CIVIL ENGINEERING SERVICES REPORT FOR THE DEVELOPMENTS ON ERF 3280 HUMANSDORP

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PROJECT	PROPOSED TOWNHOUSE DEVELOPMENT (128 APARTMENTS) ON ERF 3280
LOCATION	HUMANSDORP
CONTENTS	PRELIMINARY CIVIL ENGINEERING SERVICES REPORT
REPORT STATUS	FIRST EDITION
DATE	JANUARY 2023

The purpose of this preliminary Civil Engineering Services Report is to prepare an overview of the existing civil engineering services on or around the site, propose civil engineering services for the development that comply with the requirements of the Kouga Municipality and provide engineering input and recommendations.

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This report was compiled and reviewed in accordance with G Squared Project Management (Pty) Ltd Internal Quality Management Policy.

This report is to be referred to as the preliminary civil engineering services report for the development of erf 3280 Humansdorp.

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1 INTRODUCTION:

G Squared Project Management (Pty) Ltd was appointed by BRIXIGUARD (PTY) LTD as Civil Engineering Consultants. This report summarises the requirements to provide streets and civil engineering services for the proposed residential Sectional Title development on Erf 1380 Humansdorp.

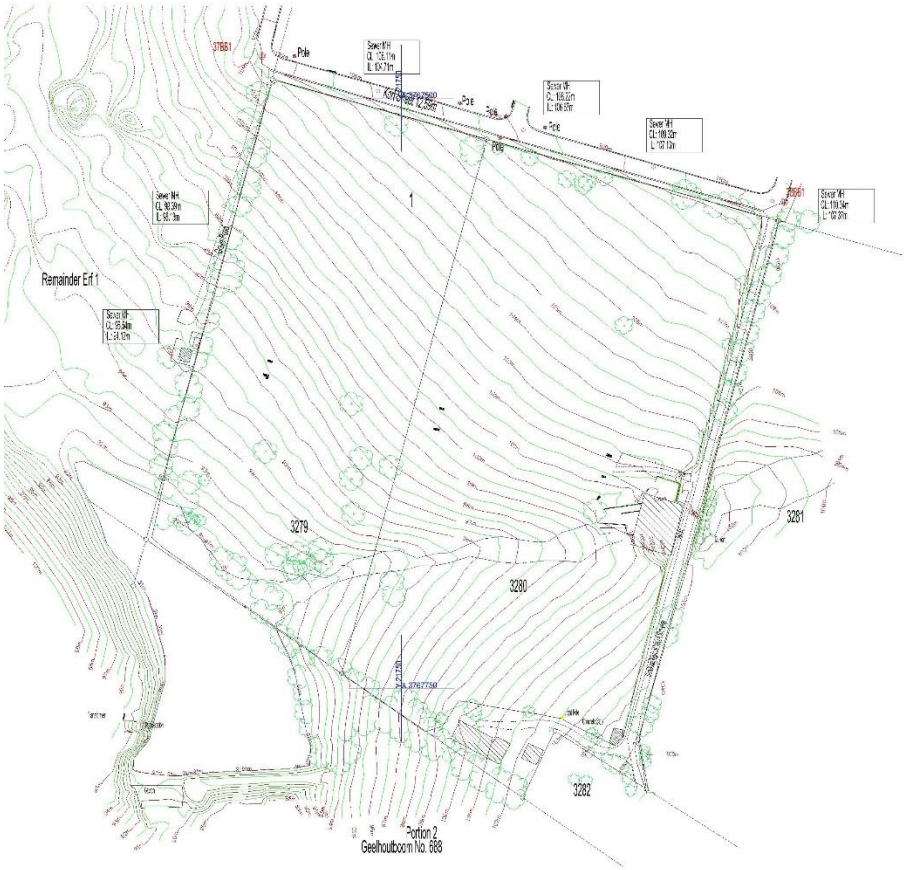
- Proposed site plan of development – G Squared Architectural Division
- Existing information for the area from Kouga Municipality.
- Map of the site from Google Maps.
- Existing sewer information from Kouga Municipality.
- Water supply information from Kouga Municipality.

The proposed development on erf 3280 would consist of a refuse area (±17m^2), a Guard house (±32m^2) and 128 dwelling (du) units of varying sizes; 1, 2 and 3 bedroom apartments. The units are double storey semi-detached. The total coverage of the site is 3744m^2 with 289 parking spaces required as per user zone development parameters (2s /du + 1s /4du for visitors). We have provided 288 parking spaces total.

