SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CRITERIA	CATAGORY ([1]global; [2]national)	OBSERVED
Ceropegia decidua subsp. *pretoriensis*	November-April	Direct sunshine or shaded situations, rocky outcrops of the quartzitic Magaliesberg mountain series, in pockets of soil among rocks, in shade of shrubs and low trees, can be seen twining around grass spikes.	A1	Vulnerable[1]	Not observed No suitable habitat
Cheilanthes deltoidea subsp. *silicicola*	November-June	Southwest-facing soil pockets and rock crevices in chert rock.	A2	Vulnerable[1]	Not observed No suitable habitat Recorded within 5km radius from study site
Cleome conrathii	March-May; December-January	Stony quartzite slopes, usually in red sandy soil, grassland or open to closed deciduous woodland, all aspects.	A3	Near Threatened[1]	Not observed No suitable habitat
Crinum macowanii	October-January	Grassland, along rivers, in gravelly soil or on sandy flats.	N/A	Declining[2]	Not observed No suitable habitat
Dicliptera magaliesbergensis	February-April	Forest, savanna (Riverine forest and bush).	A1	Vulnerable[1]	Not observed No suitable habitat Recorded within 5km radius from study site

SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CRITERIA	CATAGORY ([1]global; [2]national)	OBSERVED
Drimia sanguinea	August-December	Open veld and scrubby woodland in a variety of soil types.	B	Near Threatened[2]	Not observed No suitable habitat Recorded within 5km radius from study site
Eucomis autumnalis	November-April	Damp, open grassland and sheltered places.	N/A	Declining[2]	Not observed No suitable habitat
Gunnera perpensa	October-March	In cold or cool, continually moist localities, mainly along upland streambanks.	N/A	Declining[2]	Not observed No suitable habitat
Habenaria barbertoni	February-March	In grassland on rocky hillsides.	A2	Near Threatened[1]	Not observed No suitable habitat
Habenaria kraenzliniana	February-April	Terrestrial in stony, grassy hillsides, recorded from 1000 to 1400m.	A3	Near Threatened[1]	Not observed No suitable habitat Recorded within 5km radius from study site
Habenaria mossii	March-April	Open grassland on dolomite or in black sandy soil.	A1	Endangered[1]	Not observed Suitable habitat
Holothrix randii	September-October	Grassy slopes and rock ledges, usually southern aspects.	B	*Holothrix randii*	Not observed No suitable habitat

SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CRITERIA	CATAGORY ([1]global; [2]national)	OBSERVED
Hypoxis hemerocallidea	September-March	Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland; also grows on dry, stony, grassy slopes, mountain slopes and plateaux; appears to be drought and fire tolerant.	N/A	Declining[2]	Observed Suitable habitat
Ilex mitis var. *mitis*	October-December	Riverbanks, streambeds, evergreen forests.	N/A	Declining[2]	Not observed No suitable habitat
Lithops lesliei subsp. lesliei	March-June	Primary habitat appears to be the arid grasslands in the interior of South Africa where it usually occurs in rocky places, growing under the protection of surrounding forbs and grasses.	B	Near Threatened[2]	Not observed No suitable habitat

SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CRITERIA	CATAGORY ([1]global; [2]national)	OBSERVED
Melolobium subspicatum	September-May	Grassland.	A1	Vulnerable[1]	Not observed Suitable habitat Recorded within 5km radius from study site
Pearsonia bracteata	December-April	Plants in Gauteng and North West occur in gently sloping Highveld grassland, while those in the Wolkberg were collected from steep wooded slopes and cliffs in river valleys.	A3	Near Threatened[1]	Not observed Suitable habitat

FAUNA HABITAT ASSESSMENT FOR PORTION 73 OF THE FARM KNOPPIESLAAGTE 385-JR, CENTURION

April 2016

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Specialists

Specialist investigators: Mr. S.E. van Rooyen (M.Sc. Restoration Ecology and Botany candidate); CW Vermeulen (B.Sc. Biological and Environmental Sciences),

Declaration of independence:

The specialist investigators responsible for conducting this particular specialist vegetation study declare that:

• We consider ourselves bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);

• At the time of conducting the study and compiling this report we did not have any interest, hidden or otherwise, in the proposed development, except for financial compensation for work done in a professional capacity;

• Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, we will not be affected in any manner by the outcome of any environmental process of which this report may form a part;

• We declare that there are no circumstances that may compromise our objectivity in performing this specialist investigation. We do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;

• We do not have any influence over decisions made by the governing authorities;

• We have the necessary qualifications and guidance from professional experts (registered Pr. Nat. Sci.) in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;

• This document and all information contained herein is and will remain the intellectual property of Bokamoso Environmental: Specialist Division. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.

• We will comply with the Act, regulations and all other applicable legislation;

S.E. van Rooyen CW Vermeulen

Review of

FAUNA HABITAT ASSESSMENT FOR PORTION 73 OF THE FARM KNOPPIESLAAGTE 385-JR, CENTURION of April 2016

Review: June 2016

Reviewer: Reinier F. Terblanche

(M.Sc, *Cum Laude*; Pr.Sci.Nat, Reg. No. 400244/05)

APPROACH OF REVIEWER TO ECOLOGICAL REVIEWS

Ecological studies and applied ecology comprise the consideration of a diversity of factors, even more so in South Africa with its exceptional high floral and faunal diversities, various soil types, geological formations and diversity of habitats in all its biomes. Therefore it would be easy to add onto or show gaps in any ecological impact assessment, rehabilitation actions or management plans stemming from ecological assessments. The approach followed here is to review the ecological study in a reasonable context and focus on the successful fulfillment of the aims of the study within the limits of cost and time.

ECOLOGICAL REVIEW: FAUNA HABITAT ASSESSMENT FOR PORTION 73 OF THE FARM KNOPPIESLAAGTE 385-JR, CENTURION, APRIL 2016

Findings of the review

- The report contains details of the expertise of the persons who prepared the report and a declaration that the person who prepared the report is acting independently.
- The aims of the report are clear.
- The report provides references and descriptions of the principles and guidelines to be taken into account for fauna habitat assessment.
- Acceptable methods and limitations have been given in detail to reach the goal of the assessment.
- Relevant laws and guidelines have been mentioned and integrated.
- The report gives a clear assessment of the status fauna at the site and also added an extensive literature survey and existing knowledge survey.
- The recommendations and the conclusion are consistent with the aims of the report.
- It is to be commended that the report is economical and practical so that it adds value to the team effort of addressing the management and future of the habitats at the site, in this case in particular noting the drainage line sensitivity in a mostly disturbed and modified area.

Overall the report appears to be relevant, detailed enough for the purposes of this study and complete and finally addressing the key issues at stake.

Reinier F. Terblanche M.Sc. Ecology; Pr.Sci.Nat, Reg. No. 400244/05

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FIGURES:

1. INTRODUCTION

Bokamoso Environmental Consultants CC; Specialist Division was appointed to conduct a Basic Faunal Habitat Assessment for the proposed mixed use development on Portion 73 of the farm Knoppieslaagte 385-JR, Centurion, also known as Peach Tree.

This report is based on the faunal species present on the study area as well as species that could potentially occur. The report acts as an overview of the probable and/or known occurrence of following faunal groups; Mammals, Reptiles, Amphibians, Invertebrates and Avifauna. The primary focus of this report falls on Threatened and Near Threatened species and other species with conservation importance occurring on or near the study area to ensure that, should any such species exists, the appropriate actions are taken to guarantee the well-being of these species.

2. SCOPE AND OBJECTIVE OF ASSESSMENT

- To qualitatively and quantitatively assess the significance of the habitat components and current general conservation status of the property
- Comment on ecological sensitive areas within the study area
- Comment on connectivity with natural vegetation and homogeneous habitats surrounding the study area
- To provide a list of faunal species which occur or might occur, and to identify species of conservation importance
- To highlight potential impacts of the proposed development on the fauna judge to be present on the study site, and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

3. STUDY AREA

The study area is situated in Centurion, Gauteng, on portion 73 of the farm Knoppieslaagte 385-JR. The study area is situated situated east of the M26 Road, adjacent to the Copperleaf Golf and Country Estate (**Figure 1**). The study site is about 4.6 ha in size and is located in the 2528CC quarter degree square (QDS). The study area consists of two main habitats units identified as disturbed Grassland and Woodland. The study area is located 1469 meters above sea level and falls in the Carletonville Dolomite Grassland, declared as Vulnerable (Government Gazette no. 34809, 2011).

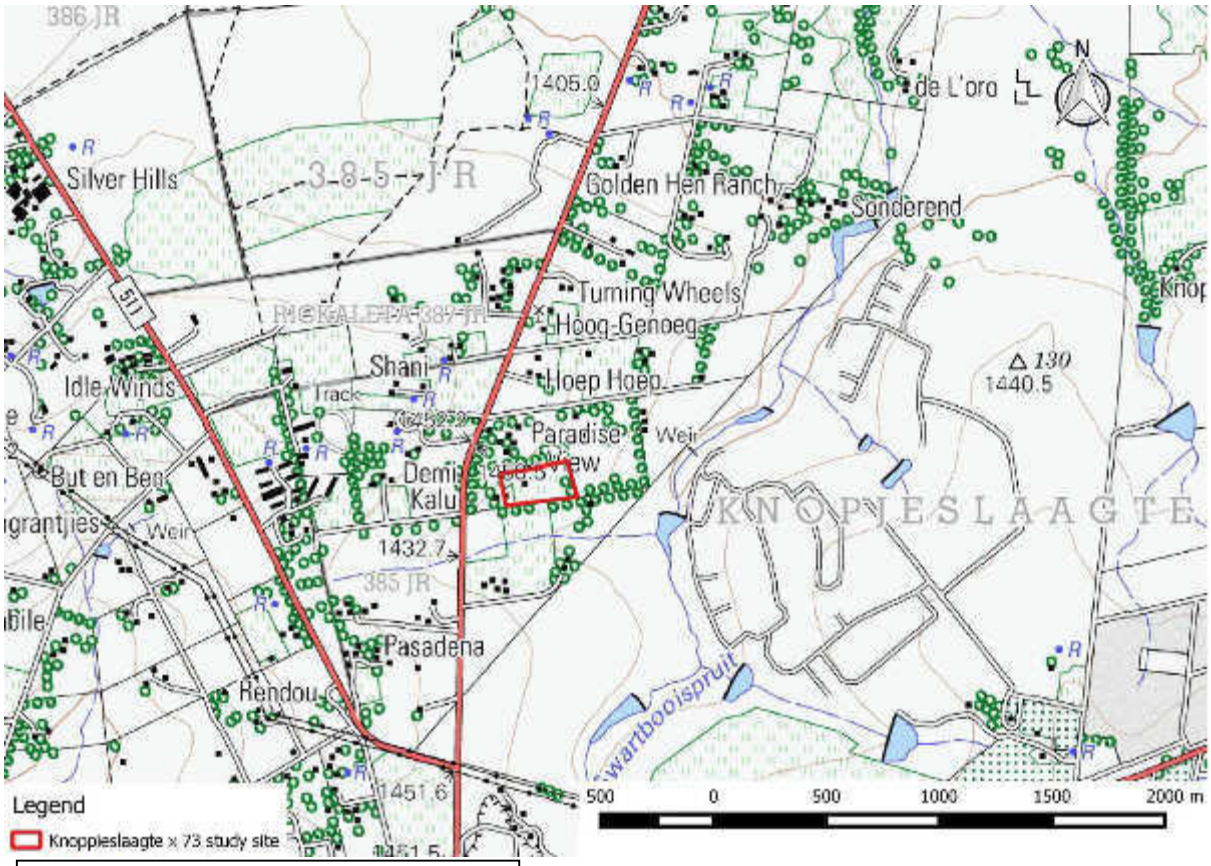

Figure 1: Location of study area

4. METHODS

Before conducting a field survey on the study area a desktop assessment was conducted to note the prevalent faunal species occurring on or near the study area. A list of expected species was compiled and used as a reference during the field survey to ensure that faunal species that should theoretically occur were not overlooked. All distinct faunal habitats were identified on site, after which each habitat was assessed to record the associated faunal species for each of

the respective faunal group (Avifauna, Herpetofauna, Invertebrates and Mammals) present in that specific habitat.

5. RESULTS

Two faunal habitat units were identified within the study area. These habitat units includes a Disturbed Grassland and Woodland (**Figure 2**).

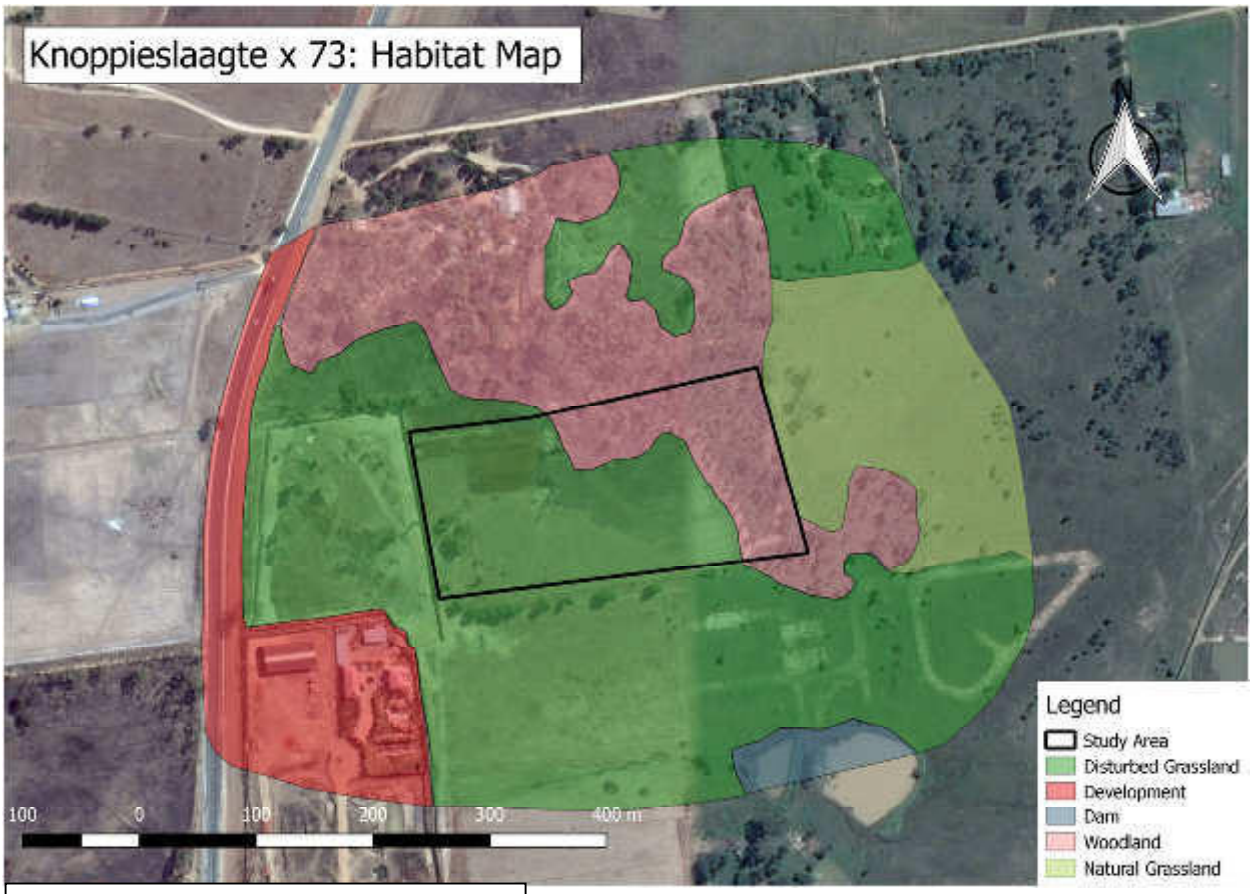

Figure 2: Fauna habitats identified

5.1 Disturbed and Secondary Grassland

The vegetation on this study unit was previously cleared, which left a transformed, semi-rehabilitated grassland area, dominated by graminoid species such as *Pennisetum clandestinum, Cynodon dactylon, Eragrostis curvula* and *Heteropogon contortus* as they occur in abundance. The ecological integrity of this Grassland has been totally destroyed and the species assemblage on the property differs from the Carletonville Dolomite Grassland species. (**Figure 3**).

The Secondary Grassland directly adjacent to the study ares, is dominated by graminoid species such as *Eragrostis* spp., *Heteropogon contortus, Andropogon* spp., *Aristida* spp. and *Hyparrhenia hirta.* Encroachment of *Seriphium plumosum* was also observed within the study unit, which explains why this grassland is classified as a Secondary Grassland. None the less, the ecological status of this Secondary Grassland is good, with fairly high floristic species richness. This enhances the favourability of this habitat for several fauna species (**Figure 3**).

Connectivity of this habitat with similar, natural areas is limited as agricultural, industrial and urban development restricts demographic patterns of faunal species that might favour this particular Grassland for foraging purposes. Thus no Threatened and/or Near Threatened fauna species are expected to be present within this study unit.

Figure 4: Disturbed Grassland

5.2 Woodland

The Woodland study unit is dominated by the alien tree species, *Eucalyptus camaldulensis* (**Figure 5**). This particular species creates an unsuitable habitat for other plant species, but

provides favorable habitats for certain faunal species. Several graminoid species were also present, such as *Aristida congesta* subsp*. congesta, Cynodon dactylon, Eragrostis curvula, Melinis repens, Panicum coloratum* and *Themeda triandra* to name a few. The current ecological status was judged to be degraded and not ecologically sensitive on account of the degraded status and the high level of alien vegetation encroachment within the habitat unit.

Figure 5: Woodland dominated by *Eucalyptus camaldulensis*

6. MAMMAL HABITAT ASSESSMENT

This part of the report focuses on the probable and/or known occurrence of Threatened and Near Threatened mammal species as well as mammal species with conservation concern based on the habitats present on the study area.

Special attention was paid to the evaluation of the quantitative and qualitative habitat conditions of Threatened and near Threatened mammal species judged to have a probable occurrence in the study area. Mitigation measures to lesser the impacts and effects of the proposed development were suggested where applicable. The secondary objective of this investigation

was to gauge which mammals might still reside in and around the study area and to compile a complete list of expected mammal diversity.

6.1 Methods

A three hour field survey was conducted on the 20th of April 2016, during which all observed mammal species as well as all the mammalian habitats present on the study area were identified. Following the field survey a desktop assessment was conducted to add additional mammal species expected to occur in the study area on account of their individual habitat preferences in accordance with the habitats identified on the study area. Mammal occurrence probability can be attributed to the well recorded and known distributions of South African mammals as well as the quantitative and qualitative nature of the habitats present on site. Moreover the 500 meters surrounding the study area was scanned for any additional mammal habitats.

Field Survey

Before the commencement of the field survey a list of expected mammal species was compiled to use as a reference in the field. All the Threatened and Near Threatened mammals with distribution ranges overlapping the study area were included in the aforementioned reference list. These species were prioritized and special attention was paid in terms of identifying their associated habitat preferences and noting signs of their occurrence. The field survey was conducted by means of random transect walks in each habitat. During the field survey mammal species were identified in accordance with individual habitat preferences as well as actual observations and signs such as; spoor, droppings, burrows and roosting sites indicating their presents (Chris & Tilde Stuart, 2011).

Desktop Survey

On account of the fact that the majority of mammals are either nocturnal, hibernators, secretive and/or seasonal it is increasingly difficult to confirm their presence or absence by means of actual observations alone. Therefore a number of authoritative tomes such as field guides, databases and scientific literature were utilized to deduce the probable occurrence of mammal species. The Animal Demography Unit: Virtual Museum (http://vmus.adu.org.za/) was consulted to verify the records and occurrence of recorded mammal species in the 2528CC QDS. The

Gauteng Conservation Plan (C-plan v3.3) was consulted to evaluate ecologically sensitive areas associated with mammals. A comprehensive list of probable mammalian occurrence with reference to the study area was compiled on account of the well-known and documented distributions of mammals in South Africa, especially in the Gauteng province.

The occurrence probability of mammal species was deduced in accordance with a species' distribution and habitat preferences. Where a species' distribution range was found to overlap with the study area and its preferred habitat was present, the applicable species was deemed to have a high occurrence probability on or near the study area.

In the case were the preferred habitat of a species' was found to be suboptimal on the study area, however its distribution range still overlapped the study area, the applicable species' occurrence probability was deemed to be medium.

When the preferred habitat of a species was absent from the site, the applicable species was deemed to have a low occurrence probability regardless of its distribution range.

6.2 Specific Requirements

During the field survey attention was paid to note any signs of potential occurrence of Threatened and/or Near Threatened species as well as other species with conservation importance such as endemic species.

These species include:

Southern African hedgehog (*Atelerix frontalis*), Woodland Dormouse (*Graphiurus murinus*), White-tailed rat (*Mystromys albicaudatus*), and several bat species including Blasius's/Peak-Saddle Horseshoe Bat (*Rhinolophus blasii*), Darling's Horseshoe Bat (*Rhinolophus darlingi*), Geffroy's Horseshoe Bat (*Rhinolophus clivosus*), Hildebrandt's Horseshoe Bat (*Rhinolophus hildebrandtii*), Scheiber's Long-Fingered Bat (*Miniopterus schreibersii*) and Temminck's Hairy Bat (*Myotis tricolo*).

Mammal species listed according to IUCN as Near Threatened: Southern African Hedgehog (*Atelerix frontalis*), Schreiber's Long-Fingered Bat (*Miniopterus schreibersii*), Temminck's Hairy Bat (*Myotis tricolor*), Horseshoe Bat (*Rhinolophus clivosus*), Darling's Horseshoe Bat (*Rhinolophus darling*) and Hildebrandt's Horseshoe Bat (*Rhinolophus hildebrandtii*).

6.3 Results

6.3.1 Mammal habitats identified

During the habitat assessment two distinct mammalian habitats were identified within the study area. These habitats include: Degraded and Secondary Grassland and Woodland dominated by *Eucalyptus camaldulensis* (**Figure 2**).

The Woodland habitat is composed of dense stands of alien *Eucalyptus camaldulensis* trees, which provide excellent refuge and nourishment for a number of robust small mammals such as Genets (*Genetta sp.*) Slender Mongoose (*Galerella sanguineus*), Yellow Mongoose (*Cynictis penicillata*), Brown rats, domestic dogs and cats and Four-striped Veld Mouse (*Rhabdomys pumilio)*.

The Degraded and Secondary Grassland provides habitat for smaller rodents and insectivorous mammals such as shrews, Slender Mongoose (*Galerella sanguineus),* Scrub Hare (*Lepus saxatilis),* Four-striped grass mouse (*Rhabdomys pumilio)* and South African Molerat (*Cryptomys hottentotus*). On account of various anthropogenic disturbances within this habitat unit as well as its isolated nature, the probability of threatened and near threatened species occurring is highly unlikely. The Secondary Grassland adjacent to the study site experience disturbances in the form of isolation from homogeneous habitats, as fences, roads and other anthropogenic disturbances hinders the movement of certain mammal species. The isolated nature of this habitat decreases the occurrence probability of robust terrestrial mammals such as Common Duiker (*Sylvicapra grimmia)* or Steenbok (*Raphicerus campestris).* The occurrence probability of nomadic mammal species such as the African Hedgehog is highly unlikely on account of the degraded and isolated status of this Grassland habitat.

On account of the current ecological state of both habitats identified the study area was identified with a low ecological sensitivity (**Figure 5**).

6.3.2 Expected and observed Mammal species

Table 1: Mammal species observed or expected to occur.

	Scientific Name	**Common Name**	**Red List Category**	**Occurrence Probability**
1.	*Aethomys*	Veld rats	Not listed	4
2.	*Atelerix frontalis*	Southern African Hedgehog	Near	1

			Threatened	
3.	*Canis mesomelas*	Black-backed Jackal	Least Concern	2
4.	*Crocidura hirta*	Lesser Red Musk Shrew	Data Deficient	2
5.	*Crocidura silacea*	Lesser Gray-brown Musk Shrew	Data Deficient	2
6.	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern	5
7.	*Cynictis*	Yellow Mongoose	Not listed	4
8.	*Dendromus mystacalis*	Chestnut African Climbing Mouse	Least Concern	1
9.	*Epomophorus wahlbergi*	Epomophorus wahlbergi	Least Concern	1
10.	*Felis catus*	Domestic Cat	Introduced	4
11.	*Genetta maculata*	Common Large-spotted Genet (Rusty-spotted Genet)	Least Concern	2
12.	*Genetta genetta*	Common Genet	Least Concern	3
13.	*Genetta tigrina*	Cape Genet	Least Concern	2
14.	*Graphiurus murinus*	Forest African Dormouse	Least Concern	3
15.	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	2
16.	*Leptailurus serval*	Serval	Near Threatened	1
17.	*Lepus saxatilis*	Scrub Hare	Least Concern	5
18.	*Mastomys coucha*	Southern African Mastomys	Least Concern	4
19.	*Neoromicia capensis*	Cape Serotine	Least Concern	3
20.	*Rattus*	Genus Rattus	Not listed	5
21.	*Rattus rattus*	Roof Rat	Least Concern	4
22.	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern	4
23.	*Scotophilus dinganii*	Yellow-bellied House Bat	Least Concern	4
24.	*Tatera*		Not listed	2

*The occurrence probability of the mammal species listed above are indicated as follows:
Not likely to occur - 1, Low occurrence probability - 2, Medium occurrence probability - 3, High occurrence probability – 4, Confirmed occurrence – 5.
Red Data species ranked as defined in Friedmann and Daly's S.A. Red Data Book of the mammals of South Africa.

6. 3.3 Threatened and Red Listed Mammal species

The listed shrews (**Table 1**) are not necessarily threatened; they are listed as a precautionary measure as a result of their unknown status. Musk shrews are widespread and commonly found in residential gardens throughout Gauteng, as such they are generally assumed to be abundant. The conservation status of musk shrews are however still to be determined and as such they are listed as Data Deficient.

Suitable habitat for the Serval (*Leptailurus serval*) was observed in the adjacent Secondary Grassland, as this habitat is approx. 300m away from a dam, connected to a water course. This particular species prefer wetlands and grasslands close to water. The Secondary Grassland

habitat is also favourable habitat for the Southern African hedgehog (*Atelerix frontalis*), as it prefer grassland areas. The probability of these species occurring within the study are is however highly unlikely, on account of the continuous human disturbances and ground clearing affecting within and around the study area. The habitat units discussed in this report are also subjected to isolation from nearby natural habitat units, which limits movement for any of the threatened and near threatened fauna species listed in **Table 1**.

6.4 Findings

The majority of the terrestrial habitats present on the study area experience anthropogenic disturbances, which decrease the occurrence probability of both the Serval (*Leptailurus serval*) and Southern African hedgehog (*Atelerix frontalis*). Isolation from similar natural habitats threatens both the Disturbed and Secondary Grassland, as genetic variation amongst species will be restricted.

The study area was identified with a low ecological sensitivity from a mammalian perspective.

7. HERPETOFAUNA HABITAT ASESSMENT

7.1 Methods

Habitat units identified within the study area were documented, and a combined species list was compiled for the possible presence of herpetofauna species, considering the knowledge of their preferred habitats. Field guides such as those of du Preez & Carruthers (2009), Marais (2004), and (Alexander & Marais 2007) were used for identification and habitat description of herpetofauna species.

A desktop study was conducted to identify suitable habitats for the threatened and near threatened herpetofauna species known to occur in the QDS 2528CC. The Animal Demography Unit: Virtual Museum (http://vmus.adu.org.za/) was consulted to verify the occurrence of herpetofauna species previously recorded within the QDS 2528CC. The Gauteng Conservation Plan (C-plan v3.3) was consulted to evaluate ecologically sensitive areas.

The majority of herpetofauna species are nocturnal, poikilothermic secretive and seasonal, which makes it difficult to observe them during field surveys. In this case the presence of

herpetofauna species was examined on habitat preferred by selected species and respective documented ranges.

7.2 Specific Requirements

Adequate amount of random transect walks in the study site was attempted to identify herpetofauna species. Emphasis on specific Red List species that might occur on the study site:

- Striped Harlequin Snake (*Homoroselaps dorsalis*)

7.3 Results

7.3.1 Herpetofauna habitats identified

The Degraded and Transformed Grassland provides no conspicuous standing or flowing water bodies as such to provide for the niche preferences for amphibian species (Du preez & Carruthers) apart from a temporary trench containing storm water which provides temporary suitable habitat for a number of widespread amphibians. The trench can however not be seen as a sustainable habitat as it a temporary and will soon be covered up by soil. No medium or large sized rocks were observed, which further decreases the probability of reptile species favouring this habitat. (**Table 2**).

Termite mounds were absent within the study area, which lessens the probability of finding the Striped Harlequin Snake (*Homoroselaps dorsalis*). This Degraded and Transformed Grassland habitat does however provide a suitable habitat for some nomadic snake species.

7.3.2 Expected and observed Herpetofauna species

One amphibian species and no reptile species were observed during the survey. Twelve amphibian species and 36 reptile species have been recorded within the QDS 2628AA, their occurrence probability was assessed and are indicated in Tables 2 and 3.

Table 2: **Amphibian** species deducted to occur.

	Scientific Name	**Common Name**	**Red List Category**	**Occurrence Probability**
1.	*Amietia fuscigula*	Cape River Frog	Least Concern	1
2.	*Amietia quecketti*	Queckett's River Frog	Least Concern	1
3.	*Cacosternum boettgeri*	Common Caco	Least Concern	3

4.	*Kassina senegalensis*	Bubbling Kassina	Least Concern	1
5.	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern	1
6.	*Pyxicephalus adspersus*	Giant Bull Frog	Near Threatened	1
7.	*Schismaderma carens*	Red Toad	Least Concern	4
8.	*Sclerophrys capensis*	Raucous Toad	Least Concern	3
9	*Sclerophrys gutturalis*	Guttural Toad	Least Concern	4
10.	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern	2
11.	*Tomopterna natalensis*	Natal Sand Frog	Least Concern	2
12.	*Xenopus laevis*	Common Platanna	Least Concern	5

*The occurrence probability of the amphibian species listed above are indicated as follows:
Not likely to occur - 1, Low occurrence probability - 2, Medium occurrence probability - 3, High occurrence probability – 4, Confirmed occurrence – 5.

Table 3: **Reptile** species observed and/or deducted to occur.

