

PROJECT: **POSTMASBURG INFRASTRUCTURE UPGRADE AREA**

DWG TITLE: **LOCALITY PLAN**

DRAWN: S.L. Pitse	CHECKED: D.O. Storbeck	APPROVED: D.O. Storbeck	SCALE: 1:100 000	DATE: May 2017	DWG No: 2296.00.ZA.01.S001	VER: A.0
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ANNEXURE A2



LAND USE TABLE

ZONING	LAND USE	ERF NUMBERS	NO. OF STREETS	AREA OF ZONE	% OF TOTAL AREA
RESIDENTIAL (DENSE) ERVEN	[Yellow]		1	10,5000	16.70
RESIDENTIAL (DENSE) ERVEN	[Green]		1	6,0291	9.23
INDUSTRIAL / OFFICE	[Red]		1	3,9633	6.09
COMMERCIAL	[Blue]		2	6,9773	10.63
RECREATION	[Light Green]		4	10,7767	16.29
COMMUNITY CENTER	[Pink]		1	2,0848	3.14
SPORTS	[Light Blue]		1	2,0848	3.14
RECREATION	[Light Green]		2	3,5114	5.33
RECREATION	[Light Green]		1	10,2403	15.52
RECREATION	[Light Green]		1	4,1571	6.27

- GENERAL NOTES**
- THE COLOR IDENTIFICATION/LEGEND REPRESENTS OUTSIDE BOUNDARY OF THE PROJECT TOWNSHIP (KOPPE-POSTMASBURG) AND IS APPROXIMATELY 131,7411km² IN EXTENT.
 - OUTSIDE BOUNDARY OF TOWNSHIP
 - GEOTECHNICAL ZONES
 - SOIL ZONES
 - 100 YEARS FLOODLINE
 - 1:100 YEARS FLOODLINE
 - LINE OF NO ACCRETION
 - FARM BOUNDARIES
 - 1001 PITS
 - PERMANENT STRUCTURES

REVISIONS

NO.	DATE	BY	DESCRIPTION	APPROVED
1			ISSUE UNDER THE APPROVED TOWN PLANNING ACT	
2			ISSUE UNDER THE APPROVED TOWN PLANNING ACT	

CLIENT: TSANTSABANE LOCAL MUNICIPALITY

TOWN PLANNER: Henk Malherbe

SCALE: 1:3 000

DRAWING REF: Posmas Koppie D2/2017.04.10

DRAWING STATUS: DRAFT

URBAN DYNAMICS

27 CURRIE ROAD
HAINSTOWN
WILHELMSBAY
7109
TEL: (+27 11) 494-8121
FAX: (+27 11) 492-9930
E-MAIL: info@urbandynamics.co.za

GENERAL NOTES

RESIDENTIAL SITES
The average size of residential sites is _____, the maximum size of residential sites is _____.
Minimum slope on roads is _____.

CONTOURS
The contours on this plan are in accordance with the provisions of Regulation 10(1)(3)(3) of the Town Planning and Township Ordinance, No. 15 of 1986. The contours on this plan were obtained from _____.

CO-ORDINATES
The co-ordinate references are based on the 2011 system. Other plans in zoning are based on _____.

DIMENSION AND SIZES
1. An dimensions shown on the plan are approximate, subject to survey and subject to final survey.
2. Township Survey Station Plan. One is provided number drawing is to look for Engineering Group and Construction Division.

FLOODWATER
It is hereby certified that in accordance with the Act (No. 26 of 1995) and the Statutory Instruments in that regard, the minimum levels shall be applied for residential works shall be a required distance of 1:100 years.