Based on our initial discussion and feedback from the Kouga Municipality Infrastructure & Engineering: Depending on the demand and supply of water for the development, a decision will be made if supplementary water supply should be considered, like boreholes etc. The units will be provided with water tanks for rain-water harvesting for grey water usage.

The objective of this report is to provide both the Kouga Municipality and the Developer with a general overview of the availability and capacity of existing bulk services with a view to servicing the proposed development. This report presents the findings of a preliminary desktop investigation relating to bulk services, and further sets out the criteria and standards for the internal services, design constraints and options for the provision of civil engineering services for the proposed development.

EXISTING SITE SURVEY



1) STUDY AREA:

Erf 3280, Kort Street, Humansdorp is a 32 104m^2 residential 3-zoned erf and is located South of Kort Street, running parallel to R330 motorway. Within walking distance of the CBD

EXISTING STREETS AND ACCESS

An existing dirt road (Kort Street) at the northern extremity of the site may be accessed from the R330 via Piet Uys Street, King Street or Queen Street.

2) SITE DESCRIPTION:

Based on the available information, the following site characteristics are summarised:

- The actual topography is known through a topographical survey done to identify locations of existing services. The terrain is characterised by even topography with a slight slope from the north-east to the south-west towards a watercourse that drains into a dam at the South Western corner of site 3279. The average gradient is ±6%, which is ideal for this development.
- There is no protected or rare species of vegetation expected to be found in this area.

- A geotechnical investigation has not yet been done on the site and thus more in depth information is not available at this time. Through knowledge of the area and visual site inspection, no known geotechnical problems are predicted. An on-site inspection of a trial-hole ±1m deep showed the presence of some clay, which will determine the foundation design for the units.

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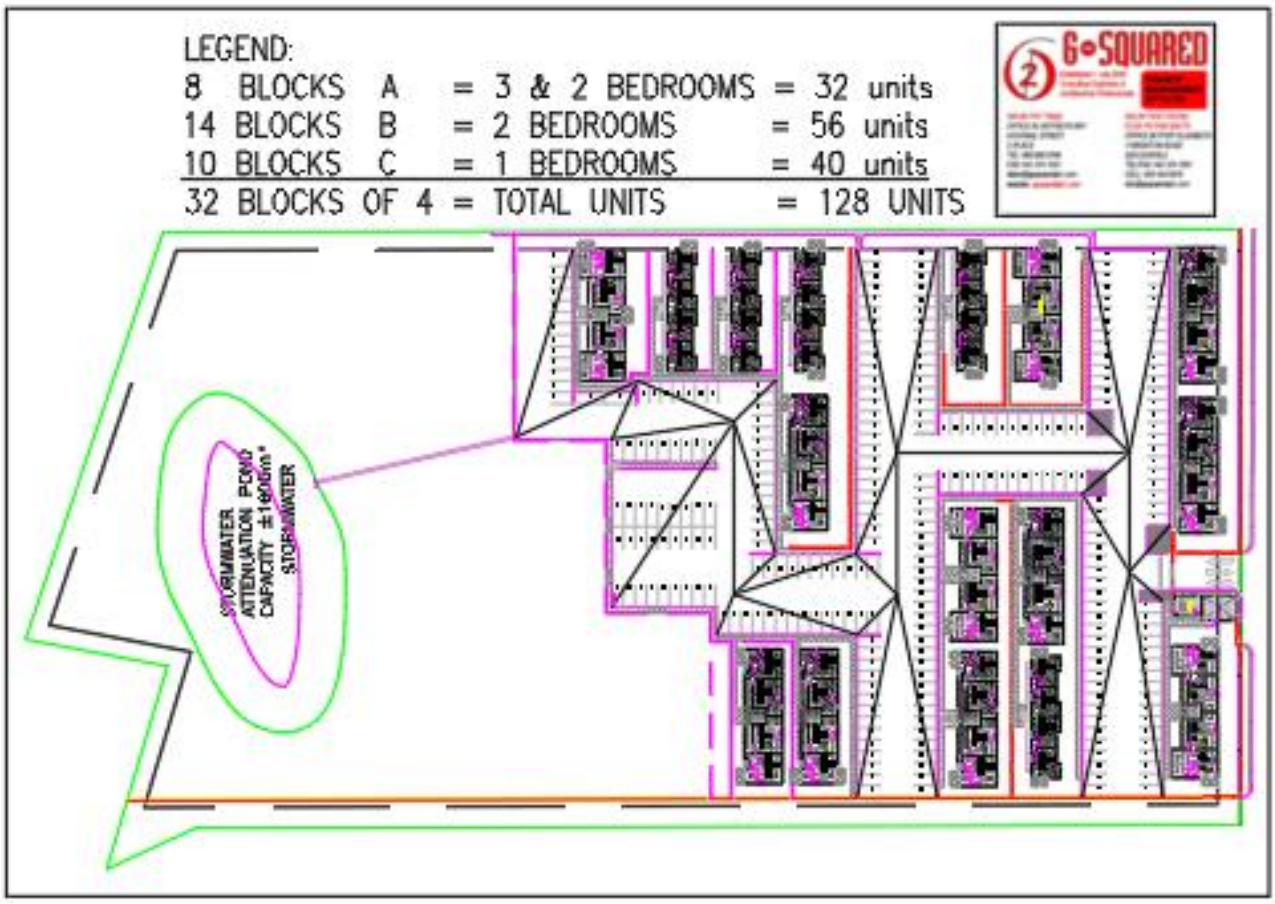

