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05 June 2024

The Project Manager
c/o Zutari
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Attention: Mr Rudolf Schröder

Dear Sir,

DEVELOPMENT OF A PORTION OF THE REMAINDER OF ERVEN 464 GEORGE, 324 AND 2819 PACALTSDORP (GWAYANG DEVELOPMENT SITE): CIVIL ENGINEERING SERVICES REPORT_REV 01

Below please find the Engineering Services Report for the proposed development of the Gwayang Development Site (portion of the Remainder of Erven 464 George, 324 and 2819 Pacaltsdorp), in George, Western Cape. This report is based on the latest preliminary town planning layout. Refer to enclosed Drawing: Gwayang Development, Structural Layout & Land Use, dated 15 May 2024rev5.

1. INTRODUCTION

1.1 Brief

As per Figure 1: Locality Map below, the preliminary project proposal is to prepare the entire property for full development of the site, in a phased manner, to include the following components:

a) A municipal utility area component;
b) A heavy industry precinct;
c) A light industry component;
d) A residential area including various typologies and urban-living supportive uses;
e) A continuous and sustainable conservation/open space system which ties into a sustainable urban drainage system (SUDS);
f) A tourism/trade corridor area and urban gateway uses; and
g) Possible Energy projects.

The ultimate intent of the Municipality is to create fully serviced erven for sale, if required, to support an integrated mixed-use development: the aim being optimal use of the land, within the strategic site context.

Ideally, the existing bulk civil infrastructure will be utilized to accommodate the proposed development, herein referred to as the Gwayang Development site. All future reticulation will conform to George Municipal Standards.

1.2 General

The proposed development area is located within the urban area of George, situated to the south and east of Groeneweide Park residential area and the George Show Grounds and to the west of the Tamsui Industrial area. The site is restricted to the North by the R102 (Airport Road), and to the South by the N2 National Road. The western side of the site encompasses the Gwayang Wastewater Treatment Works (WWTW) and shooting range. The remaining area of the site is generally vacant and used for cattle grazing.

Figure 1: Locality Map

The projected land use for the proposed development is as follows:

Land Use Description	Zoning - George Integrated Zoning Scheme By-Law	Units	Stands	Area (ha)	% of units
Group Housing	General Residential Zone II Group Housing	145	4	4.1	7.6%
Apartment Housing	General Residential Zone IV Flats/Apartments	1762	7	8.8	92.4%
Light Industrial	Industrial Zone I	-	32	20.7	-
Heavy Industrial	Industrial Zone II & III	-	16	38.1	-
Mixed Use / Business / Retail	Business Zone I	-	8	15.0	-
Public facilities (Creche's & religious centre)	Community Zone I & II	-	4	0.3	-
Sludge Outlet	Utility Zone	-	-	0.3	-
Open / conservation areas etc.	Open Space Zone I	-	4	55.9	-
Planned roads	Transport Zone II	-	TBC	38.2	-
Total number of units/stands		**1907**	**75**	**181.4**	**100%**

In order to implement the proposed development in a practical and more affordable manner, it was considered to follow a phasing approach to all infrastructure required. The proposed land use phasing is shown in the figure below, based on the town planning layout dated 09 June 2023 Rev4:

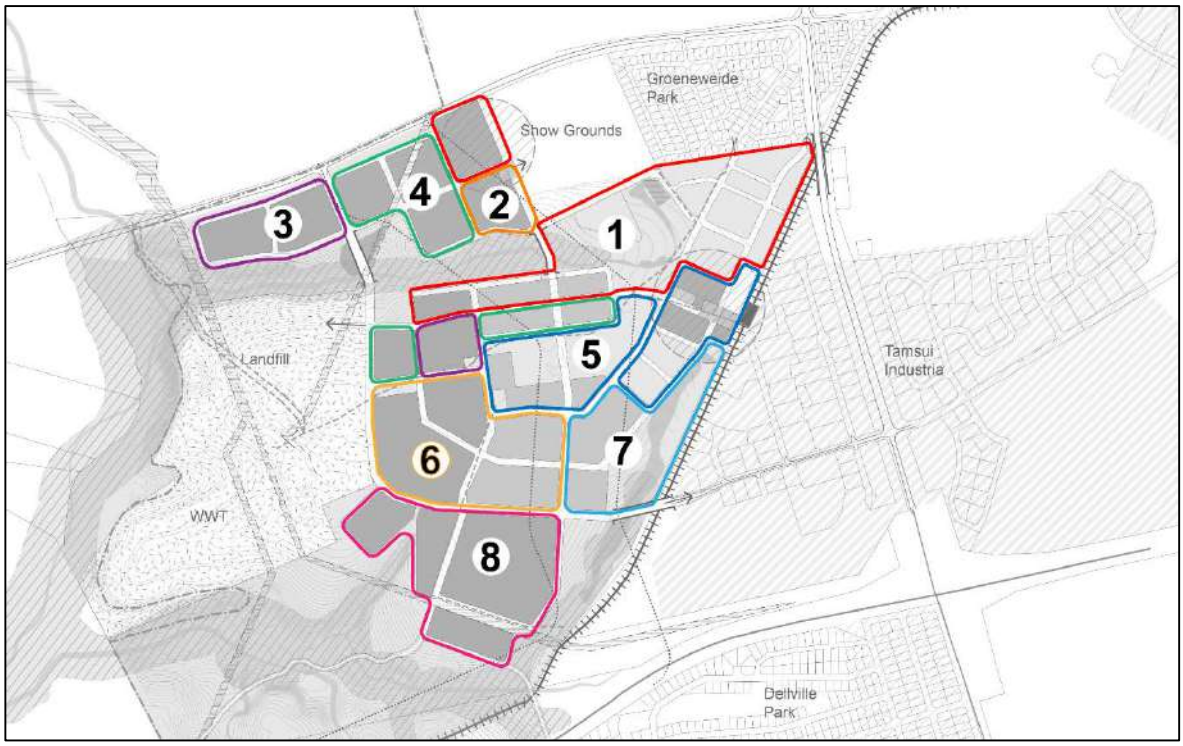


Figure 2: Layout and phasing

The Traffic Analysis conducted by Techso (Pty) Ltd proposed the following further initial phasing for consideration. In order to standardize, a comparable phasing will be adopted for Civil Engineering Services.

Figure 3: Proposed phasing for initial development

2. BULK WATER SUPPLY SYSTEM

2.1 Proposed Water Demand for the Development

The availability of network capacity in the vicinity of the site was investigated by GLS Consulting (GLS), previously appointed by George Municipality to compose a Water Master Plan for the Municipal area and to determine the effect of any form of developments in the Municipal area on the Water Master Plan. GLS's Water Master Plan with reference m2022-12 made provision for water demand of 2,143 kl/day. This Master Plan has been updated (m2023-03) to include the proposed development. The updated water demand is 2,363 kl/day

George Municipality indicated that a bulk water distribution line ('Airport Main line') with diameter between 160mm and 200mm, is positioned on the Northern border of the Gwayang Site, i.e. along the R102/ Hope Street. The current pipeline is an asbestos cement pipe, which will be upgraded to a 400 mm diameter PVC-O Class 12 and 16 pipeline, scheduled for implementation in the 2023/2024 and 2024/2025 financial years. Phase 1 (incorporating the Gwayang development) is scheduled for completion by June 2024. The pipeline will have sufficient capacity for the development in its entirety once the upgraded Phase 1 portion of the pipeline is commissioned. This pipeline will be the main water supply to the proposed development.

According to Table J.2 – J.4 for Calculating the Annual Average Daily Demand (AADD) from "The Neighbourhood Planning and Design Guide", the following calculation was done to determine the AADD for the various Land Uses:

The water use for the applicable areas of the proposed development is as follows:

Description / Land Use	Calculations	AADD
Group Housing	145 no. x 0.5 kℓ/unit/day	72.50 kℓ/day
Apartment Housing	1762 no. x 0.3 kℓ/day	528.60 kℓ/day
Light Industrial	20.7 ha x 13 kℓ/ha/day	269.10 kℓ/day
Heavy Industrial	38.1 ha x 13 kℓ/ha/day	495.30 kℓ/day
Mixed Use / Business / Retail	15.0 ha x 21 kℓ/ha/day	315.00 kℓ/day
Public facilities (Creche's & religious centre)	0.3 ha x 12 kℓ/ha/day	3.60 kℓ/day
Sludge outlet	N/A	-
Open / conservation areas etc.	N/A	-
TOTAL AADD (kℓ/day)		**1,684.10 kℓ/day**
TOTAL AADD (ℓ/day)		**1,684,100.00 ℓ/day**

This development is classified as medium to high density Residential (Low-Income Housing) with a component of Business/ Commercial, Industrial as well as a variety of public facilities. According to Table J.9, the Total Peak Hour Demand is calculated as follows, based on the revised land use tables:

Total Peak Hour Demand = [(601.10 kℓ/d x 4.6) + (1,079.40ℓ/d x 3.3) + (3.6 kℓ/d x 1.0)] ÷ (60 x 60 x 24)
= 0.07327 kℓ/s
= 73.27 ℓ/s

Fire flow:

Such a development would fall into the moderate risk 1 – Industrial, business, high-rise flats ≥ four storeys category according to Table J.17 – J.18 and as such, the following would apply:

- 50 ℓ/second total fire flow;
- 25 ℓ/second minimum flow at one hydrant;
- 15 m pressure at fire node;
- 5 m pressure at the rest of the system; and
- 4-hour design fire flow

2.2 Proposed Services

George Municipality requested GLS to determine whether the existing water system has sufficient capacity to accommodate the proposed development. Feedback received from GLS and George Municipality indicated that upgrading of existing infrastructure as well as the construction of new supporting bulk infrastructure must be constructed, and existing infrastructure upgraded and/or abandoned where necessary to accommodate the services demand of all new developments in George, including the proposed development.

Both the Old and New Water Treatment Works are currently operating under constraint. A 20Ml/day capacity upgrade of the new treatment works is in progress with an estimated completion date of during January/February 2025. The water treatment works, after commissioning of the 20Ml/day capacity, will have sufficient capacity for the development in its entirety.

A water reticulation system exists within the adjacent neighbourhoods to which the proposed development could connect (see enclosed GLS Water Master plan). A system of reservoirs, water pump stations and water mains deliver potable water to developed areas surrounding the proposed development. This development falls within the George main zone. Currently sufficient spare storage capacity exists within the zone.

The demand for fire flow will be addressed as part of the internal network design.

2.3 Water-use strategy

In terms of the light- and heavy industries allowed for in the development, it is proposed that a supplementary water source in the form of a dedicated pipeline of greywater, or inferior effluent, be employed as part of the water supply for non-potable uses. This will also entail a direct line from the Wastewater Treatment Works for a take-off point. It is proposed that each of these properties will have two water connections, i.e. one connection to the potable water network and the other to the re-used water source.
Greywater is a convenient alternative water source to potable water in instances where the reduced water quality can be tolerated, as in the instance of some parts of this development. It will further result in the potable water demand being subsequently less.

3. BULK SEWAGE SYSTEM

3.1 Wastewater Treatment Works

The proposed development is located within the existing Gwayang Wastewater Treatment Works Main Outfall drainage area. Thus, effluent generated from the site will drain directly towards the existing Gwayang Wastewater Treatment Works (WWTW) and joins the Groeneweide Ext. Pumpstation F3, in the interim, and future Groeneweide Est. Pumpstation F1, as indicated on GLS's Updated Sewer System Layout (dated March 2023) attached.