CONTRACT ENGINEER: _____

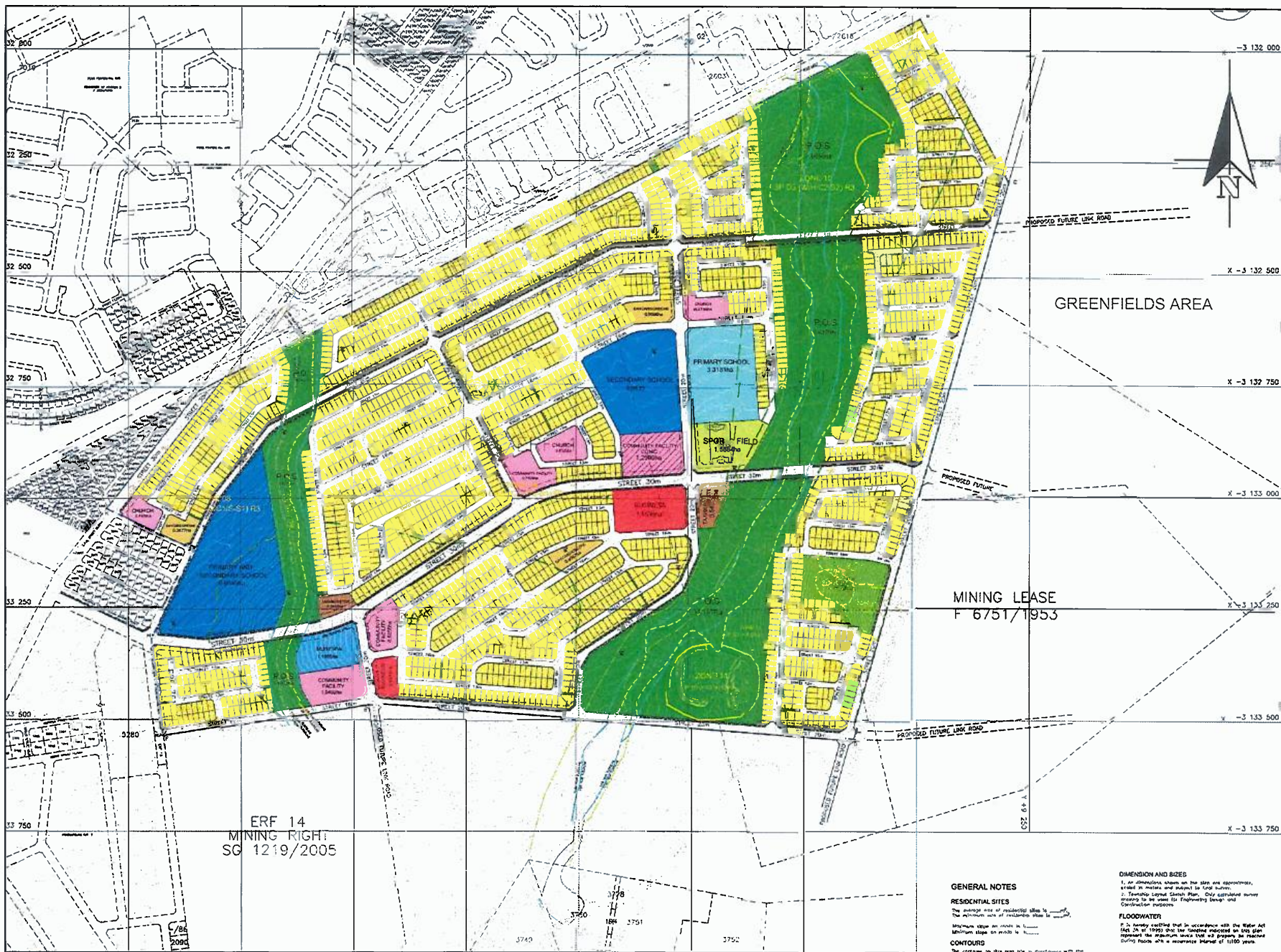
ENGINEERING GROUP: _____



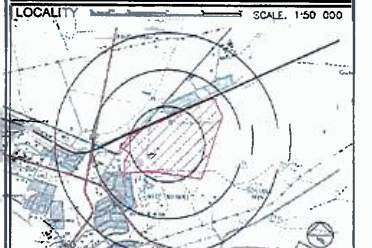
PROJECT: **POSTMASBURG - GREENFIELDS AND KOPPIE DEVELOPMENT**

FIGURE: **DEVELOPMENT PLAN - KOPPIE**

NUMBER: **4**



1 AND PART OF ERF 761 POSTMASBURG,
 LOCAL AUTHORITY : TSANTSABANE LOCAL MUNICIPALITY
 DISTRICT : ZF MOGAWU
 GEODETICAL SYSTEM : WG 23



LAND USE TABLE

ZONING	LAND USE	ERF NUMBERS	NO. OF STANDS	AREA OF STANDS	% OF AREA
PROVIDED RESIDENTIAL	RESIDENTIAL (300M ² ERER)		2479	85,4102	62.60
BUSINESS PREMISES			2	2,6129	1.92
OPTIONAL ZONE			2	0,8276	0.64
PLACE OF WORSHIP			1	2,9317	1.42
			1	4,8343	2.24
			1	5,3181	1.65
			1	1,5242	1.13
RESTURANT			3	2,4557	1.22
			1	1,2292	0.64
PLACE OF WORK			3	1,5328	0.71
MANUAL USES			1	1,1084	0.62
PUBLIC PLACES			20	5,5279	1.24
RYLES OF BUSINESS				38,1431	19.03
ROADS AND HIGHWAYS				1,5584	0.79
SPORTS				3,4487	2.72
PUBLIC STREETS				47,3521	21.22
				700,4444	100%

GENERAL NOTES
 THE FUTURE SUBDIVISION REPRESENTS OUTSIDE BOUNDARY OF THE PROPOSED TOWNSHIP POSTMASBURG-GREENFIELDS BEING APPROXIMATELY 200x400M IN EXTENT.

- OUTSIDE BOUNDARY OF TOWNSHIP
- DECEDETRONAL ZONES
- SOILS ZONAL
- ENVIRONMENTAL ZONE
- 100 YEARS FLOODLINE
- 1100 YEARS FLOODLINE
- LINE OF NO ACCESS
- FARM PORTIONS
- 32m FLOODLINE BUFFER FEET 10M

REVISIONS

NO.	DESCRIPTION	D. DRAFT	E. CIRCULAR	A. APPROVED
01	100 AND 1100 YEAR FLOODLINE ADDED			2017/04/24
02	REVISION			2017/04/24
03	AMEND INTERSECTION			2017/04/24
04	AMEND LAND USE TABLE			2017/04/24
05	AMEND LEGEND TO ADD ENVIRONMENTAL AND SOILS ZONAL			2017/04/24

CLIENT: TSANTSABANE LOCAL MUNICIPALITY

DESIGNER: PosMas Greenfields

SCALE: 1:3,000

DRAWING REF: PosMas_Greenfields D5/2017.04.10

DRAWING STATUS: DRAFT

GENERAL NOTES

RESIDENTIAL SITES
 The average size of residential sites is 1,000m²
 The minimum size of residential sites is 500m²
 Minimum slope on roads is 1:100
 Maximum slope on roads is 1:50

CONTOURS
 The contours are 1m apart.

FLOODWATER
 If a storm is certified that in accordance with the Water Act (Act 36 of 1957) that the maximum rainfall on this plan represent the maximum likely fall of property, the floodwater during floods with a recurrence period of 1100 years.

DIMENSION AND SIZES
 1. All dimensions shown on this plan are approximate, stated in meters and subject to 1:50 survey.
 2. Township Layout Control Plan. Only approved survey drawings to be used for Engineering Design and Construction purposes.

