URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

21 March 2025

18 Varing Avenue, Dormehls Drift
GEORGE, 6529. Tel 044 874 4098
Our Reference:24-054 CES

George Municipality
71 York Street
GEORGE
6529

Attention: Mr. Deon de Jager

CONTRACT NUMBER: T/ING/010/2020 – PROJECT NO. 4 (WORK PACKAGE 9): AD HOC BUILDINGS, SMALL STRUCTURE AND FENCING – MULTI FUNCTIONAL STEEL STRUTURES FOR THE CIVIL ENGINEERING SERVICES DEPOTS: CIVIL ENGINEERING SERVICES REPORT

Herewith the Civil Engineering Services Report for the George Municipality Civil Engineering Services Depot. Reference is made to the Site Development Plan (2409-001 Revision 3), attached as **Annexure A**.

1 INTRODUCTION

1.1 BRIEF

As per Figure 1-1 below, the property under consideration is the expansion of the existing George Municipality Civil Engineering Services Depot. The George Municipality is in the process of expanding its depot facilities to cater for future development needs and to ensure effective essential service delivery. Part of the depot upgrades include the erection of a multi-functional steel structure.

Existing civil infrastructure will be utilized to accommodate the expansions. This report will consider the existing and proposed new buildings.

1.2 GENERAL

The site is located south of Nelson Mandela Boulevard and East of Hope Street on a portion of Erf 464. It is proposed that the site be consolidated and subdivided. The land use for the expanded depot facilities consists of Office and Industry.

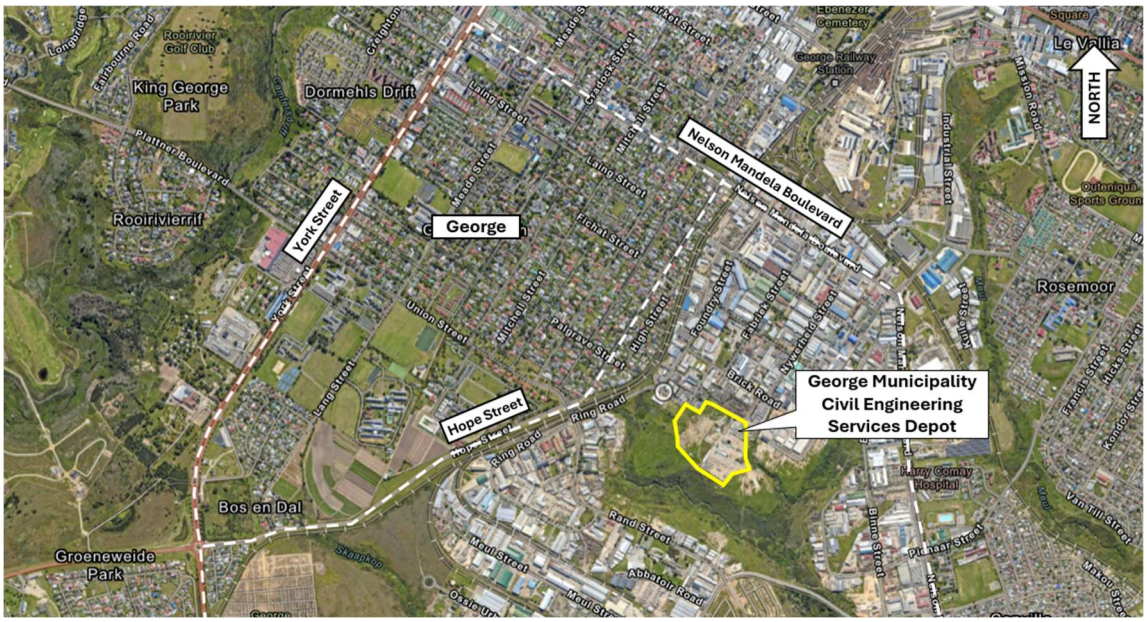


Figure 1-1: Locality - George Municipality Civil Engineering Services Depot

2 BULK WATER SUPPLY SYSTEM

2.1 PROPOSED WATER DEMAND FOR THE DEVELOPMENT

Our calculations are based on "The Neighbourhood Planning and Design Guide". Existing network capacity in the vicinity of the site is subject to the confirmation by George Municipality. GLS Consulting was 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. The Water master Plan, dated 2022, does not indicate proposed water upgrades for the area.

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 extension is as follows:

Description	Land Use	Calculations	AADD
Existing Building 1	Office	0.65 kℓ/day	0.65 kℓ/day
Existing Building 2	Office	0.65 kℓ/day	0.65 kℓ/day
Existing Building 3	Office	0.65 kℓ/day	0.65 kℓ/day
Existing Building 4	Office	0.65 kℓ/day	0.65 kℓ/day
Existing Building 5	Office	0.65 kℓ/day	0.65 kℓ/day
Building 6 – proposed new office	Office	0.65 kℓ/day	0.65 kℓ/day
Building 7 – proposed new water depot	Office	0.65 kℓ/day	0.65 kℓ/day
Existing building 8	Industry	0.4 kℓ/day	0.4 kℓ/day
Building 9 – proposed new guard house	N/A	0.3 kℓ/day	0.3 kℓ/day
		TOTAL AADD	**5.25 kℓ/day**

This development is classified as Business/Commercial/Industrial (BCI) according to Table J.9. From the design codes, we expect to design for a peak demand of 1.7.

Total Peak Hour Demand = 5.25 kℓ/d x 1.7
= 8.925 kℓ/d
= 0.103 ℓ/s

It should be noted that no additional provision has been made for water for irrigation on the property. This may be added, should it be required by the Client.

FIRE FLOW:

This 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/s total fire flow;
- 25 ℓ/s 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

The capacity of the existing water system will need to be checked to ensure that the reservoirs have enough storage capacity and capacity for the fire flow conditions to accommodate the facilities.

2.2 PROPOSED SERVICES

There are two existing 150mm diameter asbestos cement pipelines supplying the existing buildings on the site.

It is proposed that the two new buildings be supplied with a new 110mm diameter uPVC pipe for fire water use, connected to the existing water pipe entering the property from Clay Road. A separate pipe, minimum 25mm diameter, is proposed for potable water supply. Refer to Figure 2-1 below.