Wastewater generated from the proposed development will gravitate into the existing system and be conveyed by means of gravity sewer lines into the existing systems to the Gwayang Wastewater Treatment Works, where it will be treated.

Feedback received from GLS and George Municipality indicated that the Gwayang Wastewater Treatment Works is currently operating under constraint and has insufficient capacity to support the development.

3.2 Wastewater Reticulation System

A wastewater reticulation system exists within the boundaries of the proposed development. It is proposed that the development will drain to the Gwayang Wastewater Treatment Works where it will be treated as can be seen on GLS Sewer Master plan.

3.3 Wastewater Flow Demand

Calculations are based on "The Neighbourhood Planning and Design Guide", including inputs from GLS Consulting.

3.3.1 According to Table K4 from "The Neighbourhood Planning and Design Guide", for Calculating the expected average daily wastewater flow per dwelling unit is as follows:

Description / Land Use	Sewer ration (% AADD)	kℓ/day
Group Housing	90%	65.25
Apartment Housing	98%	518.03
Light Industrial	80%	215.28
Heavy Industrial	80%	396.24
Mixed Use / Business / Retail	70%	220.50
Public facilities (Creche's & religious centre)	65%	2.34
TOTAL ADWF (kℓ/d)		**1,417.638**

Based on the above, the Average Dry Weather Flow (ADWF) for the units would therefore be:

ADWF = 1,417.638 kℓ/d

3.3.2 The proposed development is classified as medium to high density Residential (Low-Income Housing) with a component of Business/ Commercial, Industrial as well as a variety of public facilities, according to Table K8. The average Peak Factors to be used is 2,5. Calculations are based on the revised land use tables

This would lead to an expected Peak Dry Weather Flow (PDWF) as follows:
Q = 1,417.638 x 2.5
= 3,544.10 kℓ/d
PDWF = 41.02 ℓ/s

If an infiltration rate of 15% is used for the ingress of stormwater into the system, the Peak Wet Weather Flow (PWWF) is calculated as follows:

Q = 41.02 x 1.15
PWWF = 47.17 ℓ/s

3.4.1 Proposed Services

The proposed development falls within the Gwayang Wastewater Treatment Works' (WWTW) drainage area and will drain to the WWTW through the existing gravity sewer network where it will be treated. As mentioned before, feedback received from GLS and George Municipality indicated that the Gwayang Wastewater Treatment Works is currently operating under constraint and has insufficient capacity to support the development. The upgrading of existing infrastructure as well as the construction of new supporting bulk infrastructure would be required to accommodate the proposed development.

A 10Ml/day capacity upgrade of the Gwayang Wastewater Treatment is currently within the planning phase. The timeframe for the upgrade of the facility to support the development is currently unknown. Furthermore, the capacity upgrade is dependent on the availability of capital funding.

The following upgrades to pump stations will be required:

- Pacaltsdorp Pump Stations 2, 5 and 7: The sanitation masterplan has earmarked the pump stations for abandonment to drain via a new gravity sewer system to the Gwayang WWTW.
- New gravity sewer mains will have to implemented in order to drain the portions situated on the southeastern boundary of the development which will also include the flow from these pump stations.
- Groeneweide Ext PS F1: The northern part of the development can drain via gravity to a new sewer pump station Groeneweide Ext PS F1, and pump via a new rising main to the existing Gwayang WWTW.
- Groeneweide Ext PS F3: The new gravity sewers collecting sewage from the abandoned Pacaltsdorp sanitation pump stations 2, 5 and 7 as well as the remainder of the development will drain via gravity to the future Groeneweide Ext PS F3, and pump via the future rising main to the existing Gwayang WWTW.

Furthermore, provision must be made for the future rerouting of an existing sludge-handling pipeline connecting the Outeniqua WWTW and the Gwayang WWTW. To this end, provision is to be made for a pipeline that may possibly run from west, at the outlet of Gwayang WWTW, to east, where it will connect to the Pacaltsdorp Pumpstation. This pipeline is however not planned for implementation by the George Municipality in the foreseeable future. The existing sludge-handling pipeline fed the area where the Gwayang Development is currently planned. It is believed that the effluent was used for irrigation purposes in that area in the past.

George Municipality indicated that the existing municipal sanitation infrastructure (specifically the treatment works) cannot support the development. Alternative infrastructure will have to be considered if the development is to proceed prior to capacity upgrades.

No alternative exists for the treatment of wastewater from the development or any other development.

Other options could be identified that will require further investigation to determine their viability. Such options are:

- Implementation of an on-site package plant
- Construction of an interim pump station to pump all wastewater to the existing network that can drain to the Outeniqua Wastewater Treatment Works.

All interim infrastructure as well as the required infrastructure described above, will be for the cost of the development.

4. STORMWATER

The site has a fairly low slope gradient, increasing towards natural drainage lines, and the in-situ soils have a low permeability. The Geotechnical Investigation indicated that surface water was encountered in some small existing dams and localised depressions across the site. The site also contains several small natural drainage lines.

It is proposed that the stormwater generated upstream of the development be conveyed through the development by means of both an underground system as well as an emergency overland flow system. However, all upstream stormwater generated by the existing developed area will have to be dealt with through the proposed development.

The objective is to disperse stormwater by applying sustainable urban drainage systems (SUDS), such as detention basins, retention ponds and swales. The topography slopes naturally to the southwestern corner of the site. Possible locations of attenuation ponds will be investigated during the detailed design stages of the project.

Accumulated stormwater will be dispersed by means of energy dissipating structures to minimize the effect of peak runoff downstream. Detention could be required in order to maintain current flow conditions; however, these detention facilities will have to be adequately designed during the detailed design stages of the project. A Stormwater Management Plan will be compiled and detailed design will be done with this in mind in order to minimize the peak runoff.

5. ACCESS ROADS

Access to the proposed development is currently obtained from the existing access road, intersecting the R102 (Airport Road) via a stop-controlled intersection. Details regarding access have been investigated and discussed in a Traffic Impact Study conducted by Urban Engineering and Techso (Pty) Ltd.

6. SOLID WASTE

Refuse removal will be dealt with once a week as applicable to all the current residential areas in the George Municipal area.

Solid waste is based on an estimated 1.29 kg/person/day

The total population of the area has been estimated at 6 293 people.

Therefore: 6 293 x 1.29 kg/person/day
= 8 117.97 kg/day
= 8.12 tonnes/day

Volume = 8.12 tons/day x 365
= 2 963.06 tonnes/annum

Confirmation will be required by George Municipality whether the existing solid waste site will be able to accommodate the additional solid waste generated by the development.

7. FLOODLINES

None of the industrial and residential properties are affected by Flood lines.

8. GEOTECHNICAL CONDITIONS

The majority of the site is generally considered suitable for the proposed urban development with some moderate geotechnical constraints expected. Some isolated areas were however found to have problematic ground conditions and would require further investigation. The natural topography will also play a role in the proposed town planning layout. The Geotechnical Investigation by Outeniqua Geotechnical Services, dated 06 June 2022 (Rev 0), indicates the presence of deposits of uncontrolled fill that could also present a hazard and obstacle to development, and these areas should be investigated further.

The Geotechnical Investigation further indicated that in-situ soil obtained from excavations for road box cuts and services trenches is likely to be too fine-grained for use as a natural construction material (compactable fill), and should be stockpiled for non-structural filling purposes, landscaping or general fill over pipe cradles. Clay material should be carted to spoil or used for construction of earth-fill retention ponds, or as directed by the engineer.
The Geotechnical Investigation and Report contains some recommendations for road design in terms of cutting of the roadbed and requirements of compaction. Good site landscaping and a piped underground stormwater management system is recommended for the collection, diversion, control and discharge of stormwater from properties and roads to prevent flooding and ingress into subsoils, which could potentially cause settlement of structures or erosion problems.

In-situ soil obtained from excavations for road box cuts and services trenches is likely to be too fine-grained for use as a natural construction material (compactable fill), and should be stockpiled for non-structural filling purposes, landscaping or general fill over pipe cradles. Clay material should be carted to spoil or used for construction of earth-fill retention ponds, for example.

In terms of foundation design, site testing indicates the presence of potentially problematic soils, possibly resulting in heave and/or settlement, and thus a requirement for improved foundation systems to mitigate movement of structures. The recommended improvements include removal and replacement of in-situ soil below foundations, stiffening of foundation reinforcement, and/or improved site drainage measures, as well as other additional systems. Further investigations may be required during construction.

Some portions of the site are classified as geotechnical Terrain 2 (Site class P), and marred by potentially highly problematic uncontrolled fill material which is not suitable for development, and will have to either be removed completely or the area abandoned for open space. Further investigations in these areas will need to be undertaken to determine the economic feasibility of developing these properties for their intended use.

9. STANDARD OF ENGINEERING SERVICES TO BE PROVIDED

Levels of services are as follows:

9.1 Sewer

- Pipe diameter: UPVC Class 34, SANS 791, 160mm diameter solid wall for main lines and 110mm solid wall for individual unit connections where required.
- Prefabricated Fibre cement shafts or concrete manhole rings to be used for manholes.

9.2 Water

- UPVC Class 9/12 pipes depending on residual pressure.
- Each erf will be serviced with a 20mm diameter connection and a Kamstrip Ultrasonic Smart water meter in a plastic meter box or similar approved meter by the Technical Services Directorate.
- Provision is made for fire hydrants according to design guidelines.
- All fire hydrants shall be 65 mm diameter (internal)
- All fire hydrant outlet shall be of bayonet coupling type.
- All valves shall be AVK type valves – left hand/closing or similar approved.
- Provision is made for a bulk water meter at the connection point.

9.3 Roads and stormwater

- The access road width will be 6.0m minimum.
- Class 3 and Class 4 roads must be asphalt paved.
- Sub-base and base materials will be imported.
- Sub-surface drainage, where applicable, will be installed.
- The underground piped stormwater drainage system will be minimum 450mm diameter.
- Barrier kerbs will be installed around bell-mouths. Bellmouth's radius minimum 10m. The minimum radius for access roads is 8m.
- All stormwater drains will be provided with a sand trap of at least 300mm.
- Low water drifts to be utilised at natural watercourses to accommodate overland flow.

9.4 Design Criteria and Standards

9.4.1 Design criteria

The following documents will serve as a base for the detail design criteria and standards:

- The Neighbourhood Planning and Design Guide ("Red Book"); and
- City of Cape Town Management of Urban Stormwater Impacts Policy – Version 1.1, 2009.
- George Municipality Minimum Standards for The Design of Civil Engineering infrastructure.

9.4.2 Construction specifications

All materials and workmanship shall comply with the specifications as set out in the South African National Standards for Civil Engineering (SANS).

9.4.3 Roads

The road system forms an integral part of the local area plan.

9.4.3.1 *Design Criteria*

The design criterion for roads is as follows:

- Design life – 20 years.
- Subgrade CBR – 15 to 20.
- Subbase CBR – 45minimum (processed crushed stone)
- Base course CBR – 80minimum (processed crushed stone)
- Surfacing – 80mm interlocking concrete paving/ Cape Seal
- Minimum road grade – 0.5 % Longitudinal
- Minimum Crossfall – 2.00 %

9.4.4 Stormwater

The following references will be used as a basis for the design of the stormwater network:

Standards and Guidelines for Roads and Stormwater of the City of Cape Town (Version 3, February 2022)

The storm water system forms an integral part of the road and urban planning layout. The system rests on three legs, the minor system, the major system and an emergency system. The minor storms are catered for in the pipe system while the major storms are routed through a linked system of roads and public open spaces using attenuation techniques. The emergency system recognizes failure of the minor and major system by storms greater than provided for in major system or in the event of malfunction of the minor system by providing continuous overland flow routes to minimize flooding of residential areas.

