BELLADONNA (PTY) LTD

SERVICES REPORT FOR
CIVIL ENGINEERING SERVICES FOR THE DEVELOPMENT OF LOT 266 & A PORTION OF REMAINDER OF LOT 21, RIVERSDALE SETTLEMENT, HESSEQUA MUNICIPALITY

HESRIV-532

Revision 1

September 2024

PREPARED BY:

ESSEQUA
RAADGEWENDE INGENIEURS • CONSULTING ENGINEERS

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TABLE OF CONTENT

1. INTRODUCTION

Hessequa Consulting Engineers CC has been appointed by Belladonna (Pty) Ltd for the planning of civil engineering services for the proposed development of Lot 266 and a remainder of Lot 21, Riversdale Settlement, Hessequa Municipality.

The provision of civil engineering services will be in accordance with the guidelines and requirements of the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as published by the CSIR and that of the Hessequa Municipality.

This report indicates, discusses and elaborates on the design criteria and specifications to be applied in the detail design of the internal and external infrastructure including roads, stormwater, water and sewer reticulation as well as requirements for the provision of fibre and electrical sleeves.

The concept design is based on a site survey completed by Andre La Cock.

Erf 22 is owned by Hessequa Municipality (HM) and borders Erf 21 along the Northern boundary. Both these erven form part of the future development node for Riversdale. Development of these erven will have a combined effect on the existing infrastructure of Riversdale. A holistic approach to the planning of external and internal services, for both erven, is therefore imperative.

GLS Consulting Engineers and CMB Electrical Engineers were appointed by Hessequa Municipality to investigate the full impact that the proposed two developments will have on the existing bulk services including the available water sources, bulk water storage, bulk water supply pipelines, bulk sewer mains, sewage treatment and the provision of electricity.

This report indicates, discusses and elaborates on the design criteria and specifications to be applied in the detail design of the internal and external infrastructure. The supply and distribution of electrical services and bulk supply will be discussed in a separate Electrical Services Report.

The following studies were completed in support of the proposed development:

- Traffic Impact Assessment : Urban Engineering, Mr. F.R. van Aardt Pr. Eng.
- Engineering Geological Report : Terra Geotechnical Mr. E. van der Walt, Engineering Geologist
- Heritage Impact Assessment : ASHA Consulting, Dr. Jayson Orton
- Terrestrial Biodiversity Compliance Statement : Nick Helme Botanical Surveys (Pr.Sci.Nat.)

- Aquatic Biodiversity Impact Assessment & DWS Section 21(C) & (I) Risk Assessment : DDK Consulting Dietmar de Klerk (Pr.Sci.Nat.)
- Animal Species Compliance Statement : Prof Jan A. Venter (SACNASP) & Mr Willem Matthee
- Site Sensitivity Verification and Agricultural Compliance Statement : Johann Lanz Spoil Scientist (Pr.Sci.Nat.)
- Visual Impact Assessment : FC Holm Architects and Landscape Architects
- Environmental Impact Assessment : KAPP Environmental Consultants : Mr. R. Kapp
- Storm Water Management Plan : Graeme McGill Consulting Engineers : Mr. G. McGill Pr. Eng.
- Electrical Consulting Engineers : Clinkscales-Maughan Brown Consulting Engineers: Mr. J de Villiers Pr.Tech.Eng.
- Civil Engineers : Hessequa Consulting Engineers: Mr. G. Pepler Pr.Tech.Eng.
- Town Planners : Planserv Town and Regional Planning Services: Mrs. Madie Coetzee Pr. Pln.

2. LOCATION AND PROPOSED ZONING

Erf 266 & Erf 21 is located to the Western boundary of Riversdale. Erf 21 is divided into two sections by the N2 National Road. The extent of the complete site is approximately 85,13 ha. The development footprint of Erf 21, North of the N2, is 56,4 ha. Development will take place over a 15–20-year period and will consist of the following zonings:

Zoning	***No. of Erven***
Agricultural Zone II	27
Single Residential Zone 1	159
General Residential Zone II	3 (35 units/ha.) – 364 erven
Business Zone III	1
Transport Zone II	7
Transport Zone III	1
Utility Zone I	1