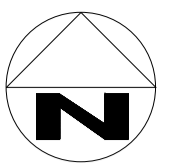


PROJECT: POSTMASBURG - GREENFIELDS AND KOPPIE DEVELOPMENT

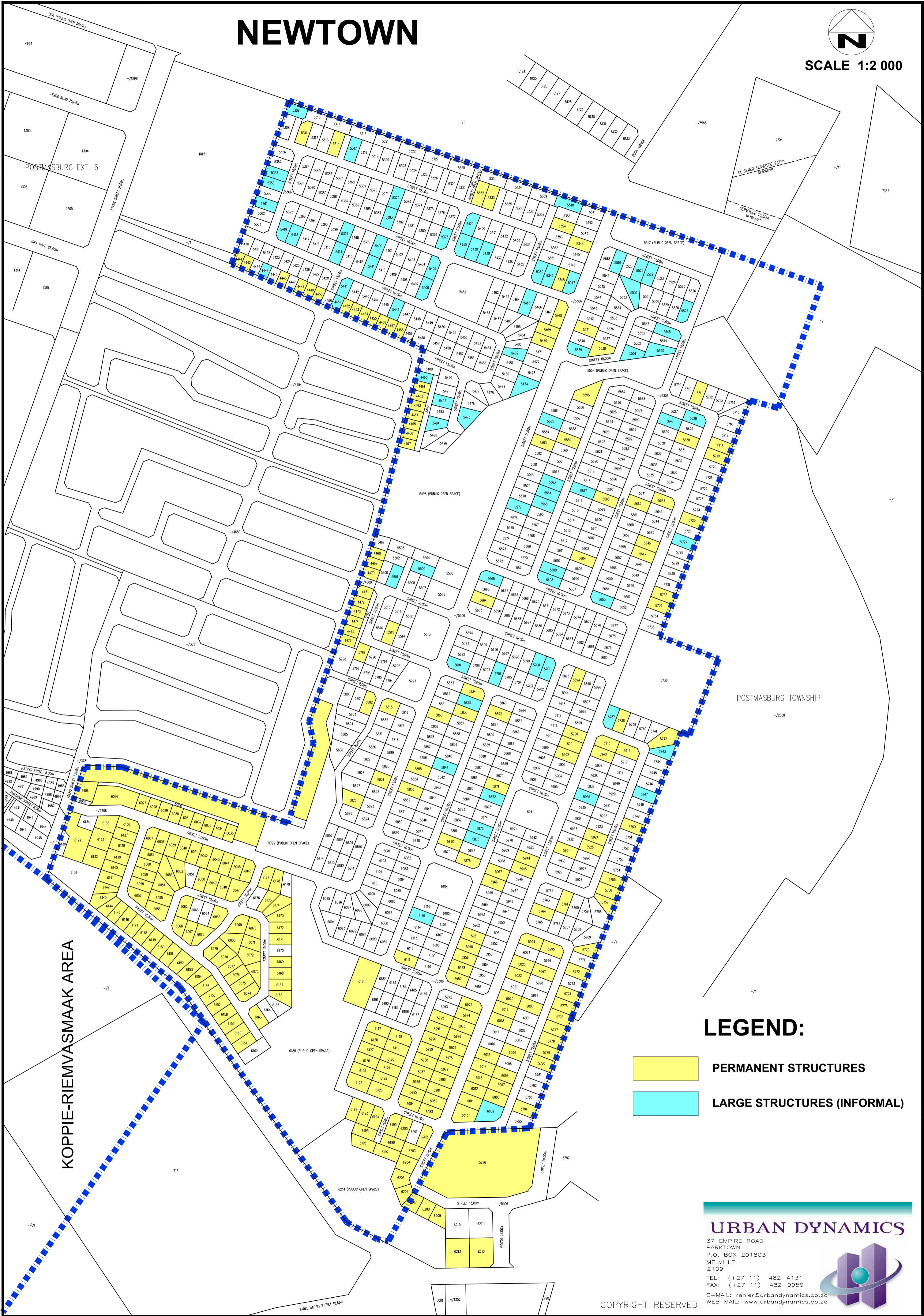
FIGURE: DEVELOPMENT PLAN - GREENFIELDS

NUMBER: 3

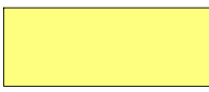

NEWTOWN



SCALE 1:2 000



LEGEND:

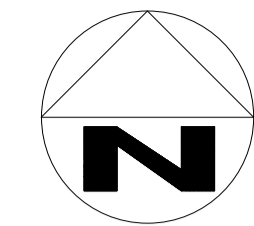
-  PERMANENT STRUCTURES
-  LARGE STRUCTURES (INFORMAL)

URBAN DYNAMICS
37 EMPIRE ROAD
PARKTOWN
P.O. BOX 291803
MELVILLE
2109
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FAX: (+27 11) 482-9959
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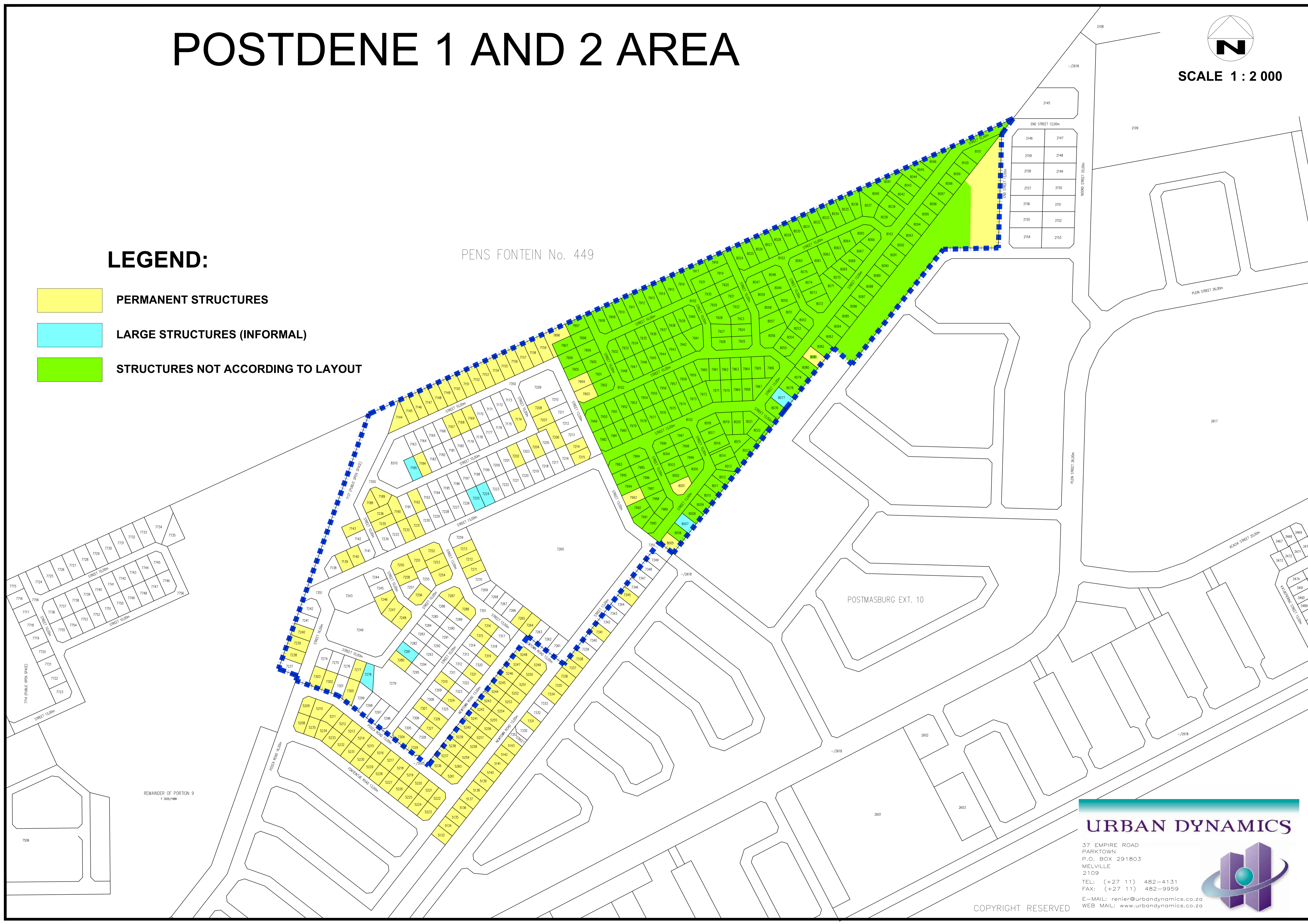
POSTDENE 1 AND 2 AREA