9.4.4.1 *Minimum design criteria for storm water system*

The data to be used for the design of the system is as follows:

- Minor system : 5-year return period conveyed in an underground pipe system. Preferably the overland flow shall not exceed 200m.
- Major system : 50-year return period. The difference between the 2 year and 50 year to be conveyed in the road prism with depth not exceeding 150mm within the road reserve width.
- The minimum gradients for pipelines are designed to give a minimum velocity of 0.7m per second with the pipe flowing full.
- The maximum velocity used is 3.5m per second.
- Major storm water overflows are to be provided to convey the excess storm water from the streets into designated public open spaces.
- Storm water flow velocities in roadways will be kept as low as possible and related to the surface finish to prevent scour and erosion.
- Roads are to be graded to ensure free and continuous flow to the main storm water system and to prevent local ponds at intersections.

9.4.4.2 *Pipelines*

- Storm water pipes are generally 50D, 75D or 100D as required by the loading and installation conditions.
- Pipes are generally laid on Class C bed.
- The minimum cover on pipes is 0.80m.
- The minimum pipe diameter is 450mm for longitudinal runs and catch pit connections.

9.4.5 Sewers

The sewer drainage system forms an integral part of the sewage system. The drainage for the site is towards the Gwayang Wastewater Treatment Works through the existing gravity sewer network within the development, as described in Item 3.

9.4.5.1 *Minimum design criteria*

- A conventional waterborne sewerage system is provided with a single connection. The main sewer line will be constructed within open areas on the site, topography dependent.

- Design parameters : Average daily flow – As calculated
  : Peak factor – As calculated
  : Extraneous flow – 15 %
  : Minimum velocity – 0.7m per second
- Minimum cover to pipes : 0.80m
- Minimum pipe size : 110mm diameter for unit connections
  : 160mm diameter for sewer mains
- Minimum gradients : 110mm diameter unit connection @ 1:60
  : Main lines at 80% capacity as follows:

No. of Units	**Grade**
Less than 6	1:80
6 to 10	1:100
11 to 80	1:120
81 to 110	1:150
111 to 130	1:180
More than 130	1:200

- Maximum manhole spacing of 80m.

9.4.5.2 *Pipelines*

- Pipeline material for pipe sizes up to 160mm diameter. UPVC Class 34 complying with SABS.
- Pipes are generally laid on Class C bedding.

9.4.5.3 *Manholes*

- Dolomite aggregate and low alkali sulphate resistant cement to SABS 471 shall be used for all concrete, mortar or screed.
- Manhole cover to be central over main pipe on downstream side.
- Manhole covers and frames to be polymer concrete/ precast concrete.

9.4.6 Water

The water reticulation network forms an integral part of the water distribution system.

9.4.6.1 *Minimum design criteria*

- The Neighbourhood Planning & Design Guide: Section J – Water Supply (Red Book 2019)
- George Municipality Civil Engineering Services: Civil Engineering Standards & Requirements for Services (Updated January 2009)

  - Peak factors for the development calculated in accordance with the "The Neighbourhood Planning and Design Guide: Section J – Water Supply (Red Book 2019)
  - Minimum pressures for the network are calculated for the fire flows of 15ℓ per second and peak demand at the point of lowest pressure under peak flow conditions.
  - Minimum cover to pipe to be 0.8m.
  - Minimum house connection size to be 25mm diameter HDPE.
  - Minimum pipe size to be 75mm diameter uPVC.

9.4.6.2 *Pipeline materials*

- uPVC Class 16 heavy duty pipes complying to SABS 966
- Erf connection – HDPE Class 16 type 5 complying to SABS 533

9.4.6.3 Isolating Valves

- Valves to be placed such that a maximum of 4 valves need to be closed to isolate a section of pipeline.
- Valves to be spaced so that the length of main included in an isolated section does not exceed 600m.
- All valves to be installed at splays where applicable and not within the road surface.
- All valves shall be in accordance with SABS 1200 / SABS 664/1974 and approved by the relevant department head.
- Valves shall be clockwise opening / left hand closing.
- Direction of opening to be clearly marked on the valve body or spindle cap.
- All valves shall be heavy duty, class 16.
- All valves shall have non rising spindles.
- All valves shall be fitted with cast iron cap, secured with retaining bolts.
- All valve belltobies shall be polymer concrete as per AV Moulding, concrete, recycled plastic or cast iron depending on area and relevant condition.
- Only valves supplied with minimum thickness of 225 micron Copon EP 2300 epoxy paint allied to all internal surfaces after it has been thoroughly cleaned by grit blasting to SA ½ finished in compliance with the requirements of SIS 05 90 00 or valves with similar approved coatings, will be accepted.
- Isolating valves shall be placed in brick chambers.

9.4.6.4 Fire hydrants

- Fire hydrants are to be spaced at a maximum of 120 m.
- All fire hydrant types shall be in accordance with SABS 1200, comply with the local Fire Department standard regulations, and approved by the relevant department head.
- All fire Hydrants shall be 65 mm diameter (Internal).
- Outlets shall be London round thread with loose cap and securing chain.
- Hydrant spindles shall be provided with cast iron caps, secured with retaining bolts.
- Hydrants shall be clockwise opening / left hand closing.
- Hydrant covers shall be polymer concrete as per AV Moulding, concrete recycled plastic or cast iron depending on area and relevant conditions.
- All hydrants shall be supplied installed complete with flanged CI extension piece complete with cadmium plated nuts and bots to ensure depth not greater than 400mm.

9.4.6.5 House connections

- House connections shall be installed as indicated on drawing no CES/W3 as part of new developments.
- SABS approved Ball Cocks, Gate valves or Ferrules shall be installed on the main water pipe.
- All cast iron saddles to be wrapped with Denso tape.
- Marker posts shall not be installed as house connections will be swopped from the old reticulation to the new reticulation.

9.4.6.6 Fittings and specials

- Fittings and specials shall be manufactured from SS304L pipe with SS316L flanges with either a FBE coating or two-pack epoxy inside and out for corrosive soil conditions.
- uPVC fittings and specials shall be class 16, fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SABS 966.
- Only stainless-steel bolts and nuts to be used on all underground saddles, flanges, short collar couplings, etc.
- All bolts and flanges shall be denso wrapped for corrosion protection.
- All pipe fittings (Valves, Hydrants and scour valve, beds) shall have thrust blocks.
- 90° bends will be avoided as far as possible and a combination of two 45° degree bends will be utilised.

9.4.6.7 Road Crossing and Reinstatement

Road crossings for the main reticulation as well as house connections will be constructed by means of conventional trench excavation. Road crossings will be reinstated with the following layerworks:

- 40 mm Continuously Graded Asphalt
- 150 mm G2 base compacted to 98% MOD AASHTO.
- Subbase in 150 mm layers from top of bedding to underside of base consisting of G5 material compacted to 95% MOD AASHTO.

Directional drilling and/or moling will be considered for the installation of long house connections beneath the road surface as well as the main reticulation. This is proposed to reduce damage to the existing asphalt road surfacing but will be dependent on the prevailing ground conditions.

We trust that sufficient detail has been provided to enable you to decide regarding the way forward. However, should any additional information be required, or if you wish to discuss this recommendation with us, please do not hesitate to contact us.

Yours faithfully

M VAN WYK Pr Tech Eng
Senior Technologist
pp Zutari

AC KEYSER Pr Tech Eng
Office Manager
pp Zutari

Encl. *Site Development Plan: Drawing: Gwayang Development, Structural Layout & Land Use, dated 15 May 2024rev5*

Letter from George Municipality with Reference Remainder of Erf 464: Proposed Gwayang Development: Availability of Bulk Water and Sewer Infrastructure & Associated Costs and Charges, dated 24 October 2023

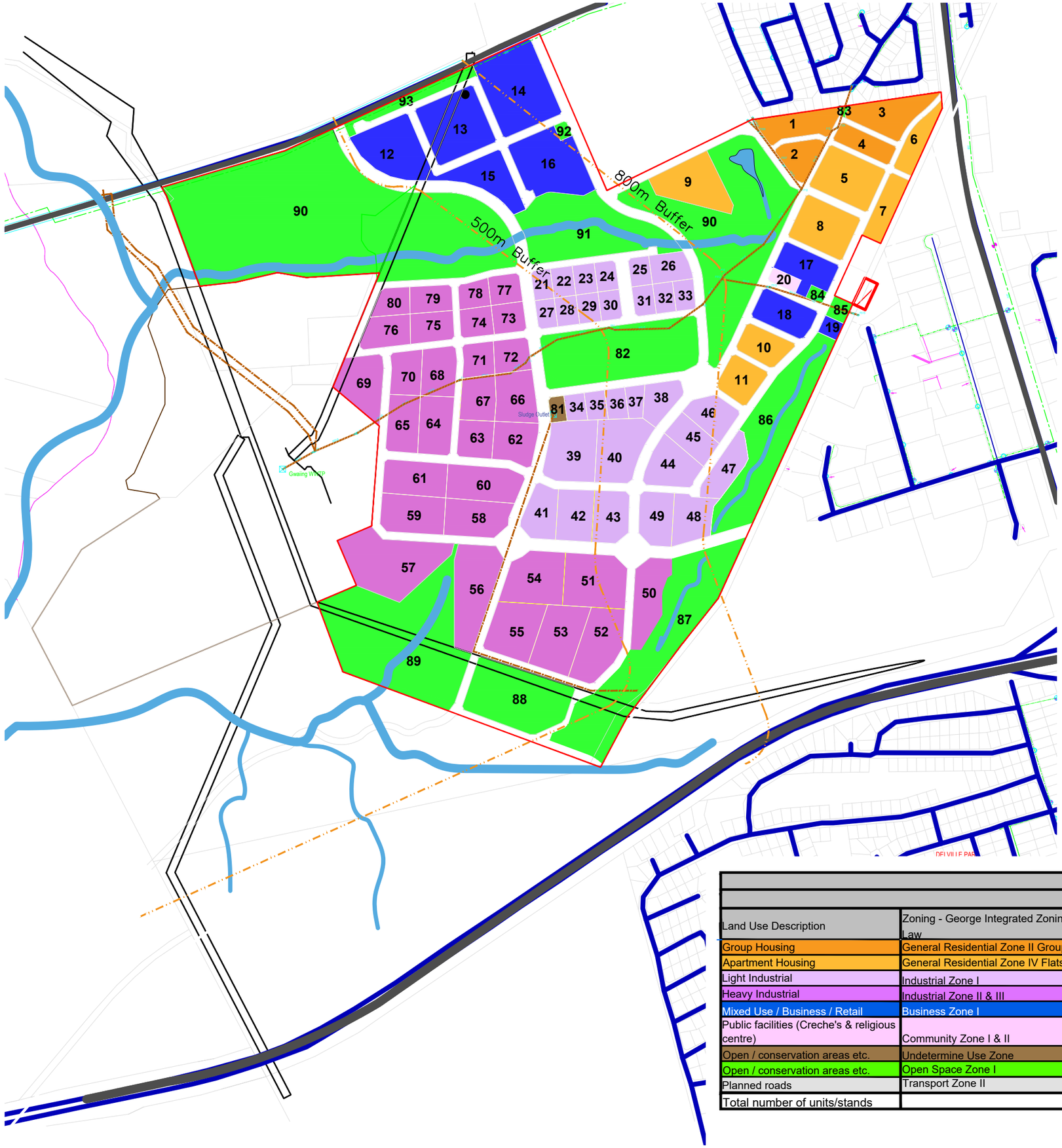
Extract from GLS Sewer Master Plan: Gwayang drainage area 2023-03