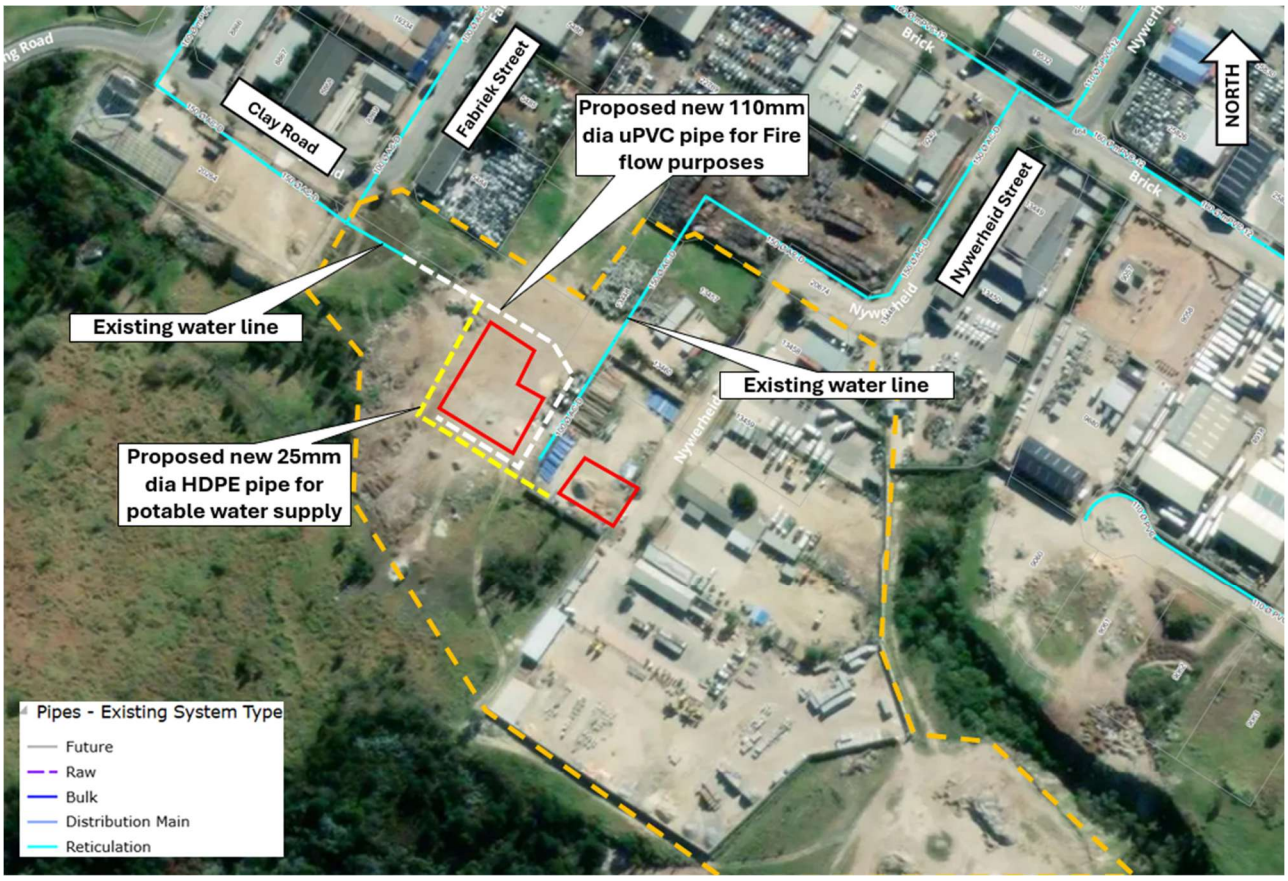


Figure 2-1: Proposed water

It is unknown at this stage whether upgrades to the existing bulk system are required to supply the development.

3 BULK SEWAGE SYSTEM

3.1 PROPOSED SEWER DEMAND FOR THE DEVELOPMENT

Our calculations are based on "The Neighbourhood Planning and Design Guide".

Existing network capacity in the vicinity of the site is subject to the confirmation by George Municipality. GLS Consulting was appointed by George Municipality to compose a Sewer Master Plan for the Municipal area and to determine the effect of any form of developments in the Municipal area on the Sewer Master Plan. The Sewer master Plan, dated 2022, does not indicate proposed sewer upgrades for the area.

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

Description	% AADD	kℓ/day
Existing Building 1	80% of AADD	0.52 kℓ/day
Existing Building 2	80% of AADD	0.52 kℓ/day
Existing Building 3	80% of AADD	0.52 kℓ/day
Existing Building 4	80% of AADD	0.52 kℓ/day
Existing Building 5	80% of AADD	0.52 kℓ/day
Building 6 – proposed new office	80% of AADD	0.52 kℓ/day
Building 7 – proposed new water depot	80% of AADD	0.52 kℓ/day
Existing building 8	80% of AADD	0.32 kℓ/day
Building 9 – proposed new guard house	80% of AADD	0.24 kℓ/day
	TOTAL ADWF	**4.2 kℓ/day**

The proposed development is classified as Business/commercial and light industrial according to Table K8. The Peak Factor to be used is 1.5 and 4.0 respectively.

This would lead to an expected Peak Dry Weather Flow (PDWF) as follows:

PDWF = (7 x 0.52 x 1.5) + (0.32 x 4.0) + (0.24 x 1.5)
PDWF = 7.1 kℓ/d
PDWF = 0.082 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:

PWWF = 0.082 x 1.15
PWWF = 0.094 ℓ/s

3.2 PROPOSED SERVICES

A well-developed sewer network exists in the area, with an existing bulk 300mm diameter uPVC line on the northern side of the property. It is proposed that the wastewater generated from the additional buildings be collected and gravitated into the existing bulk line on the northern side of the depot. Refer to **Figure 3-1** below.

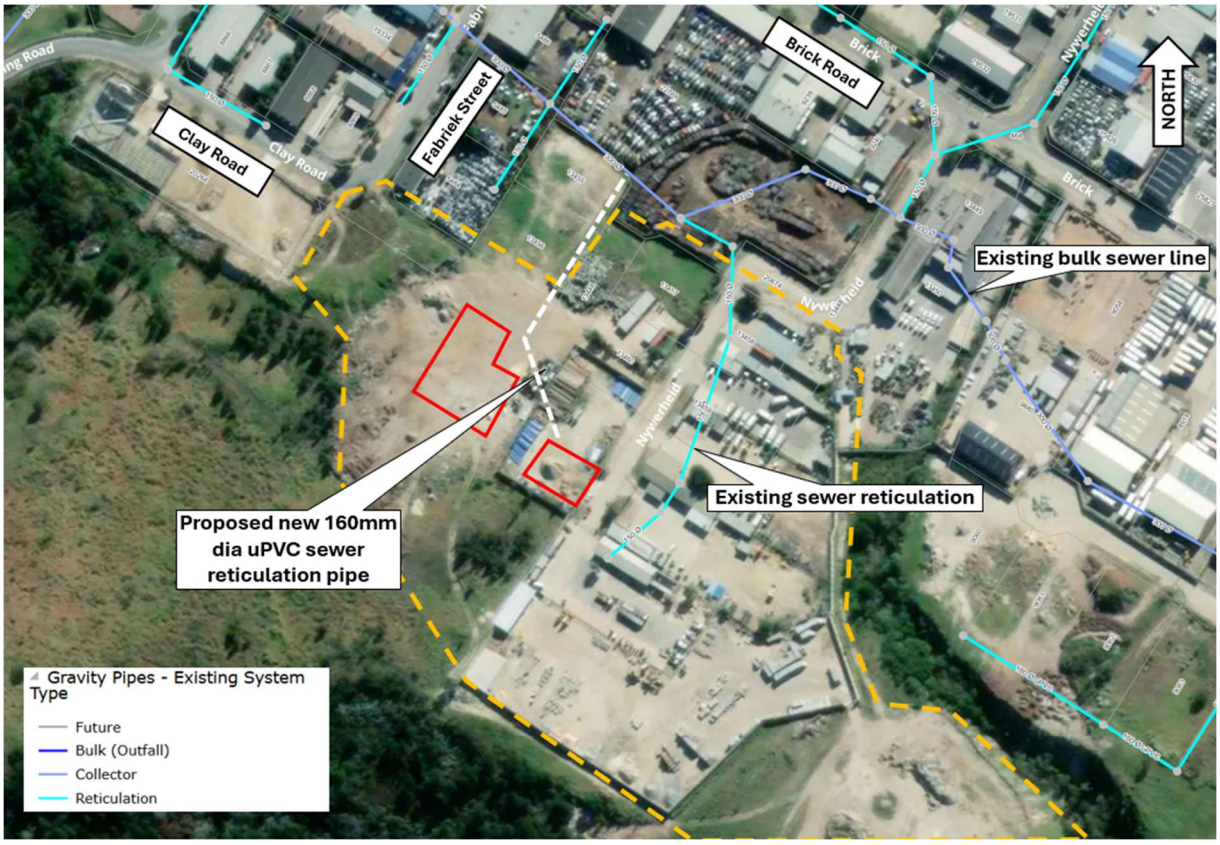


Figure 3-1: Proposed sewer

4 STORMWATER

The site has an existing stormwater attenuation pond on the western corner, collecting stormwater runoff from the northwestern side of the property. The stormwater collected from the new multifunctional steel structure will be attenuated in this pond, before being discharged or used for irrigation purposes.

There are two existing stormwater piped networks on the property, collecting runoff from the existing developed portion and discharging into the valley on the eastern side of the property.

A new 450mm diameter stormwater network is proposed to collect runoff from the road extensions, discharging into the valley on the southwestern side of the property. Erosion protection measures shall be implemented at the stormwater outlet structure. Refer to **Figure 4-1** below.

Rainwater harvesting tanks are to be installed as a control measure on site as local controls for stormwater runoff from the property.