#	***Scientific Name***	**Common Name**	**Red List Category**	**Occurrence Probability**
1.	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern	2
2.	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern	1
3.	*Agama atra*	Southern Rock Agama	Least Concern	1
4.	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern	1
5.	*Atractaspis bibronii*	Bibron's Stiletto Snake	Least Concern	1
6.	*Boaedon capensis*	Brown House Snake	Least Concern	4
7.	*Causus rhombeatus*	Rhombic Night Adder	Least Concern	3
8.	*Chamaeleo dilepis dilepis*	Common Flap-neck Chameleon	Least Concern	1
9.	*Cordylus vittifer*	Common Girdled Lizard	Least Concern	1
10.	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern	3
11.	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern	4
12.	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern	1
13.	*Hemachatus haemachatus*	Rinkhals	Least Concern	4
14.	*Hemidactylus mabouia*	Common Tropical House Gecko	Least Concern	2
15.	*Homoroselaps dorsalis*	Striped Harlequin Snake	Near Threatened	1
16.	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern	1
17.	*Kinixys lobatsiana*	Lobatse Hinged Tortoise	Least Concern	1
18.	*Lamprophis aurora*	Aurora House Snake	Least Concern	3
19.	*Leptotyphlops*		Not listed	1
20.	*Leptotyphlops scutifrons*	Eastern Thread Snake	Not listed	1

	conjunctus			
21.	*Lycodonomorphus inornatus*	Olive House Snake	Least Concern	2
23.	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern	1
24.	*Lygodactylus capensis capensis*	Common Dwarf Gecko	Least Concern	4
25.	*Naja annulifera*	Snouted Cobra	Least Concern	2
26.	*Pachydactylus affinis*	Transvaal Gecko	Least Concern	3
27.	*Pachydactylus capensis*	Cape Gecko	Least Concern	2
28.	*Panaspis wahlbergii*	Wahlberg's Snake-eyed Skink	Least Concern	1
29.	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern	1
30.	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern	2
31.	*Psammophylax rhombeatus rhombeatus*	Spotted Grass Snake	Least Concern	2
34.	*Pseudaspis cana*	Mole Snake	Least Concern	3
35.	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern	1
36.	*Trachylepis capensis*	Cape Skink	Least Concern	3

*The occurrence probability of the reptile species listed above are indicated as follows:
Not likely to occur - 1, Low occurrence probability - 2, Medium occurrence probability - 3, High occurrence probability – 4, Confirmed occurrence – 5.

7.3.3 Threatened and Red Listed Herpetofauna species

The preferred habitat of the Striped Harlequin Snake (*Homoroselaps dorsalis*) were absent from the study area as minimal termite mounds, medium-sized rocks and crevices were observed during the site visit. It is thus highly unlikely for this particular species to occur within the study area due to the disturbed nature of the site as well as the lack of favourable habitat.

7.4 Findings

The majority of the terrestrial habitats present on the study area have been transformed and degraded by alien invasive species and anthropogenic activities to such an extent that it can no longer be regarded as Carletonville Dolomite Grassland vegetation. No suitable habitat for any near Threatened herpetofauna species such as the Striped Harlequin Snake (*Homoroselaps dorsalis*) were observed during the field survey.

8. INVERTEBRATE HABITAT ASSESSMENT

8.1 Methods

Surveys consisted of two random walked transects. The dominant invertebrate species and possible suitable habitats for Red List invertebrate species were noted and sampled if necessary. Habitat characteristics for species present were derived from the field survey and descriptions given in the field guide by Picker *et al.* (2004). The IUCN Red Listed Species were consulted online for conservation status of Red List species (IUCN 2015). All insects were identified *sensu*. Picker *et al*. (2004). IUCN Red Listed Butterflies were identified *sensu*. Henning *et al.* (2009).

A desktop study was done to identify suitable habitats for the Red List invertebrate species known to occur in the QDS 2528CC. The Animal Demography Unit: Virtual Museum (http://vmus.adu.org.za/) was consulted to verify the records of occurrence of invertebrate species recorded within the QDS 2528CC.

The majority of invertebrate species are nocturnal, poikilothermic secretive and seasonal, which makes it difficult to observe them during field surveys. In this case the presence of invertebrate species was examined on habitat preferred by selected species and respective documented ranges.

8.2 Specific Requirements

During the field survey attention was paid to note any signs of potential occurrence of Threatened and/or near threatened species.

These species include:

(1) Roodepoort Copper Butterfly (*Aloeides dentatis* subsp. *dentatis*), (2) Heidelberg Copper Butterfly (*Chrysoritis aureus*), (3) Stobbia's Fruit Chafer Beetle (*Ichnestoma stobbiai*) and (4) Highveld Blue Butterfly (*Lepidochrysops praeterita*), which are all regarded as Vulnerable and prioritised by GDARD.

1. **Roodepoort Copper Butterfly (*Aloeides dentatis* subsp. *dentatis*):**

This butterfly is proposed for Endangered (Henning et al., 2009), based on its limited distribution. Suitable habitat around known localities was mapped off satellite imagery. A 100 %

target was set for these areas, though it is worth noting that all of this area is within existing Protected Areas, and hence does not influence the outcome of the Gauteng C-Plan v3.3.

This particular species prefer a predictable Grassland habitat where ants can protect it. It prefers the Carletonville Dolomite Grassland described in Mucina & Rutherford (2006), between elevations 1500 – 1900 m. The species is sedentary, with strict population control due to finite facilities in *Lepisiota* ant nests. Males are strongly territorial and need open gravel patches as territorial sites (SANBI Biodiversity series, 2009).

2. **Heidelberg Copper Butterfly (*Chrysoritis aureus*):**

This butterfly is proposed for Endangered (Henning et al., 2009), based on limited distribution, as it is host specific and known from a handful of localities on the Heidelberg-Balfour-Greylingstad ridge system. It is possible that the species is under-recorded. Known localities were buffered by 500m and the full extent of this area was included as a target. Modelling for the species was based on SABCA atlas and data from site visits, and this resulted in the development of a model which reflected the high altitude ridge systems which host the species.

The habitat preference of this species is on South-facing, well-drained slopes with shallow humus in the two vegetation types Andersite Mountain Bushveld and Gold Reef Mountain Bushveld, belonging to the Central Bushveld Bioregion of the Savanna Biome (Mucina & Rutherford, 2006). Few localities of the species have been identified. The habitat structure of these localities is similar as a tree stratum is absent. Frost and fire may both therefore be important ecological factors that sustain a suitable habitat for *Chrysoritis aureus*(SANBI Biodiversity series, 2009).

3. **Stobbia's Fruit Chafer Beetle (*Lchnestoma stobbiai*):**

Although not listed, it appears that this species of beetle would qualify as Vulnerable under the IUCN Red List criteria. An expert driven mapping approach was used for the species to map the area likely to be occupied by the beetle at known localities. All suitable, untransformed habitat in the vicinity of known records were mapped as suitable, occupied habitat for the species. No attempt was made to predict the occurrence of additional populations in other areas. A 100% of the confirmed habitat and the extended mapped suitable habitat were targeted.

This species in particular only occur in small fragments in pristine grassland along the Transvaal Magaliesberg system. This rare Fruit Chafer Beetle is mostly endemic to Gauteng Province, with a single population occurring in the adjacent parts of North West Province (Kruger& Scholtz, 2008).

4. **Highveld Blue Butterfly (*Lepidochrysops praeterita*):**

Although the species is classified as Vulnerable, it is proposed for Endangered (Henning et al., 2009), based on a limited distribution and the extent of mining and agricultural activities within its range. It is largely endemic to Gauteng, but extends into the Potchefstroom area in the North West. Known localities were buffered by 500m and the full extent of this area was included as a target. Modelling for the species was based on South African Butterfly Conservation Assessment (SABCA) atlas and data from site visits. The model refined the basic distribution by incorporating slope and aspect, and removed unsuitable land cover classes and areas smaller than the smallest known patch of habitat occupied by the species.

The vegetation types where this species have been recorded is described in Mucina & Rutherford (2006) as Soweto Highveld Grassland and Rand Highveld Grassland in the Mesic Highveld Grassland Bioregion of the Grassland Biome.

8.3 Results

8.3.1 Invertebrate habitats identified

The major habitats of concern in this area is the Degraded and Transformed Grassland, which could hold grasshoppers (Order: *Orthoptera*), grassland adapted mantids (Order: *Mantoidea*), stick insects (Order: *Phasmatoidea*), etc. The Woodland habitat is dominated by the alien tree species *Eucalyptus camaldulensis* which is favored by selected bee and beetle species, as they utilize these trees as a food source.

8.3.2 Occurrence probability of prioritised threatened Invertebrate species.

Table 4: Threatened invertebrate occurrence probability.

	Scientific Name	**Common name**	**Red List Category**	**Occurrence Probability**

1.	*Aloeides dentatis* subsp. *dentatis*	Roodepoort Copper Butterfly	Endangered	2
2.	*Chrysoritis aureus*	Heidelberg Copper Butterfly	Endangered	1
3.	*Lchnestoma stobbiai*	Stobbia's Fruit Chafer Beetle	Vulnerable	2
4.	*Lepidochrysops praeterita*	Highveld Blue Butterfly	Endangered	1

**The occurrence probability of the invertebrates species listed above are indicated as follows:
Not likely to occur - 1, Low occurrence probability - 2, Medium occurrence probability - 3, High occurrence probability – 4, Confirmed occurrence – 5. * Odonata associated with the wetland habitat.

8.3.3 Threatened and Red Listed Invertebrate species

No IUCN Red List species were identified in the survey or from virtual museum records.

8.4 Findings

The disturbed Grassland does provide suitable habitat for the Roodepoort Copper Butterfly (*Aloeides dentatis* subsp. *Dentatis*) as it prefers a predictable Grassland habitat where ant species are present. It prefers the Carletonville Dolomite Grassland, which fit the description of this Disturbed Grassland. The probability of locating this species is however unlikely as disturbances decrease the favourability of this specific habitat.
No other Threatened or Near Threatened invertebrate species are expected to occur in this particular disturbed Grassland habitat on account of minimal optimal habitat and various anthropogenic disturbances within the habitat units.

9. Avifauna Habitat Assessment

9.1 Methods

A field survey was conducted on the 20th April 2016. A total of 3 hours was spent on the study area whilst conducting the field survey. Before conducting the field survey, a desktop assessment was conducted to document the prevalent avifaunal species occurring on or near the study area. A list of expected species was compiled and used as a reference guide during the field survey to ensure that bird species that should theoretically occur within the study area were not overlooked. All discrete avifaunal habitats were identified on site, after which each habitat was assessed to document the associated avifaunal composition by means of random transect walks. Species were identified by actual sightings, calls as well as signs of presence in the form of eggshells, nests, droppings and feathers (Chris & Tilde Stuart., 2000). Where necessary, species were verified using Sasol Birds of Southern Africa (Sinclair et al., 2011).

By consulting the Southern Africa Bird Atlas Project 1 and 2 (SABAP2), a comprehensive species list could be compiled for the 2528CC QDS and the 2550_2800 pentad. SABAP2 is the follow-up project to the Southern African Bird Atlas Project (referred to as SABAP1). SABAP1 took place from 1987-1991. The second bird atlas project started on 1 July 2007 and plans to

run indefinitely. The project aims to map the distribution and relative abundance of birds in Southern Africa. The field work for this project is done by more than one thousand nine hundred volunteers, known as citizen scientists. The unit of data collection is the pentad, five minutes of latitude by five minutes of longitude, squares with sides of roughly 9 km (SABAP2).

The species list for the QDS can however not be used as an accurate list in terms of the species actually occurring within the study area since it covers a larger area, as well as a larger variety of habitat types. In order to compile an accurate species list for the study area, all the species previously recorded in the 2528CC QDS were considered, and added or eliminated based on the habitat types present on the study area as well as the habitat preferences of individual species.

9.2 Specific Requirements in terms of Red Data Avifaunal species

According to the Gauteng Department of Agriculture and Rural Development's (GDARD) requirements for Biodiversity Assessments, Version 3.3 (March 2014), as well as for any other Red Data species: Eleven threatened and near threatened bird species were prioritized for inclusion into the Gauteng C-Plan based on:

1. Threat status (2 Endangered **(EN),** 5 Vulnerable (**VU**) and 4 Near Threatened (**NT**)).
2. Whether the species was actually present, on a frequent basis, in the province. Vagrants, erratic visitors or erratic migrants to the province (Tarboton et al., 1987) have been excluded from the conservation plan.
3. Whether the threat was due to issues related to land use planning. Species which are impacted on mostly by threats such as poisoning were excluded.

Important Threatened and Near Threatened Bird species regional conservation status (only those favoring grassland habitats) (Taylor et al., 2015):

- Blue Crane (*Anthropoides paradiseus*) **NT**
- African Marsh-Harrier (*Circus ranivorus*) **EN**
- White-bellied Korhaan (*Eupodotis senegalensis)* **VU**
- Secretarybird (*Sagittarius serpentarius*) **VU**
- African Grass-Owl (*Tyto capensis*) **VU**
- Abdims Stork (*Ciconia abdimii)* **NT**
- Verreauxs Eagle (*Aquila verreauxii)* **VU**

9.3 Avifaunal Habitats identified

Two avifaunal habitats namely Disturbed Grassland and Woodland (*Eucalyptus sp.*) was identified within the study area.

The Desturbed Grassland habitat contains mostly grass and forb vegetation and is dominated by *Pennisetum clandestinum, Cynodon dactylon, Eragrostis curvula* and *Heteropogon contortus.* Grassland habitats generally have a low to medium avifaunal species richness as a result of the highly specialised environment. A number of widespread bird species such as Bishops and Bishops (*Euplectes sp*), Sparrows (*Passer sp.*), Doves (*Steptopelia sp.),* Lapwings (*Vanellus sp.),* Swallows (Hirundo sp.) and Mynas (*Acridotheres tristis*.) were present within the grassland habitat. Connectivity with surrounding homogenous habitats was found to be low as a result of various developments, both residential and agricultural, in the surrounding area. A number of disturbances such as vegetation clearing, unpaved roads and tracks, trampling, and alien vegetation encroachment were also noted within this habitat unit. Due to the ongoing disturbances within the disturbed grassland habitat unit and because the habitat is isolated from homogeneous grasslands, the sustainability in terms of the continual well-being and persistence of this grassland habitat is highly unlikely. Consequentially the disturbed grassland was identified with a low avifaunal sensitivity.

The *Eucalyptus sp*. dominated woodland contains minimal natural vegetation. Although the entire habitat consists mainly of alien vegetation, it still provides suitable habitat for a number of species adapted to this environment such as Green Wood-hoopoe (*Phoeniculus purpureus*) , Greater Honeyguide (*Indicator indicator*), Hadeda Ibis (*Bostrychia hagedash*), Black-headed Oriole (*Oriolus larvatus*) and Pied Crow (*Corvus albus*). No threatened and/or near threatened bird species are expected to occur within this habitat unit since most are highly specialised and are not associated with alien woodlands.

On account of the aforementioned low connectivity and other disturbances including vegetation clearance, alien vegetation encroachment and sub-optimal habitat for threatened and near threatened bird species the study area was identified with a low avifaunal sensitivity.

Table 3. Bird species recorded during the field survey:

	Common English name	**Taxonomic name**
1.	Bee-eater, European	*Merops apiaster*
2.	Bishop, Southern Red	*Euplectes orix*
3.	Bulbul, Dark-capped	*Pycnonotus tricolor*
4.	Canary, Black-throated	*Crithagra atrogularis*
5.	Canary, Yellow-fronted	*Crithagra mozambica*
6.	Crow, Pied	*Corvus albus*
7.	Dove, Laughing	*Streptopelia senegalensis*
8.	Dove, Red-eyed	*Streptopelia semitorquata*

9.	Fiscal, Southern	*Lanius collaris*
10.	Heron, Grey	*Ardea cinerea*
11.	Ibis, African Sacred	*Threskiornis aethiopicus*
12.	Ibis, Hadida	*Bostrychia hagedash*
13.	Kite, Black-shouldered	*Elanus caeruleus*
14.	Lapwing, Crowned	*Vanellus coronatus*
15.	Longclaw, Cape	*Macronyx capensis*
16.	Martin, Rock	*Hirundo fuligula*
17.	Masked-weaver, Southern	*Ploceus velatus*
18.	Mousebird, Red-faced	*Urocolius indicus*
19.	Myna, Common	*Acridotheres tristis*
20.	Palm-swift, African	*Cypsiurus parvus*
21.	Pigeon, Speckled	*Columba guinea*
22.	Prinia, Tawny-flanked	*Prinia subflava*
23.	Sparrow, Cape	*Passer melanurus*
24.	Sunbird, Amethyst	*Chalcomitra amethystina*
25.	Swallow, Greater-striped	*Hirundo cucullata*
26.	Swift, Little	*Apus affinis*
27.	Swift, White-rumped	*Apus caffer*
28.	Thick-knee, Spotted	*Burhinus capensis*
29.	Turtle-dove, Cape	*Streptopelia capicola*
30.	Wagtail, Cape	*Motacilla capensis*
31.	Whydah, Pin-tailed	*Vidua macroura*
32.	Wood-hoopoe, Green	*Phoeniculus purpureus*

The study area was found to hold a low avifaunal species richness and density. The various disturbances identified within the study area as well as its isolation form homogeneous habitats and the lack of natural vegetation can be held accountable for the low avifaunal species richness and species density.

9.3.1 Threatened and Near Threatened bird species:

Table 4: Threatened and near threatened bird species previously recorded within the 2528CC QDS.

	Species name	Latest Date Record (Year)	Red Data: (Regional; Global)	Taxonomic name	Rep Rate (%)	Occurrence Probability
1.	Crane, Blue	**Prior to 2007**	**NT, VU**	*Anthropoides paradiseus*	1.6	0
2.	Duck, Maccoa	**Prior to 2007**	**NT, NT**	*Oxyura maccoa*	0.06	0
3.	Eagle, Martial	**Prior to 2007**	**EN, VU**	*Polemaetus bellicosus*	0.16	0
4.	Eagle, Verreauxs'	**Prior to 2007**	**VU, LC**	*Aquila verreauxii*	1.275	0
5.	Falcon, Lanner	**2010**	**VU, LC**	*Falco biarmicus*	2.44	0
6.	Falcon, Red-footed	**Prior to 2007**	**NT, NT**	*Falco vespertinus*	0.08	0
7.	Finfoot, African	**Prior to 2007**	**VU, LC**	*Podica senegalensis*	0.08	0
8.	Grass-owl, African	**2012**	**VU, LC**	*Tyto capensis*	2.06	0
9.	Kingfisher, Half-collared	**Prior to 2007**	**NT, LC**	*Alcedo semitorquata*	0.32	0
10.	Korhaan, White-bellied	**2016**	**VU, LC**	*Eupodotis senegalensis*	1.97	0
11.	Marsh-harrier, African	**Prior to 2007**	**EN, LC**	*Circus ranivorus*	0.16	0
12.	Roller, European	**2012**	**NT, LC**	*Coracias garrulus*	1.11	0
13.	Stork, Abdim's	**2012**	**NT, LC**	*Ciconia abdimii*	3.58	0
14.	Stork, Black	**Prior to 2007**	**VU, LC**	*Ciconia nigra*	0.16	0
15.	Stork, Yellow-billed	**Prior to 2007**	**EN, LC**	*Leptoptilos crumeniferus*	0.08	0
16.	Vulture, Cape	**Prior to 2007**	**EN, EN**	*Gyps coprotheres*	0.16	0

The reporting rate is calculated as follows: Total number of cards on which a species was reported (SABAP1) x 100 ÷ total number of cards submitted for the particular grid cell + the total number of cards on which a species was reported (SABAP2) x 100 ÷ total number of cards submitted for the particular pentad ÷ 2.

A total of 16 threatened and near threatened bird species have previously been recorded within the 2528CC QDS (**Table 4**). Eleven (11) of which have not yet been recorded within the 2550_2800 pentad since the commencement of the second South African Bird Atlas Project (SABAP2) in 2007. Therefore these species are highly unlikely to recur as they have not been recorded in the pentad in the past 9 years. Three of the above listed species have been recorded within the pentad within the past 4 years. They are African Grass-owl, European Roller, Abdims Stork and White-bellied Korhaan. One species have been recorded within the pentad during 2016 (White-bellied Korhaan), however its preferred habitat is not present within the study area, as such it is highly unlikely to occur. All the species listed in Table 2 are highly unlikely to be resident on or near the study area since they are predominantly recorded as vagrants and/or occasional visitors. In addition, most of these species were recorded in habitats

not present within the study area, although present within the larger quarter degree square. On account of the habitats present within the study area, none of the species listed above are likely to occur or be resident within the study area.

9.4 Findings and Conclusion

The habitat units identified within the study area contained a low avifaunal diversity and density. The majority of the species observed during the field survey are widespread species adapted to a transformed and/ or urban environment. None of the threatened and/or near threatened bird species previously recorded within the larger QDS are expected to be resident or rely on the study area for survival. As such it is not feasible to conserve this area since it is not viable as a sustainable habitat for bird species with conservation concerns in the long-term. The surrounding land use and disturbance in the form of roads, urbanization, alien vegetation encroachment, trampling, habitat transformation and limited connectivity significantly reduces the probable occurrence of any additional terrestrial threatened and near threatened bird species. Consequentially the entire study area was identified with a low avifaunal sensitivity.

10. OVERALL FINDINGS AND IMPLICATIONS

The study area consists of two degraded and transformed habitat areas. These habitats are not suitable to support any Threatened or Near Threatened fauna species. Thus this study area was identified with a low sensitivity from a faunal perspective (**Figure 5**).

11. LIMITATIONS

The bulk of the data used to conclude the distribution of Red Data species were sourced by making use of the Animal Demography Unit: Virtual Museum data basis. Any limitations in the above mentioned data basis will in effect have implications on the findings and conclusion of this assessment. Furthermore this faunal assessment was conducted during April; hence the survey was done outside the main reproductive period of the local faunal species. Moreover, a lot of the hibernating fauna commenced with their hibernation period.

Limited time to conduct the survey could potentially result in not recording all species in the study area.

12. RECOMMENDATIONS

- An appropriate management authority that must be contractually bound to implement the EMP and ROD during the constructional and operational phase of the development should be identified and informed of their responsibilities in terms of the EMP and ROD.

- Induction should be done for all civil contractors and for each building contractor prior to them commencing on site.
- Construction should be restricted to areas deemed to have a low to medium ecological sensitivity (Please refer to **Figure 5**).
- It is recommended that prior to the commencement of construction activities' initial clearing of all alien vegetation should take place.
- The contractor must ensure that no faunal species are trapped, killed or in any way disturbed during the constructional phase.
- It is recommended that all concrete and cement works be restricted to areas of low ecological sensitivity and defined on site and clearly demarcated. Cement powder has a high alkalinity pH rating, which can contaminate and affect both soil and water pH dramatically. A shift in the pH can have serious consequences on the functioning of soil, vegetation and fauna.
- To ensure minimal disturbance of faunal habitat it is recommended that construction should take place during winter, outside the reproductive season of the species present on site.
- Construction, vegetation clearing and top soil clearing should commence from a predetermined location and gradually commence to ensure that fauna present on the site have enough time to relocate.
- When construction is completed, disturbed areas should be rehabilitated using vegetation cleared prior to construction to ensure that the habitat stays intact and that faunal species present on the site before construction took place, return to the area.
- The open space system should be managed in accordance with an ecological management plan that complies with the Minimum Requirements for Ecological Management Plans and forms part of the EMP.
- The open space system should be fenced off prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be excluded from the open space system.
- Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases.
- Outside lighting should be designed to minimize impacts on fauna. All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible.

- Forage and host plants required by pollinators should also be planted in landscaped areas.
- Where possible, indigenous trees naturally growing on the site should be retained as part of the landscaping. Measures to ensure that these trees survive the physical disturbance from the development should be implemented. A tree surgeon should be consulted in this regard.
- In order to minimize artificially generated surface storm water runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilized for these purposes.

13. CONCLUSION

The study area is not regarded as ecological sensitive from a faunal perspective, thus construction will have a minimal influence on the biodiversity patterns of fauna species mentioned in this report.

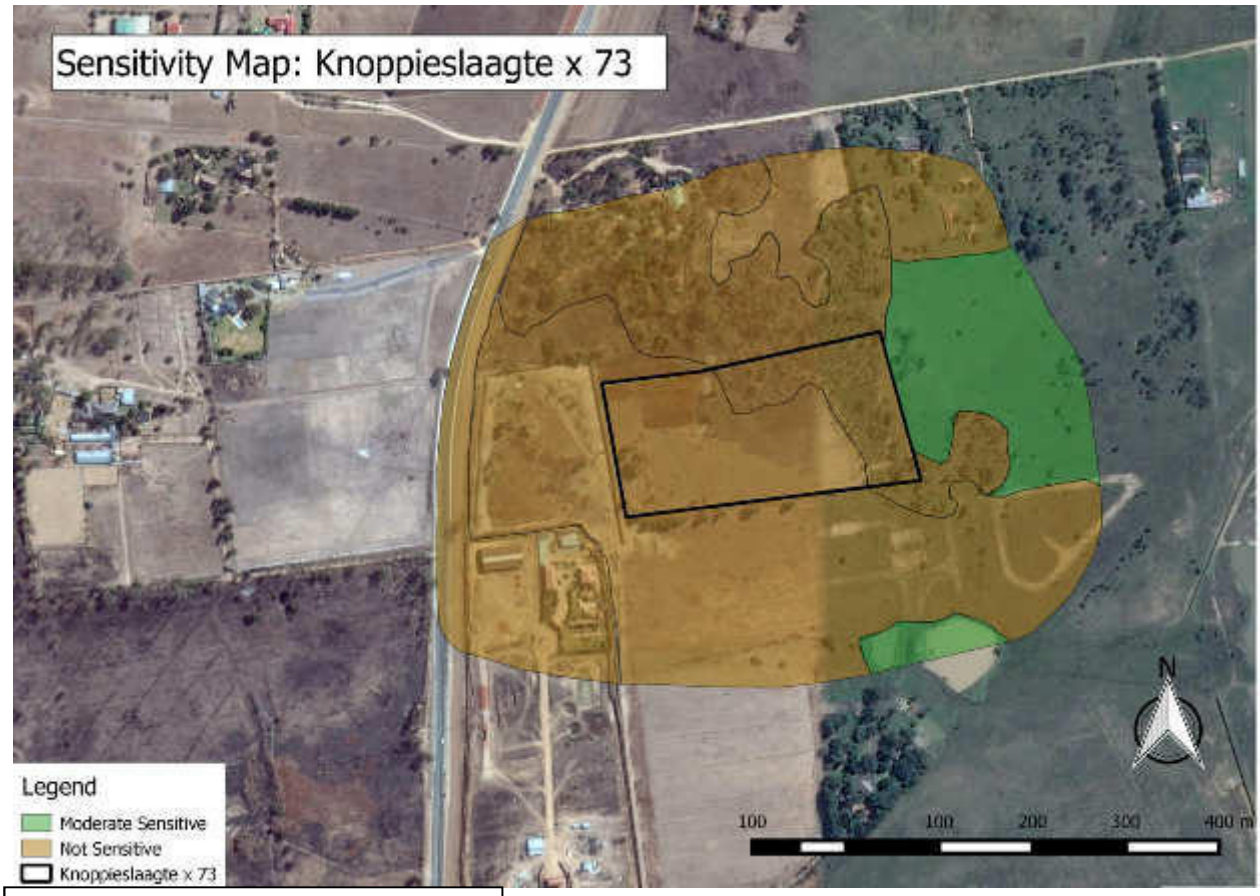

Figure 5: Faunal Sensitivity Map

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Appendix G3

Geotechnical Report

REPORT
ON
THE ENGINEERING GEOLOGICAL INVESTIGATION
ON
PORTIONS 72 AND 73
OF
THE FARM
KNOPJESLAAGTE 385 JR
FOR
TOWNSHIP ESTABLISHMENT

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OCTOBER 2015

Client

KEYMACX

REPORT ON THE ENGINEERING GEOLOGICAL INVESTIGATION OF PORTIONS 72 AND 73 OF THE FARM KNOPJESLAAGTE 385 JR FOR TOWNSHIP ESTABLISHMENT

CONTENTS Page

REPORT ON THE ENGINEERING GEOLOGICAL INVESTIGATION OF PORTIONS 72 AND 73 OF THE FARM KNOPJESLAAGTE 385 JR FOR TOWNSHIP ESTABLISHMENT

1. INTRODUCTION

Louis Kruger Geotechnics CC was appointed to do an engineering geological investigation on Portions 72 and 73 of the farm Knopjeslaagte 385 JR for township establishment. The investigation was undertaken according to the normal requirements to assess the suitability of the site (SANS 634: Geotechnical Investigations For Township Development, SANS 633: Profiling, and Percussion and Core Borehole Logging In Southern Africa for Engineering Purposes, Home Building Manual Part 1 & 2", National Home Builders Registration Council, 1999). The following aspects are addressed in this report:

- Geology and Soil profile
- Undermining
- Geohydrology
- Foundation conditions
- Construction material

2. TERMS OF REFERENCE

The appointment was to do an engineering geological investigation on Portions 72 and 73 of the farm Knopjeslaagte 385 JR for township establishment. The following aspects were to be addressed:

- The geotechnical characteristics of the site
- Geotechnical constraints
- Founding conditions
- NHBRC Zoning

The locality of the site is shown on Figure 1.