SCALE 1 : 2 000

LEGEND:

- PERMANENT STRUCTURES
- LARGE STRUCTURES (INFORMAL)
- STRUCTURES NOT ACCORDING TO LAYOUT



URBAN DYNAMICS

37 EMPIRE ROAD
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ANNEXURE B1

No.	DATE	AMENDMENT	D.P.W.

coordinate system	Ellips: Nottingham
vertical accuracy	Scale Factor = 1
horizontal accuracy	Contour Interval = 20'
	Datum = WGS 84
	False Easting = 0'

as-built drawings	
checked as built drawings as per Contract Drawing	
AS PER AS BUILT DRAWING REQUIREMENTS	
name:	
date:	
professional registration no.:	

cont file name	page type
	A 0

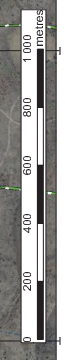
consultant	VGiconsult
	2 MULBERRY HILL
	OFFICE PARK
	BROADACRES DRIVE
	PO BOX 604
	FOURWAYS
	2055 011 469 0854
	FAX: (011) 469 0851
	E-mail: vjhb@mvweb.co.za
discipline	GEOTECHNICAL
service	VGJ3954-2:
	PROPOSED POSTMASBURG
	HOUSING PROJECT: FEASIBILITY-STAGE
	DOLOMITE STABILITY INVESTIGATION

Project Number	VGJ3954
drawing title	TEST PIT'S, RESIDUAL GRAVITY AND DOLOMITE HAZARD ZONATION
version	VGJ3954
scale	1:5 500
date	APRIL 2016
drawing number	DRAWING VGJ3954/01



LEGEND

	BOUNDARIES
	RESIDUAL GRAVITY ZONATION (VG J3)
	DOLOMITE HAZARD ZONATION
	DOOR INTERFERENCES (GSI)
	DRAINAGE (ON AND OFF ROAD) (PRELIM)
	NEW RE FAULTS
	NEW FAULTS
	SPH. NORTHWIND CAPE
	AREAS OF INVESTIGATION
	ROADS
	STRADES
	PERMISSION