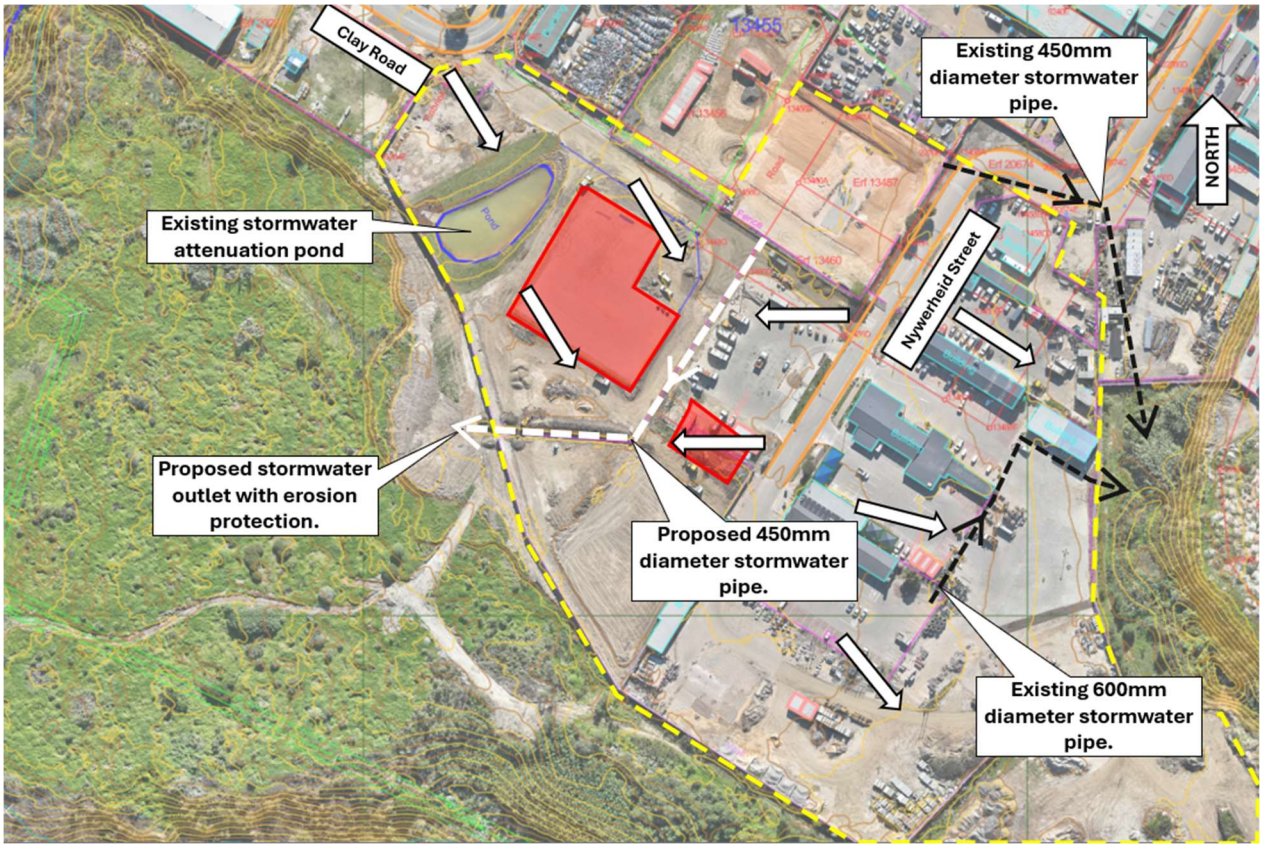


Figure 4-1: Proposed stormwater

5 ACCESS

Access to the existing Municipal facilities is currently obtained from the northeastern side of the site, via Nywerheid Street. An additional access is proposed via Clay Road on the northwestern side of the site. Refer to **Figure 5-1** and **Annexure A**.

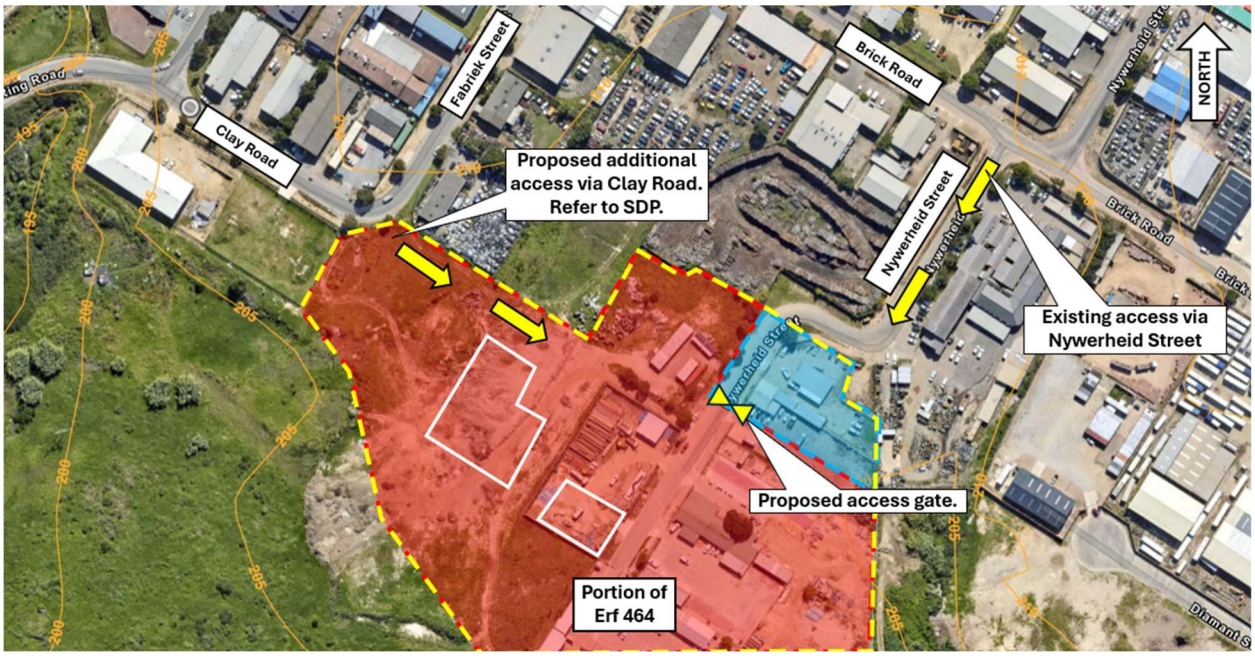


Figure 5-1: Existing and proposed access to George Municipal Stores

The access from Nywerheid Street will remain the access to the municipal buildings highlighted in blue and the proposed new access via Clay Road will provide access to the municipal buildings highlighted in red. The two areas will be separated by a fence and an access gate.

6 REFUSE REMOVAL

A central point for refuse removal will be provided from where further re-use and recycling will be managed.

7 FLOODLINES

The proposed extension is not directly affected by any flood lines.

8 STANDARD OF ENGINEERING SERVICES TO BE PROVIDED

The following documents will serve as a basis for the detailed design criteria and standards:

- The Neighbourhood Planning and Design Guide ("Red Book").
- SANRAL Drainage Manual.
- George Municipality Minimum Standards for The Design of Civil Engineering infrastructure.

9 CONSTRUCTION SPECIFICATIONS

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

We trust that sufficient detail has been provided on the way forward. Should any additional information be required, please do not hesitate to contact the undersigned.

Yours faithfully,

Corlia Rens (B.Tech, Pr.Techni Eng)

On behalf of Urban Engineering (Pty) Ltd

ANNEXURE A – Site Development Plan

ANNEXURE A

SITE DEVELOPMENT PLAN

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

STORMWATER MANAGEMENT PLAN

CIVIL ENGINEERING SERVICES DEPOT DEVELOPMENT ON ERF 464, GEORGE

Report Number 24-054_SW

Date: February 2026 Revision 2

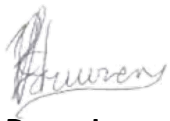
QUALITY ASSURANCE DATA

Report Title:	CIVIL ENGINEERING SERVICES DEPOT DEVELOPMENT ON ERF 464, GEORGE
Client:	George Municipality
Report Number:	24-054_SW
Revision Number	Revision 2

Revision History

Date	Rev	Written By	Issued to		Distribution	Format
			Name	Institution		
June 2025	0	Ruan Espach	Deon de Jager	George Municipality	Email	.pdf
Aug 2025	1	Ruan Espach	Deon de Jager	George Municipality	Email	.pdf
Feb 2026	2	Douw Louwrens	Deon de Jager	George Municipality	Email	.pdf

Written by:



Douw Louwrens B.Eng

on behalf of Urban Engineering (Pty) Ltd

Reviewed by:

Digitally signed by Ruan Espach
Date: 2026.02.03 12:15:13 +02'00'

Ruan Espach Pr.Eng

on behalf of Urban Engineering (Pty) Ltd

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

msl	Mean Sea Level
WCG	Western Cape Government
WGS	World Geodetic System
HDPE	High Density Polyethylene
uPVC	Unplasticised Polyvinyl Chloride
SDP	Site Development Plan
Mℓ	Mega Litre (1,000,000 litres)
NPDG	The Neighbourhood Planning and Design Guide
FAR	Floor Area Ratio
GIZSBL	George Integrated Zoning Scheme by-law
Mℓ	Mega Litre (1,000,000 litres)
GHPSD	Guidelines for Human Planning and Settlement Design

1 INTRODUCTION

1.1 BACKGROUND

Urban Engineering (Pty) Ltd was appointed by George Municipality to prepare a Stormwater Management Plan for the proposed expansion of the Civil Engineering Services Depot on a portion of Erf 464, George. The site is located south of Nelson Mandela Boulevard and East of Hope Street. The subject portion of Erf 464 is zoned "Undetermined Use Zone". The intention is to rezone the portion subject to the S24G to "Utility Zone", with the remainder of Erf 464 to remain "Undetermined Zone". The approximate site center has WGS 84 coordinates of 33°58'42.1" S and 22°27'49.3" E. Access to the site is via Clay Road as per the SDP. A basic locality plan has been included as Figure 1-1 below.