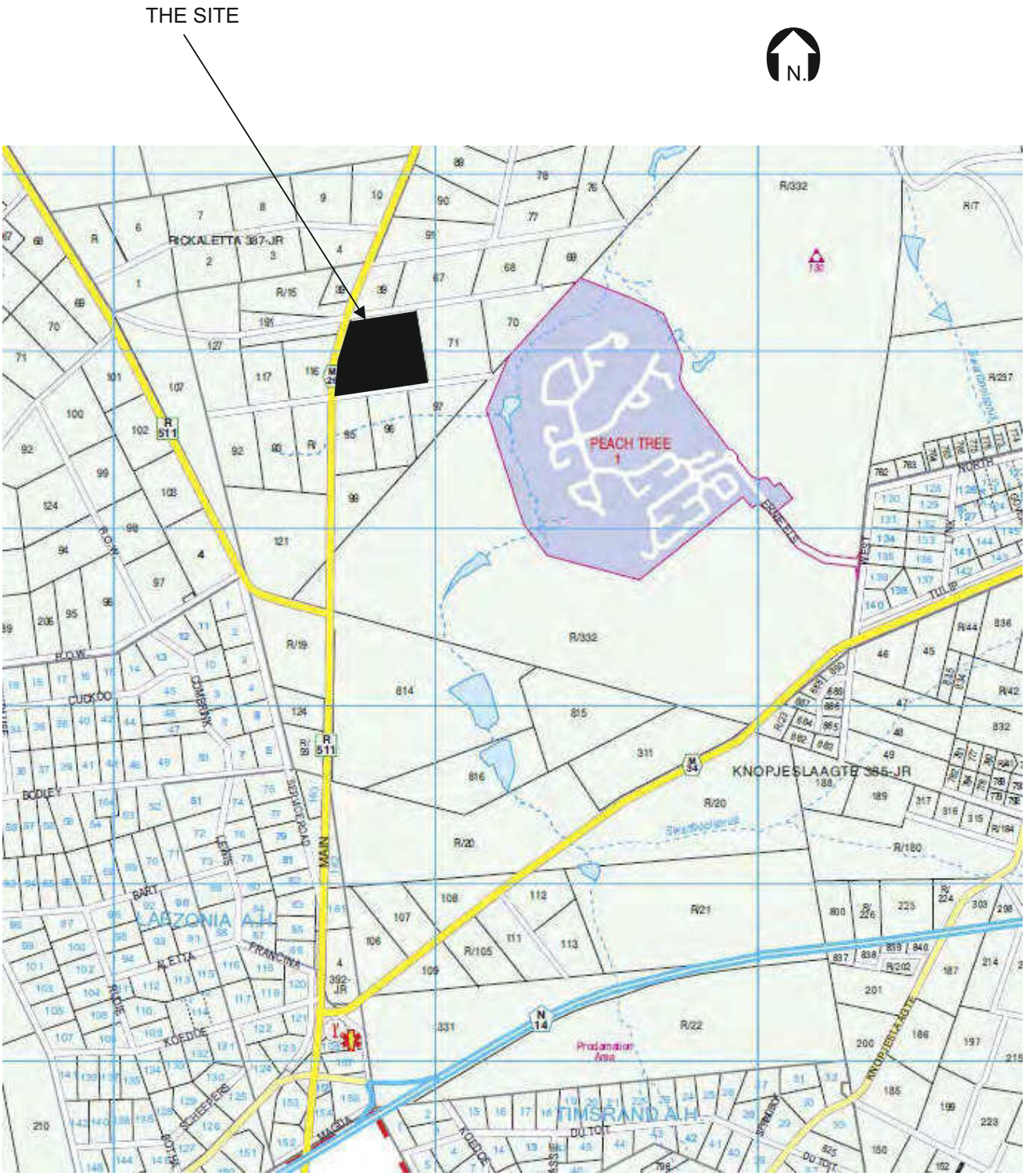
3. AVAILABLE INFORMATION

The following information was available:

- 1 : 50 000 Geological Map 2528 CC Lyttelton
- Colour aerial photographs, Tshwane Metropolitan Council
- Tshwane Internet Geographical information System

4. LOCALITY

The site is situated on Portions 72 and 73 of the farm Knopjeslaagte 385 and is bounded by the M26 tar road in the west and by a dirt road in the north. The locality of the site is shown on Figure 1.



LOCALITY

FIGURE 1

NTS

5. TOPOGRAPHY AND DRAINAGE

No topographical information was available. The Tshwane Internet Geographical information System shows that the site slopes at an average of 6% towards the south-east. Surface water is expected to drain by means of sheet wash in the same direction. The available information does not show drainage features on the site.

6. METHOD OF INVESTIGATION

Nine test pits were dug on the site, and six soil profiles were recorded in a trench that was dug on Portion 73. The soil profiles were described according to the standard method proposed by Jennings, Brink and Williams (1973). Disturbed samples of the most prominent soil horizons were taken and submitted to a soils laboratory for foundation indicator tests. Due to the high gravel content of the materials encountered on the site, no undisturbed samples or samples.

7. GEOLOGY AND SOIL PROFILE

According to the 1:50 000 scale Geological Map the site is underlain by migmatite gneiss (granite) of the Halfway House Suite. This was confirmed during the investigation; granite bedrock was encountered in the test pits and was visible in the entire trench.

7.1 Soil profile

The test pit positions are shown on Figure 2 and the soil profiles are attached as Appendix A. The following materials were encountered on the site:

71.1 Hillwash

Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules was encountered in all the test pits from surface up to a depth of 0,4 meters

7.1.2 Ferricrete

Nodular ferricrete with patches of honeycomb ferricrete was encountered in eight test pits from an average depth of 0,5 meters up to an average depth of 1,1 meters. Honeycomb- and hardpan ferricrete with patches of nodular ferricrete was encountered in seven test pits from an average depth of 0,4 meters up to an average depth of 1,0 meters.

7.1.3 *Granite*

Very soft rock granite with soft patches of soft silty clay was encountered in five test pits from an average depth of 1,0 meters up to an average depth of 1,5 meters. Very soft- to soft rock granite was encountered in all the test pits from an average depth of 1,2 meters up to an average depth of 1,9 meters. The back actor refused at an average depth of 1,7 meters on soft- to medium hard rock granite. The trenches were dug up to an average depth of three meters.

8. GEOHYDROLOGY

No ground water was encountered during the investigation. The presence of pedogenic material however indicates that a perched water table could be present during and after periods of high rainfall.

N.

TEST PIT POSITIONS

FIGURE 2

SCALE 1: 3 000

9. LABORATORY TEST RESULTS

9.1 Indicator test results

The laboratory test results are attached as Appendix B and are summarized in the following table:

MATERIAL	TP	DEPTH (m)	PI	% Clay	% Silt	% Sand	% Gravel
Hillwash	2	0.3	8	11	20	60	10
Hillwash	4	0.3	8	6	22	66	7
Hillwash	11	0.3	SP	2	13	48	37
Ferricrete	2	0.8	8	3	11	33	54
Ferricrete	4	0.7	7	2	8	34	55
Ferricrete	10	1.0	SP	3	13	36	48
Ferricrete	12	0.7	7	2	11	36	51

The predominantly sandy and gravely nature of the materials are clearly reflected by the laboratory test results. The difference between the hillwash and the ferricrete is reflected by the higher gravel- and lower sand- and clay content of the ferricrete. The variation in the composition of the materials is clearly reflected by the results.

9.2 Potential expansiveness

The potential expansiveness of the materials encountered on the site was calculated according to the method proposed by Van der Merwe (1964). The following material characteristics are considered when applying this method:

- Plasticity index
- Clay fraction (< 0,002 mm)
- Thickness of expansive material
- Thickness of non - expansive material

Assuming the laboratory test results typify the material encountered on the site, the application of the method of Van der Merwe shows that the materials classify as “Low” and is therefore considered to be non-expansive.

9.3 Collapse potential

Due to the consistency and the gravel content of the materials, no undisturbed samples were taken.

10. ENGINEERING GEOLOGICAL ZONING

Due to the fairly uniform soil profile the site is not divided into different engineering geological zones:

11. GEOTECHNICAL CONSIDERATIONS

The laboratory test results were not available at the time that the report was compiled**.** The following geotechnical considerations, which could influence the proposed development, were identified:

11.1 Founding of structures

- The consistency of the hillwash is soft and the gravel content varies considerably, therefore it is not considered suitable founding material for unadapted structures. If unadapted structures are founded on this material, and the moisture content should increase, unacceptable differential, vertical movements could occur, with resultant cracking.

- The consistency of the nodular ferricrete with patches of honeycomb ferricrete is loose and the gravel content varies considerably, therefore it is not considered suitable founding material for unadapted structures. If unadapted structures are founded on this material, and the moisture content should increase, unacceptable differential, vertical movements could occur, with resultant cracking.

- Although the consistency of the Honeycomb- and hardpan ferricrete is stiff, soft patches of nodular ferricrete are present; therefore it is not considered suitable founding material for unadapted structures. If unadapted structures are founded on this material, and the moisture content should increase, unacceptable differential, vertical movements could occur, with resultant cracking

- Although the consistency of the very soft rock granite is firm to stiff, soft patches are present; therefore it is not considered suitable founding material for unadapted structures. If unadapted structures are founded on this material, and the moisture content should increase, unacceptable differential, vertical movements could occur, with resultant cracking

11.2 Excavatability

The back actor refused at an average depth of 1,7 meters on soft- to medium hard rock granite. The trenches were dug up to an average depth of three meters.

11.3 Construction material

The hillwash and the ferricrete classifies as A-2-4. The Plasticity Index and Grading Modulus were used to assess the suitability as construction material (TRH 14)

11.4 Groundwater

A perched water table, which could cause the flooding of excavations, could be present during or after periods of high rainfall. This is confirmed by the presence of pedogenic material.

11.5 Stability of excavations

Limited instability occurred in the sidewalls of the test pits.

12. GEOTECHNICAL CLASSIFICATION

The site was classified according to the Geotechnical Classification for Urban Development (after Partridge, Wood and Brink 1993). The criteria for the classification are shown in the following table:

GEOTECHNICAL CLASSIFICATION FOR URBAN DEVELOPMENT (after Partridge, Wood and Brink 1993)

	CONSTRAINT	MOST FAVOURABLE (1)	INTERMEDIATE (2)	LEAST FAVOURABLE (3)
A	Collapsible soil	Any collapsible horizon or consecutive horizons totalling a depth of less than 750 mm in thickness	Any collapsible horizon or consecutive horizons totalling a depth of more than 750 mm in thickness	A least favourable situation for this constraint does not occur
B	Seepage	Permanent or perched water table more than 1,5 meters below surface	Permanent or perched water table less than 1,5 meters below surface	Swamps or marshes
C	Active soil	Low soil heave predicted	Moderate soil heave predicted	High soil heave predicted
D	Highly compressible soil	Low soil compressibility expected	Moderate soil compressibility expected	High soil compressibility expected
E	Erodibility of soil	Low	Intermediate	High
F	Difficulty of excavation to 1,5 m depth	Scattered or occasional boulders less than 10% of the total volume	Rock or hardpan pedocretes between 10 and 40% of the total volume	Rock or hardpan pedocretes more than 40% of total volume
G	Undermined ground	Undermining at a depth greater than 100 m below surface (except where total extraction mining has not occurred)	Old undermined areas to a depth of 100 m below surface where stope closure has ceased	Mining within less than 100 m of surface or where total extraction mining has taken place
H	Instability in areas	Possibly unstable	Probably unstable	Known sinkholes and

	CONSTRAINT	MOST FAVOURABLE (1)	INTERMEDIATE (2)	LEAST FAVOURABLE (3)
	of soluble rock			dolines
I	Steep slopes	Between 2 and 6 degrees (all regions)	Slopes between 6 and 18 degrees and less 2 degrees (Natal and Western Cape) Slopes between 6 and 12 degrees and less 2 degrees (all other regions)	More than 18 degrees (Natal and western Cape) More than 12 degrees (all other regions)
J	Areas of unstable natural slopes	Low risk	Intermediate risk	High risk (especially in areas subject to seismic activity)
K	Areas subject to seismic activity	10% probability of an event less than 100 cm/s^2 within 50 years	Mining induced seismic activity more than 100 cm/s^2	Natural seismic activity more than 100 cm/s^2
L	Areas subject to flooding	A "most favourable" situation for this constraint does not occur	Areas adjacent to a known drainage channel or floodplain with slope less than 1%	Areas within a known drainage channel or floodplain

Based on the above, the site is classified as 2A 1/2B 1C 2D 2E 1F 1I

13. NHBRC CLASSIFICATION (SANS 10400-H: THE APPLICATION OF THE NATIONAL BUILDING REGULATIONS - PART H)

Due to the variation in composition, and the overall consistency, collapse / settlement is expected in the hillwash, nodular ferricrete and very soft rock granite with the soft patches if unadapted structures are founded on this material. The average thickness of the potentially collapsible / compressible material is 1,2 meters with a minimum of 0,8 meters and a maximum of 1,8 meters. The collapse / settlement of this material could not be quantified due to the composition and consistency. Therefore a conservative approach is adopted and the site is zoned as C2-S2. The presence of the periodical shallow perched water table is accommodated by adding a zoning of P(Perched water table).

The site is zoned as NHBRC Zone P(Fill, Perched water table)-C2-S2

It is important to note that the zoning is based on the profiling of test pits and the interpolation of information between test pits; therefore it is possible that variations from the expected conditions can occur. The zoning is shown on Figure 3.

14. CONCLUSIONS AND RECOMMENDATIONS

It is important to note that the recommendations are based on the profiling of test pits and the interpolation of information. It is therefore possible that variations from the expected conditions can occur.

14.1 Foundations

The hillwash, nodular ferricrete and very soft rock granite with soft patches are considered to be potentially collapsible. Therefore this material is considered unsuitable in its natural state to act as a founding medium. This even applies for light structures with a foundation pressure of less than 100kPa. From the discussion foundation improvement and imparting flexibility in the brickwork are clearly required.

The following alternatives are recommended:

If granite bedrock is present at shallow depth:

- *Deep strip footings*:
  Found structures below the potentially collapsible material. Structures should be provided with vertical movement joints, light reinforcement in the masonry and floor slabs should be provided with fabric reinforcement.

Due to the variation in composition, and the overall consistency, collapse / settlement is expected in the fill, nodular ferricrete and very soft rock granite with the soft patches if unadapted structures are founded on this material. The average thickness of the potentially collapsible / compressible material is 1,2 meters with a minimum of 0,8 meters and a maximum of 1,8 meters. The collapse / settlement of this material could not be quantified due to the composition and consistency. Therefore a conservative approach is adopted and the site is zoned as C2-S2. The presence of the periodical shallow perched water table is accommodated by a zoning of P(Perched water table).

The entire site is zoned as NHBRC Zone P(Fill)-C2-S2

The zoning is based on the interpolation of information, therefore a conservative approach to the use zoning is recommended.

NHBRC ZONING	FIGURE 3 SCALE 1: 3 000

If the depth to granite bedrock becomes too deep to found economically

- *Stiffened strip footings, stiffened or cellular raft:*
  Found structures on stiffened strip footings or a stiffened or cellular raft with lightly reinforced masonry. The bearing pressure should not exceed 50 kPa and floor slabs should be reinforced.

- *Compaction of insitu soil below footings:*
  Remove unsuitable material up to a depth and width of 1,5 times the foundation width, below normal founding depth. The loose material in the bottom of excavations should be compacted, and the excavations backfilled with suitable material, compacted in 150 mm layers to at least 93% of Mod AASHTO density at -1% to +2% of optimum moisture content. Structures can be founded on normal reinforced strip footings on the backfill and should be provided with vertical movement joints, light reinforcement in the masonry and floor slabs should be provided with fabric reinforcement.

- *Soil raft:*
  Remove all or necessary parts of the expansive horizon to 1,0 meters beyond the perimeter of the structures. The loose material in the bottom of excavations should be compacted, and the excavations backfilled with inert material, compacted to at least 93% of Mod AASHTO density at -1% to +2% of optimum moisture content. Structures can be founded on normal, lightly reinforced strip footings on the backfill and should be provided with light reinforcement in the masonry if the residual movements are < 7,5 mm, or the construction type should be appropriate to residual movements.

- *Piled construction:*
  Piled foundations with suspended floor slabs, with or without ground beams. The test pits were dug up to the maximum reach of the back actor.

Due to the slope of the site, it is envisaged that a level platform for the structure will be created by way of a balanced cut to fill operation. This means that on the cut end of the platform, excavations may have proceeded to the level of the bedrock, depending on the depth of cut and the thickness of the transported material at the cut end. When building platforms are constructed, the soil profile should be investigated to establish the approximate thickness of the various horizons within the platform area. The following guidelines should be followed:

- In cut sections, the alternatives listed in the previous section apply. Should the cut extend up to competent founding material, only loose material at founding level has to be removed or must be compacted

- On the fill end, the founding alternatives listed in the previous section apply. If the entire fill section is constructed by compacting a competent material, founding at shallow depth is possible.

It is important though that in spite of the guidelines given above, inspection of foundation excavations and the involvement of a competent engineer familiar with structural founding are necessary. ***It is furthermore recommended that the trenches for services be profiled and that a construction report be compiled for the development. The purpose of the construction report is to confirm or adapt the zoning of the site, and to provide more accurate information regarding the founding conditions.***

14.2 Excavatability

The excavatability of the materials encountered on the site was evaluated according to the South African Bureau of Standards Standardized Specification for Civil Engineering Construction DB: Earthworks (Pipe Trenches. The excavatability is considered to classify as "soft to intermediate" up to an **average** depth of one meter. It should be noted that the trenches were dug to depths exceeding 2,5 meters with a heavy excavator. *It is important to note that the evaluation is based primarily on the profiling of test pits and the interpolation of information between test pits. It is therefore possible that variations from the expected conditions can occur.*

14.3 Geohydrology

All excavations should be provided with adequate drainage. Structures should be provided with damp proofing and provision should be made to prevent the ingress of water into– and below foundations.

14.4 Construction material

The laboratory test results show that the hillwash could be suitable as fill and selected subgrade, the ferricrete could be suitable as fill, selected subgrade and subbase*. It is recommended that the suitability of material that is to be used, be confirmed by detailed laboratory testing.*

14.5 Services

Due to the expected corrosivity, it is recommended that all services be protected.

14.7 Stability of excavations

It is recommended that all excavations be cut back or shored.

14.8 General recommendations

- Water has a significant influence on the behaviour of the in-situ material. To reduce differential movements of structures it is necessary to maintain moisture equilibrium under the structures. Therefore it is recommended that the following measures regarding drainage around structures be implemented:

- No accumulation of surface water must be allowed around the perimeter of the structures and the entire development must be properly drained.

- Down pipes should discharge into a lined or precast furrow. This furrow should discharge the water 1,5 meters away from the foundation onto a paved or grassed surface sloping away from the building.

- Preferably, if no gutters or paving is to be provided around structures, a 1,5 meter wide sealed concrete apron should be cast along the perimeter of the structures the water must be channeled away from the foundation.

- Leaks in water bearing services should be attended to without undue delay.

- No large shrubs or trees should be planted closer to structures than the distances provided in the following Table:

DESCRIPTION	MATURE HEIGHT OF TREE		
	Up to 8m	8m tot 15m	Over 15m
Buildings other than single storey buildings of lightweight construction	-	0.5	1,2
Single storey buildings of lightweight construction (e.g. timber framed)	-	0.7	1,5
Free standing masonry walls	-	1,0[1] 0,5[2]	2,0[1] 1,0[2]
Drains and underground services • less than 1 meter deep • more than 1 meter deep	 0,5 -	 1,5 1,0	 3,0 2,0

Note:

1) These distances will generally avoid all direct damage

2) These distances assume that some movement and minor damage, which may be tolerated, might occur.

This table provides guidance on the acceptable proximity of young trees or new planting to allow for future growth. This table should not be taken to imply that construction work can occur at the specified distances from existing trees; as such work might damage the tree, or render it dangerous, but refers to the potential for future growth, either of a young tree or of planting, occurring subsequent to construction

L.J Kruger Pr. Sci. Nat.

15. REFERENCES

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APPENDIX A

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 1. (Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
		0,2	
			Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
		1,0	Slightly moist, orange mottled grey speckled white and black, very soft rock granite with patches of soft silty clay
		1,4	Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
		1,8	Slightly moist, orange speckled white grey with black stained joints, soft- to medium hard rock granite
		3,0	No refusal (Trench dug with a tracked excavator)
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 2. (Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
		0,6	Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
		1,2	Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
		3,0	No refusal (Trench dug with a tracked excavator) No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 3. (Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
		0,6	
			Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
		0,9	
			Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
		3,0	No refusal (Trench dug with a tracked excavator)
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 4.

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,5 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
			1,0 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			1,3 Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 5.

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,3
			Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
			1,0
			Slightly moist, orange mottled grey speckled white and black, very soft rock granite with patches of soft silty clay
			1,6
			Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			2,1
			Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 6.

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,5
			Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
			1,1
			Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			1,8
			Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

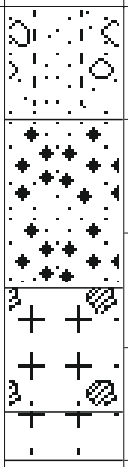
CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 7

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,5
			Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
			1,3
			Slightly moist, orange mottled grey speckled white and black, very soft rock granite with patches of soft silty clay
			1,8
			Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			2,0
			Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 8.

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,3 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
			0,9 Slightly moist, orange speckled white grey with black stained joints, very soft-
			1,2 to soft rock granite
			Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 9

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,5 Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
			1,2 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			1,5 Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 10(Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,4
			Slightly moist becoming moist, orange brown mottled red and black, loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete and patches of honeycomb ferricrete
			1,2
			Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			1,8
			Slightly moist, orange speckled white grey with black stained joints, soft- to medium hard rock granite
			3,0
			No refusal (Trench dug with a tracked excavator)
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 11(Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
		0,5	Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
		1,0	Slightly moist, orange mottled grey speckled white and black, very soft rock granite with patches of soft silty clay
		1,5	Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
		1,8	Slightly moist, orange speckled white grey with black stained joints, soft- to medium hard rock granite
		3,0	No refusal (Trench dug with a tracked excavator) No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

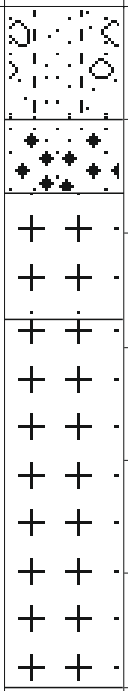
CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 12(Trench profile)

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash 0,5 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete 0,8 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite 1,4 Slightly moist, orange speckled white grey with black stained joints, soft- to medium hard rock granite 3,0 No refusal (Trench dug with a tracked excavator) No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 13

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,3 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
			0,8 Slightly moist, orange mottled grey speckled white and black, very soft rock granite with patches of soft silty clay
			1,2 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			2,1 Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

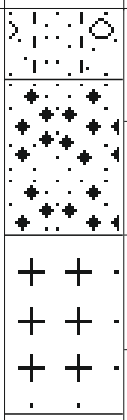
CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 14

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash 0,3 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete 1,0 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite 1,8 Refusal on soft- to medium hard rock granite No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

SOIL PROFILE

PROJECT: Ptn 72 and 73

SITE: Knopjeslaagte 385 JR

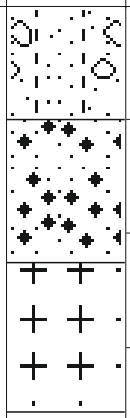
CLIENT: Keymacx

LOGGED BY: LJK

MACHINE: TLB

DATE: 11/09/2015

TEST PIT: 15

SAMPLE / TEST	GROUND WATER	LEGEND	DESCRIPTION
			Slightly moist, brown, loose, shattered, gravely, silty sand with abundant small and medium quartz pebbles and with ferricrete nodules - Hillwash
			0,5 Slightly moist, orange mottled black, stiff to very stiff, honeycomb- and hardpan ferricrete with patches of loose, silty, sandy, fine and medium gravel consisting of hard, round, intact, nodular ferricrete
			1,2 Slightly moist, orange speckled white grey with black stained joints, very soft- to soft rock granite
			1,8 Refusal on soft- to medium hard rock granite
			No ground water

LOUIS KRUGER GEOTECHNICS PO BOX 90093 GARSFONTEIN TEL 082 651 4819

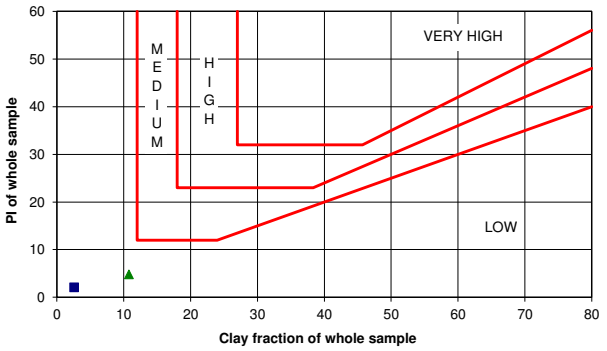
APPENDIX B

PARTICLE SIZE ANALYSIS

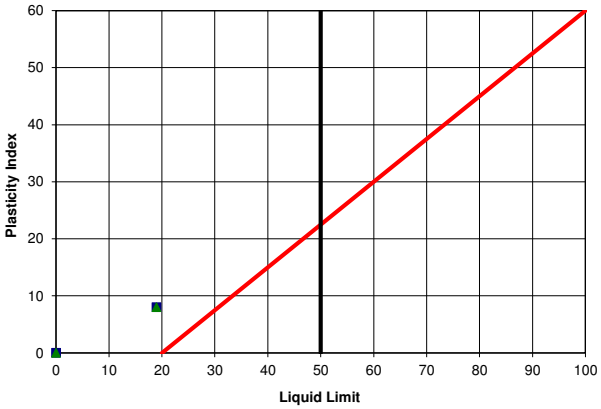
Sample No.	1	2
Soillab Sample No.	2015-S-1242-01	2015-S-1242-02
Depth (m)		
Position	SAMPLE 1	SAMPLE 2
Material Description	DARK GREY FERRICRETE QUARTZ SANDY GRAVEL	LIGHT OLIVE FERRICRETE SILTY SAND
Moisture (%)		
Dispersion (%)		
SCREEN ANALYSIS (% PASSING) **(TMH 1 A1(a) & A5)**		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	96	100
26.5 mm	94	100
19.0 mm	92	100
13.2 mm	86	99
4.75 mm	57	95
2.00 mm	46	90
0.425 mm	26	60
0.075 mm	15	32
HYDROMETER ANALYSIS (% PASSING) **(TMH 1 A6)**		
0.040 mm	10	28
0.027 mm	8	24
0.013 mm	6	17
0.005 mm	4	14
0.002 mm	3	11
% Clay	3	11
% Silt	11	20
% Sand	33	60
% Gravel	54	10
ATTERBERG LIMITS **(TMH 1 A2 - A4)**		
Liquid Limit	19	19
Plasticity Index	8	8
Linear Shrinkage (%)	3.0	4.0
Grading Modulus	2.13	1.17
Uniformity coefficient	143	-
Coefficient of curvature	1.7	-
Classification	A-2-4 (0)	A-2-4 (0)
Unified Classification	GC	SC
Chart Reference		

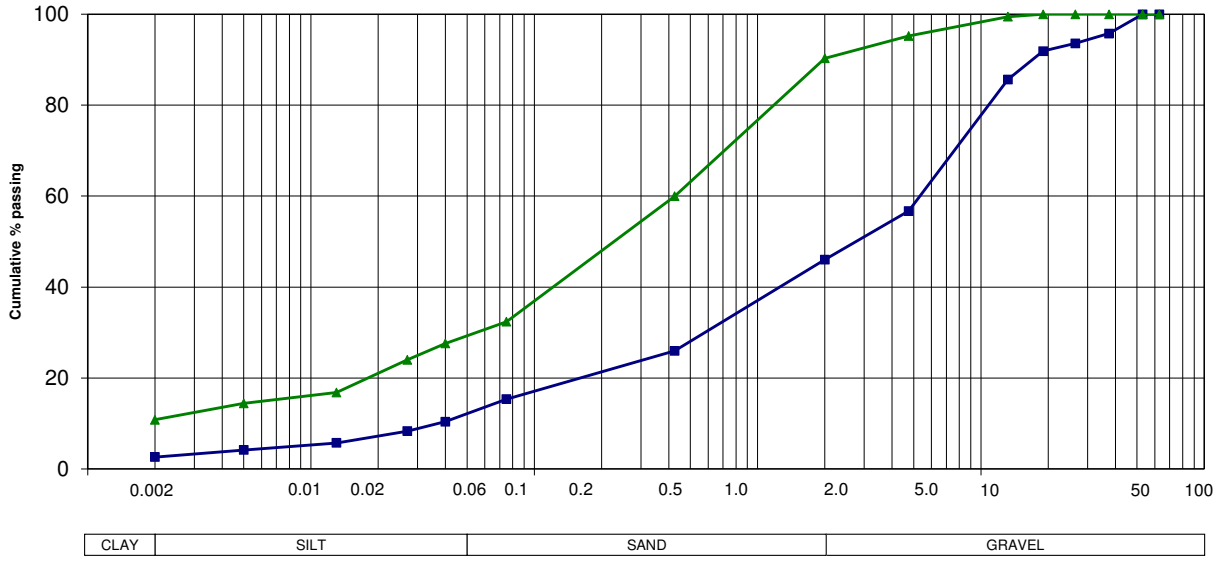
PROJECT : PEACH TREE
JOB No. : 2015-S-1242
DATE : 11-09-2015

POTENTIAL EXPANSIVENESS



PLASTICITY CHART





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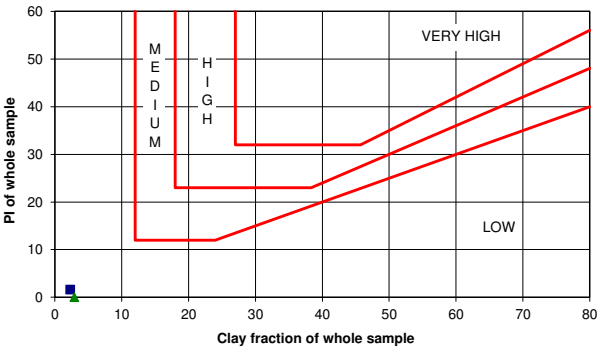
PARTICLE SIZE ANALYSIS

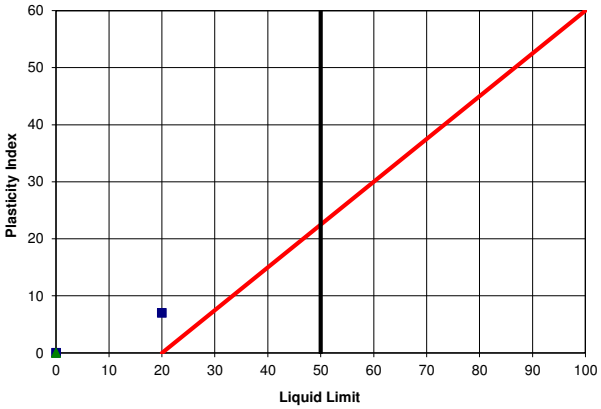
Sample No.	3	4
Soillab Sample No.	2015-S-1242-03	2015-S-1242-04
Depth (m)		
Position	SAMPLE 3	SAMPLE 4
Material Description	DARK GREY FERRICRETE QUARTZ SANDY GRAVEL	LIGHT OLIVE FERRICRETE QUARTZ SANDY GRAVEL
Moisture (%)		
Dispersion (%)		
SCREEN ANALYSIS (% PASSING) **(TMH 1 A1(a) & A5)**		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	98	91
4.75 mm	65	64
2.00 mm	45	52
0.425 mm	23	29
0.075 mm	12	19
HYDROMETER ANALYSIS (% PASSING) **(TMH 1 A6)**		
0.040 mm	8	12
0.027 mm	7	10
0.013 mm	5	6
0.005 mm	4	4
0.002 mm	2	3
% Clay	2	3
% Silt	8	13
% Sand	34	36
% Gravel	55	48
ATTERBERG LIMITS **(TMH 1 A2 - A4)**		
Liquid Limit	20	
Plasticity Index	7	SP
Linear Shrinkage (%)	2.5	1.0
Grading Modulus	2.20	2.01
Uniformity coefficient	74	133
Coefficient of curvature	2.4	2.0
Classification	A-2-4 (0)	A-1-b (0)
Unified Classification	SM & SC	SM
Chart Reference		