3. ACCESS ROADS

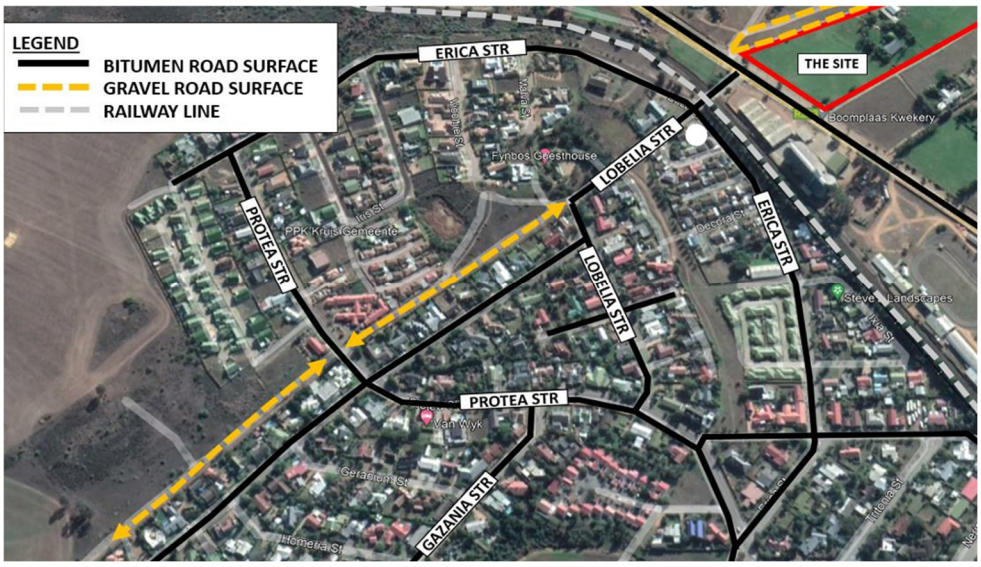
Urban Engineering completed a Traffic Impact Assessment for the proposed development. The following Short- and Long-term measures were identified:

Short Term (Immediate Implementation):

To access Erf 21, it is proposed that Erica Street be extended over Erf 22 as per the proposed site development plan. It is further proposed that the current 4-way STOP, at intersection of Bauhinia Street and Protea Street, to be converted to a new 2-way STOP controlled intersection with priority movement along the Bauhinia approaches to the intersection.

Long Term (5 to 15 Year Period):

Formalisation of the gravel track road currently situated within the Lobelia Street road reserve.



Extract from Urban Engineering TIA : Lobelia Street.

4. ENGINEERING SERVICES

Civil engineering services will be designed in accordance with the design standards of the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as published by the CSIR as well as the minimum requirements of Hessequa Municipality.

4.1. MASS EARTHWORKS

Mass earthworks will be limited to the creation of stormwater attenuation areas on Lifestyle Plots, Parks, within Group Housing Developments and within the Retirement Village.

4.2. ROADS

The access roads will consist of a 6,5m wide extension of Erica Street (Class 5b), over Erf 22 as well as an extension, of 6,5m wide, Bauhinia Street (Class 5b). The 5-15-year development window will result in the completion of Lobelia Street with a 6,5m wide road surface.

Surface treatments will consist of 13,2 and 6,7mm aggregates with a single coat thick slurry. Intersections will be constructed with 80mm Interlocking segmented paving.

The design criteria will be based on the design standards of the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as shown in Table 1 below.

Table 1: Road Design Criteria

Parameter	Local Distributor (Class 4)	Residential Access Loop (Class 5b)	Residential Access way (Class 5d)
Category	UB	UC	UC
Traffic Class	E1	E0	E0
Structural Design Traffic	0.05 - 3 x 10^6	< 0.2 x 10^6	< 0.2 x 10^6
Surface Treatment	13,2 + 6,7mm Aggregates with single coat thick slurry. 80mm Interlocking Segmented Paving at intersections	13,2 + 6,7mm Aggregates with single coat thick slurry. 80mm Interlocking Segmented Paving at intersections	13,2 + 6,7mm Aggregates with single coat thick slurry. 80mm Interlocking Segmented Paving at intersections
Sub-base from commercial sources	150mm G4 (98% MAASHTO) on 150mm G5 (95% MAASHTO) on	150mm G4 (98% MAASHTO) on 150mm G5 (95% MAASHTO) on	150mm G4 (98% MAASHTO) on 150mm G5 (95% MAASHTO) on