Figure 1.1 Proposed Layout on erf 3280

2) DESIGN STANDARDS:

The following Design standards and documents were used to inform and guide the design process:

Government and Local Authorities codes, ordinances and regulations

- Statuary requirements: Kouga Local Municipality
- Development of Water and Sanitation Infrastructure, 2nd Ed 2004 (DWAF)
- Draft UTG 2 Structural Design of segmental block pavements for Southern Africa
- Guidelines for Human Settlement Planning and Design ("The Red Book 2019 2019")
- Guidelines for the provision of Engineering Services and Amenities in Residential Township Development
- SANS 1200: Standardised Specification for Civil Engineering Construction
- SANS 10400: The Application of the National Building Regulations
- SANS 10252 – Part 1: Water Supply installations for Buildings
- SANS 10252 – Part 2: Drainage installations for Buildings

3) CIVIL ENGINEEERING SERVICES

3.1 BULK EARTHWORKS

The bulk earthworks are designed and constructed by taking cognisance of the following:

- Optimizing the cut to fill and imported fill required to reduce cost.
- The requirements to tie into the existing roads at the northern edge of the site.
- Prevention of overland stormwater ingress into buildings.

The bulk earthworks specifications are as follows:

- Strip vegetation and topsoil to a depth of 200mm and stockpiled on site (for landscaping) or removed from site if instructed by the engineer.
- Excavate material to indicated levels. Cut material no suitable to use in fill to be stockpiled site (for landscaping) or removed from site if instructed by the engineer.
- Rip in situ to a depth of 150mm and compact to 90% MOD AASHTO density.
- Where fill is required, import approved G9 material in layers of 150mm and compacted to 93% MOD AASHTO density.
- Import 300mm approved G7 natural gravel in layers of 150mm under building footprints and compact to93% MOD AASHTON density.

3.2 WATER RETICULATION

3.2.1 MUNICIPAL WATER SUPPLY

- The site will be supplied by municipal pressure mains supply that situated on the Northern boundary of the site, with possible supplementary borehole supply in future.
- A bulk water meter will be installed at the main entrances to each site and each individual unit will have a domestic metered water connection.
- The scope of work will cover the installation of new lines to provide the new developments with sufficient flow and pressure to all domestic and fire water supplies points.
- The internal water reticulation will be provided to achieve the supply of potable water

3.2.2 POTABLE WATER DEMAND

- The use of on-site supplementary water sources could potentially reduce the municipal water demand requirement. Each unit will be supplied with a 2500 litre rainwater tank for grey water usage.
- Design (WSD) (refer to Section J.2.3.3).
- The uptake and use of supplementary water can form part of a coordinated community effort. It can take place at a consumer level. Rainwater harvesting, greywater reuse can defer or even eliminate the need for largescale water resource augmentation as supplied through municipal systems.

POTABLE WATER SUPPLY

The documents and standards outlined in Guidelines for Human Settlement Planning and design (The Red Book 2019 2019") were used as basis for determining the expected domestic water demand for this site.