Figure 1-1 Basic Locality Plan

1.2 SITE DESCRIPTION AND STATUS QUO

The Civil Engineering Services Depot of George Municipality is located partially on Erf 13448 and on a portion of Erf 464. Based on historic aerial photographs, most of the buildings on the eastern side of the depot facilities were developed to some extent by 1998. This developed area is seen as the Pre-development site for the purpose of this report.

Figure 1-2 Pre current development

At the time of the report approximately 80% of the site is Rural and covered by grass, shrubs and a limited number of large trees. Steep slopes are located near the river that forms the partial western, eastern and southern boundaries. The topography of the 20% of the site used for Utilities can be described as flat.

1.3 PROPOSED DEVELOPMENT PARTICULARS

It is George Municipality's intention to develop a new Office Building and Multifunctional Steel Structure on the portion of Erf 464 to supplement the Civil Engineering Services department's capabilities. The proposed Site Development Plan (SDP) was prepared by Schenk Architects and has been attached as **ANNEXURE A** to this report. For ease of reference, an extract of the SDP has been included below.

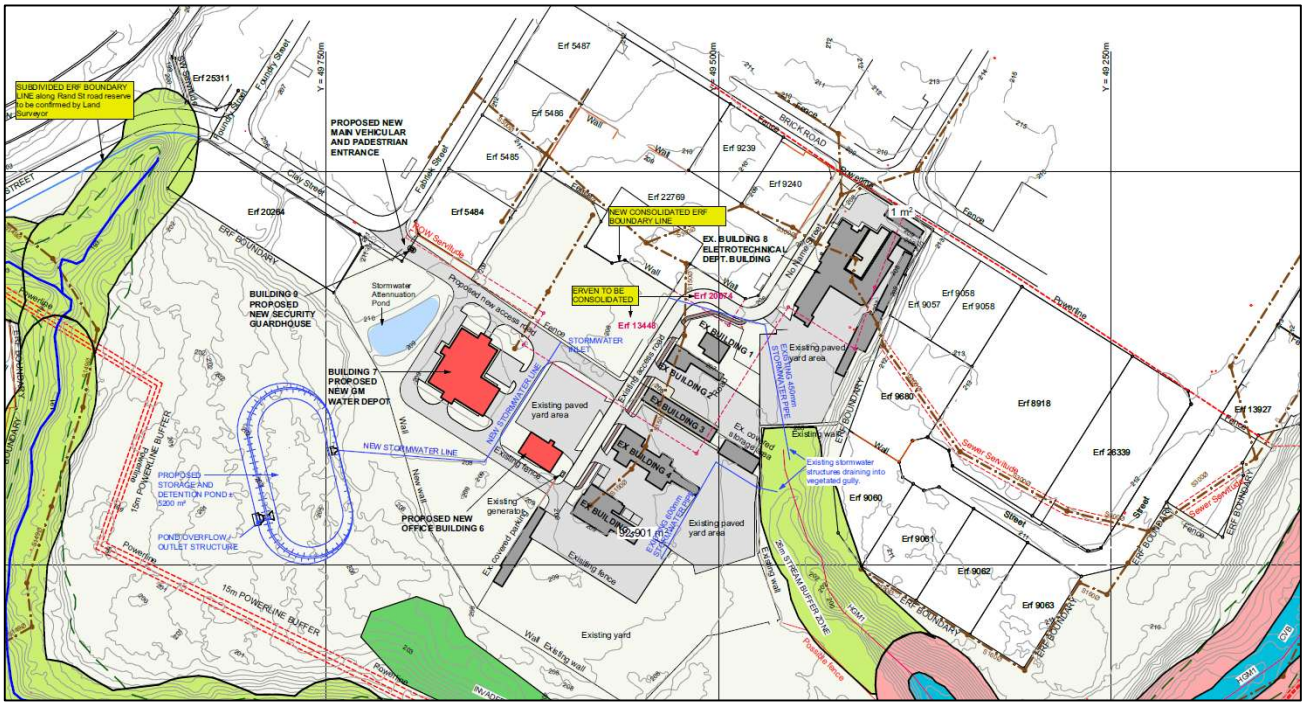


Figure 1-3 Extract of SDP

1.4 OBJECTIVE OF THIS REPORT

This report aims to provide a strategy for the management of stormwater for the proposed new development. The objectives of the Stormwater Management Plan are to:

- Attenuate the peak flow
- Reduce flooding
- Reduce the instream litter load
- Protect and improve biodiversity within the catchment.
- Provide methods for removing, reducing, or retarding runoff flows, and preventing targeted stormwater runoff constituents, pollutants and contaminants from reaching receiving waters.

This Stormwater Management Plan provides a range of principles and recommendations based on site constraints and consultation with the relevant stakeholders. The stormwater management system aims to improve the runoff quality and attenuate stormwater flows through principles of Sustainable Urban Drainage (SUDS).

1.5 PREDEVELOPMENT STORMWATER SCENARIO

For the pre-development site, stormwater run-off flowed overland in heavily vegetated areas or over paved areas to kerb inlets before being collected and piped towards the small ravine along the western site boundary. This ravine is highly vegetated and limited evidence of erosion is evident. Existing pipe stormwater on the eastern side of the development will remain as is.

1.6 STORMWATER MANAGEMENT PRINCIPLES

Stormwater Management aims to minimize the change in stormwater runoff from pre-development to post-development conditions for all storm durations and recurrence intervals in line with CSIR NPDG, by incorporating mitigation to reduce and/or attenuate the post development flows. Historic developments on this site such as hard surfaces and existing stormwater pipes (beginning with the site development in the 1930's) are deemed to be "Pre-development". Typical stormwater management strategies are indicated below.

As existing piped networks that traverses the site is required to transport collected runoff from neighboring areas north of the site, monitoring and maintenance will be done to the existing outlet points as required to ensure controlled discharge takes place.

2 POST DEVELOPMENT STORMWATER MANAGEMENT

2.1 PROPOSED STORMWATER CONTROL MEASURES

The following SUDS components are considered for Stormwater Management:

I. **Source Controls** manage stormwater runoff as close to its source as possible. Typical options include green roofs, rainwater harvesting, permeable pavements and soak-aways.

II. **Local Controls** manage stormwater runoff in the local area, typically within the road reserves. Typical options include bio-retention areas, filter strips, infiltration trenches, sand filters and swales.

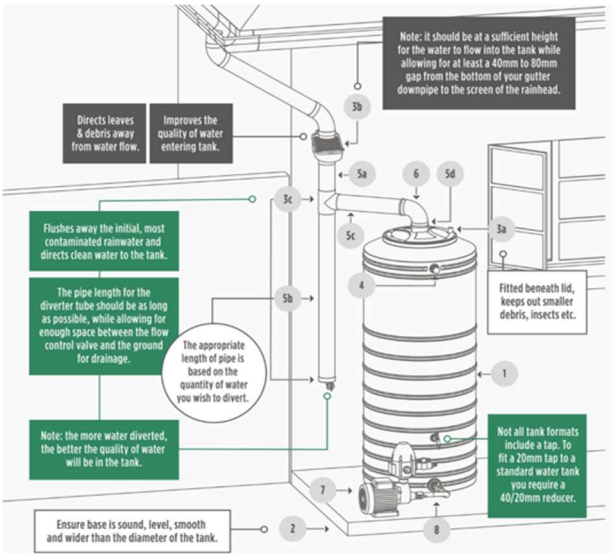
III. **Regional Controls** manage the combined stormwater runoff from several developments. Typical options include constructed wetlands, detention ponds and retention ponds.