Extract from GLS Water Master Plan: Bulk & Retic – George main zone 2023-03

Updates to Water and Sewer Master Plans received from GLS, dated 25 July 2023

Information on existing services received from George Municipality, Civil Engineering Services

ANNEXURES



ZUTARI
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Gwayang Industrial Development
Drawing: Structural Layout & Land Use
Date: 15-05-2024rev5

NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)	NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)
	1	11683 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		48	11186 sqm	INDUSTRIAL ZONE I
	2	7796 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		49	10840 sqm	INDUSTRIAL ZONE I
	3	14208 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		50	15388 sqm	INDUSTRIAL ZONE II & III
	4	7528 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		51	20075 sqm	INDUSTRIAL ZONE II & III
	5	18087 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		52	17609 sqm	INDUSTRIAL ZONE II & III
	6	7985 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		53	17743 sqm	INDUSTRIAL ZONE II & III
	7	8636 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		54	18195 sqm	INDUSTRIAL ZONE II & III
	8	17032 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		55	16705 sqm	INDUSTRIAL ZONE II & III
	9	17985 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		56	22980 sqm	INDUSTRIAL ZONE II & III
	10	9048 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		57	30915 sqm	INDUSTRIAL ZONE II & III
	11	9308 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		58	14178 sqm	INDUSTRIAL ZONE II & III
	12	20710 sqm	BUSINESS ZONE 1		59	14856 sqm	INDUSTRIAL ZONE II & III
	13	24045 sqm	BUSINESS ZONE 1		60	15540 sqm	INDUSTRIAL ZONE II & III
	14	40809 sqm	BUSINESS ZONE 1		61	13406 sqm	INDUSTRIAL ZONE II & III
	15	14550 sqm	BUSINESS ZONE 1		62	10749 sqm	INDUSTRIAL ZONE II & III
	16	24578 sqm	BUSINESS ZONE 1		63	8159 sqm	INDUSTRIAL ZONE II & III
	17	11580 sqm	BUSINESS ZONE 1		64	12026 sqm	INDUSTRIAL ZONE II & III
	18	11601 sqm	BUSINESS ZONE 1		65	11218 sqm	INDUSTRIAL ZONE II & III
	19	2302 sqm	BUSINESS ZONE 1		66	12585 sqm	INDUSTRIAL ZONE II & III
	20	2607 sqm	COMMUNITY ZONE I & II		67	9494 sqm	INDUSTRIAL ZONE II & III
	21	3569 sqm	INDUSTRIAL ZONE I		68	10423 sqm	INDUSTRIAL ZONE II & III
	22	4054 sqm	INDUSTRIAL ZONE I		69	14266 sqm	INDUSTRIAL ZONE II & III
	23	4038 sqm	INDUSTRIAL ZONE I		70	8357 sqm	INDUSTRIAL ZONE II & III
	24	3850 sqm	INDUSTRIAL ZONE I		71	6471 sqm	INDUSTRIAL ZONE II & III
	25	3714 sqm	INDUSTRIAL ZONE I		72	7287 sqm	INDUSTRIAL ZONE II & III
	26	6868 sqm	INDUSTRIAL ZONE I		73	5859 sqm	INDUSTRIAL ZONE II & III
	27	3445 sqm	INDUSTRIAL ZONE I		74	5832 sqm	INDUSTRIAL ZONE II & III
	28	3974 sqm	INDUSTRIAL ZONE I		75	7924 sqm	INDUSTRIAL ZONE II & III
	29	3990 sqm	INDUSTRIAL ZONE I		76	8972 sqm	INDUSTRIAL ZONE II & III
	30	3834 sqm	INDUSTRIAL ZONE I		77	5627 sqm	INDUSTRIAL ZONE II & III
	31	3876 sqm	INDUSTRIAL ZONE I		78	5052 sqm	INDUSTRIAL ZONE II & III
	32	3739 sqm	INDUSTRIAL ZONE I		79	6945 sqm	INDUSTRIAL ZONE II & III
	33	3811 sqm	INDUSTRIAL ZONE I		80	5781 sqm	INDUSTRIAL ZONE II & III
	34	3381 sqm	INDUSTRIAL ZONE I		81	2502 sqm	UNDETERMINED USE ZONE
	35	3632 sqm	INDUSTRIAL ZONE I		82	51958 sqm	OPEN SPACE ZONE I
	36	3893 sqm	INDUSTRIAL ZONE I		83	506 sqm	OPEN SPACE ZONE I
	37	3441 sqm	INDUSTRIAL ZONE I		84	1473 sqm	OPEN SPACE ZONE I
	38	7928 sqm	INDUSTRIAL ZONE I		85	2733 sqm	OPEN SPACE ZONE I
	39	18341 sqm	INDUSTRIAL ZONE I		86	50103 sqm	OPEN SPACE ZONE I
	40	18224 sqm	INDUSTRIAL ZONE I		87	65625 sqm	OPEN SPACE ZONE I
	41	10060 sqm	INDUSTRIAL ZONE I		88	34257 sqm	OPEN SPACE ZONE I
	42	11495 sqm	INDUSTRIAL ZONE I		89	83737 sqm	OPEN SPACE ZONE I
	43	11097 sqm	INDUSTRIAL ZONE I		90	211685 sqm	OPEN SPACE ZONE I
	44	12538 sqm	INDUSTRIAL ZONE I		91	46465 sqm	OPEN SPACE ZONE I
	45	8699 sqm	INDUSTRIAL ZONE I		92	1298 sqm	OPEN SPACE ZONE I
	46	9627 sqm	INDUSTRIAL ZONE I		93	8894 sqm	OPEN SPACE ZONE I
	47	9947 sqm	INDUSTRIAL ZONE I				

Gwayang Development - George

Projected Land Use

Land Use Description	Zoning - George Integrated Zoning Scheme By-Law	Units	Stands	Density	stand size (average)	Area (ha)	FAR	GLA (m2)	% of total area	% of units
Group Housing	General Residential Zone II Group Housing	145	4	35	285	4.1	na	na	4.1%	7.6%
Apartment Housing	General Residential Zone IV Flats/Apartments	1762	7	200	1.3	8.8	1.0	88081	8.8%	92.4%
Light Industrial	Industrial Zone I	na	32	na	0.6	20.7	1.5	310637	11.4%	na
Heavy Industrial	Industrial Zone II & III	na	17	na	2.2	38.1	1.5	570926	21.0%	na
Mixed Use / Business / Retail	Business Zone I	na	8	na	2	15.0	3.0	450525	8.3%	na
Public facilities (Creche's & religious centre)	Community Zone I & II	na	4	na	0.07	0.3	1.0	2607	0.1%	na
Open / conservation areas etc.	Undetermine Use Zone	na	na	na	na	0.3	na	na	0.1%	na
Open / conservation areas etc.	Open Space Zone I	na	4	na	1.0	55.9	na	na	30.8%	na
Planned roads	Transport Zone II	na	tbd	na	na	38.2	na	na	21.1%	na
Total number of units/stands		1907	75			181.3			100%	100%

RL Daniels
Acting Director: Civil Engineering Services
Directorate: Civil Engineering Services
E-mail: rldaniels@george.gov.za
Tel: +27 (0)44 801 9278

Reference number: Erf RE 464 (Gwayang)
Date: 24 October 2023

Enquiries: M Geyer
044 801 9268

ATTENTION: MRS M VAN WYK

ZUTARI (Pty) Ltd
PO BOX 509
George
6530

REMAINDER OF ERF 464: PROPOSED GWAYANG DEVELOPMENT

AVAILABILITY OF BULK WATER AND SEWER INFRASTRUCTURE & ASSOCIATED COSTS AND CHARGES

The accommodation of the proposed development in the George Municipal water and sanitation system refers.

The Civil Engineering Services (CES) Directorate confirms that the proposed development was taken into consideration in the current and future water and sanitation master plans as part of the George Municipal development area.

Upon conclusion of the above, the appointed master planning consultant, GLS, provided the required technical detail to confirm the water and sanitation system upgrades required and associated estimated costs to support the proposed development.

1. PROPOSED DEVELOPMENT

The proposed implementation plan of the development is included in Annexure A.

2. WATER AND SANITATION BULK INFRASTRUCTURE CAPACITY

In line with general growth and demand, new supporting bulk infrastructure must be constructed, and existing infrastructure upgraded and/or abandoned where necessary to accommodate the services demand of all new developments in George.

The capacity of the treatment works, and bulk infrastructure is discussed below.

2.1. TREATMENT CAPACITY

a) Water Treatment:

- The Water Treatment Works (old and new) is currently operating under constraint.
- A 20Ml/day capacity upgrade of the new treatment works is in progress with an estimated completion date of during January/February 2025.
- After commissioning the treatment works, at the time, will have sufficient capacity for the development in its entirety once the 20Ml/day capacity upgrade is commissioned.

b) Wastewater Treatment:

- The Gwaing Wastewater Treatment works has insufficient capacity to support the development.

- A 10Ml/day capacity upgrade is currently within the planning phase. The timeframe for the upgrade of the facility to support the development is currently unknown. Furthermore, the capacity upgrade is dependent on the availability of capital funding.

2.2. BULK PIPELINES AND PUMP STATIONS

a) Water

- George Main Zone – reservoirs: The development falls within the George main zone. Currently sufficient spare storage capacity exists within the zone.
- Airport mainline: The upgrade of the Airport mainline is scheduled for implementation in the 2023/24 and 2024/25 financial year. Phase 1 (incorporating the Gwayang development) is scheduled for completion by June 2024. The pipeline will have sufficient capacity for the development in its entirety once the upgraded phase 1 portion of the pipeline is commissioned.

b) Sanitation

Pacaltsdorp Pump Stations 2, 5 and 7:

- The sanitation masterplan has earmarked the pump stations for abandonment to drain via a new gravity sewer system to the Gwaing WWTW.
- New gravity sewer mains will have to implemented in order to drain the portions situated on the southeastern boundary of the development which will also include the flow from these pump stations.

Groeneweide Ext PS F1:

- The northern part of the development can drain via gravity to a new sewer pump station Groeneweide Ext PS F1, and pump via a new rising main to the existing Gwaing WWTW.

Groeneweide Ext PS F3:

- The new gravity sewers collecting sewage from the abandoned Pacaltsdorp sanitation pump stations 2, 5 and 7 as well as the remainder of the development will drain via gravity to the future Groeneweide Ext PS F3, and pump via the future rising main to the existing Gwaing WWTW.

The existing municipal sanitation infrastructure (specifically the treatment works) cannot support the development. Alternative infrastructure will have to be considered if the development is to proceed prior to capacity upgrades.

3. ALTERNATIVE SANITATION BULK INFRASTRUCTURE CAPACITY

No alternative exists for the treatment of wastewater from the development or any other development.

Other options could be identified that will require further investigation to determine their viability.
Such options are:

- Implementation of an on-site package plant
- Construction of an interim pump station to pump all wastewater to the existing network that can drain to the Outeniqua WWTW's. Note that interim infrastructure as well as the infrastructure described in section 2.2b) will be for the cost of the development.