	150mm Upper Selected (93% MAASHTO) on 150mm Roadbed prep in-situ Material (90% MAASHTO)	150mm Upper Selected (93% MAASHTO) on 150mm Roadbed prep in-situ Material (90% MAASHTO)	150mm Upper Selected (93% MAASHTO) on 150mm Roadbed prep in-situ Material (90% MAASHTO)
Carriage Way Width	6,5m	5,5/6,5m	4,5/5m
Design Speed	50 km/h	40 km/h	30 km/h
Maximum Gradient	10% over 100m max	16% over 50m max	16% over 30m max
Minimum Gradient	0.5%	0.5%	0.5%
Cross Fall	2%	2%	2%
Bell mouths	8m Radius	8m Radius	8m Radius

The study area hosts at least two geological formations with the contact on the western edge of the site. According to the geology map, the site is predominantly underlain by Tertiary aged River Terrace Gravels, with the western edge underlain by sediments of the Kirkwood Formation consisting of Reddish and Greenish Mudstone and Sandstone with subordinate Conglomerate lenses forming part of the Uitenhage Group. The whole site is covered with a variable thickness of boulder alluvium. It is present as frequent rounded and sub-rounded gravels and cobbles in a matrix of slightly moist grey, brown medium dense silty/clay sand.

The results of road indicator tests conducted on the bulk samples of this material can be summarized as follows:

- This material reacts very poorly to compaction with as CBR value of 5 at a compaction effort of 93% MOD AASHTO. This material classifies as a worse than G9-type material (COLTO classification system). These test results will be used as basis for the pavement design, which will be done in accordance with the Urban Transport Guidelines, UTG2, Structural Design of Segmental Pavements for Southern Africa, 1987. Suitable commercial sources for the construction materials are available within Hessequa municipal area and surrounding towns.

4.3. STORMWATER

4.3.1. Stormwater Management Strategy

Graeme McGill Consulting Engineers was appointed to prepare a Storm Water Management Plan (SWMP) for the proposed development as well the drainage through the lower lying areas.

The following measures are proposed to mitigate the impact of post development stormwater runoff on the existing infrastructure downstream from the proposed development:

- Installation of 5 000 kℓ water tanks on each residential erf will contribute to the attenuation of initial runoffs.
- Public Open Spaces will be utilised as recreation areas as well as stormwater detention areas where the concentration of stormwater runoff will be minimised through the application of landscaping techniques, i.e. by creating grass lined swales, undulations and depressions.
- Post development runoffs will be attenuated with the construction of stilling basins and energy dissipating structures at outlet structures.

4.3.2. Stormwater Design

Stormwater infrastructure will be constructed in accordance with the standard requirements and specifications as agreed with the Hessequa Municipality as well as the SWMP.

Stormwater runoff from the erven will drain towards the internal road network that will be divided into two drainage zones (Annexure A).

Drainage Zone 1:

Surface runoff, from drainage zone 1, will drain in a north-eastern direction to new stormwater inlet structures and pipework parallel, constructed for the development, to the connection road with Erica Street. Stormwater attenuation areas will be created on the lowest Estate Plot(s), within the Retirement Village and the Park (Erf 191). This area represents approximately 87% of the area and will exit through a stormwater servitude parallel to the side boundary of erf 5788.

Drainage Zone 2:

Surface runoff, from drainage zone2, will also drain in a north-eastern direction parallel to the new Lobelia connecting road, crossing Protea Street and exiting in the existing dam situated within a park area (Erf 4177). Stormwater attenuation areas will be created on the lowest Estate Plot(s) and within Group Housing erven (Erven 30 & 31). This area represents approximately 13% of the development area.

The attenuation areas will prevent any negative effect on lower lying properties.

Design criteria adopted for the development regarding stormwater infrastructure is summarised as follows:

Runoff rates will be determined according to the Rational Method.