The following is proposed to manage stormwater for the Site:

1. Reduce run-off from roofs by installing rainwater, harvesting tanks for all buildings. These tanks will collect rainwater for re-use. Due to heavy traffic loads and existing paved areas, permeable pavements and soak aways are not an option for local control.
2. Attenuate overflow from tanks for the Multifunctional Building in a stormwater attenuation pond, with a second pond considered on the southern side of the development.
3. Design road cross sections against the general site slope and provide stormwater inlets to receive collected stormwater. This approach helps prevent uncontrolled stormwater discharge and increases "Time of concentration".
4. Utilize the natural vegetation for infiltration and evaporation of collected run-off at all stormwater exit structures.

2.2 RAINWATER HARVESTING

Rainwater harvesting will be done by collecting stormwater from the roof of the new multifunctional building. Harvested water can be reused for general purposes such as irrigation, cleaning and sanitation and general maintenance of facilities. A typical setup is indicated below.



LEGEND

1. Water Tank
2. Base/Foundation
3. Pre-filtration - Improves the quality of harvested rainwater and protects the pump. The quality of the rainwater in the tank is a function of the number of pre-filtration systems.
   - 3a. Tank Filter Screen – fitted beneath lid
   - 3d. Rainhead
   - 3c. First flush rainwater diverter
4. Tank mozzie screen – fitted to the outside of the tank inlet. This allows water to pass through the while blocking entry for mosquitoes and other insects.
5. Pipes – standard plumbing pipes in 110mm, 80mm or 75mm
6. Elbow according to downpipe size
7. Pump (0,37kW to 0,75kW) and pump cover
8. Pump to tank connector kit

Figure 2-1 Rainwater Harvesting

2.3 ENERGY DISSIPATION

The installation of Reno Mattresses, Gabion Box Berms and Permeable Berms at downslope outlets, act as energy dissipaters and stilling basins. These structures are also used as silt traps to prevent the loss of silt to the natural water courses. Silt that gets trapped on the Reno Mattresses acts as a growing medium for vegetation which thereby accelerates the re-establishment of natural vegetation. This rehabilitated vegetation also acts as a dissipation medium, resulting in attenuated run-off.

Energy dissipation blocks will be installed at all **new** stormwater outlets. These structures assist in reducing the velocity of stormwater discharged at the outlet point. These structures will take the form of formal concrete block or more natural stone pitching. The large patches of kikuyu grass in the southern parts of the site will serve to attenuate discharged flow after energy dissipation.

Figure 2-2 Energy Dissipaters

2.4 ATTENUATION PONDS WITH OVERFLOW MEASURES

Attenuation ponds serve as flood protection and flood alleviation mechanisms by slowing down the high flow rate during rainfall periods. Depending on the position and capacity of the pond, inlet structures could be constructed within the pond to allow accumulated stormwater to flow into the

subterranean stormwater system and be piped away. Typical inlet structures constructed in ponds and at swale termination points are indicated in Figure 3-6. These structures allow water levels to rise to an acceptable level, before water starts flowing into the structure from where it is diverted via a piped system to a controlled discharge point. Stormwater from the proposed new multifunctional steel structure will be collected in rainwater tanks before being piped to a stormwater attenuation pond.

Figure 2-3 Ponds and Overflow Inlet Structures

2.5 LANDSCAPING

Due to the existing nature of the facilities and the requirement to maximize the use of available space for facilities, landscaped areas in the "Urban" portion are kept to a minimum. However, 80% of the site is still considered "Rural" and covered in vegetation.

2.6 RUN-OFF QUALITY

The possible sources of pollutants in stormwater are:

- Atmospheric fall-out including dust and transported soils.
- Erosion of catchment materials from buildings and pavements.
- Transported materials from spills and littering.

The vegetation growing within the southern section of the site will reduce the speed of the discharged stormwater, allow suspended soils to be deposited in the vegetation and provide high infiltration rates. These vegetated areas are also capable of absorbing pollutants within certain limits. They are of value in attenuating floods and have the added advantage of producing a unique ecosystem.

2.7 STANDARDS AND SPECIFICATIONS

All material specifications must comply with the applicable SANS specifications. All construction work must comply with at least the SANS 1200 specifications or better.

3 GEOTECHNICAL INVESTIGATION

A geotechnical investigation report of the site was prepared by Terra Geotechnical Services. The report is attached as Annexure B. Based on the geotechnical report the site is covered by a prominent uncontrolled fill horizon (i.e., landfill) consisting of clayey/silty sand with abundant refuse (plastic, glass etc.) and organic material (large tree stumps and other plant matter). Previous use of the site as a landfill is also evident from various historical photographs starting from 1936. Natural granite occurs at a depth of 2.5 to 5m.

4 FLOOD ESTIMATION

Due to the relatively small catchment area (< 10km2), the Rational Method of Flood Estimation in combination with PCSWMM software was used to estimate pre- and post-development stormwater run-off for the site. The pre- and post-development stormwater peak flow calculations have been attached as **ANNEXURE C** and a summary of the results have been included below:

Pre-Development Peak Flow:

Location (I)nland or (C)oastal)?		C					
Return Period	2	5	10	20	50	100	200
Point rainfall (mm)	16,3	21,5	26,5	32,6	42,9	52,8	65,0
Point Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Area reduction factor	1	1	1	1	1	1	1
Average Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Peak Flow (m^3/s)	0,88	1,42	1,95	2,65	3,49	4,29	5,64

Table 4-1 Pre-Development Run-off

Post Development Peak Flow

Location (I)nland or (C)oastal)?		C					
Return Period	2	5	10	20	50	100	200
Point rainfall (mm)	16,3	21,5	26,5	32,6	42,9	52,8	65,0
Point Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Area reduction factor	1	1	1	1	1	1	1
Average Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Peak Flow (m^3/s)	1,35	2,04	2,73	3,52	4,85	6,22	7,74

Table 4-2 Post Development Run-off

The "softening" of the urbanized parts of Erf 464 through rainwater harvesting and stormwater attenuation by means of a detention pond is proposed. A stormwater detention and retention pond with a permanent storage capacity of 6 000 m^3 as indicated in Annexure D is proposed:

Surface area (top):	5181	m^2
Surface area (bottom):	3630	m^2
Total Depth:	3,0	m
Permanent Storage Depth:	1,5	m
Permanent Storage Volume	6000	m^3
Freeboard 1:100 year RI Storm:	0,5	m
Outlet:	2 x 900 mm dia. pipes	
	3000 x 1000 mm Broad Crested Weir	

Table 4-3 Proposed Detention Pond Characteristics

The proposed pond was modelled with PCSWMM software. The inclusion of the pond has the result that the post-development peak-flows from the site will be less than pre-development flows:

Storm Event	1:2	1:5	1:10	1:20	1:50	1:100
Pre-Development Runoff (m^3/s)	0,88	1,42	1,95	2,65	3,49	4,29
Post-Development Runoff (m^3/s)	1,35	2,04	2,73	3,52	4,85	6,22
Post-Development Runoff with Detention (m^3/s)	0,36	0,62	0,90	1,35	2,34	3,33

Table 4-4 Peak Flow Runoff Summary

5 SUMMARY

The design approach to be adopted for the proposed development can be summarized as follows:

1. Attenuate run-off from roofs by installing rainwater harvesting tanks. These tanks will collect rainwater from roofs and gutters for re-use on lawns and gardens. Overflow from the new store will be piped to the stormwater attenuation pond.
2. Design road cross sections against the general site slope. This approach helps prevent uncontrolled stormwater discharge and increases the time of concentration.
3. Construct attenuation ponds where run-off can collect for infiltration and evaporation.
4. Drain runoff in to vegetated areas with erosion protection for infiltration and evapo-transpiration.

By implementing the principles highlighted in this report, it is estimated (refer to **ANNEXURE C** for detailed calculations) that the post development peak flow run-off will remain unchanged.

6 REFERENCES

1) Guidelines for Human Settlement Planning and Design, *Department of Housing*, 2000 CSIR
2) Drainage Manual 5th Edition, *The South African National Roads Agency Limited*, 2006
3) Guidelines for Urban Stormwater Management UTG 4, *Committee of Urban Transport Authorities*, 1999.
4) Introduction to Flood Hydrology, *J Haarhoff and AM Cassa*, 2009.
5) City of Cape Town Management of Urban Stormwater Impacts Policy – Version 1.1, 2009.
6) South African Guidelines for Sustainable Drainage Systems (*Armitage et al., 2013*)

ANNEXURE A
SITE DEVELOPMENT PLAN

NOTES:

LANDSCAPING

All landscaping to comply with the specifications of an approved **Enviromental Authorisation** and **Enviromental Management Programme** requirements.

CIVIL

All civil work e.g. site levels, shaping, retaining walls/structures/paving layouts/substrates and storm water run-off/distribution as per Civil Engineers design and specifications.