4. COST

The estimated pro-rata (excluding VAT) cost for water and sanitation infrastructure upgrades in support of the development amounts to:

- Water : R 50 791 000.00
- Sanitation : R 39 742 000.00
- **Total : R 90 533 000.00**

A breakdown of the cost indicated above are included in table 1 below for ease of reference.

Table 1: Estimate pro-rata cost breakdown

Description	GLS Table reference	Water (Excluding VAT)	Sanitation (Excluding VAT)
General items required	1 & 2	R 36 942 000.00	R 24 725 000.00
Development specific items required	1 & 2	R 13 849 000.00	R 15 017 000.00
Total		**R 50 791 000.00**	**R 39 742 000.00**

It should be noted that the unit cost for the water and sanitation infrastructure included in the water and sanitation master plan is under review. The cost and pro-rata cost indicated by GLS and captured in this memorandum is therefore subject to change and is furthermore subject to change based on actual construction cost.

Refer to annexure B for the associated water and sanitation costs.

5. BULK INFRASTRUCTURE IMPLEMENTATION

The developing Directorate will be required to perform the necessary project management services from commencement to close out for implementation of the bulk, link and internal infrastructure, excluding treatment works upgrades. The Directorate shall ensure sufficient capital budget is in place for the appointment of all consultants and specialists for the full project life cycle, the appointment of contractors and the associated construction costs.

The deliverables per stage shall be submitted to the Civil Engineering Services Directorate for approval and who shall be invited to attend all construction progress meetings.

6. DEVELOPMENT CHARGES

The current total development charges (DC's) relating to Civil Engineering Services (roads, water, and sanitation services only), and in accordance with the current guidelines, for the development as currently proposed were calculated on 24 October 2023 and amount to R 240 093 482.44 excluding VAT. This amount includes water, sanitation, and road development contributions and will also be adjusted according to the final approved land uses per individual erf.

The Developer is reminded of the following Clause relating to the calculation of development charges:
"Any amendments or additions to the proposed development which is not contained within the calculation sheet as stated in clause 2 above which might lead to an increase in the proportional contribution to municipal public expenditure, will result in the recalculation of the development chargers and the amendment of these conditions of approval or the imposition of other relevant conditions of approval."

In addition, the development charges amount is subject to amendment based on annual escalation and applicable at the time that development contributions are due for payment. The Council has an approved Development Contributions Policy and guidelines for the calculation of DC's.

The CES Directorate notes that authority by Council is required to waive DC's for the proposed development. The Directorate: Human Settlements, Planning and Development and Investment Property Management will be required to prepare an item to obtain the necessary authorization from Council to waive any DC's, and the source of funding from municipal own financial resources will have to be identified at the same time.

7. COMMENCEMENT OF DEVELOPMENT

The development, in its entirety or in phases, is subject to confirmation by the Director: Civil Engineering Services regarding the availability of water supply & treatment capacity and sanitation bulk conveyance & treatment capacity at the time of the development implementation, or if developed in phases before the commencement of each phase.

A development/implementation program is to be provided by the Developer when requesting confirmation of the capacity from the Director: Civil Engineering Services. If the Developer does not adhere to the program provided and approved by the Director: Civil Engineering Services, the Director: Civil Engineering Services will be entitled to revise the availability of such bulk capacity.

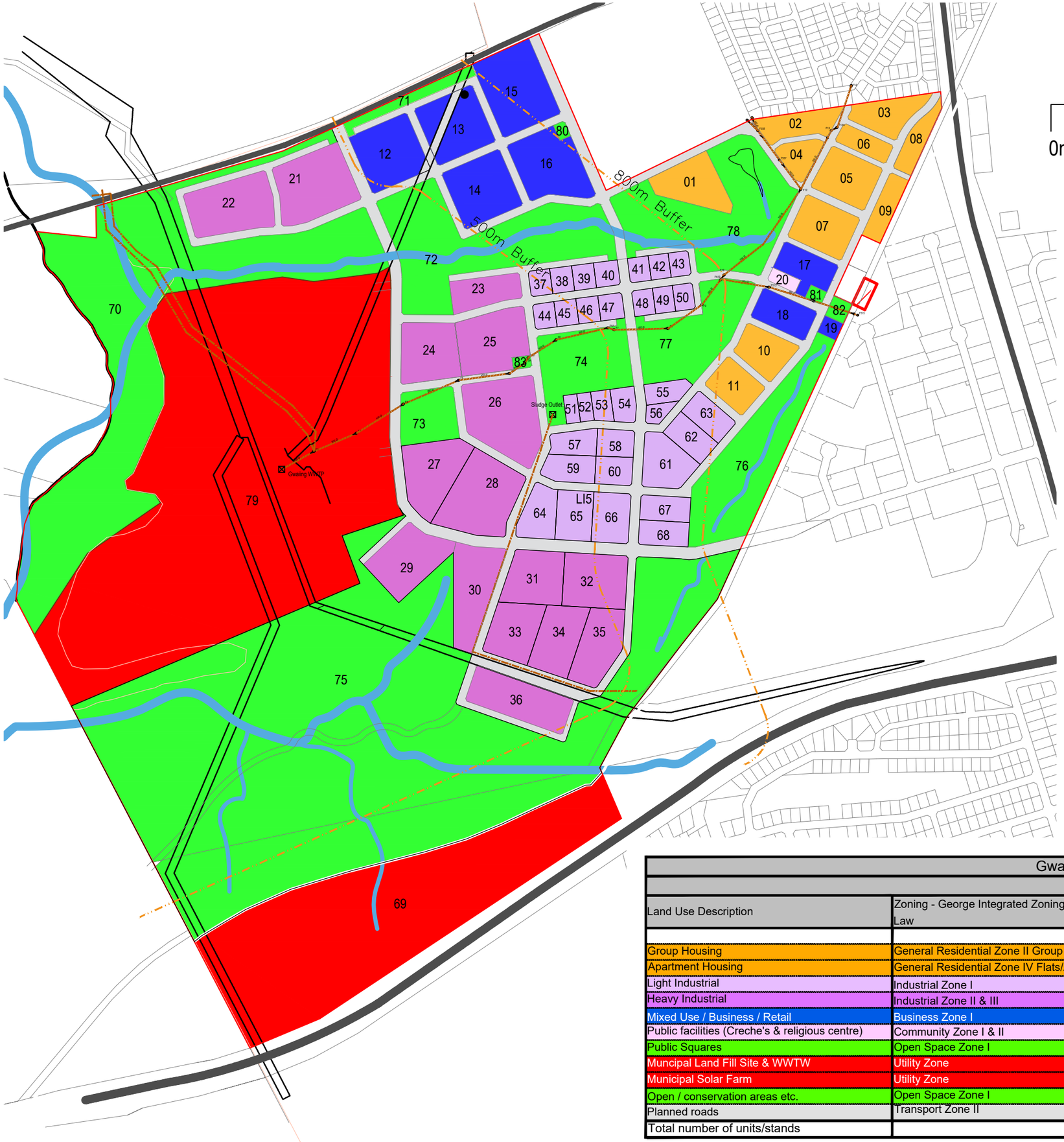
No development may connect to the municipal water and sewer system unless the required bulk and link infrastructure is available, and a services agreement (if applicable) is signed between the Developer and the Municipality.

Yours faithfully,

LIONEL DANIELS
ACTING DIRECTOR: CIVIL ENGINEERING SERVICES

ANNEXURES

A Proposed development layout
B Water and Sewer masterplan items tables
C Water and sewer masterplan items figures
D Land use water and sanitation demand table



ZUTARI
IMPACT. ENGINEERED.

Gwayang Industrial Development
Drawing: Structural Layout & Land Use
Date: 28-04-2023rev2

NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)	NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)
	1	131663 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		43	3036 sqm	INDUSTRIAL ZONE I
	2	17984 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		44	3378 sqm	INDUSTRIAL ZONE I
	3	11951 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		45	3502 sqm	INDUSTRIAL ZONE I
	4	12699 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		46	3507 sqm	INDUSTRIAL ZONE I
	5	7696 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		47	3827 sqm	INDUSTRIAL ZONE I
	6	16565 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		48	3366 sqm	INDUSTRIAL ZONE I
	7	6800 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		49	3246 sqm	INDUSTRIAL ZONE I
	8	8129 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		50	3238 sqm	INDUSTRIAL ZONE I
	9	8636 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		51	2439 sqm	INDUSTRIAL ZONE I
	10	12787 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		52	2456 sqm	INDUSTRIAL ZONE I
	11	11384 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		53	3702 sqm	INDUSTRIAL ZONE I
	12	23606 sqm	BUSINESS ZONE 1		54	5001 sqm	INDUSTRIAL ZONE I
	13	20750 sqm	BUSINESS ZONE 1		55	5448 sqm	INDUSTRIAL ZONE I
	14	23743 sqm	BUSINESS ZONE 1		56	2843 sqm	INDUSTRIAL ZONE I
	15	31430 sqm	BUSINESS ZONE 1		57	6967 sqm	INDUSTRIAL ZONE I
	16	25722 sqm	BUSINESS ZONE 1		58	6244 sqm	INDUSTRIAL ZONE I
	17	11597 sqm	BUSINESS ZONE 1		59	8474 sqm	INDUSTRIAL ZONE I
	18	11746 sqm	BUSINESS ZONE 1		60	6435 sqm	INDUSTRIAL ZONE I
	19	2302 sqm	BUSINESS ZONE 1		61	14399 sqm	INDUSTRIAL ZONE I
	20	2600 sqm	COMMUNITY ZONE I & II		62	8501 sqm	INDUSTRIAL ZONE I
	21	29414 sqm	INDUSTRIAL ZONE II & III		63	8467 sqm	INDUSTRIAL ZONE I
	22	26750 sqm	INDUSTRIAL ZONE II & III		64	10885 sqm	INDUSTRIAL ZONE I
	23	12429 sqm	INDUSTRIAL ZONE II & III		65	11195 sqm	INDUSTRIAL ZONE I
	24	20510 sqm	INDUSTRIAL ZONE II & III		66	11470 sqm	INDUSTRIAL ZONE I
	25	24364 sqm	INDUSTRIAL ZONE II & III		67	7733 sqm	INDUSTRIAL ZONE I
	26	33021 sqm	INDUSTRIAL ZONE II & III		68	7608 sqm	INDUSTRIAL ZONE I
	27	23061 sqm	INDUSTRIAL ZONE II & III		69	245498 sqm	UTILITY ZONE
	28	31257 sqm	INDUSTRIAL ZONE II & III		70	268038 sqm	OPEN SPACE ZONE I
	29	23128 sqm	INDUSTRIAL ZONE II & III		71	9215 sqm	OPEN SPACE ZONE I
	30	24121 sqm	INDUSTRIAL ZONE II & III		72	93535 sqm	OPEN SPACE ZONE I
	31	18717 sqm	INDUSTRIAL ZONE II & III		73	18326 sqm	OPEN SPACE ZONE I
	32	21091 sqm	INDUSTRIAL ZONE II & III		74	38394 sqm	OPEN SPACE ZONE I
	33	16913 sqm	INDUSTRIAL ZONE II & III		75	717418 sqm	OPEN SPACE ZONE I
	34	18211 sqm	INDUSTRIAL ZONE II & III		76	66639 sqm	OPEN SPACE ZONE I
	35	18705 sqm	INDUSTRIAL ZONE II & III		77	43767 sqm	OPEN SPACE ZONE I
	36	23795 sqm	INDUSTRIAL ZONE II & III		78	84128 sqm	OPEN SPACE ZONE I
	37	3391 sqm	INDUSTRIAL ZONE I		79	578784 sqm	UTILITY ZONE
	38	3458 sqm	INDUSTRIAL ZONE I		80	1196 sqm	OPEN SPACE ZONE I
	39	3435 sqm	INDUSTRIAL ZONE I		81	1473 sqm	OPEN SPACE ZONE I
	40	3708 sqm	INDUSTRIAL ZONE I		82	2735 sqm	OPEN SPACE ZONE I
	41	3202 sqm	INDUSTRIAL ZONE I		83	1377 sqm	OPEN SPACE ZONE I
	42	3058 sqm	INDUSTRIAL ZONE I		84	333852 sqm	TRANSPORT ZONE II