Flood recurrence interval	:	2 years
Pipe material	:	Concrete
Pipe class	:	75D / 100D
Pipe diameters	:	Minimum 375mm Ø up to diameter as required
Bedding	:	Class C
Inlets	:	Kerb and drop inlets as required
Manholes	:	Point of deflections on pipes

4.4. WATER

4.4.1. Water Demand

The estimated Annual Average Daily Demand (AADD) for the development is as follows:

27 Estate (Agricultural II) plots @ 2,000 ℓ/plot/day	54,0 kℓ/day
159 Single Residential erven @ 1,000 ℓ/erf/day	159,0 kℓ/day
2 Group Housing Erven (3,89ha @ 35 units/ha@ x 800 ℓ/unit/day)	109,0 kℓ/day
1 Retirement Lifestyle Village (6,5ha @ 35 units/ha@ x 750 ℓ/unit/day)	170,0 kℓ/day
1 Business erf: 0,65ha: 2000m² floor space @ 400 ℓ/100m²	8,0 kℓ/day
Total AADD	**500 kℓ/day or 5,79 ℓ/s**

4.4.2. Availability of sufficient Water Sources

Hessequa Municipality confirmed on 30 July 2024, through the Municipal Manager Mr. A. de Klerk, reference 17/7/5/9, that Hessequa Municipality (Riversdale) consists of sufficient water sources to accommodate the development of Erf 21. (Annexure B)

4.4.3. Water Storage

The proposed development falls within the High-Level Reservoir Zone and require storage capacity of 1 Mℓ that represent 48 hours of the AADD. The existing storage capacity at the High-Level Reservoir Zone is 5,64 Mℓ with a Full Water Level (FWL) of 213,02m.

The proposed development has an elevation range between 135,5 and 183,5 m a.s.l. All erven will have a minimum of 24m water pressure.

Hessequa Municipality confirmed on 30 July 2024, through the Municipal Manager Mr. A. de Klerk, reference 17/7/5/9, that Hessequa Municipality (Riversdale) consists of sufficient water storage

capacity, within the High-Level Reservoir Zone, to accommodate the development of Erf 21. (Annexure B)

4.4.4. Water Link Services

In accordance with the GLS Report, dated June 2015, the following Link Water Main will be required to accommodate the proposed development in the existing High-Level Zone (Annexure C):

- 1,855m Long, 200mm Ø, uPVC Water Link between existing 200mm High Level pipe network, at the northwestern corner of the Cemetery (adjacent to the N2) and Erf 21. It is proposed that the pipeline be upsized to an 250mm Ø, uPVC to accommodate the future development of Erf 22.

The cost for the construction of the external link water main will be deducted from the Capital Contributions, payable per erf, to Hessequa Municipality.

4.4.5. Water Reticulation

New 75/110/160/200mm Class 9 uPVC water mains complete with isolating valves, fire hydrants and erf connections will be provided. Erf connections will be made with HDPE PE80 PN12,5 pipes and terminate with an end cap.

The basis of the water reticulation design for the proposed development is summarised in the table below:

Table 4: Water Reticulation Design Criteria

PARAMETER	GUIDELINE
Pipe materials for erf connections	HDPE PE80 PN12,5
Pipe materials for reticulation mains	uPVC (Class 9)
Minimum diameter for reticulation mains	75mm
Minimum diameter for erf connections serving two erven	25mm branching to 2 x 20mm
Minimum diameter for Estate Plots	25mm
Minimum diameter for erf connections serving a single erf	20mm Polycop

Valves	75/110/160/200mm AVK (open clockwise)
Fire Hydrants	AVK London V on respective pipe Ø
Water meters	20mm Elster Kent or similar (Water meter to be installed by Hessequa Municipality with Building Plan approvals.)

4.5. SEWERAGE

4.5.1. WWTW

The existing WWTW has a design capacity of 4,0 Mℓ/d. Hessequa Municipality confirmed on 30 July 2024, through the Municipal Manager Mr. A. de Klerk, reference 17/7/5/9, that the WWTW in Hessequa Municipality (Riversdale) consists of sufficient capacity to accommodate the proposed development. (Annexure B)

4.5.2. Sewer Design Flows

In accordance with the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* it is expected that 70% of the Average annual water daily demand will end up in the wastewater system.

The annual average dry weather flow (AADWF) equals 70% of 500 kℓ/d = 350 kℓ/d = 4,05 ℓ/s.