We base our calculations on the section J (water supply) using:

Equation J.3: Per capita method for calculating AADD

Table J.3: Residential AADD (per capita) is used with Land use as house residential with 5 persons per unit and typical AADD 0f 230 L/c/d and AADD range 120 to 400 L/c/d

AADD (kL/d) = Unit Water Demand per capita (L/c/d) × population ÷ 1 000

= 230 x 128 ÷ 1 000 (66 units with an average of 5 persons per unit)

= 29.44 kL

REAL LOSS

Method 1. Use a percentage of 15% to account for the anticipated real losses. Or obtain real loss percentages from the municipality, if available.

J.4.1.4 Total Average Annual Daily Demand

Equation J.6: Calculation of Total Average Annual Daily Demand

TAADD = AADD/ (1- Real Losses)

= 29.44 / (1-0.15)

= 34.64 KL

3.2.3 DOMESTIC WATER RETICULATION

- Pipe specification = Ø75 mm Class 10 HDPe
- Velocity = 1.30 m/s
- Flow capacity = 3.82 L/s

Block connection – Design Parameters

- Pipe specification = Ø 32 mm Class 10 HDPe
- Velocity = 0.73 m/s
- Flow capacity = 0.39 L/s

SUMMARY

1) Municipal supply with possible supplementary borehole supply in future
2) Water pipes are HDPE with diameters of 32mm, 75mm and 110mm for fire reticulation mains.
3) 34.64 kL/day (approximately 13190 kL per annum)

3.2.3 FIRE WATER DEMAND

The documents and standards outlined in Guidelines for Human Settlement Planning and Design ("The Red Book 2019") were used as basis for determining the expected fire water demand for this site.

J.4.5.8 Provision of water for firefighting:

(i) Fire flow

The water requirements for firefighting are dependent on the relevant fire-risk classification as indicated in Table J.17.

Moderate risk 2: Cluster & low-income housing, high rise flats ≤ three storeys:

Total fire flow (L/s) = 25

Minimum flow at one hydrant (L/s) = 25

Minimum pressure at fire node (m) = 10

Minimum pressure at rest of system (m) = 5

(ii) Fire duration

The volume of water to be available for firefighting is calculated by multiplying the Total Fire Flow from Table J.17 with the recommended fire duration from Table J.18 being 2 hours (Average from Table J.17 for moderate to low risk) Volume of water to be available for firefighting = 20L/s x 120 = 240 L

Risk group	Minimum design flow (ℓ/s)	Reference	Maximum Number of Hydrants Discharging simultaneously
Low risk – group 2	500	GHSPD – Table 9.18	1

Table 2: Fire water demand

3.2.4 FIRE WATER RETICULATION

Fire reticulation Mains – Design parameters

- Pipe specification = Ø 110 mm Class 12 uPVC
- Velocity = 2.59 m/s
- Flow capacity = 20.30 ℓ/s

Hydrant connection – Design parameters

- Pipe Specification = Ø 110mm Class 12 uPVC
- Velocity = 4.12 m/s
- Flow capacity = 20.62 ℓ/s

3.2.5 FIRE WATER RETICULATION

- Water for firefighting purposes shall be distributed on site from the existing municipal supply. A dual fire brigade booster connection will be installed at the site entrance. Fire hydrants will be installed at 85m intervals. All fire hydrants shall be compatible with local authority's pattern.

3.3 SEWER RETICULATION

3.3.1 EXISTING SEWER NETWORK

- For Erf 3280 there are three manholes in Kort Street along the Northern Boundary. The manholes in Kort Street are reported to be unable to sustain any new sewage, and consequently it is impossible for the development to tie directly into this existing system. We will be constructing a new pump-station alongside erf 3279 that will bypass the existing pump-station alongside erf 3279 that was vandalised. This pump-station will service both erf 3279 & 3280.

The scope of work will cover the installation of new sewer mains, with erf connections to each residential block

3.2.2 SEWAGE YIELD

We are using the tables K.4, K.8 and Figure K.16 to calculate the sewer flow and peak factor method.