ANNEXURE C1

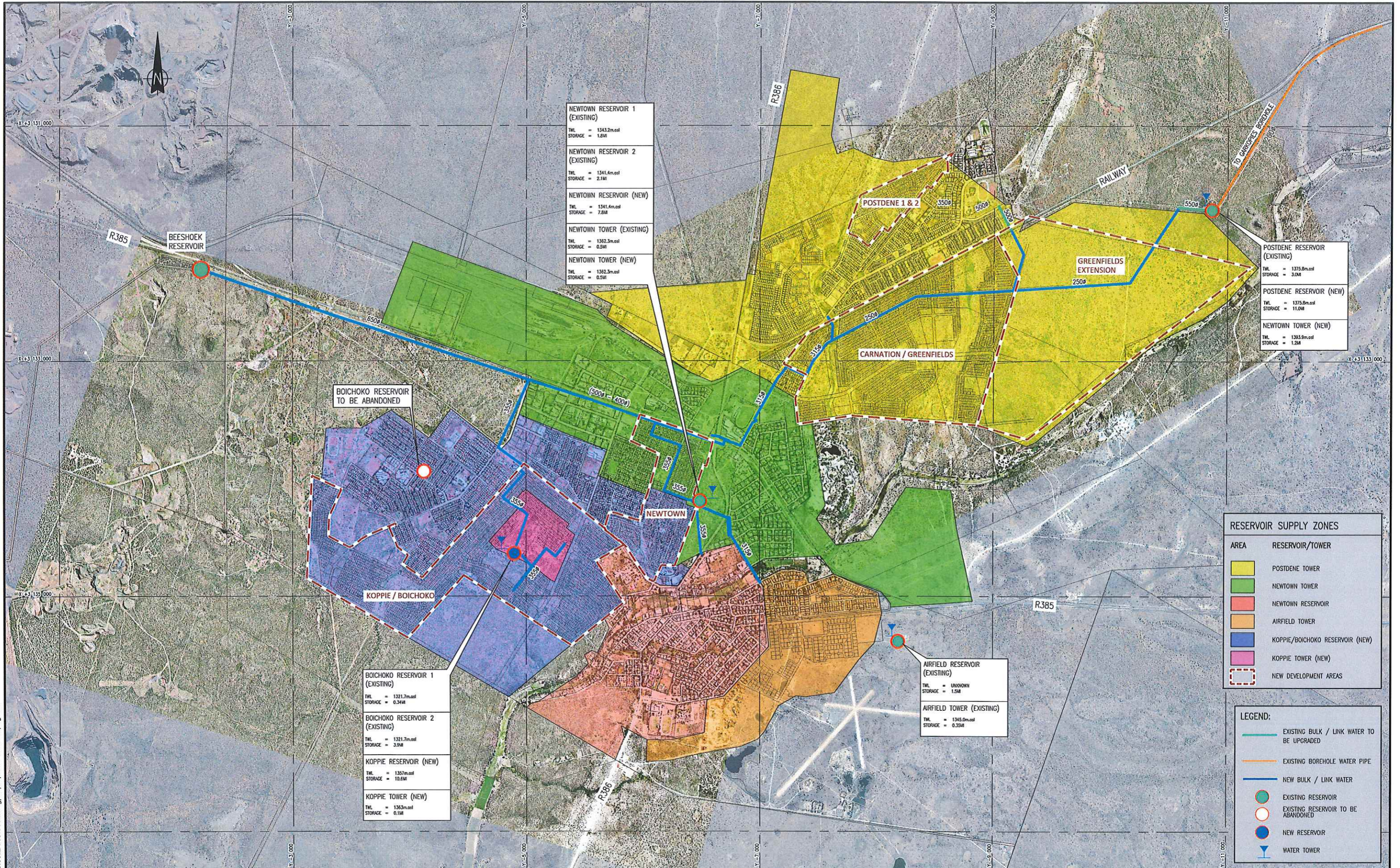
UNIT DEMANDS

Water Supply	
Description of Consumer	Daily Demand
Residential 1	700 l per unit
Business, Industrial & Commercial erven per 100 m ² floor area (GLA = 0.7)	400 l/day
Schools/Crèche (<2 Ha)	15 kℓ per Ha
Schools/Crèche (>2 Ha)	12.5 kℓ per Ha
Community Facility per 100 m ² floor area	400 l/day
Bus/taxi ranks/railway stations (1800 users per day)	15 l per user
Churches	2000 l/day
Clinics per 100 m ² floor area	500 l/day
Public Open Space and Sportsground (<2 Ha)	15 kℓ per Ha
Public Open Space and Sportsground (>2 Ha)	12.5 kℓ per Ha

WATER DESIGN GUIDELINES

Parameter	Element	Guidelines
Pressure	Maximum (Static)	9,0 bar
	Minimum (at peak flow)	1,5 bar
	Minimum in high-lying areas (at peak flow)	1,0 bar
	Trunk Mains	2.5 bar
Flow Velocity	Supply mains (max)	1,5 - 2,5 m/s
	Supply mains (recommended)	1,0 m/s
	Supply mains to reservoirs (max)	2,0 m/s
	Supply mains to reservoirs (rec.)	1,5 m/s
	Network pipe maximum	1,2 m/s
	Network pipe recommended	0,6 m/s
	At fire flow	3,5 m/s *
Fire Conditions	Minimum Hydrant Delivery	High risk - 25 l/s Moderate risk - 25 l/s Low risk - 15 l/s
	Minimum Pressure	High risk - 15 m Moderate risk - 15 m Low risk - 7 m
	Minimum hydrant spacing	High risk - 120 m Moderate risk - 180 m Low risk - 240 m
	Minimum pressure	0,7 bar
Hydraulic Calculation	Darcy Weisbach	uPVC Pipes k = 0.01 Steel Pipes k = 0.03
	Secondary losses	5%
Pipe Materials	Reticulation Mains	uPVC Z-lock Joints (Class 9)
	Distribution Mains < 355mm	uPVC Z-lock Joints (Class 12)
	Distribution Mains > 355mm	Steel welded joints – Copon or cement mortar lined, Sintacote coating
Valves	Spacing	Maximum 600m, not more than 5 valves to isolate a section (usually 3)
Pipe Location	All Areas	1 - 2 m from Boundary
Cover to Pipes	Minimum : Gravel Roads	1 000mm
	Tarred Roads and Traffic areas	800mm
	Other Areas	600mm
	Maximum : All areas	1 500mm

ANNEXURE C2



NEWTOWN RESERVOIR 1 (EXISTING)
 TWL = 1343.2m.a.s.l
 STORAGE = 1.8M

NEWTOWN RESERVOIR 2 (EXISTING)
 TWL = 1341.4m.a.s.l
 STORAGE = 2.1M

NEWTOWN RESERVOIR (NEW)
 TWL = 1341.4m.a.s.l
 STORAGE = 7.8M

NEWTOWN TOWER (EXISTING)
 TWL = 1362.3m.a.s.l
 STORAGE = 0.5M

NEWTOWN TOWER (NEW)
 TWL = 1362.3m.a.s.l
 STORAGE = 0.5M

POSTDENE RESERVOIR (EXISTING)
 TWL = 1375.8m.a.s.l
 STORAGE = 3.0M

POSTDENE RESERVOIR (NEW)
 TWL = 1375.8m.a.s.l
 STORAGE = 11.0M

NEWTOWN TOWER (NEW)
 TWL = 1363.8m.a.s.l
 STORAGE = 1.2M

BOICHOKO RESERVOIR TO BE ABANDONED

BOICHOKO RESERVOIR 1 (EXISTING)
 TWL = 1321.7m.a.s.l
 STORAGE = 0.34M

BOICHOKO RESERVOIR 2 (EXISTING)
 TWL = 1321.7m.a.s.l
 STORAGE = 3.9M

KOPPIE RESERVOIR (NEW)
 TWL = 1357m.a.s.l
 STORAGE = 10.6M

KOPPIE TOWER (NEW)
 TWL = 1363m.a.s.l
 STORAGE = 0.1M

AIRFIELD RESERVOIR (EXISTING)
 TWL = UNKNOWN
 STORAGE = 1.5M

AIRFIELD TOWER (EXISTING)
 TWL = 1345.0m.a.s.l
 STORAGE = 0.30M

RESERVOIR SUPPLY ZONES	
AREA	RESERVOIR/TOWER
	POSTDENE TOWER
	NEWTOWN TOWER
	NEWTOWN RESERVOIR
	AIRFIELD TOWER
	KOPPIE/BOICHOKO RESERVOIR (NEW)
	KOPPIE TOWER (NEW)
	NEW DEVELOPMENT AREAS