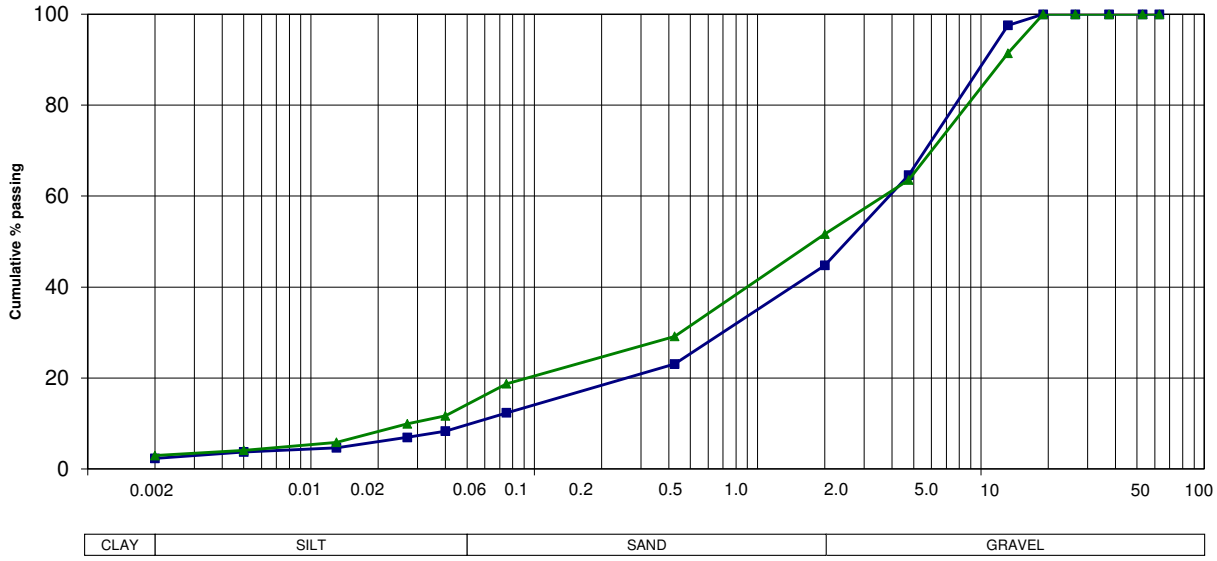
PROJECT : PEACH TREE
JOB No. : 2015-S-1242
DATE : 11-09-2015

POTENTIAL EXPANSIVENESS



PLASTICITY CHART





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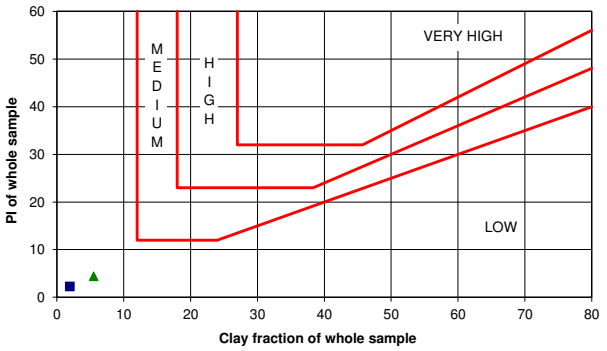
PARTICLE SIZE ANALYSIS

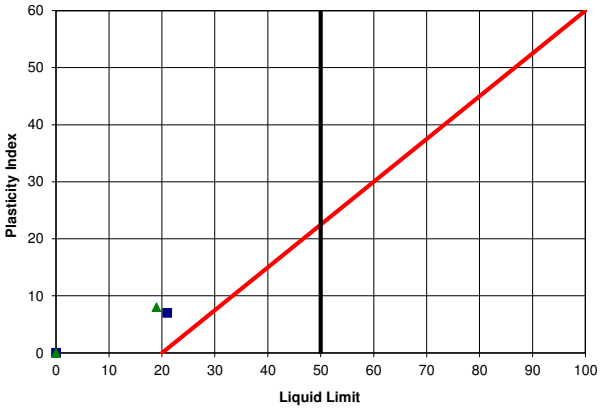
Sample No.	5	5
Soillab Sample No.	2015-S-1242-05	2015-S-1242-05
Depth (m)		
Position	SAMPLE 5	SAMPLE 6
Material Description	DARK GREY FERRICRETE QUARTZ SANDY GRAVEL	DARK GREY QUARTZ FERRICRETE SILTY SAND
Moisture (%)		
Dispersion (%)		
SCREEN ANALYSIS (% PASSING) **(TMH 1 A1(a) & A5)**		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	94	100
19.0 mm	92	100
13.2 mm	90	99
4.75 mm	69	97
2.00 mm	49	93
0.425 mm	32	55
0.075 mm	16	31
HYDROMETER ANALYSIS (% PASSING) **(TMH 1 A6)**		
0.040 mm	10	22
0.027 mm	8	18
0.013 mm	5	12
0.005 mm	3	9
0.002 mm	2	6
% Clay	2	6
% Silt	11	22
% Sand	36	66
% Gravel	51	7
ATTERBERG LIMITS **(TMH 1 A2 - A4)**		
Liquid Limit	21	19
Plasticity Index	7	8
Linear Shrinkage (%)	2.0	3.0
Grading Modulus	2.04	1.21
Uniformity coefficient	78	74
Coefficient of curvature	0.9	1.3
Classification	A-2-4 (0)	A-2-4 (0)
Unified Classification	SM & SC	SC
Chart Reference		

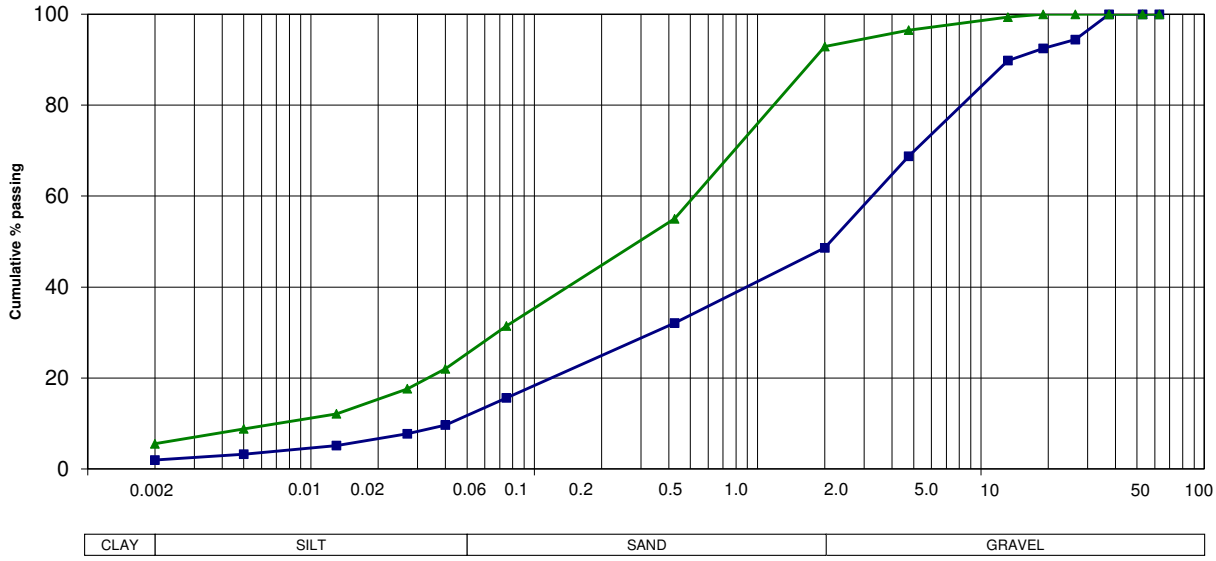
PROJECT : PEACH TREE
JOB No. : 2015-S-1242
DATE : 11-09-2015

POTENTIAL EXPANSIVENESS



PLASTICITY CHART





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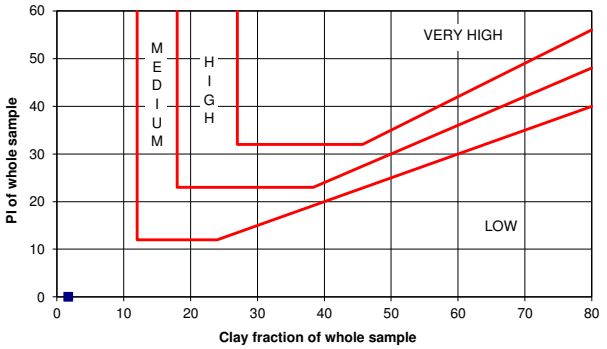
PARTICLE SIZE ANALYSIS

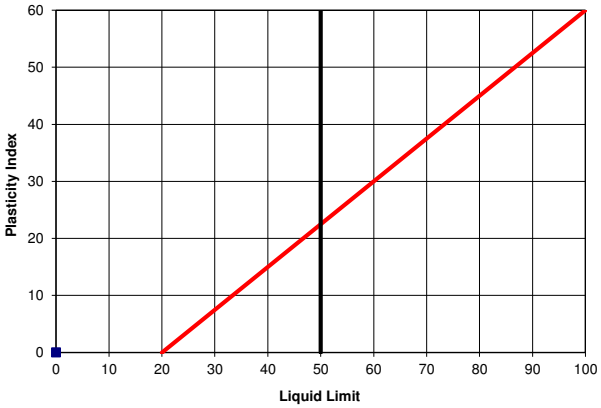
Sample No.	7	
Soillab Sample No.	2015-S-1242-07	
Depth (m)		
Position	SAMPLE 7	
Material Description	DARK GREY FERRICRETE QUARTZ GRAVELLY SAND	
Moisture (%)		
Dispersion (%)		
SCREEN ANALYSIS (% PASSING) **(TMH 1 A1(a) & A5)**		
63.0 mm	100	
53.0 mm	100	
37.5 mm	100	
26.5 mm	100	
19.0 mm	97	
13.2 mm	94	
4.75 mm	78	
2.00 mm	63	
0.425 mm	42	
0.075 mm	18	
HYDROMETER ANALYSIS (% PASSING) **(TMH 1 A6)**		
0.040 mm	10	
0.027 mm	8	
0.013 mm	5	
0.005 mm	3	
0.002 mm	2	
% Clay	2	
% Silt	13	
% Sand	48	
% Gravel	37	
ATTERBERG LIMITS **(TMH 1 A2 - A4)**		
Liquid Limit		
Plasticity Index	SP	
Linear Shrinkage (%)	1.0	
Grading Modulus	1.77	
Uniformity coefficient	43	
Coefficient of curvature	0.5	
Classification	A-1-b (0)	
Unified Classification	SM	
Chart Reference		

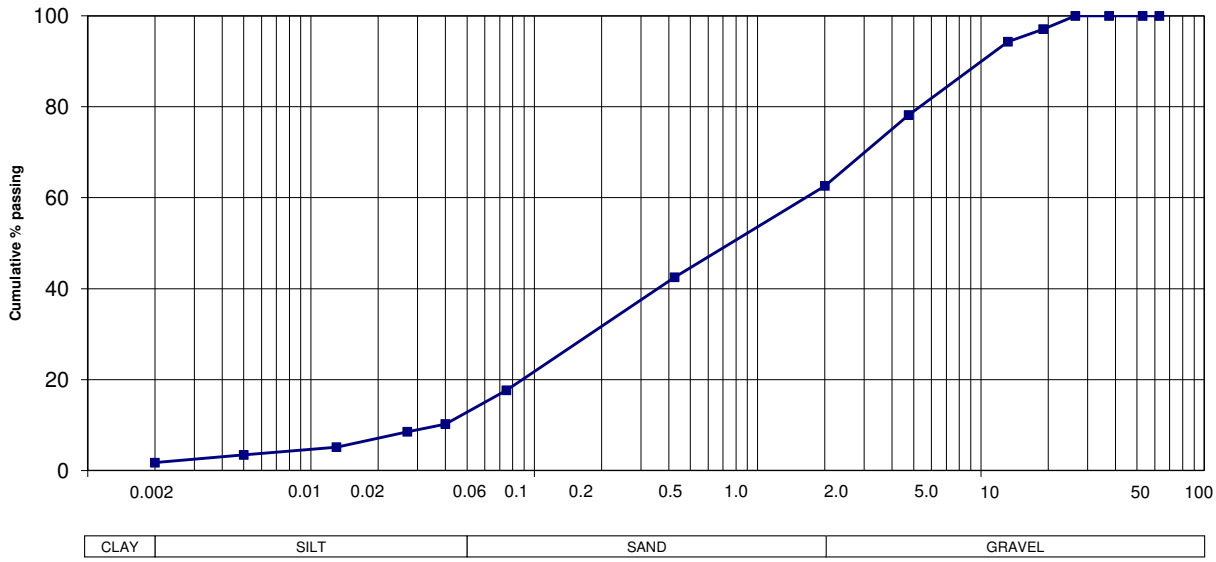
PROJECT : PEACH TREE
JOB No. : 2015-S-1242
DATE : 11-09-2015

POTENTIAL EXPANSIVENESS



PLASTICITY CHART





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Appendix G4

Electrical Report

ELEKTROPLAN
CONSULTING ENGINEERS cc

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VAT REG. NO. 4160128684

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FAX : +27 (0) 12 663 7106
e-mail : scarrack@elektroplan.co.za

YOUR REF:	OUR REF:	DATE:
	PT20/05/16	2016-05-19

Mr. E. M. Keyser
NAPAJ Property Investment & Development (Pty) Ltd.
P.O. Box 34093
ERASMIA
0023

Dear Sir,

PROPOSED PEACH TREE EXTENSION 20 : ELECTRICAL RETICULATION : SERVICES REPORT

1. BULK ELECTRICAL SERVICES

This area falls within the Eskom, and more specific, the Eskom Laezonia Substation supply area and/but also within the boundaries of the City of Tshwane Metropolitan Municipality.

Following the possible upgrade of the Laezonia substation by Eskom, the supply of bulk power (maximum demand) to this proposed development, should under normal circumstances not pose a problem. However, for the proposed development of Peach Tree Extensions 15 & 16, Eskom indicated/written to those Developers (see attached correspondence in Annexure A), that they are presently not able to supply bulk power to those developments, in the near future. Therefore, with this development, situated next to those developments, it is recommended that negotiations are entered into with the City of Tshwane, for the supply of bulk power to this development.

It is known to us that, the CoT : Energy & Electricity department, is in the process of establishing a new 11kV satellite substation in the close vicinity of the existing Copper Leaf Golf Estate. This substation should be completed within the next nine months.

Therefore, due to the above-mentioned and the location of this satellite substation, negotiations will be entered into with the CoT, for the supply of bulk power to this proposed development.

.....2/

2. ESTIMATED LOAD REQUIREMENTS

This proposed development consists mainly of seven stands planned for residential group housing & one stand for retail purposes. This proposed development is situated on Portion 72 & 73 of the farm Knopjeslaagte 385-JR, totaling approximately 17.17ha. With this taken into account, the estimated load requirements for this development, are as follows :-

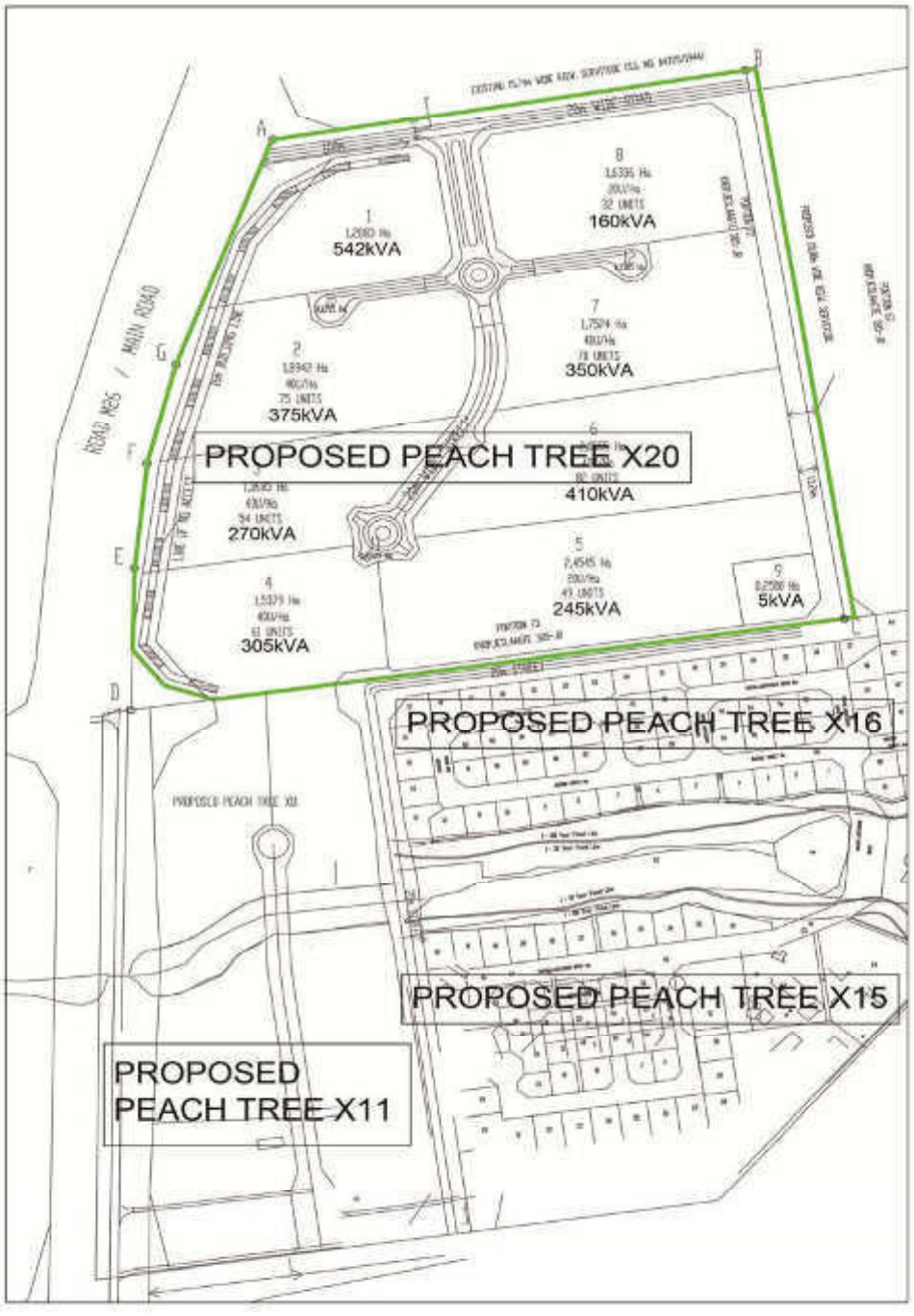

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TABLE 1

Estimated Load Requirements Per Proposed Stand

Item	Description	Estimated Load
1.	Stand 1 : 1.2883ha @ 60% FSR X 7kVA/100m²	542kVA
2.	Stand 2 : 75 units @ 5kVA ADMD/unit	375kVA
3.	Stand 3 : 54 units @ 5kVA ADMD/unit	270kVA
4.	Stand 4 : 61 units @ 5kVA ADMD/unit	305kVA
5.	Stand 5 : 49 units @ 5kVA ADMD/unit	245kVA
6.	Stand 6 : 82 units @ 5kVA ADMD/unit	410kVA
7.	Stand 7 : 70 units @ 5kVA ADMD/unit	350kVA
8.	Stand 8 : 32 units @ 5kVA ADMD/unit	160kVA
9.	Stand 9 : 0.25ha Municipal	5kVA
10.	Total Estimated Load	2 662kVA

The total estimated load for the complete area is approximately **2.66 MVA**

3. REQUIRED ELECTRICAL MATERIALS AND EQUIPMENT

3.1 11 kV (Medium Voltage) Ring Feeder Cables

The minimum requirement for residential type developments 70mm² Cu 3-core PVC SWA PVC 11/11kV, underground cables. It may be a CoT requirement to supply & install 150mm² Cu 3-core PVC SWA PVC 11/11kV cables complete with outdoor SF6 switching units for the external bulk supply to this proposed development.

3.2 Miniature-substations

SF6 type, concrete base, pavement mounted miniature= substations must be installed to supply low voltage power to the individual stands, as per the load requirements and designs.

3.3 Main Low Voltage Feeder Cables

600/1 000 V Cu 4-core SWA main low voltage underground feeder cables, sized as per the load requirements for each individual stand, must be installed from the miniature-substations to at least 1m into each stand.

3.4 Metering/Distribution Cubicles

12 Way, 3CR12, stubby type, side walk mounted cubicles, must be installed to supply power to individual stands and allow individual

…../4

metering of electrical consumption. For larger bulk type service connections, SF6 type metering units in combination with T3 ring main units, will be required.

3.5 Street-ligting

Street-light luminaires mounted on galvanized steel poles with galvanized steel luminaire outreach must be installed in accordance with CIE 140 specifications/standards for Group A or B type roads.

For Eskom, it is a requirement of Eskom that the Developer utilize energy efficient technologies and equipment in accordance with good practice in the Residential sector and the Developer must comply with the provisions of the Distribution code.

All required electrical materials and equipment for this development must be in accordance with the Eskom specifications.

4. FINANCIAL :

CITY OF TSHWANE : BULK SUPPLY CONTRIBUTIONS

With the City of Tshwane assumed as the supply Authority for this planned/proposed development, electrical bulk supply contributions as determined and calculated by the City of Tshwane Electrical Services Department, based on the estimated load and current Municipal tariffs (adjusted on the first day of July every new Council financial year), will be payable for these proposed developments by the Developer to the City of Tshwane. The amounts payable will be indicated in the Services Agreement between the City of Tshwane and the Developer.

The estimated bulk contribution amounts (at this stage worst case scenario), based on the City of Tshwane current financial year tariffs, are as follows :-

Extension 20 : 2 662kVA x R 2 233.00/kVA = **R 5 944 246.00** (Ex V.A.T.)

ESKOM CONNECTION CHARGES (IF APPLICABLE)

In addition to the Eskom standard tariff charges, connection charges are payable to Eskom to recoup the cost of providing the bulk connection.

The following short explanations for Connection Fee, Standard Connection Charge, Up-front Connection Charge and Distribution Connection Charges, are as follows :-

a. Connection Fee : It is the minimum up-front contribution towards the connection charge that is payable on the acceptance of the budget quotation.

   If acceptance of the budget quote is cancelled before actual survey or any physical construction work has been done, the Connection Fee plus quotation fee less any actual cost incurred, will be refundable. If the survey or construction has started, the full fee will be forfeited.

b. Standard Connection Charge : Is payable for cost associated with a standard connection. This Charge comprises of the Standard Connection Fee and the Standard Up-front Connection Charge.

c. Up-front Connection Charge : This charge, together with the Connection Fee, make up the Total Connection Charge.

d. Distribution Connection Charges : These Charges are raised on connection cost associated with the Distribution network.

We trust that the above meets with your requirements. Please do not hesitate to contact us for any further information.

Yours Faithfully

S CARRACK

ANNEXURE A :

COPIES OF ESKOM CORRESPONDANCE WITH PEACH TREE X 15 & 16 DEVELOPER

Stephen Carrack

From: Hylda Steenkamp <gaylin1@gmail.com>
Sent: 11 November 2014 12:20 PM
To: scarrack@elektroplan.co.za
Subject: Fwd: FW: Capacity Check

FYI
---------- Forwarded message ----------
From: **Theresa Smith**
<SmithT@eskom.co.za>
Date: Wed, Oct 15, 2014 at
8:12 AM
Subject: RE: FW: Capacity Check
To: Hylda Steenkamp <gaylin1@gmail.com>

Hi

The 1.3 mil is only for the upgrade costs project cost is additional.

The period of 2years is the **minimum** time span for mayor projects we have mayor projects that has been running for 6 years, there is no time guarantee on mayor projects.

This is an Eskom supply area but you can enquire at Tshwane if they will give you supply as I cannot say

Thank you

From: Hylda Steenkamp [mailto:gaylin1@gmail.com]
Sent: 10 October 2014 05:21 PM
To: Theresa Smith
Subject: Re: FW: Capacity Check

Hello Theresa,

Thank you for your mail.

The pole number on the property is LG60/3. I do not know if this will make a difference.

The estimate of R1.3mil, will that be the total cost of the power supply? Please clarrify.

Should we wish to continue, is there any possibilty that the period for the upgrade can be reduced as the power requirement is needed July next year.

Lastly, is it possible for us to obtain power from Tshwane if Eskom cannot meet the

required timeline?

King regards,

Tinus Steenkamp

On Fri, Oct 10, 2014 at 2:08 PM, Theresa Smith <SmithT@eskom.co.za> wrote:

Dear Customer

Please see the response from our Engineering department regarding your application for 2000kVa supply. Please note that should you wish to continue with the application the costs for the upgrade of the backbone will be for your account. The strengthening of the back bone will take a minimum of 2 years to complete as it will be registered as a mayor project.

Please notify me if we should go ahead with the application.

Thank you

From: Buhle Bujela
Sent: 10 October 2014 01:39 PM
To: Theresa Smith
Subject: RE: Capacity Check

Hi Theresa,

The 2MVA load can be added, however it collapses the voltage profile as shown below (Fig. 1) Eskom acceptable limits, to fix it we would have to upgrade the backbone conductor from Mink to Hare (about 3.5km of line) which will cost about R1.3mil.

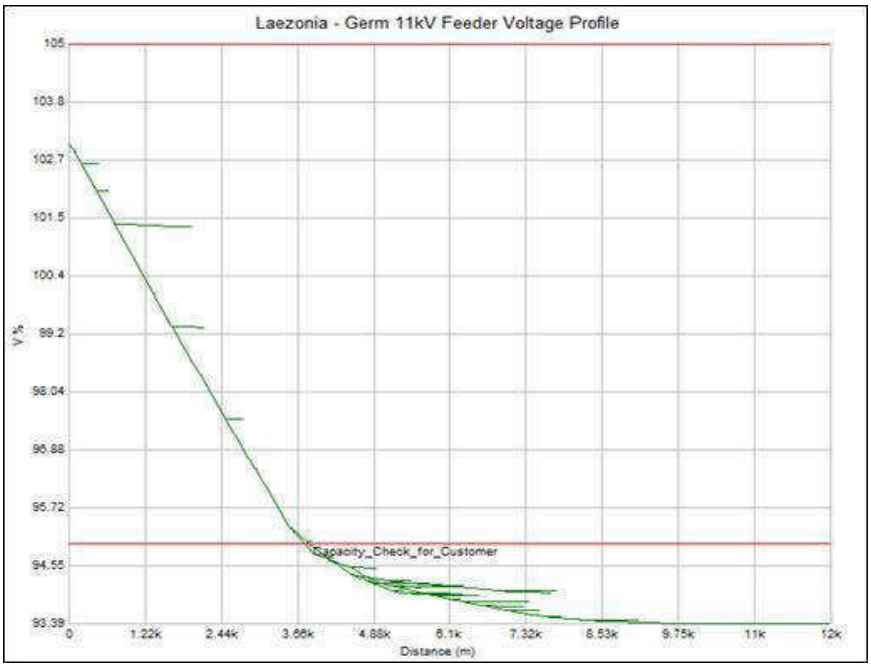

Figure 1:After adding customer on the existing line.

Kind Regards,

Buhle Bujela

From: Theresa Smith
Sent: 10 October 2014 07:53 AM
To: Buhle Bujela
Subject: Capacity Check

Hi Buhle

Can you please check if the LG54 feeder has capacity to accommodate additional 2MVA.

Thank you

I'm part of the 49Million initiative.
http://www.49Million.co.za

NB: This Email and its contents are subject to the Eskom Holdings SOC Limited EMAIL LEGAL NOTICE which can be viewed at
http://www.eskom.co.za/Pages/Email_Legal_Spam_Disclaimer.aspx

Appendix G5

Services Report

CIVILCONSULT
Consulting Engineers

CITY OF TSHWANE

PEACH TREE X20 (PORTION 72 AND 73 OF THE FARM KNOPJESLAAGTE 385-JR)

SERVICES REPORT FOR TOWNSHIP ESTABLISHMENT PURPOSES

PROJECT NO. 1947

JUNE 2016

CITY OF TSHWANE

PEACH TREE X20

(PORTION 72 AND 73 OF THE FARM KNOPJESLAAGTE 385-JR)

SERVICES REPORT FOR TOWNSHIP ESTABLISHMENT PURPOSES

CITY OF TSHWANE : PEACH TREE X20 : (PORTION 72 AND 73 OF THE FARM KNOPJESLAAGTE 385-JR) : SERVICES REPORT

1. CLIENT :

Name of Client	Napaj Property Investment and Development (Pty) Ltd
Contact Person	Emil Keyser
Address	P O Box 34093 ERASMIA 0023
Tel No. / Cell No.	012-161 0888
Fax No	086 585 7602 / 086 662 6029
E-mail	emo@velmore.co.za / wilma@napaj.co.za

2. FOR SUBMISSION TO :

Local Authority	City of Tshwane (Water & Sanitation)
Contact Person	Stephens Notoane
Address	P O Box 1022 PRETORIA 0001
Telephone No.	012-358 3773 / 072 125 1449
Fax No.	012-325 3476
E-mail	SteveN@TSHWANE.GOV.ZA

2. FOR SUBMISSION TO :

Local Authority	City of Tshwane (Roads and Storm Water)
Contact Person	Aubrey Green
Address	P O Box 14013 LYTTELTON 0140
Telephone No.	012-358 3571
Fax No.	086 210 0535
E-mail	AubreyG@tshwane.gov.za

3. COMPILED BY :

Company	CIVILCONSULT
Contact Person	Leon Wentzel (ECSA 950052)
Address	P O Box 12645 HATFIELD 0028
Telephone No. / Cell No.	012-343 6297/0181/0845 / 082 574 3558
Fax No.	086 583 6249 / 012-343 8929
E-mail	mail@civilconsult.co.zas

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ANNEXURES

CITY OF TSHWANE : PEACH TREE X20 : (PORTION 72 AND 73 OF THE FARM KNOPJESLAAGTE 385-JR) : SERVICES REPORT

1. INTRODUCTION

CIVILCONSULT was appointed by Emil Keyser of Napaj Property Investment and Development (Pty) Ltd as consulting civil engineers for Peach Tree X20 i.e. Portion 72 and 73 of the Farm Knopjeslaagte 385-JR.