Gwayang Development - George
Projected Land Use

Land Use Description	Zoning - George Integrated Zoning Scheme By-Law	Units	Stands	Density	stand size (average)	Area (ha)	FAR	GLA (m2)	% of total area	% of units
Group Housing	General Residential Zone II Group Housing	137	4	35	285	3.9	na	na	1%	6.9%
Apartment Housing	General Residential Zone IV Flats/Apartments	1850	7	200	1.3	9.3	1.0	92517	3%	93.1%
Light Industrial	Industrial Zone I	na	32	na	0.5	16.7	1.5	251003	5%	na
Heavy Industrial	Industrial Zone II & III	na	16	na	2.3	36.5	1.5	548231	11%	na
Mixed Use / Business / Retail	Business Zone I	na	8	na	2	15.1	3.0	452688	5	na
Public facilities (Creche's & religious centre)	Community Zone I & II	na	4	na	0.07	0.3	1.0	2600	5%	na
Public Squares	Open Space Zone I	na	4	na	1.0	0.5	na	na	0%	na
Muncipal Land Fill Site & WWTW	Utility Zone	na	2	na	na	57.9	na	na	17%	na
Municipal Solar Farm	Utility Zone	na	1	na	na	24.5	na	na	7%	na
Open / conservation areas etc.	Open Space Zone I	na	9	na	na	134	na	na	40%	na
Planned roads	Transport Zone II	na	tbd	na	na	33.4	na	na	10%	na
Total number of units/stands		1988	87			332.1			100%	100%

Table 1: Sewer MP Items

Item No		MP Type	Description	Existing Diam (mm)	New Diam (mm)	Length (m)	Design Flow	Cost	Pro-rata Cost	
GW_17.00		MP	Upgrade existing Treatment Plant: Gwaiing WWTW	-	-	-	3.5 ML/d	R 93 851 000	R 20 999 000	22.37%
GW_17.01a		MP	Upgrade existing Flow Diversion	-	-	-	845.9 L/s	R 690 000	R 155 000	22.37%
GW_17.01b		MP	New Gravity	-	315	21	101.6 L/s	R 147 000	R 33 000	22.37%
GW_17.01c		MP	New Treatment Plant: Gwaiing WWTW	-	-	-	4.2 ML/d	R 109 666 000	R 24 537 000	22.37%
GW_39.01		MPa	Abandon existing Pump Station: Pacaltsdorp PS 5	-	-	-	- L/s	R 284 000	R -	0.00%
GW_39.02		MPa	Abandon existing Rising	150	200	434	- L/s	R 10 000	R -	0.00%
GW_39.03		MPa	Abandon existing Gravity	150	160	6	- L/s	R 10 000	R -	0.00%
GW_F17.01		FM	New Flow Diversion	-	-	-	1.4 L/s	R -	R -	0.00%
GW_F17.02		FM	New Gravity	-	160	47	1.4 L/s	R 341 000	R -	0.00%
GW_F17.03		FM	New Gravity	-	160	164	3.5 L/s	R 389 000	R 256 000	65.71%
GW_F17.04		FM	New Gravity	-	160	363	4.4 L/s	R 796 000	R 597 000	75.00%
GW_F17.05		FM	New Gravity	-	160	439	9.2 L/s	R 953 000	R 695 000	72.83%
GW_F17.06		FM	New Gravity	-	250	477	29.6 L/s	R 1 391 000	R 574 000	41.22%
GW_F17.07		FM	New Gravity	-	315	342	39.8 L/s	R 1 256 000	R 707 000	56.28%
GW_F17.08		FM	New Gravity	-	315	466	43.1 L/s	R 1 689 000	R 1 008 000	59.63%
GW_F17.09		FM	New Gravity (Future extension)	-	315	202	43.2 L/s	n.a.	n.a.	0.00%
GW_32.01		MPa	Abandon existing Pump Station: Pacaltsdorp PS 7	-	-	-	- L/s	R 284 000	R -	0.00%
GW_32.02		MPa	Abandon existing Rising	110	125	546	- L/s	R 10 000	R -	0.00%
GW_32.03		MPa	Abandon existing Gravity	110	110	5	- L/s	R 10 000	R -	0.00%
GW_F44.01		FM	New Flow Diversion	-	-	-	1.5 L/s	R -	R -	0.00%
GW_F44.02a		FM	New Gravity	-	160	39	1.5 L/s	R 291 000	R -	0.00%
GW_F44.02b		FM	New Gravity	-	160	15	1.5 L/s	R 83 000	R -	0.00%
OT_22.01		MPa	Abandon existing Pump Station: Pacaltsdorp PS 2	-	-	-	- L/s	R 284 000	R -	0.00%
OT_22.02		MPa	Abandon existing Rising	160	160	2 106	- L/s	R 10 000	R -	0.00%
OT_22.03		MPa	Abandon existing Gravity	149	160	8	- L/s	R 10 000	R -	0.00%
GW_F18.01		FM	New Flow Diversion	-	-	-	15.0 L/s	R -	R -	0.00%
GW_F18.02a		FM	New Gravity	-	160	156	15.0 L/s	R 374 000	R -	0.00%
GW_F18.02b		FM	New Gravity	-	160	94	15.0 L/s	R 630 000	R -	0.00%
GW_F18.02c		FM	New Gravity	-	160	59	15.0 L/s	R 175 000	R -	0.00%
GW_F18.03a		FM	New Gravity	-	160	67	15.8 L/s	R 191 000	R 10 000	5.06%
GW_F18.03b		FM	New Gravity	-	160	27	15.8 L/s	R 217 000	R 11 000	5.06%
GW_F18.03c		FM	New Gravity	-	160	92	15.8 L/s	R 243 000	R 13 000	5.06%
GW_F19.00		FM	New Gravity	-	160	379	7.5 L/s	R 830 000	R 830 000	100.00%
GW_F20.01a		FM	New Gravity	-	160	21	1.5 L/s	R 182 000	R 182 000	100.00%
GW_F20.01b		FM	New Gravity	-	160	193	1.5 L/s	R 448 000	R 448 000	100.00%
GW_F20.02		FM	New Gravity	-	160	147	2.7 L/s	R 355 000	R 355 000	100.00%
GW_F21.01a		FM	New Gravity	-	160	21	1.5 L/s	R 178 000	R 178 000	100.00%
GW_F21.01b		FM	New Gravity	-	160	312	1.5 L/s	R 692 000	R 692 000	100.00%
GW_F21.02		FM	New Gravity	-	160	237	3.4 L/s	R 538 000	R 538 000	100.00%
GW_F72.01	#[1]	FA	New Flow Diversion (Alternative)	-	-	-	43.2 L/s	R -	R -	59.49%
GW_F72.02	#[1]	FA	New Gravity (Alternative)	-	315	11	43.2 L/s	R 97 000	R 58 000	59.49%
GW_F73.01	#[1]	FA	New Pump Station (Alternative): Groeneweide Ext. PS F3	-	-	-	50.0 L/s	R 5 624 000	R 3 346 000	59.49%
GW_F73.02	#[1]	FA	New Rising (Alternative)	-	250	1 295	- L/s	R 3 112 000	R 1 852 000	59.49%
GW_F45.01		FM	New Gravity	-	160	437	4.1 L/s	R 949 000	R 949 000	100.00%
GW_F45.02		FM	New Gravity	-	160	503	12.7 L/s	R 1 082 000	R 1 082 000	100.00%
GW_F05.09		FM	New Gravity	-	200	37	23.4 L/s	R 140 000	R 91 000	64.53%
GW_F05.08		FM	New Gravity (Future connection)	-	160	79	8.8 L/s	n.a.	n.a.	0.00%
GW_F06.01		FM	New Pump Station: Groeneweide Ext. PS F1	-	-	-	23.4 L/s	R 4 081 000	R 2 634 000	64.53%
GW_F06.02		FM	New Rising	-	160	548	23.4 L/s	R 897 000	R 579 000	64.53%
							Total	R 233 490 000	R 63 409 000	

Notes: *#[1] Interim Pump Station prior to the implementation of future Groeneweide Ext. PS F2*