LEGEND:	
	EXISTING BULK / LINK WATER TO BE UPGRADED
	EXISTING BOREHOLE WATER PIPE
	NEW BULK / LINK WATER
	EXISTING RESERVOIR
	EXISTING RESERVOIR TO BE ABANDONED
	NEW RESERVOIR
	WATER TOWER

AS-BUILT RECORD			
CONTRACT No.	DESCRIPTION	CERTIFIED BY	DATE

CERTIFIED AS-BUILT FOR CONTRACT :

ENGINEER _____ DATE _____

VERSION/AMENDMENTS			
No.	DATE	DESCRIPTION	AUTHORISED BY

BIGEN AFRICA Services (PTY) LTD
 Allan Cormack Street
 The Innovation Hub Perseus Pretoria
 PO Box 29 The Innovation Hub Pretoria 0087
 Tel: + 27 (0) 12 842 8700
 Fax: + 27 (0) 12 843 9000/9001
 E-mail: pretoria@bigenafrica.com
 www.bigenafrica.com

PROJECT TITLE:
POSTMASBURG HOUSING DEVELOPMENT

DRAWING TITLE:
WATER DISTRIBUTION ZONES

TSANTSABANE LOCAL MUNICIPALITY
 P.O. Box 5 Postmasburg, 8420
 13 Springbok Street, Postmasburg
 NORTHERN CAPE
 Tel: + 27 (0) 53 313 7300
 Fax: + 27 (0) 53 313 3548
 E-mail: mm@tsantsabane.gov.za

0 50 100
 100mm DN ORIGINAL DRAWING

ORIGINAL DRAWING SCALE: 1:15 000 ORIGINAL DRAWING SHEET SIZE: A1

APPROVED: _____
 CLIENT OR ASSIGNEE: _____ DATE: _____
 CLIENT DRAWING No.: _____ CLIENT REF No.: _____

SURVEYED	DESIGNED	S. Van Blerk
DRAWN	CHECKED	D.O. Starbeck
CO-ORDINATE SYSTEM: WGS23	DATE: May 2017	
APPROVED ON BEHALF OF BIGEN AFRICA:		
ENGINEER: _____	DATE: _____	
DRAWING No.: 2296.00.ZA.05.S001	VERSION: A.0	

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ANNEXURE D1

SANITATION UNIT DISCHARGES

Sanitation	
Description of Consumer	Daily Flow
Residential Low Income	600 ℓ /erf
Schools ¹	15 ℓ per pupil
Crèches ¹	15 ℓ per pupil
Municipal/Community Facility	400 ℓ per 100 m ² floor area
Churches	600 ℓ per erf
General Business and Commercial	400 ℓ 100 m ² floor area
Bus/Taxi Rank	10 ℓ per visitor
Sports Fields	12 kℓ per hectare
Clinics	400 ℓ per 100 m ² floor area
Public Open Space (Where Developable)	12 kℓ per hectare
Peak factor	2.50 (Red Book: Figure C1-Min 1.8)
FSR assumed for Commercial/industrial stands	0.5
Allowance for extraneous infiltration	15%

Notes:

1 – According to the 'Red Book' (August 2003), the discharge from day schools need not be taken into account, since these are relatively minor flows that do not peak at the same time as the main residential flow.

FSR assumed for Commercial/industrial stands is 0.5

SANITATION DESIGN GUIDELINES

Parameter	Element	Guidelines
Minimum Pipe diameter	Gravity sewers	160 mm ND
Minimum Velocity at full flow	Gravity sewers	0,7 m/s
Pipe capacity	Flow level in pipe as percentage of diameter	80% (d/D) at peak flow
Minimum Slopes for Pipes	First Pipe Section 150 mm 200 mm 300 mm and bigger	1 : 80 1 : 150 1 : 200 1 : 300
Hydraulic Calculations	Manning Equation	n = 0,012
Pipe Materials	Underground	<ul style="list-style-type: none"> • uPVC Structured Wall (Class 34) • 75 AND 100D Concrete pipe, • Structured HDPE (-8kN/m²) • Solid HDPE-PE80 PN10.
Location of Sewers	In Road Reserves Midblock	1 - 2m offset from boundary 1m from boundary
Cover over pipe	In road reserves On stands	1,4 m 1,0 m
Manholes	Spacing Diameter (depths up to 3m) Diameter (deeper than 3m) Material Minimum fall through manholes	80 m maximum 1,05 m dia 1,50 m Pre-cast concrete rings 50 mm (no fall on straight sections)

ANNEXURE D2



AS-BUILT RECORD			
CONTRACT No.	DESCRIPTION	CERTIFIED BY	DATE

CERTIFIED AS-BUILT FOR CONTRACT : _____

ENGINEER _____ DATE _____

VERSION/AMENDMENTS			
No.	DATE	DESCRIPTION	AUTHORISED BY

BIGEN AFRICA Services (PTY) LTD
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 The Innovation Hub Perseus Pretoria
 PO Box 29 The Innovation Hub Pretoria 0087
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 Fax: +27 (0) 12 843 9000/9001
 E-mail: pretoria@bigenafrica.com
 www.bigenafrica.com