To determine the Peak Wet Weather Flow (PWWF) a peak factor of 2,32 were taken in consideration with an expected stormwater infiltration of 15%. The PWWF equals 10,8 ℓ/s.

4.5.3. Sewer Link and Bulk Infrastructure (Annexure D)

Drainage Zone 1:

Sewage, from drainage zone 1, will drain in a north-eastern direction. A 160mm Ø connecting sewer main will be constructed, parallel to the Erica Street link road, and connect to existing 160mm Ø sewer main. This drainage zone represents approximately 87% of the development area.

Drainage Zone 2:

Sewage, from drainage zone 2, will drain in a north-eastern direction. A 160mm Ø connecting sewer main will be constructed to link to the existing 160mm Ø sewer main in Bauhinia Street. This drainage zone represents approximately 13% of the development area.

Hessequa Municipality confirmed on 30 July 2024, through the Municipal Manager Mr. A. de Klerk reference 17/7/5/9, that the existing sewer network, in Riversdale, consists of sufficient capacity to accommodate the proposed development. (Annexure B).

4.5.4. Design Criteria

The following minimum design criteria shall be applicable to sewer pipework:

- Design parameters: Average daily flow as per Red Book for the different housing categories Peak factor – Harmon formula: Extraneous flow – 15% : Minimum velocity – 0.7m
- Minimum cover to pipes: 0.80m
- Minimum pipe size: 110mm diameter for house connections : 160mm diameter for sewer mains
- Minimum gradients: 110mm diameter house connection 1:60 : main lines at 80% capacity as follows :

Number of Dwelling/units	**Grade**
Less than 6	1:80
6 to 10	1:100
11 to 80	1:120

- House connection depth shall generally be 1.0m but at least be able to drain 80% of an erf.
- Maximum manhole spacing of 80m.

4.6. ELECTRICAL SLEEVES

The position of electrical sleeves (110/160mm Class 34 PVC) will be determined in consultation with the Electrical Engineer.

5. SOLID WASTE

Hessequa Municipality to collect solid waste for discharging at the Riversdale solid waste dump site.

Hessequa Municipality confirmed on 30 July 2024, through the Municipal Manager Mr. A. de Klerk reference 17/7/5/9, that the existing permitted landfill site consists over sufficient airspace for the next 10 years. At the end of the life span, of the existing site, solid waste will be transported to the Garden Route Regional Landfill Site. (Annexure B)

The estimated solid waste generated per day, fully developed, is as follows:

3,5kg x person/d (1742) = 6,097 ton/day = 5,232 m^3/day (volume).

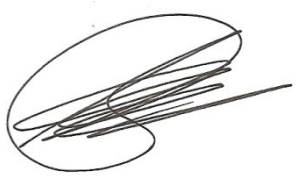
6. AUGMENTATION LEVIES

It is accepted that budgetary constraints, within the approved three-year Hessequa Municipality budget, will result in the Developer having to provide bridging finance for incremental services. The offset of Augmentation Levies, payable for water, sewer and road and stormwater services, against the bridging finance of incremental services will be negotiated with Hessequa Municipality.

Cost for link/bulk services will be carried by the Developer and will be deducted from Augmentation Levies payable per development opportunity. The Developer will be able to deduct cost, for link/bulk services to prevent an extended interest factor. The Levies will be determined and escalated in accordance with the municipality's annual budgets.

7. CONCLUSION

We trust that the information included in this report will provide insight to the level of services required for the proposed development.



G PEPLER Pr Tech Eng
HESSEQUA CONSULTING ENGINEERS

16 September 2024

ANNEXURE A - DRAWING

HESRIV-532-SW1 : STORMWATER DRAINAGE ZONES

LEGEND - WATER		
ITEM	EXISTING	NEW
EXTERNAL STORMWATER NETWORK PIPE SIZES TO BE DETERMINED BY SWMP		
DRAINAGE ZONE 1		
DRAINAGE ZONE 2		

VERKLEINDE SKAAL/REDUCED SCALE

0 10 20 30 40 50

50

Notas/Notes

Wysiging/Amendment

Nr. No.	Datum Date	Nagesien Checked	Deur By	Beskrywing Description

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CESA
Consulting Engineers South Africa