STRUCTURE

All structural work strictly as per Structural Engineers design and specifications. Any discrepancies between Architectural and Structural drawings to be reported immediately.

FIRE PLAN

All fire protection and installation requirements as per the Fire Engineers specifications and layouts. Architectural plans to be read in conjuction with the Fire Engineers layouts and any discrepancies reported to the architect before any work is carried on site.

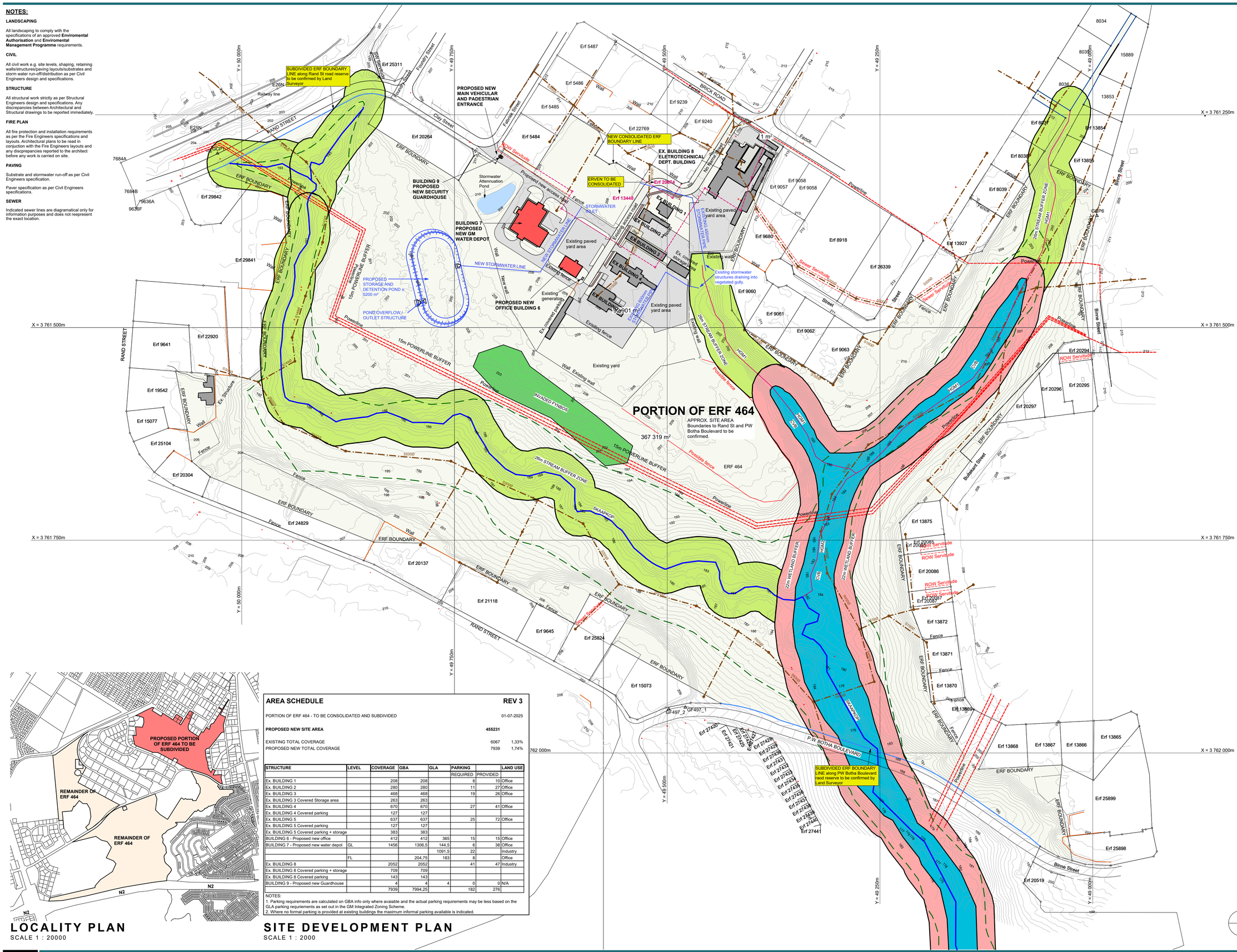
PAVING

Substrate and stormwater run-off as per Civil Engineers specification.

Paver specification as per Civil Engineers specifications.

SEWER

Indicated sewer lines are diagramatical only for information purposes and does not reprecent the exact location.



LOCALITY PLAN
SCALE 1 : 20000

AREA SCHEDULE — REV 3

PORTION OF ERF 464 - TO BE CONSOLIDATED AND SUBDIVIDED — 01-07-2025

PROPOSED NEW SITE AREA — **455231**

EXISTING TOTAL COVERAGE	6067	1,33%
PROPOSED NEW TOTAL COVERAGE	7939	1,74%

STRUCTURE	LEVEL	COVERAGE	GBA	GLA	PARKING		LAND USE
					REQUIRED	PROVIDED	
Ex. BUILDING 1		208	208		8	10	Office
Ex. BUILDING 2		280	280		11	27	Office
Ex. BUILDING 3		468	468		19	26	Office
Ex. BUILDING 3 Covered Storage area		263	263				
Ex. BUILDING 4		670	670		27	41	Office
Ex. BUILDING 4 Covered parking		127	127				
Ex. BUILDING 5		637	637		25	72	Office
Ex. BUILDING 5 Covered parking		127	127				
Ex. BUILDING 5 Covered parking + storage		383	383				
BUILDING 6 - Proposed new office		412	412	365	15	15	Office
BUILDING 7 - Proposed new water depot	GL	1456	1306,5	144,5	6	38	Office
				1091,5	22		Industry
	FL		204,75	183	8		Office
Ex. BUILDING 8		2052	2052		41	47	Industry
Ex. BUILDING 8 Covered parking + storage		709	709				
Ex. BUILDING 8 Covered parking		143	143				
BUILDING 9 - Proposed new Guardhouse		4	4	4	0	0	N/A
		7939	7994,25		182	276	

NOTES:
1. Parking requirements are calculated on GBA info only where avaiable and the actual parking requirements may be less based on the GLA parking requriements as set out in the GM Integrated Zoning Scheme.
2. Where no formal parking is provided at existing buildings the maximum informal parking available is indicated.

SITE DEVELOPMENT PLAN
SCALE 1 : 2000

PAGE FORMAT A1

GENERAL NOTES
All building work to comply with SANS 10400 regulations.
No dimensions to be scaled or scanned from drawing.
All dimensions to be checked on site before any work is carried out on site.
Where applicable the contractor is to check on site the size of components to be manufactured prior to installation.
The contractor is responsible for correct setting out of the buildings, all external and internal walls with particular reference to erf boundaries, building lines, etc.
The contractor has to verify all levels, heights and dimensions on site and to check the same against the drawings before any work is carried out on site. Any discrepancies must be reported to the architect and appointed structural engineer.
The contractor is to locate and identify existing services on the site and protect these from damage throughout the duration of the works.
Any errors, discrepancies or omissions to be reported immediately.
The contractor is to build in approved 4 ply D.P.C. weather or not these are shown on drawings, to all walls at each floor, beam or parapet level and to all windows, doors, grilles or other openings in external walls.
Any queries arising from all the above must be reported and clarified before any work is carried out on site.
This drawing to be read in conjunction engineers with all engineers/land surveyors/specialist or any other drawing/information applicable.

COPYRIGHT

REGISTERED OWNER DETAILS: DATE: SIGNATURE OF OWNER/ CLIENT:

REGISTERED ARCHITECT DETAILS:
Andrew Schenk
Schenk Architects
SACAP Reg No. 24751507
65 Stander St, Loerie Park
George
6529
DATE:
SIGNATURE OF ARCHITECT:

REVISIONS

REV 4	05-11-2025	1.EIA Buffer zones added. 2.Proposed new stormwater detention pond added.
REV 5	30-01-2026	1.Proposed new stormwater detention pond revised. 2.Edge of future disturbance removed.

PROJECT TITLE
Proposed New Water Depot on:

Erf 464, George for George Municipality.