For the purposes of this report we will refer to Peach Tree X20 i.e. Portion 72 and 73 of the Farm Knopjeslaagte 385-JR as the Proposed Development.

2. PROFESSIONAL TEAM

The professional team is as follows :

Professional Discipline	Name of Company	Contact Person(s)
Client	Napaj Property Investment and Development (Pty) Ltd	Emil Keyser
Town Planner	Urban Innovate Consulting CC	Annerine Dreyer / Werner Slabbert
Land Surveyor	Cobus Pienaar	Cobus Pienaar
Geologist	Les Holland-Muter & Associates	Les Holland-Muter
Traffic Engineer	Route² Transport Strategies	Jac Botha
Environmentalist	Bokamoso	Lizelle Gregory
Electrical Engineers	Elektroplan Consulting Engineers cc	Stephen Carrack
Civil Engineers	CIVILCONSULT	Gideon Ras / Damian Queck

3. LOCATION OF DEVELOPMENT

The Proposed Development is located on Potion 72 and 73 of the Farm Knopjeslaagte 385-JR to the east of Centurion.

The Proposed Development is bounded by Main Road (M26) to the west and Portion 67 of the Farm Knopjeslaagte 385-JR to the east. The northern boundary is bounded by Portion 39 of the Farm: Kopjeslaagte 385-JR. Peach Tree X11 and Peach Tree X16 forms the southern boundary of the Proposed Development.

The Proposed Development will to the best of our knowledge not be affected by any 1:50 and 1:100-year flood lines.

A locality plan is included in Annexure A.

4. LAND USES

The land uses for the Proposed Development are summarized in Table 4 below.

Table 4 : Land Uses

Use Zone/ Reservation	Erf No.	No. Erven	Area (ha)	FSR / Coverage	No. of Units	Floor Area (m^2)
Residential 3 (40 Units/ha)	2-11	10	13.0921	N/A	523	-
"Special" for Access and Control	13	1	-	N/A	-	-
"Special" for Retail, Place of Refreshment	1	1	1.2742	0.4/-	-	5096.8
"Special" for Municipal Purposes	12	1	-	N/A	-	-

5. GEOLOGICAL INVESTIGATION

A Geological Investigation was conducted by Louis Kruger Geotechnics CC during October 2015.

The following is an extract from the report :

Foundations

The hillwash, nodular ferricrete and very soft rock granite with soft patches are considered to be potentially collapsible. Therefore, this material is considered unsuitable in its natural state to act as a founding medium. This even applies for light structures with a foundation pressure of less than 100kPa. From the discussion foundation improvement and imparting flexibility in the brickwork are clearly required.

Excavatability

The excavatability of the materials encountered on the site was evaluated according to the South African Bureau of Standards Standardized Specification for Civil Engineering Construction DB: Earthworks (Pipe Trenches). The excavatability is considered to classify as "soft to intermediate" up to an average depth of one meter. It should be noted that the trenches were dug to depths exceeding 2,5 meters with a heavy excavator. It is important to note that the evaluation is based primarily on the profiling of test pits and the interpolation of information between test pits. It is therefore possible that variations from the expected conditions can occur.

Geohydrology

All excavations should be provided with adequate drainage. Structures should be provided with damp proofing and provision should be made to prevent the ingress of water into- and below foundations.

Construction Material

The laboratory test results show that the hillwash could be suitable as fill and selected subgrade, the ferricrete could be suitable as fill, selected subgrade and subbase. It is recommended that the suitability of material that is to be used, be confirmed by detailed laboratory testing.

Services

Due to the expected is recommended that all services be protected.

Stability of Excavations

It is recommended that all excavations be cut back or shored.

Refer to Annexure G for a complete copy of the Geotechnical Report.

6. TRAFFIC IMPACT STUDY

A Traffic Impact Study was conducted by Route² Transport Strategies during May 2016.

The following is an extract from the report :

The development is expected to generate more than a 1 000 peak hour trips during the peak hours. The capacity analysis indicates that the intersection of the M26 and the road to the Access Road needs to be signalized and upgraded to Gautrans Standards.

The following is proposed and can be concluded :

- *Provision of 1,5m wide sidewalks along the site frontage in the M26*
- *The access road should have two lanes in and two lanes out*
- *The implementation of bus and minibus-taxi lay-bys on both sides of the New Road to the access road along the M26*
- *A detailed SDP should be compiled showing parking, on-site circulation and refuse removal*

Refer to Annexure H for a complete copy of the Traffic Impact Study.

7. CIVIL ENGINEERING SERVICES

7.1 Design Standards

The design standards to be followed for the design of the infrastructure will be based on the technical requirements of the Engineering Department of the City of Tshwane for the provision of municipal services.

The design of the water reticulation will be done in accordance with the latest edition of the Design Guidelines for Water Reticulation and Supply issued by the Water and Sanitation Division of the City of Tshwane.

Sewer designs will be done according to the design guidelines for Sewer Mains and Sewer Drainage Systems in the City of Tshwane.

All roads and storm water will be according to the Tshwane Manual for the Design of Streets and Storm Water, Issued by the Town Engineer's office of City of Tshwane.

7.2 Design Software

The designs of the civil engineering services will be carried out with TechnoCad design programs.

7.3 Ownership of Services

The internal and external services will be taken over by the City of Tshwane who will be responsible for the maintenance of the services.

8. WATER

8.1 Bulk Services

No formal City of Tshwane water reticulation is available in the vicinity of the Proposed Development.

A 110mm uPVC Class 12 water pipeline is located east of the Proposed Development within Copperleaf Golf Estate.

The existing water reticulation in Copperleaf Golf Estate does not have enough capacity for a permanent water connection to the Proposed Development.

According to the GLS Investigation dated 21 October 2015, water could be supplied from Mnandi Reservoir to the Proposed Development.

The following network items are required to supply the Proposed Development with water from the Mnandi Reservoir :

- 1 488m of 450mm Ø and a PRV to be installed
- 165m of 450mm Ø main pipe
- 2 340m of 355mm Ø main pipe
- 480m of 250mm Ø main pipe

Please refer to Annexure F for a copy of the GLS Report.

The Swartbooi Spruit will have to be crossed to install the external water pipeline and a Water Use License Application (WULA) will have to be submitted.

Refer to Annexure C, Drawing No. 1947/200/01/00 and 1947/200/02/00 for details.

8.2 Internal Water Reticulation

8.2.1 Water Design Criteria

The design criteria to be used and to analyze and design the water network are indicated in Table 8.2.1 below.

Table 8.2.1 : Water Design Criteria

Item No.	Design Element		Criteria
1.	Average Annual Daily Demand (AADD) for residential and recreational sites		Refer to Table 8.2.2 below
2.	Gross Average Annual Daily Demand (GAADD)		Allow 10% losses
3.	Daily Peak Factor (DPF)		1.7
4.	Instantaneous Peak Factor (IPF)		3.3
5.	Design Peak Flow Rate (DPFR) for domestic flows		GAADD x IPF
6.	Maximum static head		90m
7.	Minimum residual head under conditions of domestic peak flows		25m
8.	Maximum linear flow velocity under conditions of domestic peak flows		2,2m/s
9.	Pipe type		uPVC
10.	Minimum pipe class		Class 12
11.	Fire flow at any one hydrant under the condition of domestic peak flows (one hydrant at a time)		50ℓ/s
12.	Minimum residual head (fire plus domestic peak flow)		10m
13.	Maximum linear flow velocity under conditions of fire-fighting		2,2m/s
14.	Boundary roughness (K-Value)		0,1mm
15.	Available static head	Current	43m
		Future	43m
16.	Available dynamic head under fire flow Conditions	Current	34m
		Future	24m
17.	Flow formulae		D'Arcy Weissbach
18.	Minimum pipe diameter		110mm

8.2.2 Estimated Water Demand

The estimated water demand for the Proposed Development is shown in Table 8.2.2 below.

Table 8.2.2 : Estimated Water Demand

Zoning	Peach Tree X20		
	No. of Units / Floor Area (m^2)	Average Annual Daily Demand (AADD)	Water Demand (kℓ/d)
Residential 3	523	0.8kℓ/unit	418.4
"Special" for Retail, Place of Refreshment	5096.8	0.8kℓ/100m^2	40.77
Special" for Access and Control	1	0.6kℓ/unit	0.6
Total			**459.77**

9. SEWER

9.1 Bulk Services

No formal City of Tshwane sewage reticulation is available in the vicinity of the proposed development.

9.2 Permanent Solution

According to the GLS Investigation dated 21 October 2015, Peach Tree X20 falls within the future Swartbooi Spruit Sewer Drainage Area. The Swartbooi Spruit Drainage Area will drain to the future Schurveberg Waste Water Treatment Plant (WWTP) which as of yet does not exist. Drainage to the Sunderland Ridge WWTP has been considered as an alternative solution in the GLS Investigation and this Services Report.

The following network items are required to be implemented to drain sewage from the Proposed Development :

- A new outfall sewer to Sunderland Ridge WWTP (as an alternative to Swartbooi Spruit Outfall Sewer)
- 340m of 160mm Ø new pipe
- 82m of 160mm Ø new pipe
- 1 455m of 600mm Ø new pipe

Please refer to Annexure F for the GLS Report.

Refer to Annexure C, Drawing No. 1947/300/01/00 for permanent solution.

9.3 Interim Solution

The developer of Peach Tree X15 and X16 received formal approval to construct a Sewage Treatment Facility (Package Plant). The Developer of the Proposed Development has an agreement with the Developer of Peach Tree X15 and X16 to drain the sewage from the Proposed Development to the Sewage Treatment Facility (Package Plant) of Peach Tree X15 and X16.

Refer to Annexure D for a copy of the agreement and servitude consent.

A manhole connection will be provided for each erf of the Proposed Development and the sewage will drain through Peach Tree X16 to the Sewage Treatment Facility (Package Plant).

Refer to Annexure C, Drawing No. 1947/300/02/00 for interim solution.

Refer to Annexure E for the typical detail of the proposed Sewage Treatment Facility (Package Plant).

The Developer is prepared to connect the sewage reticulation of the Proposed Development to the new outfall sewer to the Sunderland Ridge WWTP once the outfall sewer is in place.

9.4 Internal Sewer Reticulation

9.4.1 Sewer Design Criteria

The design criteria to be used to design the sewage network are indicated in Table 9.4.1 below.

Table 9.4.1 : Sewer Design Criteria

Item No.	Design Element	Criteria
1.	Average Annual Daily flow for special and residential erven	Refer to Table 9.4.2 below
2.	Peak Factor	2.5
3.	Allowance for infiltration	15%
4.	Capacity of Sewer	Pipes may run full at the Total Design Flow, which includes the peak and infiltration flows
5.	Sewer pipe type	Maincore Class 400
6.	Minimum velocity	0,6m/s
7.	Minimum pipe diameter	160mm
8.	Minimum depth of cover	1,2m
9	Minimum depth of cover in road reserves	1,5m

9.4.2 Estimated Sewerage Flow

The estimated sewerage flow for the Proposed Development is shown in Table 9.4.2 below.

Table 9.4.2 : Estimated Sewerage Flow

Zoning	Peach Tree X20		
	No. of Units / Floor Area (m^2)	Average Annual Flow (AADD)	Sewer Flow (kℓ/d)
Residential 3	523	0.6kℓ/unit	313.8
"Special" for Retail, Place of Refreshment	5096.9	0.8kℓ/100m^2	40.77
"Special" for Access and Control	1	0.6kℓ/unit	0.6
Total			355.17

10. STORM WATER DRAINAGE

10.1 Storm Water Systems

The general drainage pattern of the Proposed Development is from north west to the south east towards the Swartbooi Spruit.

A storm water connection will be provided to each erf and the storm water run-off will drain towards the southern boundary of the Proposed Development, draining through Peach Tree X16 to discharge into a natural water course which is a tributary of the Swartbooi Spruit.

The storm water will be designed according the Storm Water Master Plan of City of Tshwane.

2m wide servitudes will be registered for the storm water pipes which will be installed over Erf 4 and Erf 7 of the Proposed Development.

The storm water outlet structures will cater for energy breakers at the outlets to minimize the possibility of erosion at the point of discharge.

The external storm water system will be designed for a 1:20 year flood return period and a run-off coofficient of 80% (C= 0.8) will be allowed.

Refer to Annexure C, Drawing No.1947/500/01/00 for details.

10.2 Hydrology

Hydrological data that is to be used in the design of the storm water drainage system for the development is summarized in Table 10.2 below.

Table 10.2 : Hydrology

Hydrological Data		
a)	Flood return period	1:2 years for storm water pipe systems
		1:20 years for the combined storm water pipe and road systems
b)	Average yearly rainfall	700mm
c)	Minimum time of concentration and run-off co-efficient according to : Tshwane Council requirements and Design Manual	
d)	Design method	According to City of Tshwane Standard Details and Requirements

10.3 Design Standards

Table 10.3 lists the standards to be used in the design of the storm water drainage system.

Table 10.3 : Storm water Design Standards

Design Element		Specification
a)	Minimum pipe size	450mm diameter
b)	Pipe Type	Interlocking Joint Pipes Pipe Class : 50D 75D road crossings
c)	Minimum pipe gradient	0,67%
d)	Storm water details	According to City of Tshwane Standard Details and Requirements

11. ROADS

11.1 Access to the Development

A Traffic Impact Study was conducted by Route² Transport Strategies during May 2016.

An access road to the Proposed Development will be provided directly from Provincial Road M26 on the north western corner of the Proposed Development.

The 20m proposed road reserve along the eastern boundary of the Proposed Development is an internal road adjacent to Portion 67 of the Farm Knopjeslaagte 385-JR. A portion of the road reserve is not registered on Portion 67 and the Developer will make arrangements for the servitude to be registered.

Refer to Annexure H for the Traffic Impact Study.

Refer to Annexure C, Drawing No. 1947/400/01/00 for details.

11.2 Classification of Roads

The classifications of roads are shown in Tables 11.2.1 to 11.2.3 below.

Table 11.2.1 : Classification of Internal Roads

Description	Class No.	Function
Internal Roads	5b	Residential Access Loop

Table 11.2.2 : Classification of Internal Access Road 2

Description	Class No.	Function
Link Road	4	Local Distributors

Table 11.2.3 : Classification of Provincial Road

Description	Class No.	Function
Provincial Road	2	Primary Distributers

11.3 Geometric Design Standards

Details of the different road classes are shown in the Tables 11.3.1 to 11.3.3 below.

Table 11.3.1 : Class 4 – Local Distributors

Design speed	50km/h
Minimum centre line radii	50m
Minimum gradient	0,67%
Favoured maximum gradient	10%
Maximum grade/grade length	12,5% over 70m
Minimum K-value : Crest	6
Sag	6
Minimum turning circle radii	10.0m

Table 11.3.2 : Class 5b – Residential Access Loop

Design speed	30km/h
Minimum centre line radii	30m
Minimum gradient	0,67%
Favoured maximum gradient	12%
Maximum grade/grade length	16% over 50m
Minimum K-value : Crest	4
Sag	4

Table 11.3.3 : Class 2 – Primary Distributer

Design speed	80km/h
Minimum centre line radii	60m
Minimum gradient	0.67%
Favored maximum gradient	7%
Maximum grade/grade length	7% over 140m
Minimum K-value : Crest	33
Sag	25

11.4 Pavement Design

The proposed pavement design will be based on anticipated traffic volumes and ground conditions. The design life of the proposed pavement is 20 years on provision that repairs to the surface will be made where necessary in order to maintain its skid resistance and impermeability during the design life of the road.

The pavement designs proposed are shown in Tables 11.4.1 to 11.4.3 below.

Table 11.4.1 : Pavement Design of Road Class 4

Wearing Course	25mm thick continuously – graded medium grade asphalt – AC. (see note below)
Base	150mm thick graded crushed stone compacted to 86% of apparent density – G1. (see note below)
Sub Base	150mm thick stabilized natural gravel compacted to 95% of modified AASHTO density. Minimum UCS = 1 200kPa at 95% of modified AASHTO density – C4
Selected Sub grade	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G6 (in-situ or imported)
Fill (where required)	150mm thick layers compacted to 93% of modified AASHTO density. Minimum CBR = 7 at 93% of modified AASHTO density – G9

Table 11.4.2 : Pavement Design of Road Classes 5b

Wearing Course	80mm interlocking paving blocks with 20mm sand bedding
Sub Base	150mm sub base stabilized to C4
Selected	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G6 (in-situ or imported)
Roadbed	150mm thick layers compacted to 93% of modified AASHTO density. Minimum CBR = 7 at 93% of modified AASHTO density – G9

Table 11.4.3 : Pavement Design of Provincial Road

Wearing Course	35mm thick continuously – graded medium grade asphalt – AC. (see note below)
Base	150mm thick graded crushed stone compacted to 86% of apparent density – G1. (see note below)
Upper Sub Base	150mm thick stabilized natural gravel compacted to 95% of modified AASHTO density. Minimum UCS = 2.500kPa at 95% of modified AASHTO density – C3
Lower Sub Base	150mm thick stabilized natural gravel compacted to 95% of modified AASHTO density. Minimum UCS = 1 200kPa at 95% of modified AASHTO density – C4
Upper Selected Sub Grade	150mm thick natural gravel compacted to 95% of modified AAHSTO density. Minimum CBR = 25 at 95% of modified AASHTO density – G6 (in-situ or imported)
Lower Selected Sub Grade	150mm thick natural gravel compacted to 93% of modified AAHSTO density. Minimum CBR = 15 at 93% of modified AASHTO density – G7 (in-situ or imported)
Fill (where required)	150mm thick layers compacted to 93% of modified AASHTO density. Minimum CBR = 7 at 93% of modified AASHTO density – G9

12. SOLID WASTE DISPOSAL

12.1 Volume of Solid Waste

The estimated volume of waste to be generated on a weekly basis is shown Table 12.1.

Table 12.1 : Estimated Volume of Solid Waste

Use Zone/Reservation	Peach Tree X20	
	No. of Units / Floor Area (m^2)	Volume of Solid Waste (m^3/Week)
Residential 3	523	104.6
"Special" for Retail, Place of Refreshment	5096.8	10.19
Special" for Access and Control	1	0.2
Total		**114.99**

12.2 The collection of solid waste in Peach Tree X20 will be carried out by the City of Tshwane.

13. BULK SERVICES CONTRIBUTIONS

The amount of Bulk Services Contributions for civil services payable to the City of Tshwane will be determined with the compilation of the services agreements.

14. COST ESTIMATES

No cost estimates for the installation of services are available at this stage.

15. CONCLUSION

We trust that the above report meets your requirements. Please contact us should you require any additional information.

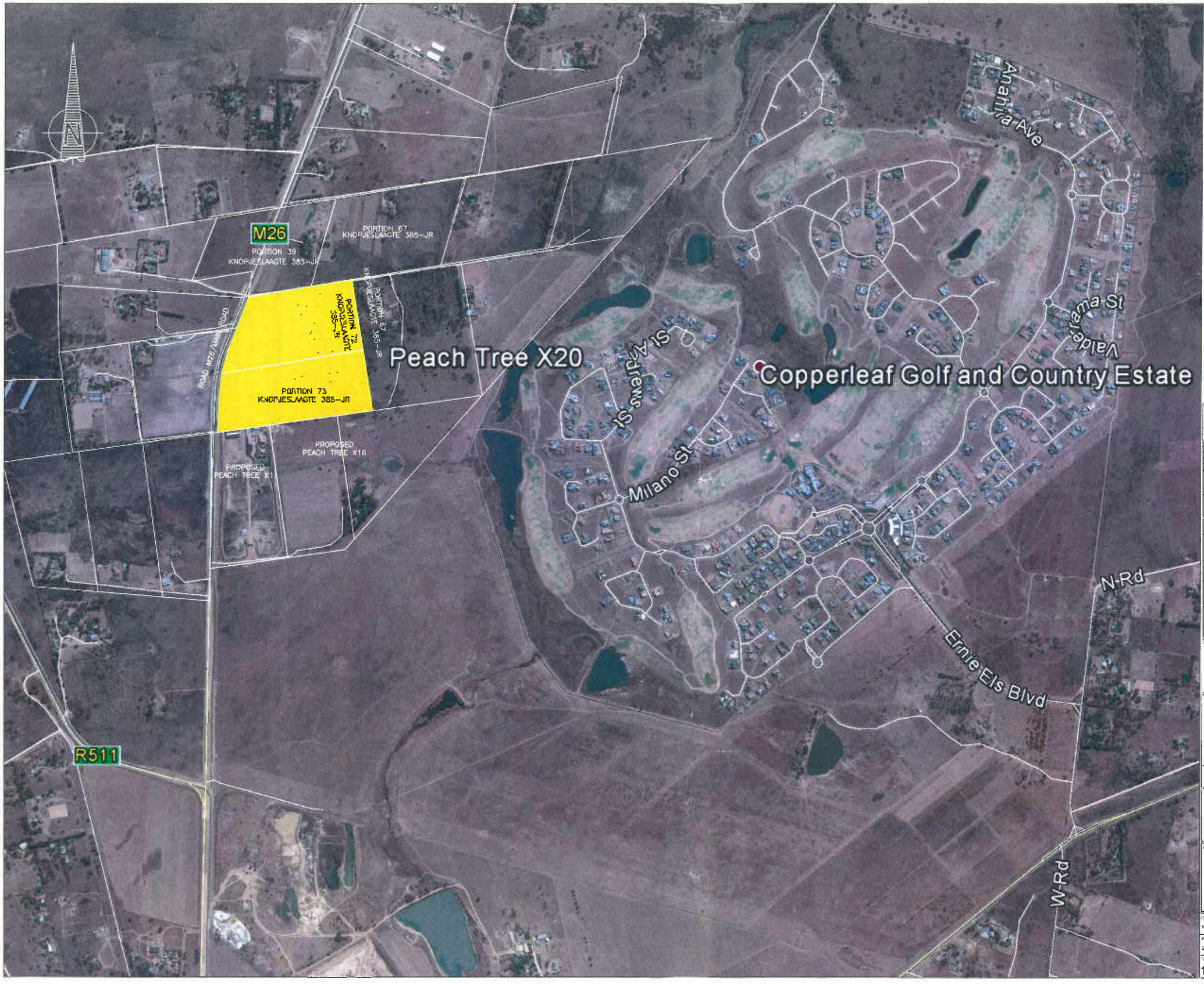
.....

Gideon Ras
for CIVILCONSULT Consulting Engineers (Pty) Ltd

01/06/2016
Date

ANNEXURE A

LOCALITY PLAN



NOTES AND SPECIFICATIONS

GENERAL

1 ALL WATER, SEWER AND STORMWATER WORK COMPLY WITH ... AND WITH REQUIREMENTS OF THE LATEST SOUTH AFRICAN BUREAU OF STANDARDS CODES OF PRACTICE.

2 ALL SEWER AND PIPE WORK TO BE ...

3 ... SHALL BE ...

4 ... AS APPROVED ON SITE.

5 ALL CONSTRUCTION TO BE DONE ... THE LATEST SPECIFICATIONS FOR ROADS AND STORMWATER WORKS AS ISSUED BY THE CITY OF TSHWANE AND THE SPECIFICATIONS OF THE ENGINEER.

6 ... IN ACCORDANCE WITH THE ABOVE TESTS.

7 ... AS DETERMINED BY THE STANDARD SPECIFICATIONS FOR MUNICIPAL ENGINEERING WORKS.

8 THE CONTRACTOR OR HIS AGENT SHALL BE ... RESPONSIBILITY WHILE WORK IS IN PROGRESS.

9 THE CONSULTING ENGINEER RESERVES THE RIGHT TO ... OF THE SPECIFICATIONS, STANDARD DRAWINGS ... IF THE REQUIREMENTS ARE NOT COMPLIED WITH.

10 FINAL TEST ON ... TO BE ...

ROADS:

1 ...

2 ...

3 VERTICAL AND HORIZONTAL ALIGNMENT ... THE EXISTING ROAD ... MINIMUM CROSS FALL OF ...

STORMWATER

1 MINIMUM ... PIPE ...

2 MINIMUM GRADE OF ...

3 ... AS PER ENGINEER'S INSTRUCTIONS.

4 NO EXCAVATION ... BEFORE ... HAS BEEN INSPECTED AND APPROVED BY THE ENGINEER OR HIS REPRESENTATIVE.

5 ... ALL STORMWATER ... AND REPAIRS WHERE NECESSARY OF ... DAMAGED.

LEGEND:

PROPOSED PEACH TREE X20 DEVELOPMENT

AMENDMENTS

PROJECT STATUS

●	○	○	○

CONSULTANT DETAIL

CIVILCONSULT
Consulting Engineers

CITY OF TSHWANE
TRANSPORT DEPARTMENT

PEACH TREE X20

LOCALITY PLAN

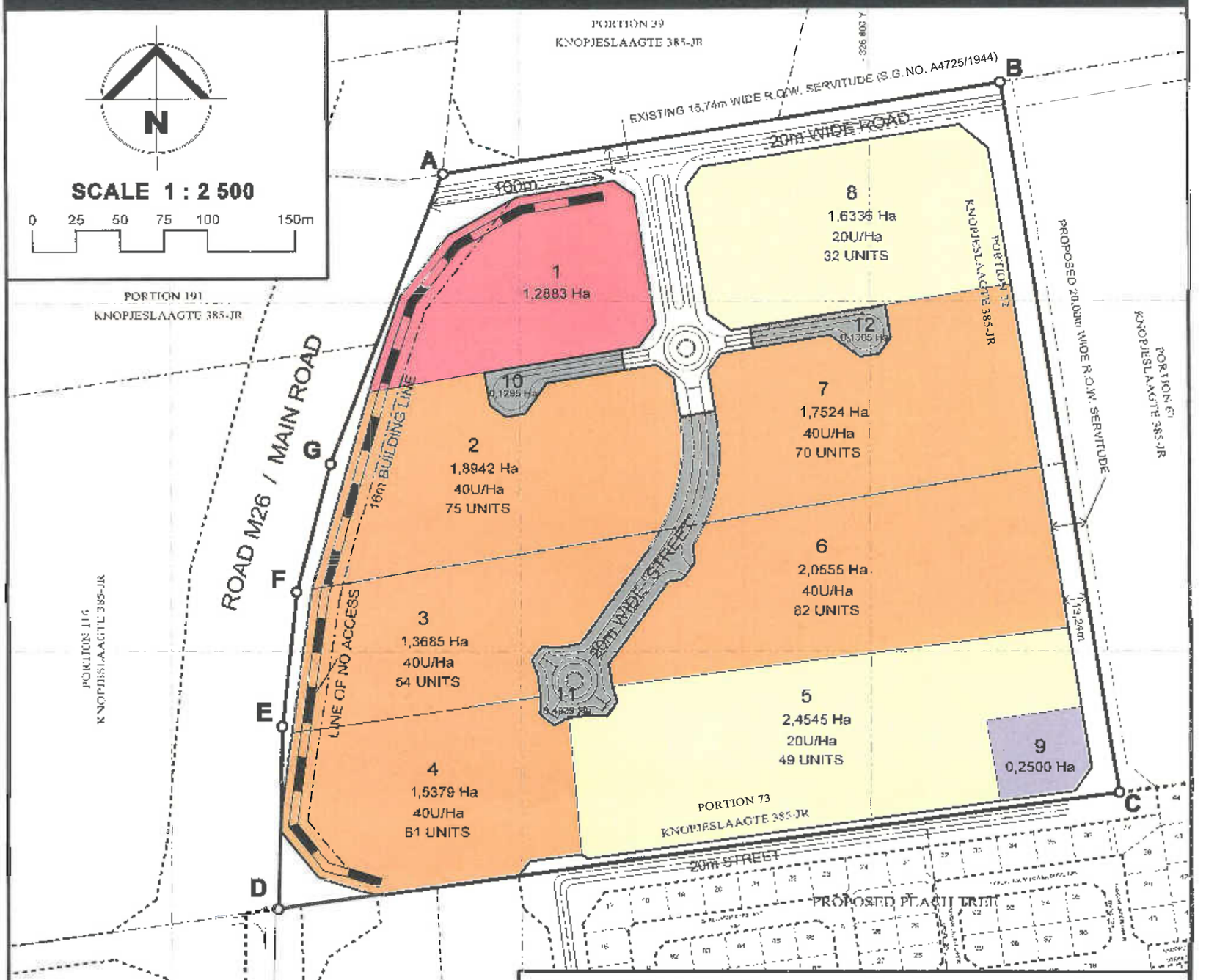
		A1

1947-100-01-00

ANNEXURE B

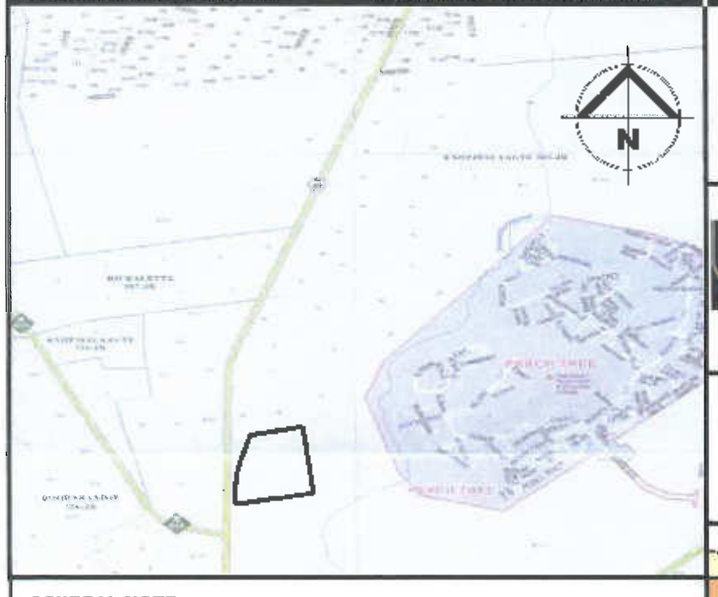
TOWNSHIP LAYOUT PLAN

PROPOSED TOWNSHIP: PEACH TREE X 20



GEOTECHNICAL CERTIFICATION

LOCALITY MAP SCALE 1 : 50 000



PLAN No: PEACH TREE X20/1 | APRIL 2016

FLOOD LINE CERTIFICATION

I HEREBY CERTIFY THAT IN TERMS OF THE REQUIREMENTS OF SECTION 144 OF THE WATER ACT, 1998, (ACT 36 OF 1998), THIS PROPOSED TOWNSHIP IS NOT AFFECTED BY A FLOOD LINE WITH AN EXPECTED FREQUENCY OF 1:50 NOR 1:100 YEARS

I. WENTZEL PR ENG NR: 980137

urban innovate
URBAN INNOVATE CONSULTING CC
PO Box 27011
MONUMENT PARK
0105
21 Lobombo Ave
ABHLEA GARDENS
Tel: (012) 459 0570
Fax: (086) 692 9974

LOCALITY: SITUATED ON PORTIONS 72 & 73 OF THE FARM KNOPJESLAAGTE 385-JR
REPRESENTED BY THE FIGURE A-B-C-D-E-F-G-A

LOCAL AUTHORITY: CITY OF TSHWANE METROPOLITAN MUNICIPALITY

SERVITUDE NOTE:

1. ERVEN 10, 11 AND 12 IS SUBJECT TO ROW SERVITUDE IN FAVOUR OF ERVEN 2-9, AS WELL AS FOR A GENERAL SERVITUDE FOR MUNICIPAL AND ELECTRICAL SERVICES.