Engineering Solutions

PROJECT TITLE:
POSTMASBURG HOUSING DEVELOPMENT

DRAWING TITLE:
BULK/LINK SEWER SCHEME PLAN

TSANTSABANE LOCAL MUNICIPALITY
 P.O. Box 5 Postmasburg, 8420
 13 Springbok Street, Postmasburg
 NORTHERN CAPE

Tel: + 27 (0) 53 313 7300
 Fax: + 27 (0) 53 313 3548
 E-mail: mm@tsantsabane.gov.za

0 50 100
 100mm ON ORIGINAL DRAWING

ORIGINAL DRAWING SCALE: 1:125 000 ORIGINAL DRAWING SHEET SIZE: A1

APPROVED: _____ DATE: _____

CLIENT OR ASSIGNEE: _____ DATE: _____

CLIENT DRAWING No.: _____ CLIENT REF No.: _____

SURVEYED: _____ DESIGNED: M. Toof

DRAWN: S.L. Pitso CHECKED: D.O. Storbeck

CO-ORDINATE SYSTEM: WGS23 DATE: November 2015

APPROVED ON BEHALF OF BIGEN AFRICA:

ENGINEER: _____ DATE: _____

DRAWING No.: **2296.00.ZA.06.S001** VERSION: **A.0**

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2296.00.ZA.06.S001

ANNEXURE E1

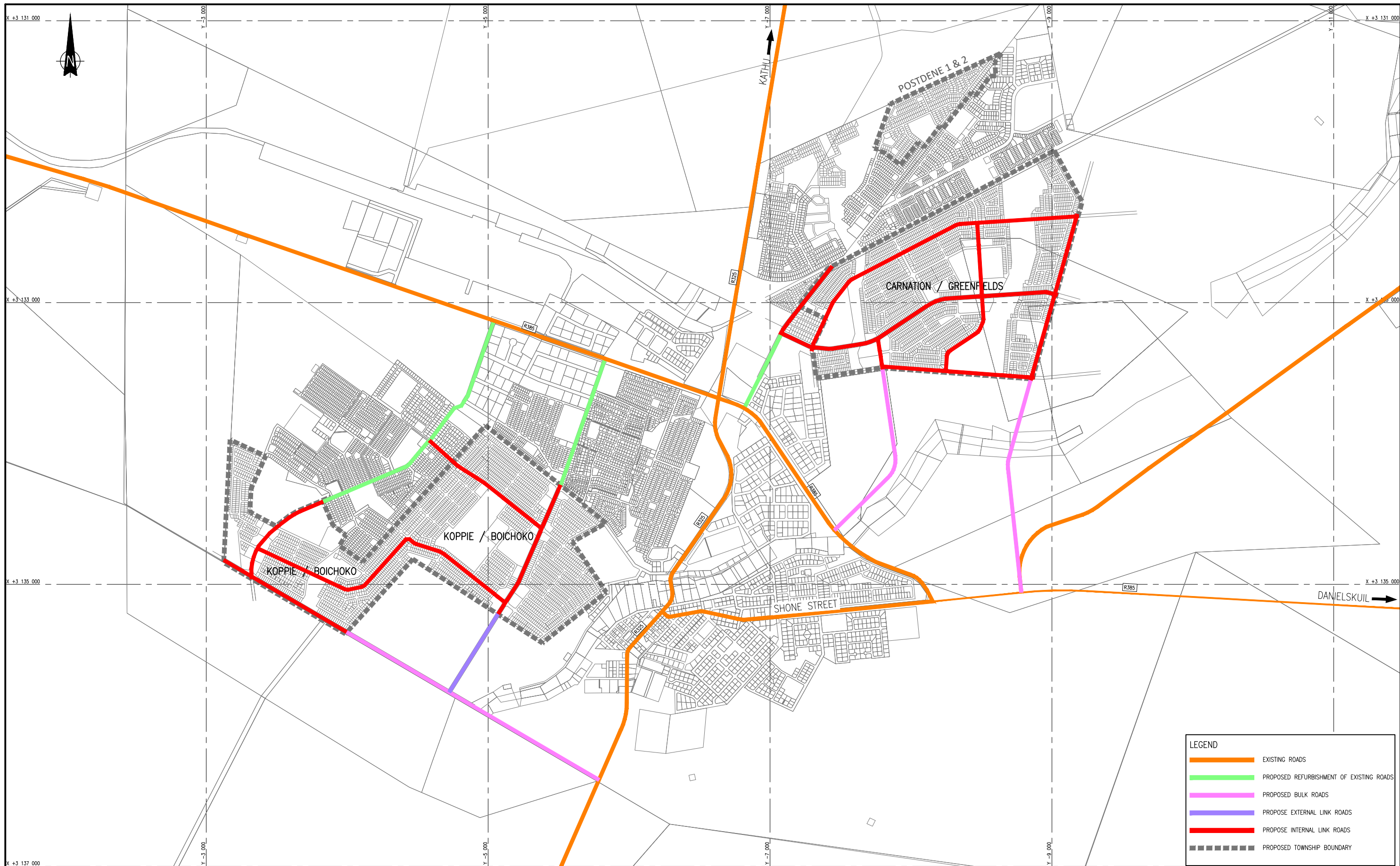
Tsantsabane Local Municipality
Outline Scheme Report: Civil Engineering Services
Proposed Geometric Design Standards



ROAD CLASS		4		5a	5b	
Function		Local Distributor		Residential Access Collector	Residential Access Loop	
Maximum dwelling units served	n.a.	1500	500	200	120	
Road reserve width (m)	30	20	16	13	13	
Roadway width (m)	7.4		7	5	5	
Design speed (km/h)	60	50		40	30	
Desirable maximum length (m)	n.a.	4000	500	500	500	
Minimum stopping distance (m)	80	65		50	30	
Intersection sight distance (m)	160	130	130	115	80	
Minimum centre line radius - deflection angle larger 60° (m)	150	90	50	15	12.5	
Minimum centre line radius - deflection angle smaller 60° (m)	150	90	50	30	30	
Minimum kerb radius (m) ¹ / ₄	12	12	12	10	10	
Minimum splay size (m) ¹	5 x 15		5	5	5	
Intersection spacing(m) - adjacent	300	90	50	50	40	
Intersection spacing(m) - opposite	300	90	25	25	20	
Favoured maximum gradient (%)	7	7	10	10	12	
Maximum gradient (%/m)	10	10	12	12.5	16	
Minimum K-Values for Vertical Curves	Crest Curves	16	11	11	6	6
	Sag Curves	16	12	12	8	8
Cross Fall / Cambre (%)	3	3	3	3	3	
Minimum verge width (m)	5	5	5	5	5	