DRAWING STATUS
FOR INFORMATION ONLY

DRAWING DESCRIPTION
Site Development Plan REV 5

SCALE	AS SHOWN
DATE	DATE OF 1ST ISSUE
ISSUED	2026/01/30
DRAWN BY	Andrew Schenk
CHECKED BY	Andrew Schenk
ARCHITECT	Andrew Schenk

SCHENK ARCHITECTS
65 Stander Street
Loerie Park
George
6529
081 857 6087
info@schenkarchitects.co.za

PROJECT NO:	DRAWING NO:	REVISION
2407	2407 - 001	5

GM WATER DEPOT - ERF 464, GEORGE

ANNEXURE B
GEOTECH REPORT

ANNEXURE C
PEAK FLOW CALCULATIONS

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job no.	24-054	Page no	1
Project	George CES Depot	Calculated by	Ruan Espach
Subject	RATIONAL METHOD	Date	2025-11-06

Description of catchment:	George CES Depot
Area:	Pre-Development

Physical characteristics

Catchment area (km²)					
Total area included within watershed	465 390,00	m²			ha
Non-contributing areas in catchment area e.g. pans, artificial ponds	0	m²	0,000		ha
Effective catchment area	0,4654	Km²			

		Overland	Watercourse	Urban	Flow in channel or pipe		m/s
Length of longest water course (km)		0,344	0,000	0,000	Link 1		
Contour height (msl):	Level @ highest point	208,500	n.v.t	0,000	Velocity V =		
	Level @ outlet	188,500	n.v.t	0,000	Length (m) =		0,000
	H0.85L	n.v.t	0,000	n.v.t	Link 2		
	H0.10L	n.v.t	0,000	n.v.t	Velocity V =		
Elevation difference along 10-85 slope		n.v.t	0,000		Length (m) =		0,000
Average slope (m/m)		0,05814	0,00000	n.v.t	Link 3		
Roughness r		0,400	n.v.t	n.v.t	Velocity V =		
Individual Time of Concentration (hours)		0,465	0,000	0,000	Length (m) =		0,000
Provision for filling of cavities Yes (Y) or No (N)?		N	0,000	minutes	Addisional Tc		0,000
Total Time of Concentration (hours)			0,465	or 27.9 min.	Check	0,206	Realistic!
					0.1<V>4 m/s		

Recommended values for roughness coefficient	
Paved Areas	0,02
Clean compacted soil, no stones	0,1
Sparse grass over fairly rough surface	0,3
Medium grass cover	0,4
Thick grass cover	0,8

Mean Annual Precipitationl (mm)	766	ok

Area distribution factors (%)	
Rural	88,2
Urban	11,8
Lakes	0,0
Sum	100

Ok!!

Adjustment for Dolomitic areas (%)	0

Physical characteristics as a percentage of the total area of the catchment:

RURAL			Mean annual rainfall (mm)			Runoff coeff.	Weighted
Surface slope		%	< 600	600 - 900	> 900	C_s	Runoff coeff.
Wetlands and pans	< 3%	0,0	0,01	0,03	0,05	0,03	0,000
Flat areas	3 - 10%	46,8	0,06	0,08	0,11	0,08	0,037
Hilly	10 - 30%	42,9	0,12	0,16	0,2	0,16	0,069
Steep areas	30 - 50%	10,3	0,22	0,26	0,3	0,26	0,027
Very steep ares	> 50%	0,0	0,26	0,3	0,34	0,3	0,000
Total		100	Ok!!				0,133

RURAL		Mean annual rainfall (mm)			Runoff coeff.	Weighted
Permeability	%	< 600	600 - 900	> 900	C_p	Runoff coeff.
Very permeable	92,7	0,03	0,04	0,05	0,04	0,037
Moderately permeable	7,3	0,06	0,08	0,1	0,08	0,006
Semi-permeable	0,0	0,12	0,15	0,2	0,15	0,000
Non-permeable	0,0	0,21	0,26	0,3	0,26	0,000
Total	100	Ok!!				0,043

RURAL		Mean annual rainfall (mm)			Runoff coeff.	Weighted
Vegetation	%	< 600	600 - 900	> 900	C_v	Runoff coeff.
Thick bush and plantation	39,3	0,03	0,04	0,05	0,04	0,016
Grasslands	60,7	0,17	0,21	0,25	0,21	0,127
No vegetation	0,0	0,26	0,28	0,3	0,28	0,000
Total	100	Ok!!				0,143
					C_1	0,319

continued to page 2

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job no. 24-054 Page no 2

Project George CES Depot Calculated by Ruan Espach

Subject RATIONAL METHOD Date 2025-11-06

continued from page 1

URBAN			Coefficient	Runoff coeff.	Weighted
Use	%	Characteristics	interval	C_2	Runoff coeff.
Lawns	1,8	Sandy, flat (<2%)	0.05 - 0.10	0,1	0,002
	0,0	Sandy, steep (>7%)	0.15 - 0.20	0,2	0,000
	0,0	Heavy soil, flat (<2%)	0.13 - 0.17	0,15	0,000
	0,0	Heavy soil, steep (>7%)	0.25 - 0.35	0,3	0,000
Residential areas	0,0	Houses	0.30 - 0.50	0,5	0,000
	0,0	Flats	0.50 - 0.70	0,7	0,000
Industrial	12,4	Light Industry	0.50 - 0.80	0,8	0,099
	0,0	Heavy Industry	0.50 - 0.90	0,7	0,000
Commercial	0,0	City Centre	0.70 - 0.95	0,88	0,000
	0,0	Subburban	0.50 - 0.70	0,6	0,000
Streets	85,8	Streets	0.70 - 0.95	0,95	0,815
Total	100	Ok!!			0,916

Area Weighted Runoff Coefficients	
Rural (C_1)	0,281
Urban (C_2)	0,108
Σ	0,390

Return period adjustment factor for run-off coefficients(Ft)							
Return Period	2	5	10	20	50	100	200
Ft (rural)	0,5	0,61	0,68	0,75	0,75	0,75	0,8
Ft (urban)	0,5	0,61	0,68	0,75	0,75	0,75	0,8

Location (I)nland or (C)oastal)?		C					
Return Period	2	5	10	20	50	100	200
Point rainfall (mm)	16,3	21,5	26,5	32,6	42,9	52,8	65,0
Point Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Area reduction factor	1	1	1	1	1	1	1
Average Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Peak Flow (m^3/s)	0,88	1,42	1,95	2,65	3,49	4,29	5,64

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job no.	24-054	Page no	1
Project	George CES Depot	Calculated by	Ruan Espach
Subject	RATIONAL METHOD	Date	2025-11-06

Description of catchment:	George CES Depot
Area:	Post-Development

Physical characteristics

Catchment area (km²)					
Total area included within watershed	465 390,00	m²			ha
Non-contributing areas in catchment area e.g. pans, artificial ponds	0	m²	0,000		ha
Effective catchment area	0,4654	Km²			

		Overland	Watercourse	Urban	Flow in channel or pipe		m/s
Length of longest water course (km)		0,344	0,000	0,000	Link 1		
Contour height (msl):	Level @ highest point	208,500	n.v.t	0,000	Velocity V =		
	Level @ outlet	188,500	n.v.t	0,000	Length (m) =		0,000
	H0.85L	n.v.t	0,000	n.v.t	Link 2		
	H0.10L	n.v.t	0,000	n.v.t	Velocity V =		
Elevation difference along 10-85 slope		n.v.t	0,000		Length (m) =		0,000
Average slope (m/m)		0,05814	0,00000	n.v.t	Link 3		
Roughness r		0,400	n.v.t	n.v.t	Velocity V =		
Individual Time of Concentration (hours)		0,465	0,000	0,000	Length (m) =		0,000
Provision for filling of cavities Yes (Y) or No (N)?		N	0,000	minutes	Addisional Tc		0,000
Total Time of Concentration (hours)			0,465	or 27,9 min.	Check	0,206	Realistic!
					0.1<V>4 m/s		

Recommended values for roughness coefficient	
Paved Areas	0,02
Clean compacted soil, no stones	0,1
Sparse grass over fairly rough surface	0,3
Medium grass cover	0,4
Thick grass cover	0,8

Mean Annual Precipitationl (mm)	766	ok

Area distribution factors (%)	
Rural	80,3
Urban	19,7
Lakes	0,0
Sum	100

Ok!!