Yellow - development specific at R39 742 000

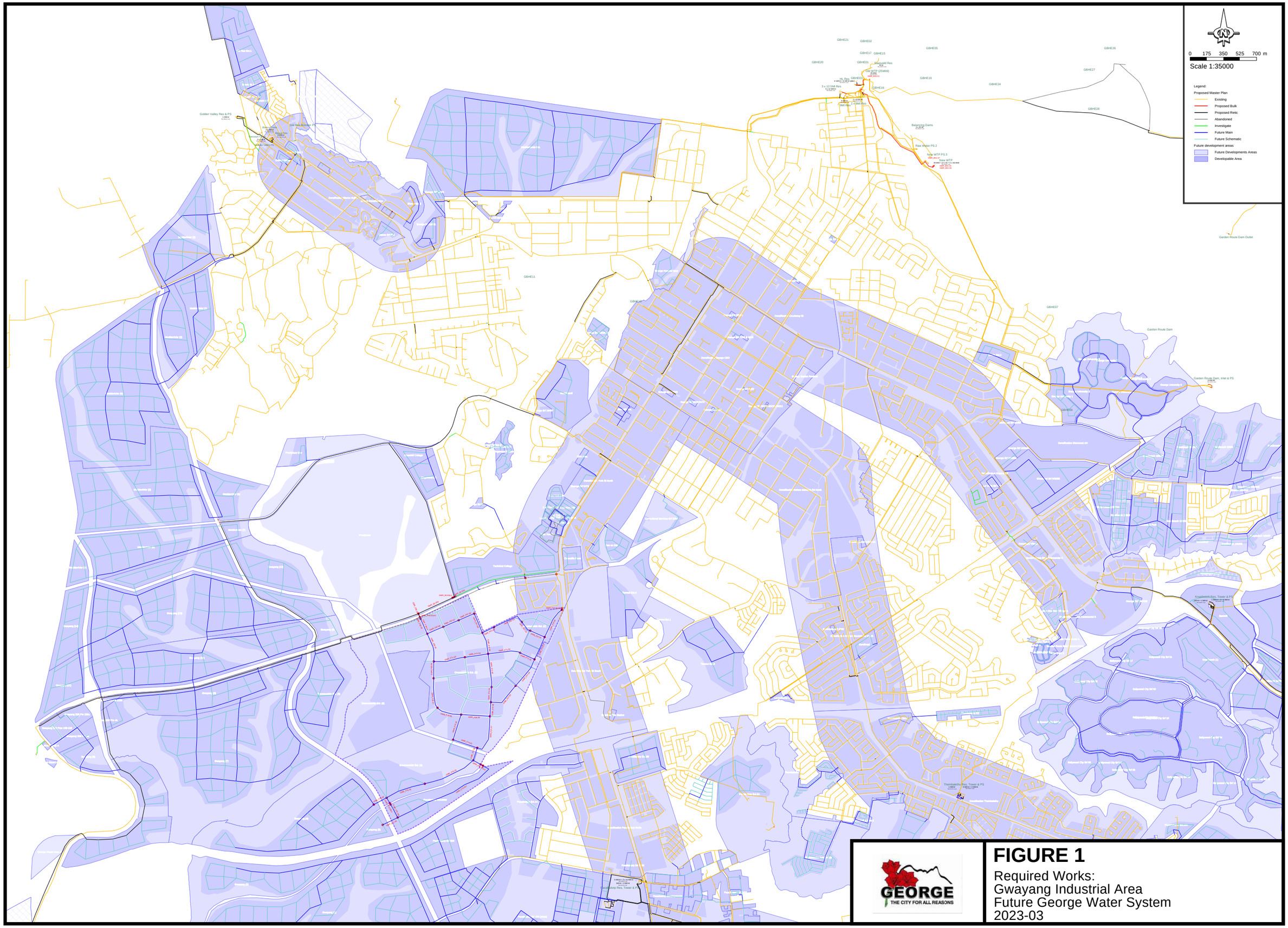
Green - general at R24 725 000

Table 1: Water MP Items

Item No	MP Type	Description	Extent	Size	Cost	Pro-rata Cost
GMR_B15.01 #[1]	MP	Water Treatment Facility to install: Old WTP	4 500 m³/d @	306 m EGL	R 78 959 000	R 7 617 000 9.65%
GMR_B01.01	MP	Water Treatment Facility to install: New WTP	20 000 m³/d @	254 m EGL	R 279 600 000	R 26 972 000 9.65%
GMR_B01.06	MP	Pipe to install	7 m x	500 mm Ø	R 630 000	R 61 000 9.65%
GMR_B01.07	MP	Pump Only to install: New WTP PS	160 L/s @	50 m	R 1 532 000	R 148 000 9.65%
GMR_05.02d	MP	Pipe to install	13 m x	400 mm Ø	R 438 000	R 153 000 34.92%
GMR_05.03a	MP	Pressure Reducing Valve to install (future)	250 m EGL	350 mm Ø	n.a.	n.a. 34.92%
GMR_05.03b	MP	Pipe to install (interim)	1 x	400 mm Ø	R 383 000	R 134 000 34.92%
GMR_05.03c	MP	Pipe with meter to install	1 x	350 mm Ø	R 642 000	R 225 000 34.92%
GMR_05.04a	MP	Pipe to install	398 m x	400 mm Ø	R 2 676 000	R 935 000 34.92%
GMR_05.04b	MP	Pipe to install (future connection)	419 m x	400 mm Ø	n.a.	n.a. 0.00%
GMR_F27.01a	FM	Pressure Reducing Valve to install	250 m EGL	200 mm Ø	R 530 000	R 455 000 85.79%
GMR_F27.01b	FM	Pipe with meter to install	1 x	200 mm Ø	R 282 000	R 242 000 85.79%
GMR_F27.02	FM	Pipe to install	355 m x	250 mm Ø	R 929 000	R 797 000 85.79%
GMR_F27.03	FM	Pipe to install	258 m x	200 mm Ø	R 589 000	R 484 000 82.17%
GMR_F27.04	FM	Pipe to install	347 m x	200 mm Ø	R 773 000	R 605 000 78.17%
GMR_F27.05	FM	Pipe to install	345 m x	200 mm Ø	R 770 000	R 549 000 71.17%
GMR_F27.06	FM	Pipe to install	149 m x	200 mm Ø	R 364 000	R 227 000 62.13%
GMR_F27.07	FM	Pipe to install	421 m x	200 mm Ø	R 927 000	R 511 000 55.02%
GMR_F27.08	FM	Pipe to install	138 m x	200 mm Ø	R 342 000	R 156 000 45.59%
GMR_F28.01	MP	Pipe to install	40 m x	250 mm Ø	R 375 000	R 313 000 83.21%
GMR_F28.02a	FM	Pressure Reducing Valve to install	250 m EGL	200 mm Ø	R 530 000	R 442 000 83.21%
GMR_F28.02b	FM	Pipe with meter to install	1 x	200 mm Ø	R 282 000	R 235 000 83.21%
GMR_F28.03	FM	Pipe to install	14 m x	250 mm Ø	R 120 000	R 100 000 83.21%
GMR_F28.04	FM	Pipe to install	173 m x	250 mm Ø	R 497 000	R 406 000 81.61%
GMR_F28.05	FM	Pipe to install	306 m x	200 mm Ø	R 689 000	R 524 000 76.03%
GMR_F28.06	FM	Pipe to install	177 m x	200 mm Ø	R 422 000	R 298 000 70.60%
GMR_F28.07	FM	Pipe to install	320 m x	200 mm Ø	R 719 000	R 488 000 67.74%
GMR_F28.08	FM	Pipe to install	266 m x	200 mm Ø	R 606 000	R 367 000 60.55%
GMR_F28.09	FM	Pipe to install	304 m x	200 mm Ø	R 685 000	R 336 000 48.92%
GMR_F67.01	FM	Pipe to install	166 m x	160 mm Ø	R 305 000	R 274 000 89.66%
GMR_F67.02	FM	Pipe to install	131 m x	160 mm Ø	R 249 000	R 232 000 92.79%
GMR_F67.03	FM	Pipe to install	350 m x	160 mm Ø	R 600 000	R 540 000 89.87%
GMR_F67.04	FM	Pipe to install	137 m x	160 mm Ø	R 259 000	R 223 000 86.05%
GMR_F67.05	FM	Pipe to install	221 m x	160 mm Ø	R 393 000	R 190 000 48.13%
GMR_F67.06	FM	Pipe to install	178 m x	160 mm Ø	R 324 000	R 245 000 75.44%
GMR_F67.07	FM	Pipe to install	177 m x	160 mm Ø	R 322 000	R 267 000 82.90%
GMR_F67.08	FM	Pipe to install	185 m x	160 mm Ø	R 336 000	R 294 000 87.28%
GMR_F71.01	FM	Pipe to install	167 m x	160 mm Ø	R 306 000	R 273 000 89.07%
GMR_F71.02	FM	Pipe to install	343 m x	160 mm Ø	R 588 000	R 521 000 88.46%
GMR_F71.03	FM	Pipe to install	248 m x	160 mm Ø	R 436 000	R 342 000 78.28%
GMR_F71.04	FM	Pipe to install	334 m x	160 mm Ø	R 574 000	R 525 000 91.34%
GMR_F72.01	FM	Pipe to install	160 m x	160 mm Ø	R 296 000	R 187 000 62.98%
GMR_F72.02	FM	Pipe to install	353 m x	160 mm Ø	R 604 000	R 423 000 69.98%
GMR_F72.03	FM	Pipe to install	233 m x	160 mm Ø	R 412 000	R 274 000 66.45%
GMR_F74.01	FM	Pipe to install	269 m x	160 mm Ø	R 470 000	R 218 000 46.21%
GMR_F74.02	FM	Pipe to install	279 m x	160 mm Ø	R 486 000	R 281 000 57.64%
GMR_F75.01	FM	Pipe to install	388 m x	160 mm Ø	R 661 000	R 269 000 40.67%
GMR_F75.02	FM	Pipe to install	618 m x	160 mm Ø	R 1 030 000	R 400 000 38.76%
GMR_F75.03	FM	Pipe to install (future connection)	153 m x	160 mm Ø	n.a.	n.a. 0.00%
GMR_F76.01a	FM	Pipe to install	90 m x	160 mm Ø	R 183 000	R 80 000 43.37%
GMR_F76.01b	FM	Pipe to install	27 m x	160 mm Ø	R 170 000	R 74 000 43.37%
GMR_F76.01c	FM	Pipe to install	1 170 m x	160 mm Ø	R 1 913 000	R 830 000 43.37%
GMR_F76.02a	FM	Pipe to install	158 m x	160 mm Ø	R 292 000	R 25 000 8.48%
GMR_F76.02b	FM	Pipe to install	17 m x	160 mm Ø	R 121 000	R 11 000 8.48%
GMR_F76.02c	FM	Pipe to install	66 m x	160 mm Ø	R 145 000	R 13 000 8.48%
GMR_F77.00	FM	Pipe to install (future connection)	176 m x	160 mm Ø	n.a.	n.a. 0.00%
				Total	**R 386 766 000**	**R 50 791 000**

Notes: *#[1] Refurbish WTP to original design capacity of 25 000 m ³/d .*
#[2] Construct the pump station building in accordance to the ultimate flow, install only phase 1 pump equipment (minimum pump capacity).

Green - general at R36 942 000.00
Remainder - development specific at R13 849 000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Proposed Master Plan
Existing
Proposed Bulk
Proposed Retic
Abandoned
Investigate
Future Main
Future Schematic
Future development areas
Future Developments Areas
Developable Area
Garden Route Dam
Garden Route Dam, Inlet & PS
Garden Route Dam Outlet
Raw Water PS 2
New WTP PS 3
New WTP
Old WTP (25Mld)
3 x 12.5Ml Res
Balancing Dams
Golden Valley Res & PS
Old Res Booster PS
GBHE01
GBHE02
GBHE05
GBHE07
GBHE11
GBHE15
GBHE16
GBHE17
GBHE19
GBHE20
GBHE21
GBHE24
GBHE26
GBHE27
GBHE28
GBHE29
GBHE30
GEORGE
THE CITY FOR ALL REASONS
FIGURE 1
Required Works:
Gwayang Industrial Area
Future George Water System
2023-03