ZONING		ERF NR	# ERVEN	MIN. SIZE	SIZE (Ha)	%
	RESIDENTIAL 2 (20U/Ha)	5, 8	2	16 000m²	4,0881	23,80
	RESIDENTIAL 3 (40U/Ha)	2 - 4, 6, 7	5	12 000m²	8,6085	50,13
	SPECIAL FOR ACCESS & ACCESS CONTROL	10 - 12	3	N/A	0,7939	4,59
	SPECIAL FOR RETAIL PLACE OF REFRESHMENT	1	1	N/A	1,2883	7,50
	SPECIAL FOR MUNICIPAL PURPOSES	9	1	N/A	0,2500	1,45
	STREETS	N/A	N/A	N/A	2,1947	12,73
	TOTAL		12	N/A	17,1736	100,00

GENERAL NOTE

ALL DIMENSIONS AND AREAS ARE APPROXIMATE PENDING FINAL SURVEY
CONTOURS: SUPPLIED BY CITY OF TSHWANE METROPOLITAN MUNICIPALITY
1,00m INTERVALS
DATUM: SEA LEVEL
THE CONTOURS ARE IN ACCORDANCE WITH REGULATION 18(1) OF THE TOWN-PLANNING AND TOWNSHIPS ORDINANCE, 1986

ANNEXURE C

ENGINEERING LAYOUT DRAWINGS

LOCALITY PLAN

PORTION 67
KNOPJESLAAGTE 385 JR

PORTION 39
KNOPJESLAAGTE 385 JR

CONNECTION TO PEACH TREE NETWORK

355mm Ø uPVC

EXISTING 15.24m WIDE R.O.W. SERVITUDE (5.0 NO. 4472S/1944)

PORTION R/15
KNOPJESLAAGTE 385-JR

PORTION 191
KNOPJESLAAGTE 385-JR

MAIN ROAD / ROAD M26

PORTION 113
KNOPJESLAAGTE 385-JR

PORTION 67
KNOPJESLAAGTE 385-JR

PORTION 73
KNOPJESLAAGTE 385-JR

PROPOSED PEACH TREE X16

PROPOSED PEACH TREE X11

Ptn 71

NOTES AND SPECIFICATIONS

GENERAL

1. ALL WORK AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST DELEGATION BASE REQUIREMENTS
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED
3. DO NOT SCALE FROM THIS DRAWING
4. ALL DIMENSIONS MUST BE CHECKED ON SITE
5. ALL EXCAVATIONS TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR WATER & SEWER CONSTRUCTION WORKS, UNLESS OTHERWISE STATED THE STANDARD DETAIL DRAWINGS
6. THE SPECIFICATIONS TO BE READ IN CONJUNCTION WITH THE STANDARD DRAWINGS (AS PER ITEM 5).
7. ANY DEVIATIONS OR MISTAKES ON THESE DRAWINGS OR ANY DISPUTE OF THE SITE WORKS AND INFRASTRUCTURE LEVELS TO BE SEEN MUST IN NO WAY BE TAKEN AS ANY RESPONSIBILITY WHATSOEVER FROM THE CONSULTANT
8. THE CONSULTANT REMAINS RESPONSIBLE TO ENSURE THAT ALL THE CONSTRUCTED STANDARD DRAWINGS & ARRANGEMENTS OF THE SITE WORKS AND INFRASTRUCTURE LEVELS WHICH DEPARTMENT HAVE BEEN MET AND ARE COMPLIED WITH.
10. FINAL POSITION OF SLOW SIDE TO BE DETERMINED ON SITE.
11. ALL PIPES TO BE [illegible] UNLESS STATED OTHERWISE

LEGEND

WATER

- DEVELOPMENT BOUNDARY
- NEW HYDRANT
- PROPOSED uPVC WATER PIPE
- NEW VALVE
- NEW BULKWAY

CITY OF TSHWANE
SERVICES & INFRASTRUCTURE DEPARTMENT
WATER & SANITATION
DIVISION

AMENDMENTS				
A/R	DATE	APPROVED	DESCRIPTION	INIT

WATER AND SANITATION
DIRECTOR: WATER AND SANITATION PLANNING
NAME / Ref. No. / SIGNATURE / DATE
REGIONAL DIRECTOR: [illegible]
DIRECTOR: SYSTEMS DEVELOPMENT
BULK WATER
DIRECTOR: BULK WATER PROVISION
DIRECTOR: WATER RETICULATION

CONSULTANT DETAIL
CIVILCONSULT
PO BOX 13562
HATFIELD
0028
Tel: (012) 343 6370/8/9
Fax: (012) 343 3929
I, [illegible] HEREBY CERTIFY THAT THE above CIVIL UTILITY SYSTEM INSTALLED ACCORDING TO NORMS OF THE ABOVE MENTIONED LAYOUT.
Ref. No.: 1847-200 01-00

DESIGNED
NAME: [illegible]
SIGNATURE:
DRAWN
NAME: [illegible]
SIGNATURE:
CHECKED
NAME & SURNAME:
SIGNATURE:
INFORMATION OFFICE CHECKED:
NAME:
SIGNATURE:
DESIGN OFFICE APPROVAL
NAME:
SIGNATURE:

CONTRACT No.: 1847
PROJECT No.: 1847
SHEET No.: 1 OF 2
PAPER SIZE: A1
SCALE: 1:500
DATE: 2013/05/20

PROJECT STATUS
CONCEPT / PRELIMINARY / DETAILED DESIGN / AS-BUILT INFORMATION

PROJECT ENGINEER OF COT:
NAME: Ref. No.:
SIGNATURE: DATE:
INSPECTION OF WORKS OF COT:
NAME: Ref. No.:
SIGNATURE: DATE:

LOCATION OF PROJECT
PEACH TREE X 20

DESCRIPTION OF PROJECT
WATER RETICULATION:
GENERAL LAYOUT : PERMANENT SOLUTION

WR6 No.:
COT DRAWING NUMBER:

LOCALITY PLAN

NOTES AND SPECIFICATIONS

GENERAL

1. ALL WORK, LABOUR AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT BYLAWS AND REGULATIONS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
3. DO NOT SCALE - USE FIGURED DIMENSIONS.
4. ALL LEVELS AND DIMENSIONS MUST BE CHECKED AND VERIFIED ON SITE.
5. ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS, INCLUDING ALL LOCAL AND THESE SHOWN ON DETAIL DRAWINGS.
6. ALL DIMENSIONS MUST BE READ IN CONJUNCTION WITH ALL OTHER STANDARD SPECIFICATIONS AND DRAWINGS, AND ANY OTHER SPECIFICATIONS AND DRAWINGS WHICH MAY BE ISSUED.
7. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR CIVIL ENGINEERING WORKS, SECTION 4.
8. THE APPROVAL OF THESE DRAWINGS, OR ANY INSPECTION OF THE WORKS AND MATERIALS BY THE ENGINEER, DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO ENSURE THAT ALL THE SPECIFICATIONS, STANDARD DRAWINGS, SUMMARIES AND DETAILS AS LAID DOWN BY THE PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT HAVE BEEN MET AND ARE COMPLIED WITH.
9. FINAL POSITION OF SERVICES TO BE DETERMINED ON SITE.
10. ALL PIPES TO BE LAID AT MINIMUM GRADES UNLESS STATED OTHERWISE.

LEGEND

WATER

- DEVELOPMENT BOUNDARY
- PROPOSED 110mm WATER PIPE
- NEW FIRE HYDRANT
- EXISTING 110mm WATER PIPE
- EXISTING 160mm WATER PIPE
- EXISTING 200mm WATER PIPE
- EXISTING 250mm WATER PIPE
- EXISTING 355mm Ø uPVC WATER PIPE
- EXISTING 400mm WATER PIPE

CITY OF TSHWANE

AMENDMENTS

NO	DATE	APPROVED	DESCRIPTION	INIT

WATER AND SANITATION

PROF. TECH. (BRANCH) (DEPT. PLANNING)

REGIONAL DIRECTOR: (REGION C, D OR F)

DIRECTOR: SYSTEM DEVELOPMENT

DIRECTOR: SUB AREA WATER

DIRECTOR: INFRASTRUCTURE PROVISION

DIRECTOR: WASTE WATER MANAGEMENT

CONSULTANT DETAIL

CIVILCONSULT

I, [illegible] HEREBY CERTIFY THAT THE SERVICES WILL HAVE BEEN INSTALLED ACCORDING TO THE SPECIFICATIONS AND DRAWINGS

DESIGNED

DRAWN

CHECKED

INFORMATION OFFICE CHECKED

DESIGN OFFICE APPROVAL

CONTRACT No: 1947

PROJECT No: 1947

SHEET No: 2 OF 2

PAPER SIZE: A1

SCALE: 1:500

DATE: 2019/09/20

1947-200 02-CD

PROJECT STATUS

PROJECT ENGINEER of COT:

INSPECTOR OF WORKS of COT:

LOCATION OF PROJECT:
PEACH TREE X 20

DESCRIPTION OF PROJECT:
WATER RETICULATION:
GENERAL LAYOUT : PERMANENT SOLUTION

WBS No.:

COT DRAWING NUMBER:

LOCALITY PLAN

SUNDERLAND RIDGE
WWTW (EXTENSION)

NOTES AND SPECIFICATIONS

GENERAL

1. ALL MATTERS AND WORKMANSHIP MUST COMPLY WITH THE LOCAL AUTHORITY'S LATEST RELEVANT BASE REQUIREMENTS.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3. DO NOT SCALE FROM THESE DRAWINGS.
4. ALL LEVELS ARE TO BE CHECKED AND APPROVED ON SITE.
5. NO CONSTRUCTION TO BE DONE IN ACCORDANCE WITH THESE DRAWINGS BEFORE APPROVAL FOR MUNICIPAL SEWER INSTALLING WORKS, INITIATION HAS BEEN GIVEN BY THE STANDARD COT DETAIL DRAWINGS.
6. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STANDARD DRAWINGS OF LATEST DATES.
7. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS SERIES 1.
8. THE SUBMITTING OF THESE DRAWINGS FOR APPROVAL GIVES NO RIGHT TO THE PUBLIC WORKS AND INFRASTRUCTURE (CITY OF TSHWANE) DEPARTMENT IN ANY WAY WHATSOEVER TO ANY DEVIATION FROM THESE SUBMITTED DRAWINGS.
9. THE CONSULTANT REMAINS RESPONSIBLE TO ENSURE THAT ALL THE GUIDELINES & STANDARD DRAWINGS & STANDARDS AND SPECIFICATIONS OF THE PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT HAVE BEEN MET AND ARE COMPLIED WITH.
10. FINAL COMPLETION SERVICES TO BE DETERMINED ON SITE.
11. ALL LEVELS TO BE ... (UNLESS STATED OTHERWISE)

LEGEND

SANITATION

- PROPOSED PEACH TREE X20 DEVELOPMENT
- EXISTING OUTFALL SEWER
- PROPOSED 450mm Ø SEWER
- PROPOSED 300mm Ø SEWER

CITY OF TSHWANE
METROPOLITAN MUNICIPALITY
GOVERNMENT OF SOUTH AFRICA

CITY OF TSHWANE
INFRASTRUCTURE DEPARTMENT
WATER AND SANITATION DIVISION

AMENDMENTS

NO	DATE	INITIALS	DESCRIPTION	PAR

WATER AND SANITATION

DIRECTOR: BULK WATER

DIRECTOR: INFRASTRUCTURE PLANNING

DIRECTOR: WASTE WATER TREATMENT

CONSULTANT DETAIL

CIVILCONSULT

P.O. BOX 13595
HATFIELD
0028

Tel 012-343 6290/6045
Fax 012-343 6729
civil@civilconsult.co.za

I, ... (SACPCMP Reg No ...)
Hereby certify that the ... drawings have been prepared in accordance with the relevant requirements of the Municipal Services and to the best of my knowledge are correct.

SIGNATURE: ... DATE: ...

CONSULTANT'S REFERENCE NUMBER
1947-300 01 00

DESIGNED
NAME OF ENGINEER: ...
SIGNATURE: ... DATE: 25/08/2020

DRAWN
NAME OF DRAUGHTSMAN: ...
SIGNATURE: ... DATE: 25/08/2020

CHECKED
NAME OF ENGINEER: ... Pr Eng Prof Reg No: 870322
SIGNATURE: ... DATE: 25/08/2020

INFORMATION OFFICIALLY CHECKED
NAME: ... Pr Eng Prof Reg No: ...
SIGNATURE: ... DATE: ...

DESIGN OFFICE APPROVAL
NAME: ... Pr Eng Prof Reg No: ...
SIGNATURE: ... DATE: ...

CONTRACT No: 1947
PROJECT No: 1947
SHEET No: 1 OF 2
PAPER SIZE: A1
SCALE: 1:1500
DATE: 25/08/20

PROJECT STATUS

PROJECT ENGINEER of COT:
NAME: ... Prof Reg No: ...
SIGNATURE: ... DATE: ...

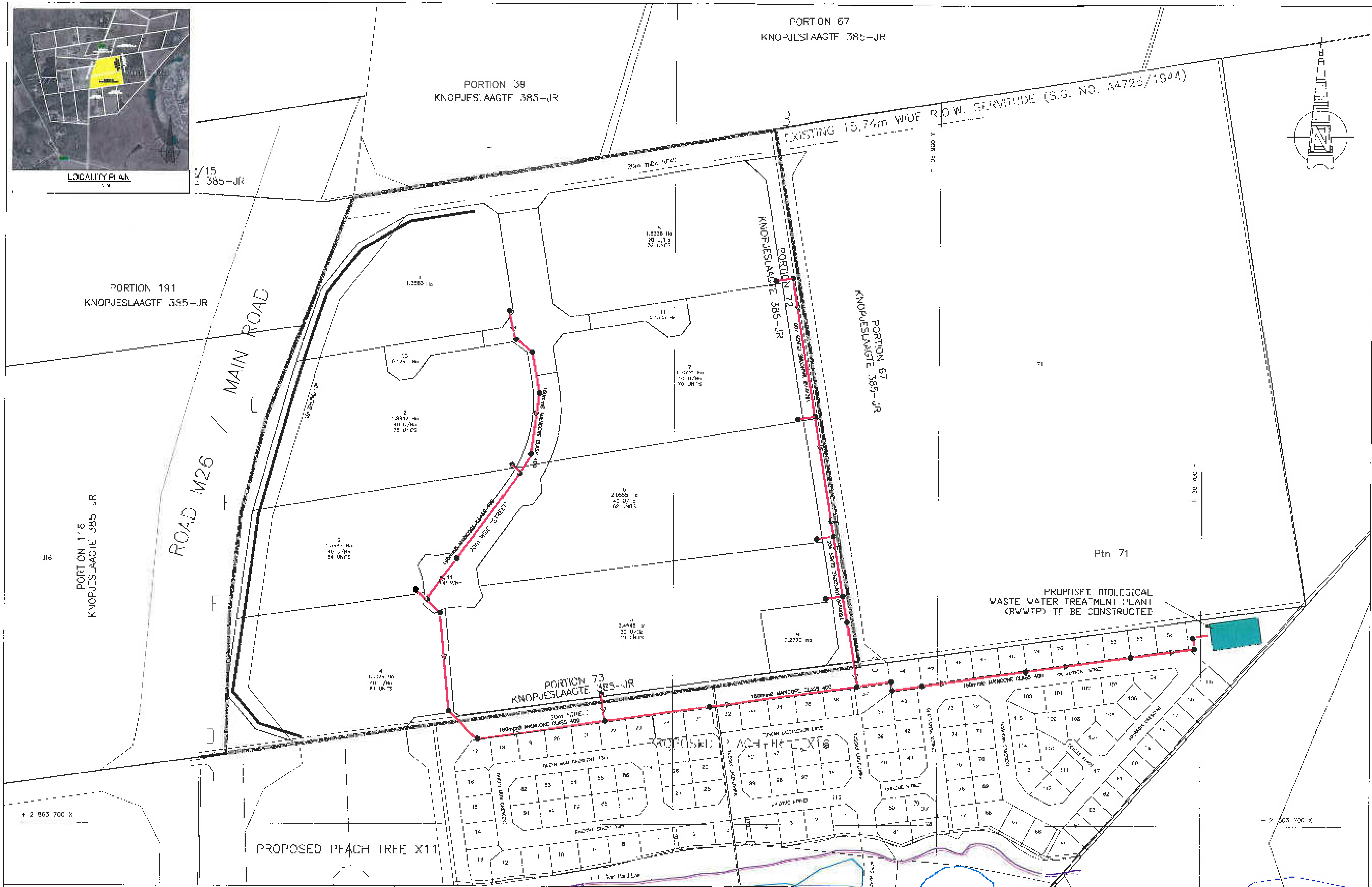
INSPECTOR OF WORKS of COT:
NAME: ... Prof Reg No: ...
SIGNATURE: ... DATE: ...

LOCATION OF PROJECT:
PEACH TREE X 20

DESCRIPTION OF PROJECT:
SEWER RETICULATION:
GENERAL LAYOUT : PERMANENT SOLUTION

WBS No: ...

COT DRAWING NUMBER: ...



NOTES AND SPECIFICATIONS

GENERAL

1. ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SABS REQUIREMENTS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (UNLESS OTHERWISE STATED)
3. DO NOT SCALE FROM THESE DRAWINGS
4. ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE
5. ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS ... EDITION 2005 AND THE STANDARD COT DETAIL DRAWINGS
6. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STANDARD DRAWINGS (IF APPLICABLE)
7. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR MUNICIPAL CIVIL ENGINEERING WORKS ...
8. THE SIGNATURE ... ON THIS DRAWING ... IN NO WAY REMOVES ANY RESPONSIBILITY WHATSOEVER FROM THE CONSULTANT
9. THE CONSULTANT REMAINS RESPONSIBLE TO ENSURE THAT ALL THE ... STANDARD DRAWINGS, STANDARDS AND SPECIFICATIONS ... HAVE BEEN MET AND ARE COMPLIED WITH
10. FINAL POSITION OF SERVICES TO BE DETERMINED ON SITE
11. ALL ... UNLESS STATED OTHERWISE

LEGEND

SANITATION

- DEVELOPMENT BOUNDARY
- PROPOSED SEWER LINES
- PROPOSED SEWER MANHOLE
- PROPOSED BIOLOGICAL WASTE WATER TREATMENT PLANT

CITY OF TSHWANE

SERVICES INFRASTRUCTURE DEPARTMENT

WATER AND SANITATION DIVISION

AMENDMENTS

NO	DATE	APPROVED	DESCRIPTION	INIT

WATER AND SANITATION

DIRECTOR: WATER AND SANITATION - PLANNING

NAME / Prof. Reg. No. / SIGNATURE / DATE

DIRECTOR: SYSTEM DEVELOPMENT

NAME / Prof. Reg. No. / SIGNATURE / DATE

DIRECTOR: BULK WATER

NAME / Prof. Reg. No. / SIGNATURE / DATE

DIRECTOR: INFRASTRUCTURE PROVISION

NAME / Prof. Reg. No. / SIGNATURE / DATE

DIRECTOR: WASTE WATER TREATMENT

NAME / Prof. Reg. No. / SIGNATURE / DATE

CONSULTANT DETAIL

CIVILCONSULT

Consulting Engineers

I HEREBY CERTIFY THAT THE SERVICES HAVE BEEN INSTALLED ACCORDING TO ... THE ABOVE NOTES AND TO THE DRAWINGS

SIGNATURE / DATE

CONSULTANT DRAWING NUMBER: 1947-S00-02-00

DESIGNED: NAME D.C. LANDSBERG, SIGNATURE, DATE 2016/05/20

DRAWN: NAME D.C. LANDSBERG, SIGNATURE, DATE 2016/05/20

CHECKED: NAME ... Pr Eng, Prof Reg No ..., SIGNATURE, DATE ...

INFORMATION OFFICE CHECKED: NAME, Pr Eng, Prof Reg No, SIGNATURE, DATE

DESIGN OFFICE APPROVAL: NAME, Pr Eng, Prof Reg No, SIGNATURE, DATE

CONTRACT No	1947
PROJECT No.	1947
SHEET No	2 OF 2
PAPER SIZE	A1
SCALE	1:1500
DATE	2016/05/20

PROJECT STATUS

PROJECT ENGINEER at COT: NAME, Pr Eng, Prof Reg No, SIGNATURE, DATE

INSPECTOR OF WORKS at COT: NAME, Pr Eng, Prof Reg No, SIGNATURE, DATE

LOCATION OF PROJECT:

PEACH TREE X 20

DESCRIPTION OF PROJECT:

SEWER RETICULATION: GENERAL LAYOUT : INTERIM SOLUTION

WBS No.:

COT DRAWING NUMBER:

NOTES AND SPECIFICATIONS

GENERAL

ROADS

STORMWATER

LEGEND:

- DEVELOPMENT BOUNDARY
- PROPOSED ROAD WIDENING
- PROPOSED STREETS
- EXISTING PROVINCIAL ROAD
- PROPOSED SIDEWALKS

AMENDMENTS

PROJECT STATUS

CONSULTANT DETAIL

CIVILCONSULT
Consulting Engineers

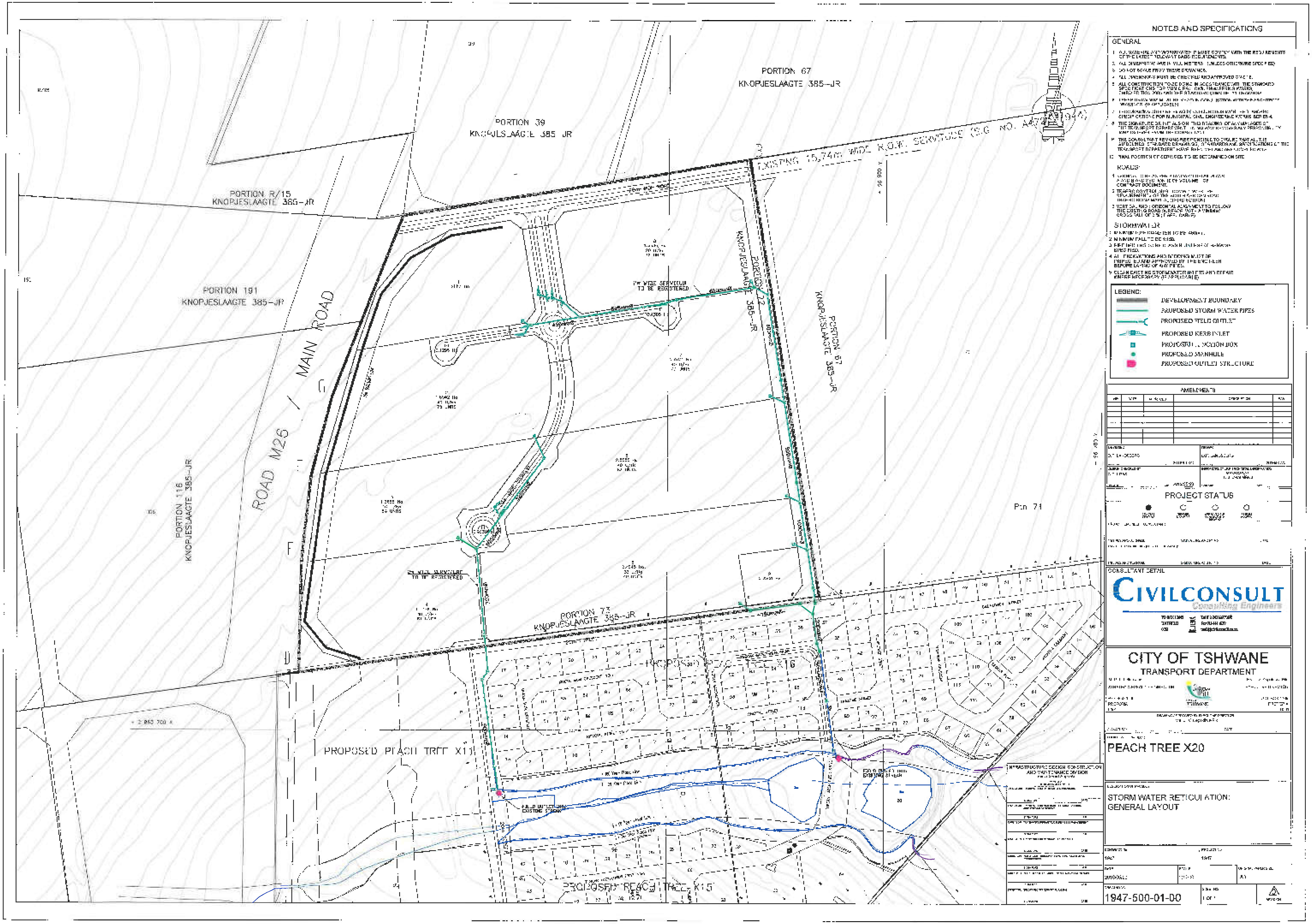
CITY OF TSHWANE

TRANSPORT DEPARTMENT

PEACH TREE X20

ROADS:
GENERAL LAYOUT

1947-400-01-00



PORTION 67
KNOPJESLAAGTE 385-JR
PORTION 39
KNOPJESLAAGTE 385 JR
PORTION R/15
KNOPJESLAAGTE 385-JR
PORTION 191
KNOPJESLAAGTE 385-JR
PORTION 116
KNOPJESLAAGTE 385-JR
ROAD M26 / MAIN ROAD
EXISTING 15,74m WIDE R.O.W. SERVITUDE (S.G. NO. A4744/1944)
PORTION 72
KNOPJESLAAGTE 385-JR
PORTION 73
KNOPJESLAAGTE 385-JR
Ptn 71
2m WIDE SERVITUDE TO BE REGISTERED
PROPOSED PEACH TREE X11
PROPOSED PEACH TREE X16
PROPOSED PEACH TREE X15
FIELD OUTLET INTO EXISTING STREAM
+ 2 863 700 X
NOTES AND SPECIFICATIONS
GENERAL
ROADS:
STORMWATER
LEGEND:
DEVELOPMENT BOUNDARY
PROPOSED STORM WATER PIPES
PROPOSED FIELD OUTLET
PROPOSED KERB INLET
PROPOSED JUNCTION BOX
PROPOSED MANHOLE
PROPOSED OUTLET STRUCTURE
AMENDMENTS
PROJECT STATUS
CONSULTANT DETAIL
CIVILCONSULT
Consulting Engineers
CITY OF TSHWANE
TRANSPORT DEPARTMENT
INFRASTRUCTURE DESIGN, CONSTRUCTION AND MAINTENANCE DIVISION
PEACH TREE X20
STORM WATER RETICULATION:
GENERAL LAYOUT
1947-500-01-00

ANNEXURE D

RELEVANT CORRESPONDENCE

CITY OF TSHWANE

City Planning and Development Department

Room 12007 | 12th Floor | Isivuno | 143 Lilian Ngoyi Street (Van der Walt) | Pretoria | 0002
PO Box 3242 | Pretoria | 0001
Tel: 012 358 0975 | Fax: 086 214 4411
Email: makgomeltjem@tshwane.gov.za | www.tshwane.gov.za | www.facebook.com/CityOfTshwane

My ref:	9/1/1/1-PETX18, PETX20	Tel:	0123587949
Your ref:		Fax:	0866244860
Contact person:	Charlotte Williams	Email:	charlottew@tshwane.gov.za
Section/Unit:	Toponymy		

Velocity Town Planning & Project Management
PO BOX 39557
MORELETAPARK
0044

19 August 2015

Dear Sir/Madam

WITHDRAWAL OF TOWNSHIP NAME AND RESERVATION OF NEW TOWNSHIP NAME

On your request the name of the township establishment known as PEACH TREE EXTENSION 18 is hereby withdrawn.

We hereby confirm that the new name: **PEACH TREE EXTENSION 20** has been reserved for your proposed township development to be situated on **Portions 72 and 73 of the Farm Knopjeslaagte 385-JR.**

Please take note of the following:

1. If you plan on using a popular name for this development, we urge you to supply this office with the planned name.
2. According to Regulation 16(1) (a) (VI) of Ordinance 15 of 1986, proposed street names are to be included on the layout plan accompanying the application for establishment of a township. Please mark all private streets in brackets.
3. All street names whether public or private have to go through the street naming process driven by the Toponymy section.
4. A list of existing street names (which may not be duplicated) is available on http://www.tshwane.gov.za/streetnames_Search.cfm.
5. Please contact the author of this letter in order to start the street naming process for private streets. A list of proposed names may be forwarded to the author. The proposed names will be checked for compliance with the approved policy on the naming of Public Places and Streets, as well as for duplications.
6. If public street names are needed you are requested to submit an application for proposed public street names for this development.

Your application should include:

- Details of the Applicant, (all proposed names to be submitted on a letterhead)
- Proposed Street Names – **Name, Origin, Language, Meaning, Resource**

Also ensure the following:

- All proposed names must comply with the approved Local Geographical Names Policy. See the link to this policy on: http://www.tshwane.gov.za/Services/Toponymy/Toponymy%20docs/Local%20Geographical%20Names%20Policy.pdf.
- All proposed street names must be checked on http://www.tshwane.gov.za/Services/Toponymy/Pages/Tshwane-Streetnames-Search.aspx before the application is submitted to avoid duplications and delays. When performing the search, if the search displays the name/s it means the name/s is already in use, if the search results display nothing it means that the name/s is available for use.
- All applications for proposed public street names must be forwarded to Toponymy at toponymy@tshwane.gov.za and CC to geo6@tshwane.gov.za as soon as possible in order for this office to process the application. These proposed names will then be submitted to Councilors. Please submit separate applications for each development.