Adjustment for Dolomitic areas (%)	0

Physical characteristics as a percentage of the total area of the catchment:

RURAL			Mean annual rainfall (mm)			Runoff coeff.	Weighted
Surface slope		%	< 600	600 - 900	> 900	C_s	Runoff coeff.
Wetlands and pans	< 3%	0,0	0,01	0,03	0,05	0,03	0,000
Flat areas	3 - 10%	46,8	0,06	0,08	0,11	0,08	0,037
Hilly	10 - 30%	42,9	0,12	0,16	0,2	0,16	0,069
Steep areas	30 - 50%	10,3	0,22	0,26	0,3	0,26	0,027
Very steep ares	> 50%	0,0	0,26	0,3	0,34	0,3	0,000
Total		100	Ok!!				0,133

RURAL		Mean annual rainfall (mm)			Runoff coeff.	Weighted
Permeability	%	< 600	600 - 900	> 900	C_p	Runoff coeff.
Very permeable	92,7	0,03	0,04	0,05	0,04	0,037
Moderately permeable	7,3	0,06	0,08	0,1	0,08	0,006
Semi-permeable	0,0	0,12	0,15	0,2	0,15	0,000
Non-permeable	0,0	0,21	0,26	0,3	0,26	0,000
Total	100	Ok!!				0,043

RURAL		Mean annual rainfall (mm)			Runoff coeff.	Weighted
Vegetation	%	< 600	600 - 900	> 900	C_v	Runoff coeff.
Thick bush and plantation	39,3	0,03	0,04	0,05	0,04	0,016
Grasslands	60,7	0,17	0,21	0,25	0,21	0,127
No vegetation	0,0	0,26	0,28	0,3	0,28	0,000
Total	100	Ok!!				0,143
					C_1	0,319

continued to page 2

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job no. 24-054 Page no 2

Project George CES Depot Calculated by Ruan Espach

Subject RATIONAL METHOD Date 2025-11-06

continued from page 1

URBAN			Coefficient	Runoff coeff.	Weighted
Use	%	Characteristics	interval	C_2	Runoff coeff.
Lawns	1,8	Sandy, flat (<2%)	0.05 - 0.10	0,1	0,002
	0,0	Sandy, steep (>7%)	0.15 - 0.20	0,2	0,000
	0,0	Heavy soil, flat (<2%)	0.13 - 0.17	0,15	0,000
	0,0	Heavy soil, steep (>7%)	0.25 - 0.35	0,3	0,000
Residential areas	0,0	Houses	0.30 - 0.50	0,5	0,000
	0,0	Flats	0.50 - 0.70	0,7	0,000
Industrial	12,4	Light Industry	0.50 - 0.80	0,8	0,099
	0,0	Heavy Industry	0.50 - 0.90	0,7	0,000
Commercial	0,0	City Centre	0.70 - 0.95	0,88	0,000
	0,0	Subburban	0.50 - 0.70	0,6	0,000
Streets	85,8	Streets	0.70 - 0.95	0,95	0,815
Total	100	Ok!!			0,916

Area Weighted Runoff Coefficients	
Rural (C_1)	0,256
Urban (C_2)	0,180
Σ	0,437

Return period adjustment factor for run-off coefficients(Ft)							
Return Period	2	5	10	20	50	100	200
Ft (rural)	0,68	0,78	0,85	0,89	0,93	0,97	0,98
Ft (urban)	0,68	0,78	0,85	0,89	0,93	0,97	0,98

Location (I)nland or (C)oastal)?		C					
Return Period	2	5	10	20	50	100	200
Point rainfall (mm)	16,3	21,5	26,5	32,6	42,9	52,8	65,0
Point Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Area reduction factor	1	1	1	1	1	1	1
Average Intensity (mm/hour)	35,1	46,3	57,0	70,1	92,3	113,7	139,9
Peak Flow (m^3/s)	1,35	2,04	2,73	3,52	4,85	6,22	7,74

ANNEXURE D
STORMWATER LAYOUT PLAN

PROPOSED NEW MAIN VEHICULAR AND PADESTRIAN ENTRANCE

BUILDING 9 PROPOSED NEW SECURITY GUARDHOUSE

BUILDING 7 PROPOSED NEW GM WATER DEPOT

PROPOSED NEW OFFICE BUILDING 6

EX. BUILDING 8 ELETROTECHNICAL DEPT. BUILDING

EX BUILDING 1

EX BUILDING 2

EX BUILDING 3

EX BUILDING 4

EX BUILDING 5

NEW CONSOLIDATED ERF BOUNDARY LINE

ERVEN TO BE CONSOLIDATED

Erf 5486

Erf 5485

Erf 5484

Erf 9239

Erf 9240

Erf 22769

Erf 20264

Erf 9058

Erf 9057

Erf 9680

Erf 8918

Erf 9060

Erf 9061

Erf 9062

Erf 9063

ERF 464

Erf 24829

367 319 m²

Existing yard

Existing paved yard area

Existing generator

Ex. covered storage area

Ex. covered parking

Existing wall

Existing fence

Exisiting fence

Possible fence

Fence

Wall

New wall

Stormwater Attennuation Pond

STORMWATER INLET

NEW STORMWATER LINE

EXISTING 450mm STORMWATER PIPE

EXISTING 600mm STORMWATER PIPE

EXISTING STORMWATER STRUCTURES DRAINING INTO VEGETATED GULLY

PROPOSED STORAGE AND DETENTION POND ± 5200 m²

POND OVERFLOW / OUTLET STRUCTURE

Proposed new access road

Existing access road

No Name Street

BRICK ROAD

Clay Street

Foundry Street

Fabriek Street

RAND STREET

Railway line

E26N

Powerline

15m POWERLINE BUFFER

26m STREAM BUFFER ZONE

22m WETLAND BUFFER

ERF BOUNDARY

INVADED FYNBOS

SKAAPKOP

HGM1

HGM2

CVB

N

FOR PLANNING PURPOSES ONLY

CONSTRUCTION DRAWINGS

REVISION	DATE	DESCRIPTION
A	22/8/2025	FOR INFORMATION
B	5/11/2025	DETENTION POND ADDED
C	15/01/2026	DETENTION POND AMENDED
D	02/02/2026	SDP AMENDED

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
PO Box 9059
George
Tel : 044-874 4098

Project

GM WATER DEPOT STORE

Drawing Title

STORMWATER LAYOUT PLAN

Scale (Paper Size)	Date
AS SHOWN	FEBRUARY 2026
Designed: DL	Drawing Number: 25-054-SW1
Drawn: DL	
Checked: RE	Revision: D

PROPOSED NEW MAIN VEHICULAR AND PADESTRIAN ENTRANCE

BUILDING 9 PROPOSED NEW SECURITY GUARDHOUSE

BUILDING 7 PROPOSED NEW GM WATER DEPOT

PROPOSED NEW OFFICE BUILDING 6

EX. BUILDING 8 ELETROTECHNICAL DEPT. BUILDING

EX BUILDING 1

EX BUILDING 2

EX BUILDING 3

EX BUILDING 4

EX BUILDING 5

NEW CONSOLIDATED ERF BOUNDARY LINE

ERVEN TO BE CONSOLIDATED

Erf 5486

Erf 5485

Erf 5484

Erf 9239

Erf 9240

Erf 22769

Erf 20264

Erf 9058

Erf 9057

Erf 9680

Erf 8918

Erf 9060

Erf 9061

Erf 9062

Erf 9063

Erf 24829

ERF 464

367 319 m²

Existing yard

Existing paved yard area

Existing generator

Ex. covered storage area

Ex. covered parking

Existing wall

Existing fence

Exisiting fence

Existing access road

Proposed new access road

Stormwater Attennuation Pond

STORMWATER INLET

NEW STORMWATER LINE

EXISTING 450mm STORMWATER PIPE

EXISTING 600mm STORMWATER PIPE

EXISTING STORMWATER STRUCTURES DRAINING INTO VEGETATED GULLY

PROPOSED STORAGE AND DETENTION POND ± 5200 m²

POND OVERFLOW / OUTLET STRUCTURE

15m POWERLINE BUFFER

26m STREAM BUFFER ZONE

22m WETLAND BUFFER

INVADED FYNBOS

SKAAPKOP

HGM1

HGM2

CVB

Possible fence

Fence

Wall

New wall

Powerline

ERF BOUNDARY

BRICK ROAD

RAND STREET

Clay Street

Foundry Street

Fabriek Street

No Name Street

Railway line

E26N

N

FOR PLANNING PURPOSES ONLY

CONSTRUCTION DRAWINGS

REVISION	DATE	DESCRIPTION
A	22/8/2025	FOR INFORMATION
B	5/11/2025	DETENTION POND ADDED
C	15/01/2026	DETENTION POND AMENDED
D	02/02/2026	SDP AMENDED

URBAN ENGINEERING
CONSULTING CIVIL AND STRUCTURAL ENGINEERS
PO Box 9059
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Project

GM WATER DEPOT STORE

Drawing Title

STORMWATER LAYOUT PLAN

Scale (Paper Size)	Date
AS SHOWN	NOVEMBER 2025
Designed: RE	Drawing Number: 25-054-SW1
Drawn: RE	
Checked: RE	Revision: D