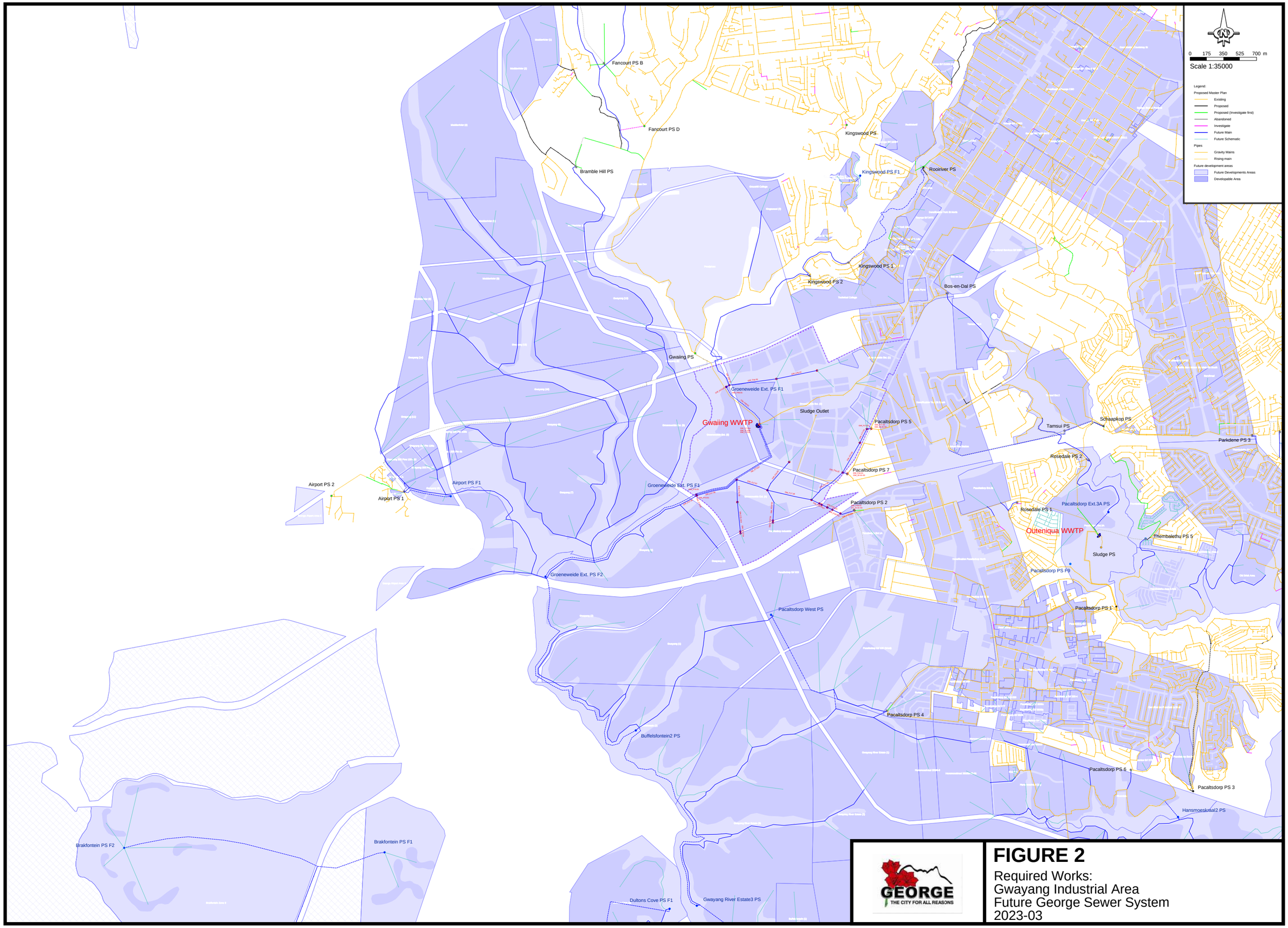

Fancourt PS B
Fancourt PS D
Bramble Hill PS
Kingswood PS
Kingswood PS F1
Rooiriver PS
Kingswood PS 1
Kingswood PS 2
Bos-en-Dal PS
Gwaiing PS
Groeneweide Ext. PS F1
Gwaiing WWTP
Sludge Outlet
Pacaltsdorp PS 5
Tamsui PS
Schaapkop PS
Parkdene PS 3
Rosedale PS 2
Pacaltsdorp PS 7
Pacaltsdorp PS 2
Rosedale PS 1
Pacaltsdorp Ext.3A PS
Outeniqua WWTP
Thembalethu PS 5
Sludge PS
Pacaltsdorp PS 9
Pacaltsdorp PS 1
Airport PS 2
Airport PS 1
Airport PS F1
Groeneweide Ext. PS F2
Pacaltsdorp West PS
Buffelsfontein2 PS
Pacaltsdorp PS 4
Pacaltsdorp PS 6
Pacaltsdorp PS 3
Hansmoeskraal2 PS
Brakfontein PS F2
Brakfontein PS F1
Dultons Cove PS F1
Gwayang River Estate3 PS
0 175 350 525 700 m
Scale 1:35000
Legend:
Proposed Master Plan
Existing
Proposed
Proposed (Investigate first)
Abandoned
Investigate
Future Main
Future Schematic
Pipes
Gravity Mains
Rising main
Future development areas
Future Developments Areas
Developable Area
GEORGE
THE CITY FOR ALL REASONS
FIGURE 2
Required Works:
Gwayang Industrial Area
Future George Sewer System
2023-03

Table 3: Water demand and sewer return flow contribution

Land Use		Unit of measure (No/100m2/ha…)	No. Units (No/100m2/ha…)	UWD/unit (kL/unit/d)	Sewer ratio (% x UWD)	AADD Inc. UAW (kL/d)	PDDWF Excl. Infilt. (kL/d)
Groeneweide Ext. (1)							
Group Housing	4.01 ha @ 35 units/ha	unit	141	0.333	85%	46.87	39.84
Apartment Housing	9.29 ha @ 200 units/ha	unit	1858	0.167	90%	309.71	278.74
	Sub-Total		**1999**			**356.58**	**318.58**
Groeneweide Ext. (2)							
Light Industrial	19.04 ha @ FSR of 0.6	100m²	1143	0.333	70%	381.00	266.70
Heavy Industrial	38.14 ha @ FSR of 0.6	100m²	2289	0.333	70%	763.00	534.10
Mixed Use / Business / Retail	15.47 ha @ FSR of 0.6	100m²	929	0.556	70%	516.11	361.28
Public facilities (Creche's & religious centre)	0.26 ha @ FSR of 0.6	100m²	16	0.667	65%	10.67	6.93
	Sub-Total		**4377**			**1 670.78**	**1 169.01**
Groeneweide Ext. (3)							
Industrial (dry), Large (FSR)	51.49 ha	100m²	100	0.222	85%	22.22	15.56
	Sub-Total		**100**			**22.22**	**15.56**
Groeneweide Ext. (4)							
Industrial (dry), Large (FSR)	23.49 ha	100m²	658	0.222	85%	146.22	102.36
	Sub-Total		**658**			**146.22**	**102.36**
Pacaltsdorp Industrial							
Industrial (dry), Large (FSR)	26.94 ha	100m²	754	0.222	85%	167.56	117.29
	Sub-Total		**754**			**167.56**	**117.29**
Total						**2 363**	**1 723**

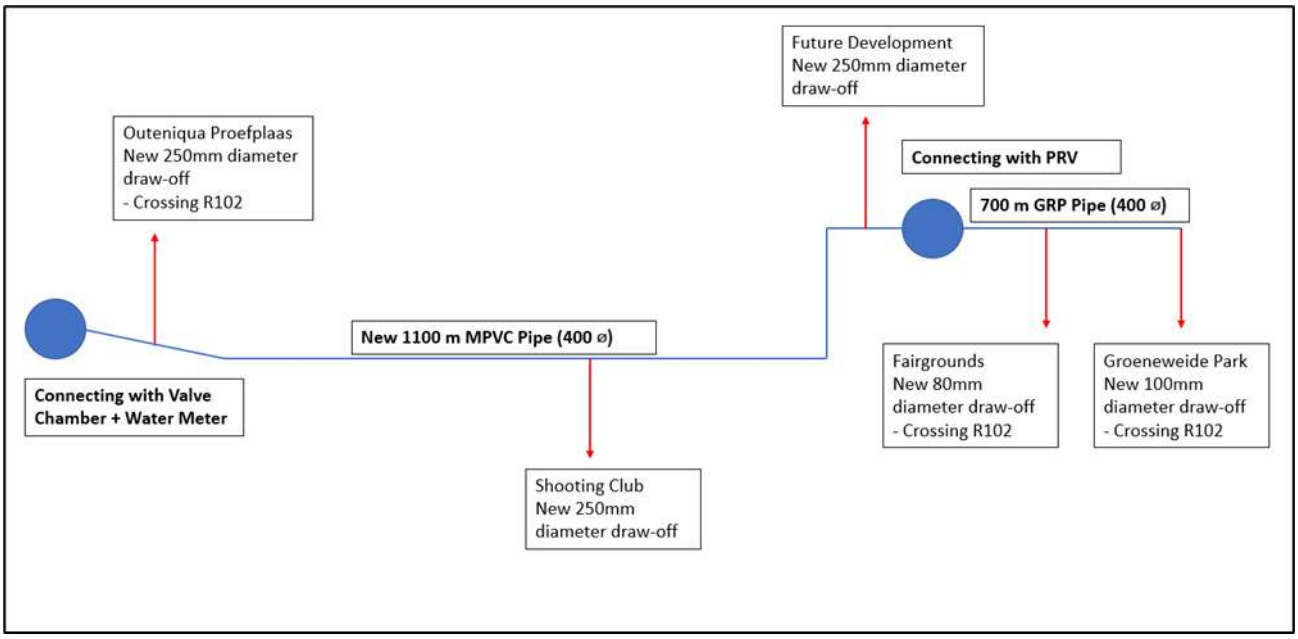
Marilise Van Wyk

From: Fabian Abrahams <fabrahams@george.gov.za>
Sent: Tuesday, 28 February 2023 15:49
To: Marilise Van Wyk
Cc: Alton Michaels
Subject: Existing CES_Gwayang Development
Attachments: 20230228_Existing CES_Zutari_Gwayang Development.pdf

Marilise,

Aangeheg soos bespreek.

Neem asb kennis dat die die 200 mm diameter pyp opgradeer gaan word met ‘n 400 mm diameter PVC-O Klas 12 en 16. Onder uittreksel vir inligiting.



Regards / Groete

Fabian Abrahams (Pr Eng Techni)
Senior Engineering Technician (CAD/GIS)
Civil Engineering Services: Planning, PMU & Support Services

Office: 044 801 9348
Cell: 083 452 4805
Email: fabrahams@george.gov.za

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Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

George Stormwater

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

Gwaiing PS

Gwaiing WWTW

Bos-en-Dal PS

Pacaltsdorp PS 5

Pacaltsdorp PS 7

Pacaltsdorp PS 2

GEORGE MUNICIPALITY

N

GEORGE
THE CITY FOR ALL REASONS

Existing Civil Engineering Services

2023-02-28 15:35

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THE CITY FOR ALL REASONS

Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

George Stormwater

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

400 Ø uPVC
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø

GEORGE MUNICIPALITY

N

GEORGE
THE CITY FOR ALL REASONS

Water: System Type

2023-02-28 15:39

GEORGE
THE CITY FOR ALL REASONS

Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

George Stormwater

S-300 Ø
S-315 Ø
S-315 Ø
Gwaiing PS
S-160 Ø
S-160 Ø
S-150 Ø
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
200 Ø AC-D
S-350 Ø

GEORGE MUNICIPALITY

N

Water: System Type

2023-02-28 15:39

Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

George Stormwater

S 850

S 850 Ø

S 900 Ø

Gwaiing WWTW

GEORGE MUNICIPALITY

N

Water: System Type

2023-02-28 15:39

Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

George Stormwater

Gwaiing WWTW

Pacaltsdorp PS 7

GEORGE MUNICIPALITY

N

Water: System Type

2023-02-28 15:40

Pipes - Existing System Type
- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

Nodes

Tanks - Tank Types
- all other values
- BULK
- WTP
- GL_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

Pumps - Pump Types
- all other values
- Closed PUMP
- Open PUMP

Valves - Valve Types
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

Gravity Pipes! - Generic
- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

Rising Mains

Structures! - Generic
- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump

George Stormwater

S 900 Ø
S 900 Ø
S 900 Ø
S 850 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 150 Ø
S 110 Ø
S 110 Ø
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S 110 Ø
S 110 Ø
S 110 Ø
S 800 Ø
S 800 Ø
150 Ø AC-D
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150 Ø AC-D
150 Ø AC-D
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110 Ø uPVC-12
110 Ø uPVC-12
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Pacaltsdorp PS 5

GEORGE MUNICIPALITY

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GEORGE
THE CITY FOR ALL REASONS

Water: System Type

2023-02-28 15:40

GEORGE
THE CITY FOR ALL REASONS

Pipes - Existing System Type
- Future
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- Reticulation
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- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
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- Open FCV
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- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
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- Open TCV

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- Sump

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Water: System Type

2023-02-28 15:41