Notes:

ANNEXURE E2



LEGEND	
	EXISTING ROADS
	PROPOSED REFURBISHMENT OF EXISTING ROADS
	PROPOSED BULK ROADS
	PROPOSED EXTERNAL LINK ROADS
	PROPOSED INTERNAL LINK ROADS
	PROPOSED TOWNSHIP BOUNDARY

AS-BUILT RECORD			
CONTRACT No.	DESCRIPTION	CERTIFIED BY	DATE

CERTIFIED AS-BUILT FOR CONTRACT :

ENGINEER: _____ DATE: _____

VERSION/AMENDMENTS			
No.	DATE	DESCRIPTION	AUTHORISED BY

BIGEN AFRICA Services (PTY) LTD
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 The Innovation Hub Persequor Pretoria
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 Tel: + 27 (0) 12 842 8700
 Fax: + 27 (0) 12 843 9000/9001
 E-mail: pretoria@bigenafrica.com
 www.bigenafrica.com

Engineering solutions

PROJECT TITLE:
POSTMASBURG HOUSING DEVELOPMENT

DRAWING TITLE:
PROPOSED BULK/LINK ROADS NETWORK

TSANTSABANE LOCAL MUNICIPALITY
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 13 Springbok Street, Postmasburg
 NORTHERN CAPE
 Tel: + 27 (0) 53 313 7300
 Fax: + 27 (0) 53 313 3548
 E-mail: mm@tsantsabane.gov.za

0 50 100
 100mm ON ORIGINAL DRAWING

ORIGINAL DRAWING SCALE: 1:125 000 ORIGINAL DRAWING SHEET SIZE: A1

APPROVED: _____ DATE: _____

CLIENT OR ASSIGNEE: _____ DATE: _____

CLIENT DRAWING No.: _____ CLIENT REF No.: _____

SURVEYED	-	DESIGNED	R. Rayners
DRAWN	S.L. Pitse	CHECKED	D.O. Storbeck
CO-ORDINATE SYSTEM:	WGS23	DATE:	May 2017
APPROVED ON BEHALF OF BIGEN AFRICA:			
ENGINEER:	_____	DATE:	_____
DRAWING No.:	2296.00.ZA.03.A005	VERSION:	1.0

2296.00.ZA.03.A005

ANNEXURE F1

Postmasburg Housing Development

Proposed Stormwater Design Standards



Design Criteria	Value
General	
Design Flood Recurrence interval (Minor Floods)	1 : 2
Design Flood Recurrence interval (Major Floods)	1 : 25
Design Flood Recurrence interval (Major Floods) at Lowest Points	1 : 50
Pre-Development runoff factor	0.28
Post-Development runoff factor	0.8
Pipe System	
Pipe Material	Concrete (SABS 677)
Pipe Joint	Spigot & Socket (Rubber Ring Joint)
Manning's roughness coefficient	0.013
Minimum pipe size (mm)	450
Minimum pipe class for pipe sizes less than 525mm (Dia <525mm)	100D
Minimum pipe class for pipe sizes more than 525mm (Dia >525mm)	To be designed
Flow Depth (^d /D)	1.0
Maximum pipe velocity (m/s)	3.0
Minimum pipe slope (%) (450 mm ø Pipe)	1 : 100
Manhole Material	Concrete (SABS 677)
Manhole chamber minimum height (mm)	1,000
Manhole chamber maximum height (mm)	1,500
Manhole chamber internal diameter (mm)	1,200
Manhole shaft internal diameter (mm)	675
Maximum manhole spacing (m)	100
Minimum kerb inlet size (m)	2.0
Junction Angles	Minimum 45° & Maximum 60°
Canal System	
Canal Material	Concrete/ grassing
Manning's roughness coefficient	0.015
Maximum side slope of trapezoidal canal	1 : 1
Minimum freeboard (mm)	150
Maximum velocity (m/s)	5.0
Roadways	
Maximum velocity in roadway (m/s)	3.0

Postmasburg Housing Development

Proposed Stormwater Design Standards



Maximum Encroachment on Roads during minor storms	
Design Criteria	Value
Residential and lower-order-roads [Class: 5b, 5c, 5d, 5e, 5f]	No Kerb overtopping*, Depth of flow not to exceed 10 mm at crown.
Residential access collector [Class 5a]	No Kerb overtopping*, Flow spread must leave at least 20 per cent of total road width free of water.
Local distributor [Class 4]	No Kerb overtopping*, Flow spread must leave at least 40 per cent of total road width free of water.
Higher-order-roads	No Encroachment is allowed on any traffic lane.
Encroachment during Major Storms	The encroachment of runoff from the major flood at the crown of the road on class 4 (local distributors) and higher order roads should not exceed depth of 150mm to allow the operation of emergency vehicles such as ambulances. The allowable depth of flow in lower order roads will depend on the ground level of adjacent properties
Maximum Encroachment on Roads during major storms	
The encroachment of runoff during the major flood at the crown of the road on class 4 (local distributors) and higher order roads should not exceed to depth of 150mm to allow the operation of emergency vehicles such as ambulances. The allowable depth of flow in lower order roads depend on the ground level of adjacent properties.	

Notes:

1. No hidden junction boxes will be allowed
2. Any servitudes required must not be less than 3m wide and to be registered in favour of Tsantsabane Local Municipality
3. * Where no Kerb exists, encroachment should not extend over property boundaries
3. ** Stormwater Drainage calculations, Layout legend shown below. This Block Shall be added to all Stormwater Design drawings
4. *** Flow in pipe based on the cumulation of the time of concentration, not cumulative inlets