Ontwerp Designed	Geteken Drawn	Nagesien Checked
AA	AA	GP

Raadgewende Ingenieur / Consulting Engineer — Pr Tech Eng — 16-9-24 — Datum/Date

Klient/Client — Datum/Date

Klient/Client

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Projek/Project

CIVIL ENGINEERING SERVICES FOR THE DEVELOPMENT OF LOT 266 & A PORTION OF REMAINDER OF LOT 21, RIVERSDALE SETTLEMENT, HESSEQUA MUNICIPALITY

Tekening Beskrywing/Drawing description

EXTERNAL STORMWATER

Skaal/Scale	Datum/Date
1:3000	SEPTEMBER 2024

Tekening nommer/Drawing number

HESRIV-532-SW1

ANNEXURE B : LETTER

LETTER FROM HESSEQUA MUNICIPALITY CONFIRMING THE AVAILABLE CAPACITY FOR:

- Water Sources
- Water Storage Capacity
- WWTW Capacity
- Sewer Network Capacity
- Solid Waste Capacity

HESSEQUA

Munisipaliteit / Municipality / U Masipala

TEGNIESE DIENSTE
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Van den Bergstraat
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Verw. / Ref: 17/7/5/9

Navrae/Enquiries: A. de Klerk

30 July 2024

Hessequa Consulting Engineers
PO Box 577
RIVERSDAL,
6670

Attention: Mr. G. Pepler

Sir

CONFIRMATION OF AVAILABILITY OF MUNICIPAL SERVICES FOR THE PROPOSED DEVELOPMENT ON ERF 21, RIVERSDALE

Correspondence with regards to the availability of municipal engineering services for the development of erf 21, has reference.

Information included herein confers no rights to the Developer and merely serves as confirmation that **Council will provide bulk water, sewage and electrical services to the proposed development of** erf 21, subject to the following conditions:

***Water Connection*:**

Bulk infrastructure must be upgraded between the high-level reservoir and the water treatment works.

A new bulk water line must be constructed from the water treatment works to the development.

The abovementioned bulk upgrades need to be constructed to ensure the minimum water pressure as prescribed in the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as published by the CSIR. Costs for the complete installation shall be for the Developer's account.

***Sewer Connection*:**

The Riversdale wastewater treatment plant capacity is 4 ML/day and is sufficient to accommodate the development. The bulk sewer line in Barnes Street needs to be upgraded. The installation shall be in accordance with the requirements of *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as published by the CSIR. Costs for the complete installation shall be for the Developer's account.

***Solid Waste Disposal*:**

Hessequa Municipality will collect solid waste generated by the development and dispose thereof at a permitted municipal landfill site. The disposal facility currently has 10 years available airspace, after which solid waste will be transported by the municipality to the Garden Route Regional Landfill Site.

Electricity:

A bulk electrical line needs to be constructed to provide electricity to the proposed development at the developer's cost.

The approval of the residential development of erf 21 remains subject to DEADP and Council's approval.

Yours faithfully

.....

A.S.A. DE KLERK

MUNICIPAL MANAGER
Copy: Mr. H. Visser / R. Manho
Collab ref.: 629462 (Correspondence)

ANNEXURE C : DRAWING

HESRIV-532-W1 : LINK WATER MAIN

VERKLEINDE SKAAL/REDUCED SCALE

0 10 20 30 40 50

50

Notas/Notes

Wysiging/Amendment

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Raadgewende Ingenieur / Consulting Engineer — Pr Tech Eng — 16-9-24 Datum/Date

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Tekening Beskrywing/Drawing description

EXTERNAL WATER

Skaal/Scale	Datum/Date
1:4000	SEPTEMBER 2024

Tekening nommer/Drawing number

HESRIV-532-W1

ANNEXURE D : DRAWING

HESRIV-532-S1 : SEWER LINKS

VERKLEINDE SKAAL/REDUCED SCALE

0 10 20 30 40 50

50

Notas/Notes

Wysiging/Amendment

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Tekening Beskrywing/Drawing description

EXTERNAL SEWER

Skaal/Scale	Datum/Date
1:3000	SEPTEMBER 2024

Tekening nommer/Drawing number

HESRIV-532-S1