Proclamation can not be supported without approved street names.

Kind Regards

STRATEGIC EXECUTIVE DIRECTOR: CITY PLANNING AND DEVELOPMENT DEPARTMENT

ANNEXURE E

SEWAGE TREATMENT FACILITY

ENBITEC
Environmental Solutions
REG NO: 2009/011538/07
VAT REG: 4590253938

We thank you for your valued enquiry and have pleasure in submitting our quote/proposal as follows:

QUOTATION FOR:

BIOLOGICAL WASTE WATER TREATMENT PLANT

MR Danie

E-MAIL: danie@keymacx.co.za
CELL: 082 412 7133

PROJECT NAME: Peach tree x 11 site

DATE: 18 February 2015

OUR REF: EQ 5037

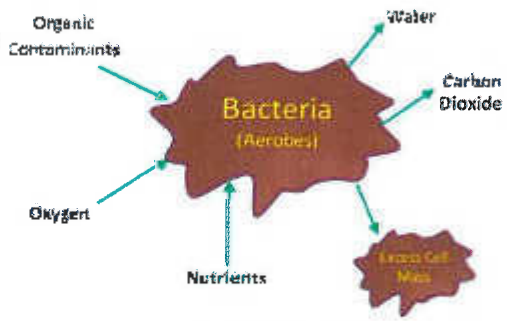
1. BIOLOGICAL TREATMENT BY ACTIVATED SLUDGE

Wastewater comes from two major sources: as human sewage and as process waste from manufacturing industries. If untreated, and discharged directly to the environment, the receiving waters would become polluted and water-borne diseases would be widely distributed. In the early years of the twentieth century the method of biological treatment was devised, and now forms the basis of wastewater treatment worldwide. It simply involves confining naturally occurring bacteria at very much higher concentrations in tanks. These bacteria, together with some protozoa and other microbes, are collectively referred to as activated sludge, which after being treated in a anaerobic followed by a aerobic process are returned to the anaerobic phase to eliminate sludge production and waste. The concept of treatment is very simple. The bacteria remove small organic carbon molecules by 'eating' them. As a result, the bacteria grow, and the wastewater is cleansed. The treated wastewater or effluent can then be discharged to receiving waters – normally a river or the sea, alternatively used for irrigation, flushing of toilets or general non-potable uses.

The two main processes used in a Biological Sewage treatment plant: Aerobic, as the title suggests, means in the presence of air (oxygen); while anaerobic means in the absence of air (oxygen).

These two terms are directly related to the type of bacteria or microorganisms that are involved in the degradation of organic impurities in a given wastewater and the operating conditions of the bioreactor. Therefore, aerobic treatment processes take place in the presence of air and utilize those microorganisms (also called aerobes), which use molecular/free oxygen to assimilate organic impurities i.e. convert them in to carbon dioxide, water and biomass. The anaerobic treatment processes, on other hand take place in the absence of air (and thus molecular/free oxygen) by those microorganisms (also called anaerobes) which do not require air (molecular/free oxygen) to assimilate organic impurities. The final products of organic assimilation in anaerobic treatment are methane and carbon dioxide gas and biomass.

Whilst the concept is very simple, the control of the treatment process is very complex, because of the large number of variables that can affect it. These include changes in the composition of the bacterial flora of the treatment tanks, and changes in the sewage passing into the plant. The influent can show variations in flow rate, in chemical composition and pH, and temperature.



Globally, the composition of effluents discharged to receiving waters is regulated by the national environment agencies. The legislation is concerned with the prevention of pollution, and therefore sets concentration limits on dissolved organic carbon (as BOD or COD), nitrogen and phosphates – which cause eutrophication in receiving waters. It also attempts to limit the discharge of known toxic chemicals by setting allowable concentration limits in the effluent.

2. ENBITEC OFFERS THE FOLLOWING BIOLOGICAL SEWAGE TREATMENT PLANTS

Enbitec offers **5 types** of biological sewage treatment systems, they are the following:

Fiberglass underground BWWTP

- The complete system is a modular system made of fiberglass tanks.
- The system incorporate the full treatment spectrum
- The advantages are as follows:
  - This system can operate without power for 48hours
  - The system life expectancy is 15 to 20 years
  - Esthetically pleasing and operate under gravity
  - All tanks fit into containers which ease transportation

Plastic HDPE Tank BWWTP

- The complete system is a modular system made of HDPE Plastic tanks.
- The system incorporate the full treatment spectrum
- The advantages are as follows:
  - Cost effective
  - Easily scalable

Combination BWWTP (Underground & Above Ground)

- Fiberglass tanks are installed underground as anaerobic system then pumped to above ground HDPE tanks for aeration
- The advantages are as follows:
  - This system can accommodate power cuts
  - Easily scalable

Civil Constructed BWWTP

- This is civil engineered and constructed system
- The system incorporate the full treatment spectrum
- The advantages are as follows:
  - Can treat from 200KLPD to 10MLPD

Containerized BWWTP

- The complete BWWTP is permanently fitted in containers
- The advantages are as follows:
  - Most economically viable transport option
  - Very Modular and can be easily transported to other sites
  - Esthetically pleasing

3. CLIENT INFORMATION SUPPLIED

ENBITEC was requested to design and propose a biological sewage treatment facility to the following specification

- Daily flow of 517m^3.
- Black and grey water must be treated.

System Design Parameters				
Description	Qty of People	Litre per person	Daily Flow	2.5 Day Retention
Civil Sewage System	3452	150,00	517 800,00	1 294 500

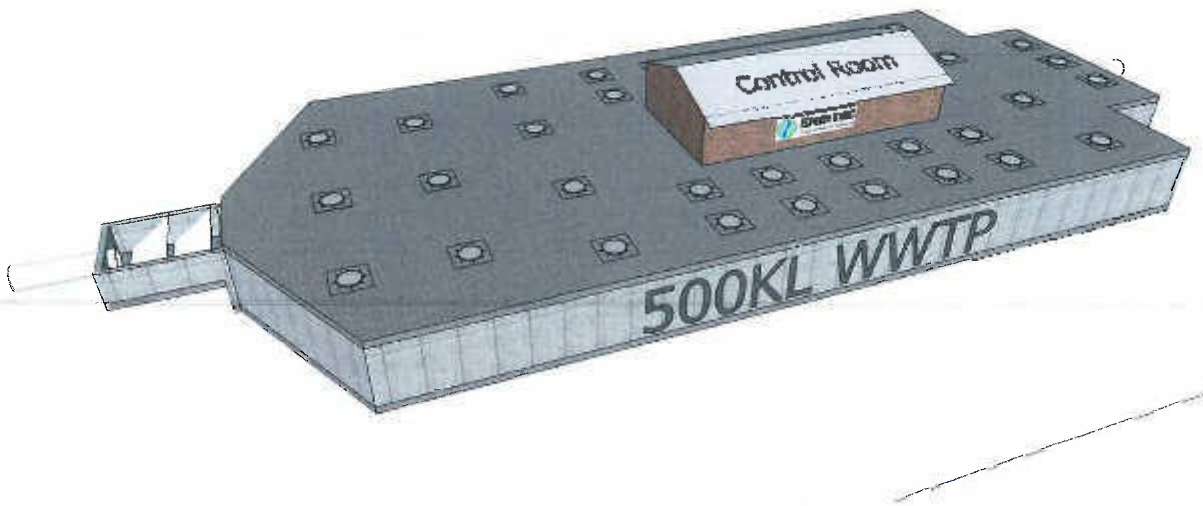
Required Plant Dimensions					
Description	Length	Width	Operating Depth	Unit Capacity	Safety Margin
Civil System	40	12,00	3	1440000,00	10,10

OTHER INFO:					
COD (Gram pp per day)	BOD (G pp per day)	Power Usage (KW P/H)	Voltage	Duration (Days)	Disinfection
200 g	100 g	42,75	380V	140,00	Ozone

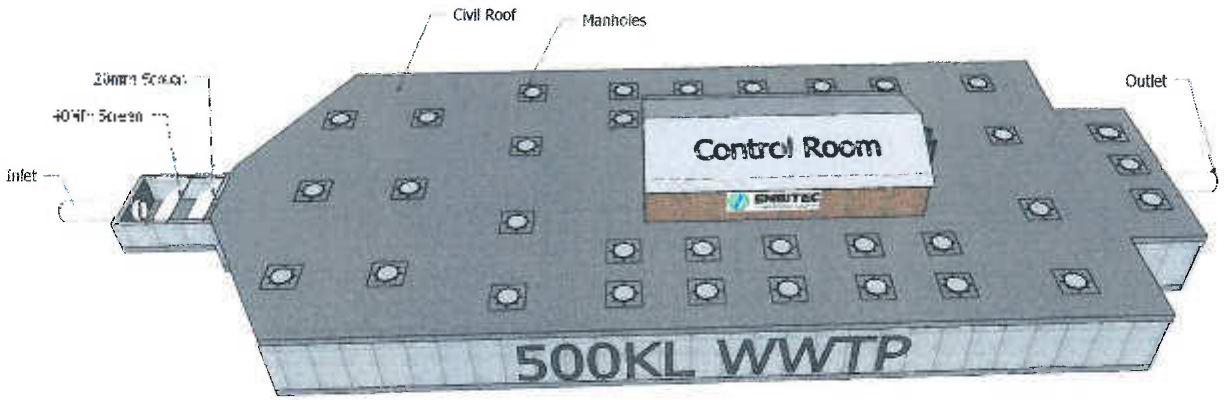
4. SCOPE OF WORK

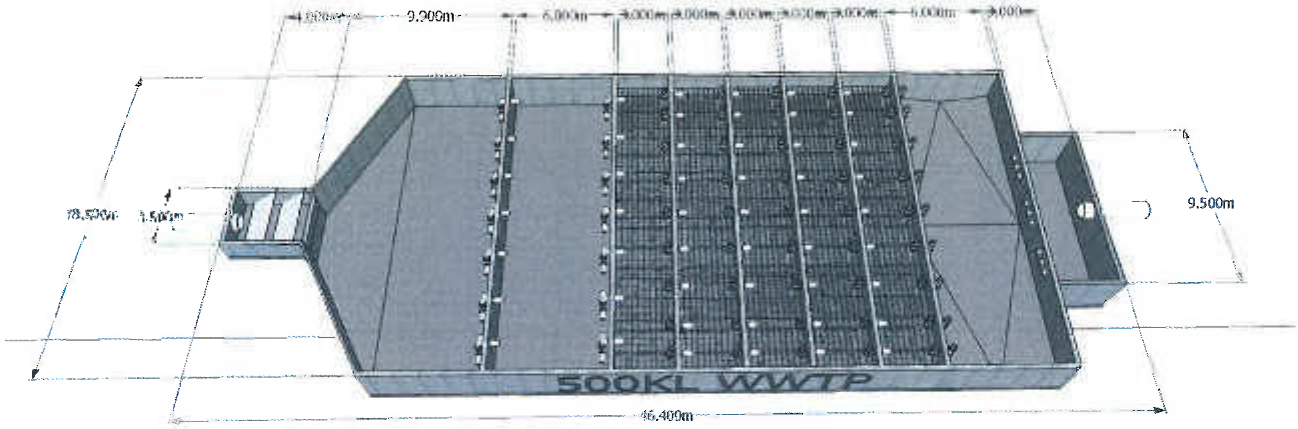
The above mentioned options will be discussed in this document. Enbitec will be offering a complete WWTP solution. The proposed BWWTP's does not require sludge removal and handling. This is a complete treatment plant that digests all biological media that reports to the plant.

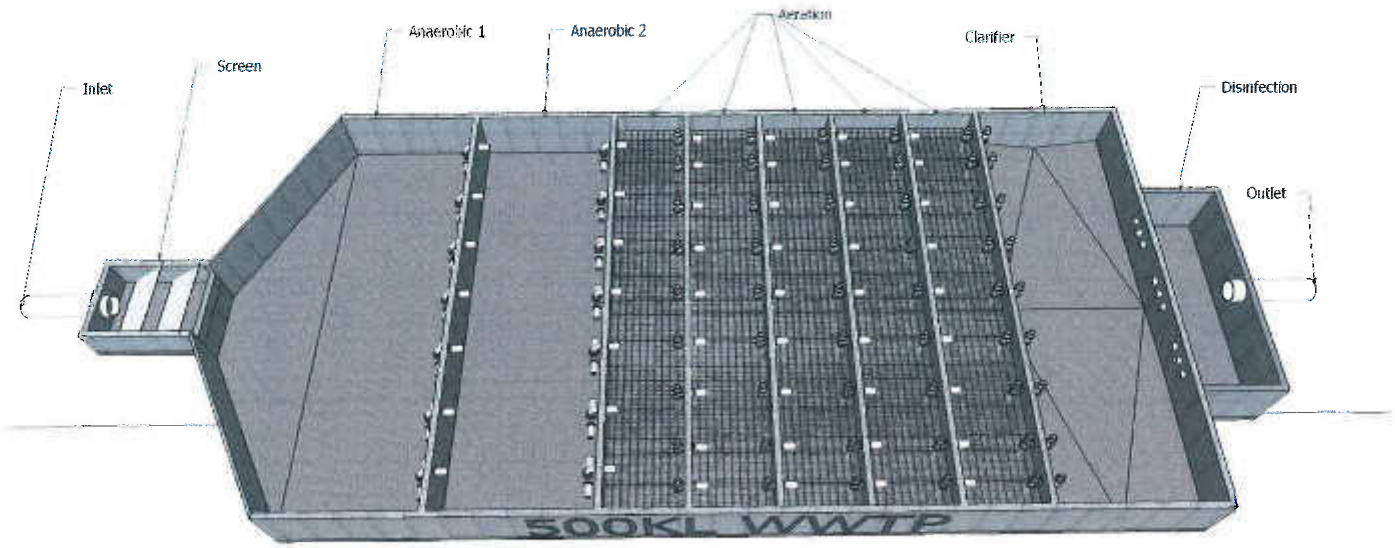
5. BELOW GROUND SEWAGE TREATMENT PLANT (TYPICAL LAYOUT)



ENBITEC
Environmental Solutions
REG NO: 2009/011538/07
VAT REG: 4590253938







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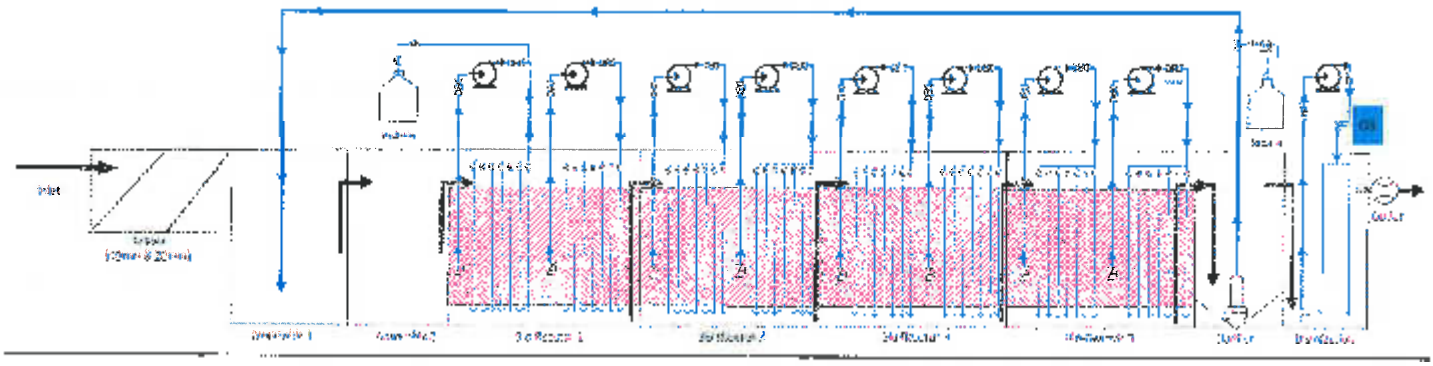
fax 013 656 4460
24 hours tel 0861 22 22 99
18 Voortrekker Street, Witbank
Postnet Suite 403, Private Bag X 7260, Witbank, 1035
www.enbitec.co.za

6. TYPICAL P & ID



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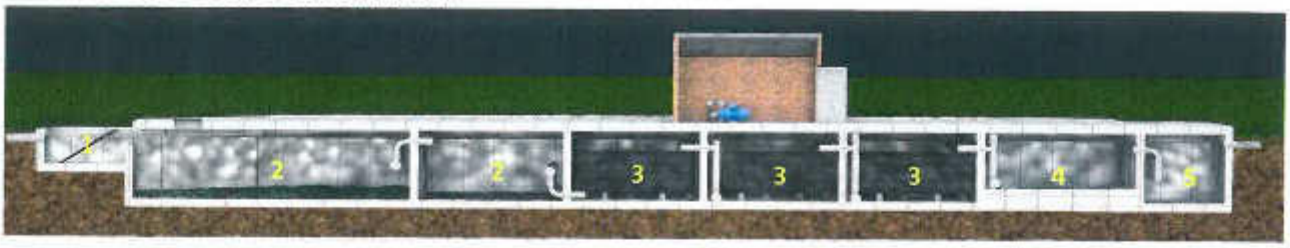
7. PRINCIPLE OF WASTE WATER TREATMENT PLANT SYSTEM



FIRST PHASE (Number 1)

- Screening takes place at the point of entrance in the WWTP.
- This can be done manually or automatically.

SECOND PHASE (Number2)

- There are two anaerobic tanks. The first tank allows for digestion of sewage and the separation of solids i.e. those that settle and those that float. The middle cut of the effluent then flows through to the second tank.
- The second tank breaks down the fine sewage particles and alters to carbon dioxide and water. This ideal effluent then passes into the aerobic chamber for polishing.
- The de-nitrification cycle takes place in this phase.
- This function is responsible for the breaking down of nitrates to nitrogen gas

THIRD PHASE (Number 3)

- In this phase the digestion takes place in an aerated environment. This phase can be divided into two or three bioreactors added together.
- This phase is called aerobic digestion or simpler terms is Bioreactor
- This phase takes the smaller solids and bio-degrade them further.
- This phase is also called the "polishing phase".
- The type of bacteria that operates in this environment is called aerobic bacteria. It is very important to aerate this phase to enrich the liquid with oxygen.
- The bacteria perform at their optimum in an oxygen enriched environment.
- In the aerobic phase the nitrification takes place. This process breaks down the ammonia to nitrites and the nitrites to nitrates.
- To provide these bacteria with their "homes" we have designed a very effective aerobic zone.

FOURTH PHASE (Number 4)

- Secondary settling takes place in the fourth phase.
- The cell material and settle able solids settle in this phase and form the so-called "sludge blanket ".
- The sludge blanket is very important for the process. When the blanket matures it is re-circulated to the primary settling tank in phase one to "seed" or inoculate the raw sewerage entering into the plant and to alter the nitrates to nitrogen gas.
- This cycle is called the re-activated sludge cycle. This technology improves the efficiency of the process and the plant.

FIFTH PHASE (Number 5)

- In the fifth and final phase the final effluent is prepared for final discharge.
- The effluent is disinfected or sterilized to prevent any dangerous or harmful bacteria from entering our environment.
- This is achieved by either dosing with chlorine or treatment by means of Ultra Violet or Ozone Systems

8. MAINTENANCE METHODOLOGY

Enbitec has developed a very simplistic system that requires very low maintenance and does not require qualified persons to conduct the maintenance. On commissioning the clients assigned responsible personnel will be trained, to identify and address any problems that can arise during operation. Enbitec advice our clients to enter into an maintenance contract with ENBITEC to conduct the three monthly maintenance, upon which an official report is given to the sufficiency of the plant to ensure that the plant is operating at optimal efficiency.

We also offer telemetric systems that is web based that monitors the plant constantly, this can be offered at a additional cost

Daily Maintenance (Client responsible person to conduct)

- Check the screen for inorganic build-up
- Should there be any inorganic build-up it should be removed using a rake and disposed of in the appropriate manner, in-line with hazardous waste disposal legislation.

Weekly Maintenance (Client responsible person to conduct)

- Check the electricity supply has not tripped
- Check that Recycling pumps motors is operational
- Check that clarifier pump is operational and clean out the filter trap
- Check the ozone generator is operational
- Check the effluent discharged from the plant.
- Check the sludge levels
- Add 250gm of biological powder into the first chamber
- Check the clarifier pump timer to ensure that the timing has not changed due to electrical failure.
- Ensure no non-organic build-up in the screen
- Check the level of the top sludge in the plant 1st chamber
- Check the level of the sludge at the bottom of the 1st chamber

Monthly Maintenance (ENBITEC to conduct)

- Take sample for analyses. (Test COD, Chemical composition of effluent and bacterial count)
- Replace the silica units on the Ozone Generator
- Conduct a comprehensive inspection of the plant and mechanical equipment
- Submit full report to client regarding the operation and efficiency of the plant, which includes the independently tested effluent analysis.

9. COMPLIANCE WITH SPECIFICATION AS SET OUT BY THE DEPARTMENT OF WATER & FORESTRY (DWAF)

VARIABLES AND SUBSTANCES	EXISTING SA GENERAL STANDARDS	EXISTING SA SPECIAL STANDARDS
Chemical Oxygen Demand	75 mg / l	30 mg /l
Ionized and Unionized ammonia (as N)	3.0 mg / l	2.0 mg / l
Nitrate (as N)	15 mg / l	1.5 mg / l
pH	Between 5.5 and 9.5	Between 5.5 and 7.5
Residual Chlorine (as Cl)	0.25 mg / l	0
Suspended solids	25 mg / l	10 mg / l
Phosphorous (Ortho Phosphate) (as P)	10 mg / l	1 mg / l
Total Iron (as Fe)	0.3 mg / l	0.3 mg / l
Faecal Coliforms per 100ml	1000	0

- DWAF accept our system as being efficient as well as environmentally friendly.
- We encourage clients to re-use their treated water for irrigation purposes, thus reducing the usage of potable water for irrigation. This will save on cost as well as preserving water, South Africa's most precious commodity.
- An added bonus to the above is that no fertilizer is needed for gardens or grass. All of Mother Nature's nutrients are present in the treated effluent and no chemical fertilizer is needed.

10. ADVANTAGES OF THE BIOLOGICAL WASTE WATER TREATMENT PLANT.

- The plants provide final effluent that complies with the strict standards set out by the Department of Water and Forestry (DWAF).
- The plants are easy to operate and do not require permanent staff on site.
- Plants use extremely low electrical equipment and therefore save on electricity
- Final effluent is guaranteed and can be re-used in a number of applications.
- The plants are gravity fed and cannot overflow.
- The plants do not generate sewage sludge.
- These plants are also safe for people, especially children, and animals as there are no open dams or pits.
- No foul odors.

11. INSTALLATION & CONSTRUCTION



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12. PROOF OF EXPERIENCE

CLIENT	DESCRIPTION	TYPE	LOCATION	VALUE	CONTACT PERSON	CONTACT NUMBER
DRA/Northam Platinum	165 Kl/Day	Civil	Steelpoort	R 2'200'000.00	Theo Erasmus	082 373 9491
Utuingo	28 Kl/day	Fiberglass	Optimum	R 1'100'00.00	Evan Dauberman	073 485 9101
DRA/Maseve	220 Kl/day	Civil	Waterberg	R 4'200'000.00	Theo Erasmus	082 373 9491
TWP	35 Kl/day	Fiberglass	Penumbra	R 1'070'000.00	Pieter v d Lith	079 883 8156
DRA/Isase Gold	120 Kl/Day	Containerized	Ghana	R 980'000.00	Ryan Males	072 237 2086
Corobrick	60 Kl/Day	Plastic Above	Lenasia	R 997'000.00	Hannes Rossouw	083 289 6799

13. INCLUSIVE

- Supply of engineering drawings
- Installation of all mechanical equipment
- Supply of electrical distribution system
- Accommodation
- Construction Supervision
- Training of key operating personnel
- Operating Manual
- One month maintenance products
- Complete Construction (Excavation, Form Work, Civils, Finishing)
- Control Room

14. EXCLUSIONS

- Feed waste water reticulation into plant
- Pipe work to and from the plant
- Holding sump is Clients responsibility
- Pipe work for discharge from plant
- All Electrical connections to DB box (supply 380V).
- First Fill of systems (Clean Water)
- A Site needs to be allocated to ENBITEC for site establishment, serviced with water and portable toilets.
- A safe& secure lay-down area needs to allocated to Enbitec for the duration of the construction phase
- Plumbing points to site during construction
- Removal of excavated spoil and construction ruble from construction site
- Medical and Induction
- Hard Rock and Intermediate Excavation

15. BILL OF QUANTITIES

Material			Responsible Person
Description	Qty	Unit	
Concrete	353	m3	ENBITEC
Re-inforcing (Double)	31759	kg	
Shuttering - Floors	239	m2	
Shuttering Walls	1392	m2	
Pre-cast Hollow Core Roof Slabs	479	m2	
Starter Bars	587	Unit	
Excavation	2430	m3	
Compaction	1436	m2	
Steel Float Finish	479	m2	
Sealant	587	m	
Control Room	48	m2	
Backfill Materials	886	m3	
Site office	5	Months	
Sub-Soil Drain	1	Sum	

Cast-in Items			Responsible Person
Screens (40mm -20mm)	2	Units	ENBITEC
Piping	144	m	
Manholes	32	Units	
Sleeves	12	m	
Foot pieces	96	Units	
Bio media Support Pipes	320	m	

Material			Responsible Person
Aeration Pumps	8	Unit	ENBITEC
Clarifier Pumps	2	Unit	
Disinfection Pumps	3	Unit	
Feed Pumps	2	Unit	
Venturi	107	Unit	
Bacteria Dosing system	4	Unit	
DB Board	2	Unit	
Ozone	9	Unit	
Bio blocks	3200	Blocks	
Pipe Work	705	m	
Electrical (Cable & trucking)	544	m	
Sewage Activator	93	Litre	

Equipment:			Responsible Person
TLB	1	33	ENBITEC
Excavator	1	9	
Dumper	1	5	
Roller Compactor	1	10	
Concrete Cutter	1	15	
Breaker	1	5	
Vibrator Unit	2	20	
Dumpy Level	1	20	
Power Float	1	10	
Hilti Drill	1	10	
Water Pump Centrifugal	1	15	
Submersible Pump & Drive Unit	1	20	
Generator Portable - 5.5KVA	1	30	
General Tools	1	40	

Labour & Wages For Mechanical Equipment			Responsible Person
Supervisor	1	140,00	ENBITEC
Team Leader	2	140,00	
Concrete Hand	1	140,00	
Shutter Hand	1	120,00	
Steel Fixer	1	120,00	
Skilled Labour	4	170,00	
Unskilled Labour	8	120,00	
Transport, Accommodation & Vehicles			**Responsible Person**
Kilometres Travel	250	66,00	ENBITEC
LDV Rental	1	140,00	
Living out allowances	18	100,00	
Accommodation - Supervisor	8	118,00	
Accommodation General Labour	6	2,00	
Delivery to site			**Responsible Person**
HDV - Kilometres travel	250	4,00	ENBITEC
Trailer	1	30,00	

16. GUARENTEE

- ***Mechanical Guarantee:*** All Mechanical & Electronic Equipment carries a 12 month guarantee
- ***Process Guarantee:*** Final Effluent is guaranteed to be in line with DWAF's general standards requirements, subject to Enbitec conducting the maintenance of the plant.