Table K.9: Sewer flow and peak factor Method

Land use	Medium density residential	Total
Number of units [EE]	128	
Unit PDDWF[UQ](kL/d/unit)	0.60	
Persons per unit	5	
Peak factor	2.5	
Peak day factor	1.00	
CALCULATIONS		
Total number of persons	640	
IPDWF (Excl. infiltration) (kL/s)	2.22	2.22
PDDWF (Excl. infiltration) (kL/d)	76.80	76.80
ADDWF (Excl. Infiltration) (kL/d)	69.80	69.80

3.3.4 GROUNDWATER INFILTRATION

We base our calculations for the medium-density development category comprising 128 units the total sewer pipe length estimated from K.11 = 15 x 128 = 1920m.

Assume that all main reticulation is 160mm Ø with no further allowance for bulk or collector outfalls. The groundwater infiltration can be calculated from Table K.12:

Groundwater Infiltration flow (L/s) = Infiltration rate (L/min/m/m) x pipe length (m) x pipe Ø (m) ÷ 60 sec

= 0.04 L/min/m/m x 1920m x (150 ÷ 1000) ÷ 60 sec

= 0.192 L/s x (24 h x 60min x 60 sec ÷ 1000)

= 16.59 Kl/d

Total = 69.80 + 16.59 = 86.39 kL/d

SUMMARY

a) All municipal connections, no site onsite treatment plant
b) New pump station along western boundary of Erf 3279 (next to existing derelict pump station), which will serve both Erf 3279 & Erf 3280 (servitude to be registered on erf 3279 to allow for the line from erf 3280 to transgress erf 3279)
c) Sewer pipes with diameters of 110mm and 160mm main
d) 86390 litres/day (approximately 31 100 kL/annum)

3.4 STORMWATER DRAINAGE

3.4.1 EXISTING STORMWATER

- No underground storm water drainage system or formal above ground storm water drainage infrastructure or services exists on the site or in the area. Presently all stormwater drains naturally to the watercourse culminating at the dam on the South Western corner of the ERF 3279.

3.4.2 STORMWATER DESIGN

The Rational Method was used for the calculation of run-off:

- Run off Qrun-off = CIA/3.6
  Where: Q = peak flow (m3/s)
  C = run-off coefficient (dimensionless)
  I = average rainfall intensity (mm/hr)
  A = effective area of catchment (km2)
  3, 6 = conversion factor
- Time of concentration Tc = 0,604{rL/S(0.5)}0.467
  Where Tc = time of concentration (hrs)
  r = roughness coefficient obtained from Table 3.9
  L = hydraulic length of catchment, measured along flow path (km)
  S = slope of catchment S=H/1000L (m/m) (see Fig 3.8)
  H = height of most remote point above outlet of catchment (m)
- Design Flood recurrence interval 1:5yrs
- Maximum Flood recurrence interval 1:50yrs
- Annual rainfall ±610mm/yr.

3.4.3 STORMWATER LAYOUT

- Specific conditions are created on site to encourage natural groundwater recharge by planting grass wherever possible between the units.
- Stormwater runoff from the site drains naturally towards the aforementioned watercourse into the dam. The post-development water runoff will not exceed the pre-development water runoff. This is achieved by managing the stormwater by means of a strategically placed retention/attenuation pond into which the roadways discharge, before overflowing into the aforementioned watercourse. The attenuation pond will be grassed with vegetation to allow stormwater to recharge the groundwater.
- The attenuation pond volume was based on the 1968 floods in the nearby Port Elizabeth area, which is a drastic approach, however in the light of climate change, we deemed it appropriate to allow for future possible extreme flooding.
- The roof runoff will discharge into 2500 l tanks provided for each unit, for grey water usage.

SUMMARY

a) 2500 litre tanks for each block
b) New concrete channel from parking/paved areas to attenuation pond
c) 1600 cubic metre attenuation pond

3.5 ROADS AND PARKING

3.5.1 NEW ROADS AND PARKING

- The roads and parking areas will drain into a suitably positioned attenuation pond.
- There will be mountable kerbs, which assists the water to drain to the centre of the roadway and ultimately draining into the attenuation/retention pond.

4) TELECOMMUNICATION

The installation of cable sleeves, draw boxes and fibre does not fall within the scope of this report.

5) ELECTRICAL

Electrical services are to be provided as per the design and electrical services report compiled by a registered Electrical Consulting Engineer. The installation of electrical sleeves will be covered with the detail design of the development and electrical sleeves will form part of the construction of civil engineering services. The installation of electrical sleeves will be done in accordance with the construction standards specified within SABS 1200 LC.

Yours faithfully

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PROUDLY BEE COMPLIANT