17. PRICING SCHEDULE

Design, Construction, Supply & Commissioning of WWTP		Flow per day (L)	517 800,00
Num	**Description**	**Selling (ZAR)**	
1	***Engineering Drawings***		
	Concrete Specification, Excavation Specifications		
	Re Bar Schedule & General Arrangement	*R*	*192 728,06*
	Relevant Sectional Views, Bill of Quantities		
	Pr Engineering Certification		
2	**Construction Supervision**	*R*	*114 285,71*
3	***Cast in Items***		
	Screen, Flow through pipes	*R*	*312 814,29*
	Manholes, Sleeves		
4	***Civil Construction (As per Bill of Quantities)***		
	Excavation, Base Compaction, Concrete Works	*R*	*7 388 615,87*
	Reinforcing, Shuttering, Backfill Compaction, Finishing		
	Control Room complete		
5	***Supply of Mechanical & Electrical Equipment***		
	Air Injectors, RAS Pumps, Pipe Work, Bio-Media	*R*	*3 018 477,63*
	Electrical Distribution Board, Related Distribution & Components		
	Flow Meter, Pipe Work, Valves		
6	***Critical Equipment***	*R*	*379 120,88*
Total for Construction of WWTP (Excl Vat)		*ZAR*	*11 406 042,44*

18. MAINTENANCE

MONTHLY MAINTENACE OF WWTP					DAILY FLOW RATE		517 800	
Num	Description				Monthly		Annually	
1	LABOUR, TRAVELLING AND VEHICLES		Visits per Month	1	R	5 984,62	R	71 815,38
2	CONSUMABLES							
	2,1	Liquid Bacteria	Litre per Month	78	R	19 417,50	R	233 010,00
3	ANALYSIS & REPORTING							
	3,1	Independent Laboratory Analysis	Per Month	1	R	2 676,83	R	32 122,00
	3,2	Report & Recommendation	Per Month	1				
TOTAL EXCLUDING VAT					R	28 078,95	R	336 947,38

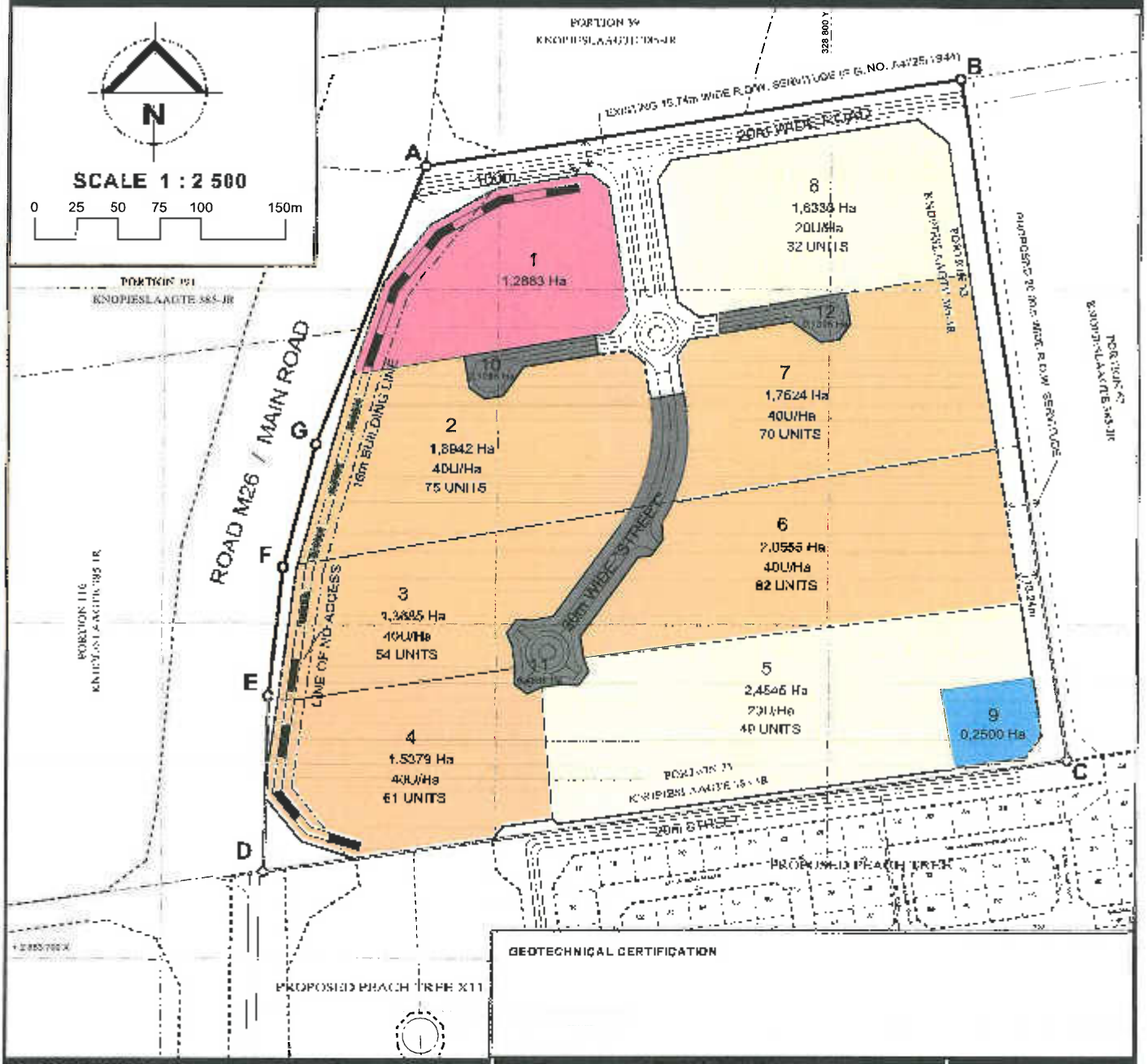
19. TERM & CONDITIONS

- Full terms and conditions apply and may be obtained on request.
- Any deviations or loss of time created by the client will be charged accordingly.
- Our reference EQ 5037, please state this number on official order.
- All prices are excluding vat, prices will remain firm for a period of 30 days.
- Provision to be made for 50% deposit and thereafter progress payments as per project schedule.
- Project Plant to be supplied when order is placed.
- Terms: 7 days from invoice

Regards

Addie de Wit
Cell: 082 903 3664
Email: sales@enbitec.co.za

PROPOSED TOWNSHIP: PEACH TREE X 20



GEOTECHNICAL CERTIFICATION

LOCALITY MAP SCALE 1 : 50 000

PLAN No: PEACH TREE X20/1 | APRIL 2016

FLOOD LINE CERTIFICATION

I HEREBY CERTIFY THAT IN TERMS OF THE REQUIREMENTS OF SECTION 144 OF THE WATER ACT 1998 (ACT 36 OF 1998), THIS PROPOSED TOWNSHIP IS NOT AFFECTED BY A FLOOD LINE WITH AN EXPECTED FREQUENCY OF 1:50 NOR 1:100 YEARS

L. NIEMTZE PR. ENG. NR. 960127

URBAN INNOVATE CONSULTING CC
PO Box 27014
MONUMENT PARK
0105
25 Lidwala Ave
ASHLEA GARDENS
Tel: (012) 460 1823
Fax: (086) 592 3974

LOCALITY: SITUATED ON PORTIONS 72 & 73 OF THE FARM KNOPIESLAAGTE 385 JR
REPRESENTED BY THE FIGURE A-B-C-D-E-F-G-A

LOCAL AUTHORITY: CITY OF TSHWANE METROPOLITAN MUNICIPALITY

SERVITUDE NOTE:

1. ERVEN 10, 11 AND 12 IS SUBJECT TO ROW SERVITUDE IN FAVOUR OF ERVEN 2 & 8, AS WELL AS FOR A GENERAL SERVITUDE FOR MUNICIPAL AND ELECTRICAL SERVICES.

ZONING	ERF NR	# ERVEN	MIN SIZE	SIZE (Ha)	%
RESIDENTIAL 2 (40U/Ha)	2, 3, 4	3	1 000m²	4,8581	28,0%
RESIDENTIAL 3 (20U/Ha)	5, 6, 7, 8	4	1 000m²	8,8564	50,1%
SPECIAL FOR ACCESS & ACCESS CONTROL	10, 11, 12	3	N/A	0,7605	4,3%
SPECIAL FOR RETAIL & OFFICE PURPOSES	1	1	N/A	1,2883	7,3%
SPECIAL FOR MUNICIPAL PURPOSES	9	1	N/A	0,2500	1,4%
STREETS	N/A	N/A	N/A	2,1947	12,4%
TOTAL		13	N/A	17,6478	100,0%

GENERAL NOTE

ALL DIMENSIONS AND AREAS ARE APPROXIMATE PENDING FINAL SURVEY
CONTOURS: SUPPLIED BY CITY OF TSHWANE METROPOLITAN MUNICIPALITY
1,0m INTERVALS
DATUM: MSL DATUM
THE CONTOURS ARE IN ACCORDANCE WITH REGULATION 16(1) OF THE TOWN-PLANNING AND TOWNSHIPS ORDINANCE, 1986

ANNEXURE F

GLS REPORT AND FIGURES

25 1989 - 2014
celebrating 25 years of excellence

C14-01
REVISED

21 October 2015

General Manager: Water and Sanitation
City of Tshwane Metropolitan Municipality
PO Box 6338
PRETORIA
0001

ATTENTION: Mr. Olebogeng Asieng

Dear Sir

WATER AND SEWER MASTER PLANS: DEVELOPMENT OF PROPOSED TOWNSHIP/REZONING – PEACH TREE X20

The attached request from Civilconsult (Damian Queck) dated 03 August 2015 with regards to accommodating the proposed development in the Tshwane water and sewer systems has reference. ... ..

Although the City of Tshwane has water and sewer master plans, you requested this further analysis and report because :

- ✓ The development is considered to be a large development (i.e. > than 250 housing units).
- ✓ The development has large fire flow requirements (e.g. 20ℓ/s, 25ℓ/s or 50ℓ/s which is usually the case for higher density cluster developments, industry, general business, shopping centres or high-rise flats >= 4 storeys).
- ✓ The development has a substantially higher water demand than used in the master plan (more then double in this case).
- ✓ The reservoir which will supply the development in future will be different to the reservoir which currently supplies the development (i.e. a change in reservoir supply zones).
- ✓ The drainage area in which the development falls is currently experiencing inadequate bulk sewer system capacity.

This report is a technical report stating upgrades required in the distribution networks in the vicinity of the proposed development. The City of Tshwane engineer (yourself) will accept the report or suggest changes and will make a final decision on works to be implemented by the proposed development.

This analysis and report is based on the 2010 water and sewer master plans which are updated every quarter. The latest master plans used in this analysis were the April 2015 master plans.

All costs shown in this report are year 2014/15 Rand value estimates and **include** 40% surcharge for P&Gs, contingencies and fees but **exclude** VAT.

1 WATER DISTRIBUTION NETWORK

1.1 Water Resource

The City of Tshwane (CoT) straddles two primary water catchments namely: the Crocodile River basin in the west and the Olifants River basin in the east. The dividing line between these two catchments runs in a north-south direction approximately through Cullinan. Water resources in the Crocodile River basin in the west together with imports from the Vaal River basin via the Rand Water system are sufficient to supply CoT reservoirs in this basin. However, water resources in the Olifants River basin in the east are fully committed and cannot supply **additional** water to any existing or future CoT reservoirs without additional Rand Water supply through new pipelines, especially to the Cullinan WTP and Bronkhorstspruit WTP.

The CoT Water Resources Master Plan (2014) indicates that the reservoir listed in section 1.2 below is supplied from the water source shown in the table below. From this information it can be seen that this water source is adequate to cater for the proposed development.

Catchment	Water Source	%	Comment
Vaal River basin	Rand Water (connection no.2609 feeding Mnandi reservoir)	100%	The master plan calculates the water volumes required at all Rand Water connections to supply applicable reservoirs. These calculations are supplied by the CoT to Rand Water and the City obtains agreements from Rand Water for these volumes.

1.2 Distribution Zone

The proposed development was taken into consideration in the above mentioned water master plan as part of the Peach Tree X14 future development area.

The master plan indicates that the proposed development falls in no reservoir zone at present but in the future will form part of the Knopjeslaagte reservoir zone as shown in **Figure 1 (Water)** attached. The Knopjeslaagte reservoir has not yet been built so temporary supply from the Mnandi reservoir has been considered in this analysis and report.

1.3 Revised Water Demand

The combined AADD for the proposed development as originally calculated and used in the analysis of the water distribution network in the master plan was 92 kℓ/d.

The revised AADD, peak flow and fire flow calculated for the proposed development and used in the re-analysis of the water distribution network was:

Development name		Anticipated Landuse	New Dev. Area	Density (Units/ ha)	FSR	Floor space (ha)	No. of Units	FSR Units	UWD Type	UWD (inc.UAW)		AADD (inc UAW) (kl/d)	PDDWF incl. infil. (kl/d)	Water / Sewer Ratio	PDWF (l/s)	PWWF (l/s)
		NEW DEVELOPMENT														
Erf 2	Res 3	Cluster housing 21 up to 40 units per hectare	1.1332	40			45		unit	0.60	kl/unit/d	95	27	75%	0.4	0.6
Erf 3	Res 3	Cluster housing 21 up to 40 units per hectare	0.6028	40			32		unit	0.80	kl/unit/d	26	19	75%	0.3	0.5
Erf 4	Res 3	Cluster housing 21 up to 40 units per hectare	1.5052	40			60		unit	0.80	kl/unit/d	48	33	75%	0.6	0.8
Erf 5	Res 3	Cluster housing 41 up to 60 units per hectare	1.1900	42			50		unit	0.70	kl/unit/d	35	25	71%	0.4	0.6
Erf 6	Res 2	Cluster housing 21 up to 40 units per hectare	0.8266	40			33		unit	0.80	kl/unit/d	26	20	78%	0.3	0.5
Erf 7	Res 3	Cluster housing 21 up to 40 units per hectare	1.7508	40			70		unit	0.80	kl/unit/d	56	42	75%	0.7	1.0
Erf 9	Res 3	Cluster housing 21 up to 40 units per hectare	2.2145	40			89		unit	0.80	kl/unit/d	71	53	75%	0.9	1.2
Erf 9	Res 3	Cluster housing 21 up to 40 units per hectare	0.8438	39			33		unit	0.80	kl/unit/d	26	20	78%	0.3	0.5
Erf 10	Res 3	Cluster housing 21 up to 40 units per hectare	1.0826	40			42		unit	0.80	kl/unit/d	34	25	76%	0.4	0.6
Erf 11	Res 3	Cluster housing 21 up to 40 units per hectare	1.7803	40			70		unit	0.80	kl/unit/d	56	42	75%	0.7	1.0
Erf 13	Access C	Gate house for security villages	0.2882	3			1		unit	3.80	kl/unit/d	4	3	67%	0.0	0.0
Erf 1	Retail	General business with an FSR	1.2742		0.60	0.637		54	floor	0.80	kl/100m²/d	51	38	75%	0.7	1.0
Erf 12	Municipal	Municipal, governmental developments	0.2882		0.25	0.072		7	floor	0.60	kl/100m²/d	4	3	67%	0.1	0.1
	Streets	Roads	0.8699						outside	0.00	kl/unit/d	0	0	0%	0.0	0.0
		New Master Plan Total	18.813				624	71				499	354	75%	5.9	8.4

- Peak flow using zone peak hour factor of: 4‡ = 21.7 ℓ/s
- Fire flow for type: Business/Industrial (moderate risk) = 50 ℓ/s @ 15 m

1.4 Accommodation of Proposed Development in the Existing Water Distribution Network

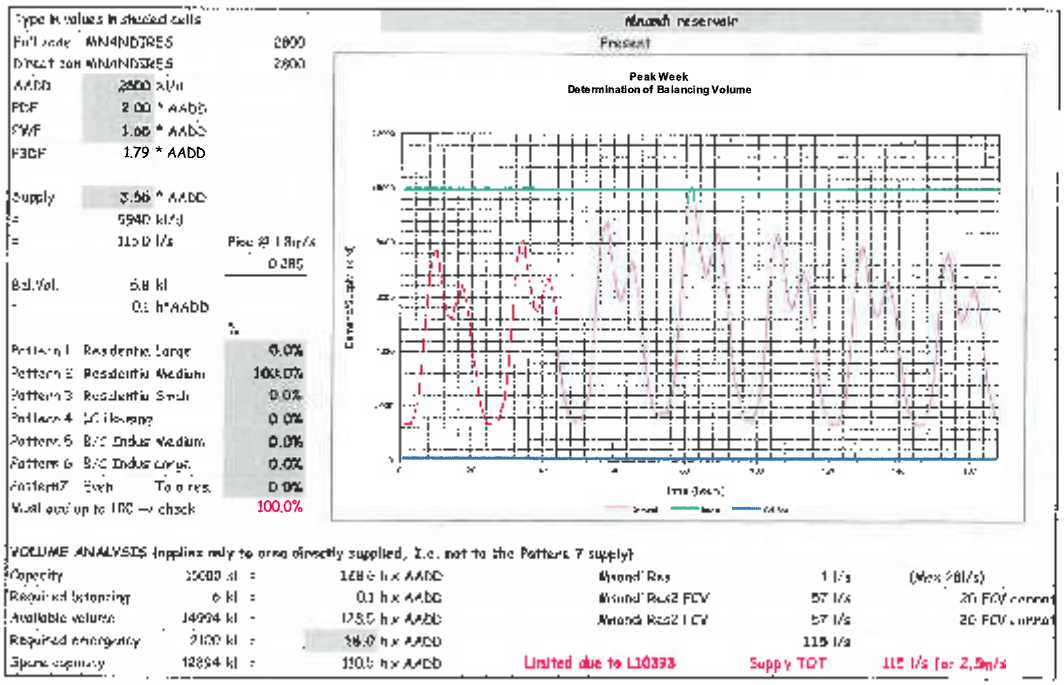
Accommodation of the proposed development, with its revised AADD, requires implementation of the following additions and adjustments to the *existing* water system as indicated **in Figure 1 (Water)** attached:

1.4.1 Bulk Items

Items required to alleviate existing problems in the bulk water system:

- None

The current Mnandi reservoir zone AADD plus UAW ("scenario 2" in WADISO) in the m2015-04 Tshwane water model is 2 800 kℓ/d. The capacity of the existing Mnandi reservoir is 15 000 kℓ. The existing FCV is set at 115 ℓ/s. Using these three input variables in a reservoir sizing spreadsheet, it shows that the remaining spare capacity of 12 894 kℓ at the Mnandi reservoir is sufficient to cater for the proposed development.



‡ Higher peak flow factors might be applicable for internal networks.

1.4.2 Reticulation Items

Items required to alleviate existing problems in the water distribution system:

- None

Items required to accommodate the proposed development (excluding fire flow requirements):

• Item 1	1 488	m	EGL	450	mm Ø PRV to be installed (32m)	R	350 000
• KLR.21	165	m	x	450	mm Ø main pipe	R	727 300
• KLR.22	2 340	m	x	355	mm Ø main pipe	R	5 878 000
• KLR.23a	480	m	x	250	mm Ø main pipe	R	738 000

Items required to accommodate the proposed development (including fire flow requirements):

- As above.

Once the Knopjeslaagte reservoir has been constructed the PRV (Item 1) will no longer be required.

The proposed connection point to the existing water distribution system is shown in **Figure 1 (Water)** attached.

1.5 Internal Reticulation

The internal network design on the property of the proposed development is beyond the scope of this report. However, the consulting engineer for the development is required to allow for the fire flow demand as listed in 1.2 above on the internal networks.

For internal network design purposes the water distribution network provides the following energy gradelines (EGLs) at the proposed connection point (see **Figure 1 (Water)**):

		Current situation (development fed from Mnandi reservoir)	Future situation (when entire Knopjeslaagte reservoir zone developed)
• Static EGL	=	1 488 m a.s.l. (43 m)	1 488 m a.s.l. (43 m)
• Residual EGL	=	1 487 m a.s.l. (42 m)	1 477 m a.s.l. (32 m)
• Fire Flow EGL	=	1 479 m a.s.l. (34 m)	1 469 m a.s.l. (24 m)
• Ground Level	=	1 445 m a.s.l.	1 445 m a.s.l.

1.6 Adjustments to the Master Plan

No adjustments to the water master plan are required due to the revised AADD of the proposed development.

2 SEWER NETWORK

2.1 Drainage Area

The proposed development was taken into consideration in the above mentioned sewer master plan as part of the Peach Tree X14 future development area.

The master plan indicates that the proposed development falls in **no** sewer drainage area at present but in the future will form part of the Swartspruit sewer drainage area as shown in **Figure 2 (Sewer)** attached. The Swartspruit drainage area will drain to the future Schurveberg WWTP which as yet does not exist. Due to this, drainage to the Sunderland Ridge WWTP has been considered in this analysis and report.

2.2 Revised Sewer Flow

The combined peak day dry weather flow (PDDWF) for the proposed development as originally calculated and used in the analysis of the sewer system in the master plan was 40 kℓ/d.

The revised PDDWF calculated for the proposed development and used in the re-analysis of the sewer system was 354 kℓ/d with an instantaneous peak dry weather flow (IPDWF) of 5.9 ℓ/s. The design flow, or instantaneous peak wet weather flow (IPWWF), is 8.4 ℓ/s.

2.3 Accommodation of the Proposed Development in the Existing Sewer System

Accommodation of the proposed development, with its revised PDDWF, requires implementation of the following additions and adjustments to the *existing* sewer system as indicated in **Figure 2 (Sewer)** attached:

2.3.1 Sewer Bulk Items

Items required to alleviate existing problems in the bulk sewer system i.e. WWTPs and outfall sewers:

- None

Items required to accommodate the proposed development in the bulk sewer system i.e. WWTPs and outfall sewers:

• Project number BLK_SB_025	New outfall sewer to Sunderland Ridge WWTP (as alternative to Swartspru t outfall sewer)	R	104 000 000

2.3.2 *Sewer Reticulation Items*

Items required to alieviate existing problems in the existing sewer system:

- None

Items required to alleviate existing problems in the existing sewer system:

					Design Flow			
• F068.01	340	m x	160	mm Ø new pipe	8.4	ℓ/s	R	403 000
• F068.02	82	m x	160	mm Ø new pipe	9.3	ℓ/s	R	124 700
• F039.26	1 455	m x	600	mm Ø new pipe	344.3	ℓ/s	R	5 644 600

The proposed connection point to the existing sewer system is shown in **Figure 2 (Sewer)** attached.

In **Figure 2 (Sewer)** attached pipes in future development areas are indicated schematically.

2.4 Adjustments to the Master Plan

No adjustments to the sewer master plan are required due to the revised PDDWF of the proposed development.

Yours sincerely,

Per: Dr BF Loubser
GLS Consulting

(Report done by: Adie Vienings)

From: Damian Queck [mailto:queck@civilconsult.co.za]
Sent: Monday, August 3, 2015 12:44 PM
To: Cyric Broadwell
Cc: Adie Vienings; 'Leon Wentzel'; 'Civilconsult'; 'Gideon Ras'
Subject: PEACH TREE X18 - GLS BULK SERVICE INVESTIGATION

Good afternoon Cyric,

Will you please provide us with a revised quotation (previous quotation dated : 12 June 2012) for the above mentioned project.

Please find attached the locality plan (proposed development indicated in red) and the revised Proposed Township Layout plan.

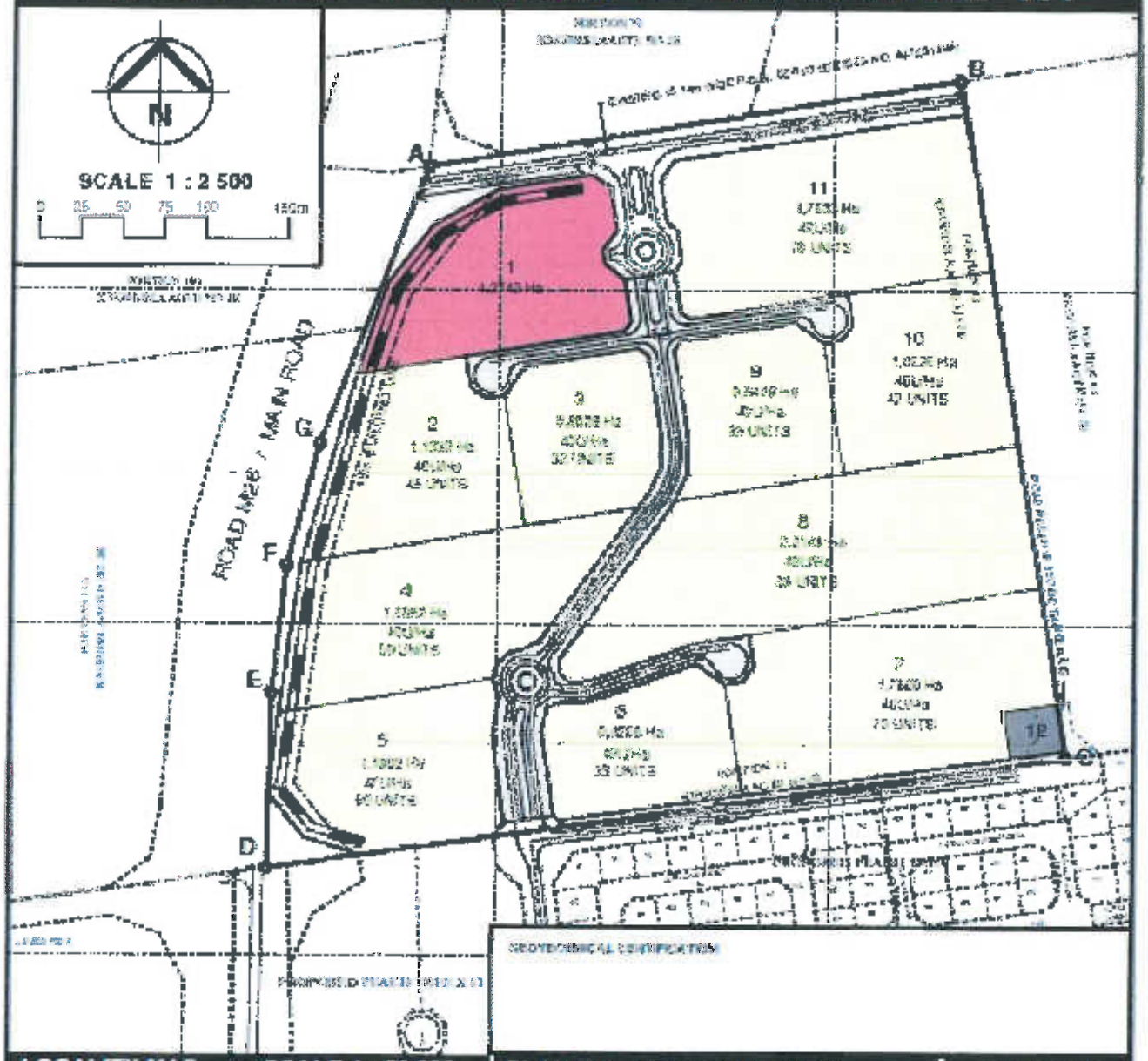
Your help in this regard will be much appreciated.

Kind Regards

Damian Queck
Tel : +27 12 343 6297
Fax: +27 12 343 8929
mail@civilconsult.co.za

CIVILCONSULT
Consulting Engineers

PROPOSED TOWNSHIP: PEACH TREE X?



LOCALITY MAP **SCALE 1 : 50 000**

PLAN No: PEACH TREE X?/1 | **JULY 2015**

FLOOD LINE CERTIFICATION

VeloCITY

LOCALITY: SITUATED ON PORTIONS 72 & 73 OF THE FARM RIDGEVERACITO 355 JR
AS INDICATED BY THE SG DIAGRAM A R 0344 /04

LOCAL AUTHORITY: CITY OF TSHWANE METROPOLITAN MUNICIPALITY

SERVITUDE NOTE:

GENERAL NOTE:

ZONING	ERF NO	# ERVEN	MIN SIZE	AVG SIZE	%
	TOTAL				

Proposed connection point

Knopjeslaagte reservoir zone (future)

KLR.22

KLR.22

KLR.22

KLR.22

KLR.23a

Item 1
(temp PRV)

Peach Tree X20

LEGEND

Pipe Diameters (mm)

- <= 110
- > 110 <= 160
- > 160 <= 200
- > 200 <= 250
- > 250 <= 315
- > 315 <= 355
- > 355 <= 400
- > 400 <= 450
- > 450 <= 500
- > 500 <= 600
- > 600

Bulkwater Pipeline

Closed Valve

PRV

Pump Station

Bulk Tower

Bulk Reservoir

Rand water Connection

Randwater Pipeline

Water Treatment Plant

Future Reservoir Distribution Zones

Tshwane Area Boundaries

Master Plan Items

Bulk Master Plan pipes

Master Plan pipes

Schematic main pipes in future areas

Schematic secondary pipes in future areas

Proposed Closed Valve

Proposed PRV

Proposed Pump Station

Proposed Bulk Tower

Proposed Bulk Reservoir

Proposed Rand Water Connection

Future Development Areas

Existing Informal areas for upgrading

Scale 1: 15 000

CITY OF TSHWANE
KNOWLEDGE EXCELLENCE

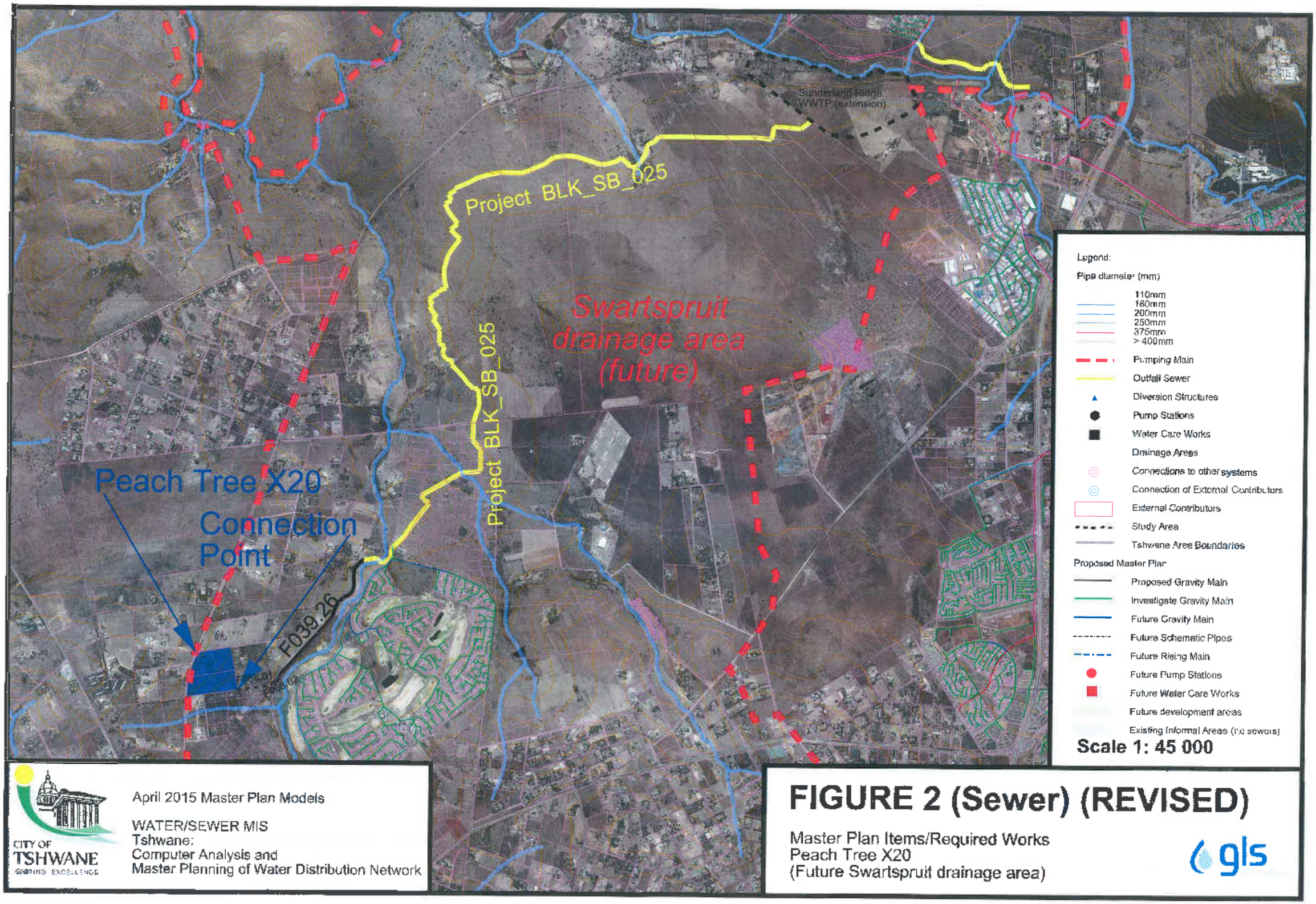
April 2015 Master Plan Models

WATER/SEWER MIS
Tshwane:
Computer Analysis and
Master Planning of Water Distribution Network

FIGURE 1 (Water) (REVISED)

Required Works/Master Plan Items
Peach Tree X20
(Future Knopjeslaagte reservoir zone)

gls



CITY OF TSHWANE
GROWING EXCELLENCE

April 2015 Master Plan Models

WATER/SEWER MIS
Tshwane:
Computer Analysis and
Master Planning of Water Distribution Network

FIGURE 2 (Sewer) (REVISED)

Master Plan Items/Required Works
Peach Tree X20
(Future Swartspruit drainage area)

gls