



14 May 2018

The Manager: Civil Engineering Services
Drakenstein Municipality
P. O. Box 1
PAARL
7620

Attention: Mr Louis Pienaar

Dear Sir

DEVELOPMENT OF ERVEN 38, 40, 42, 52 & 193/2, WELLINGTON: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Gawie Le Roux of Triple 3 Engineering Solutions regarding comments on the bulk water and sewer supply to the proposed development (development of erven 38, 40, 42, 52 & 193/2, Wellington), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Drakenstein Municipality) dated February 2017 and the Sewer Master Plan dated February 2017.

Future areas W1, W2 & W24, which includes the proposed development area, were conceptually taken into consideration for the master plans for the water and sewer networks.

1. WATER DISTRIBUTION SYSTEM

1.1 *Distribution zone*

The master planning indicated that this development area should be accommodated in the existing Newton/Van Blerk reservoir zone. Currently the area in Wellington adjacent to the R44 Main Road north of the Krom River is however supplied with water from the existing Welvanpas reservoir zone. Adjustment to the zone boundaries between the existing Newton/Van Blerk reservoir and Welvanpas reservoir distribution zones will therefore be required to supply the proposed development with water from the existing Newton and Van Blerk reservoirs.

The connection to the existing system should be done to the existing 110 mm diameter pipe adjacent to the R44 Main Road, as shown on Figure 1 attached.

The development is situated inside the water priority area.

1.2 *Water demand*

The previous water analysis for the master plan was performed with a total annual average daily demand (AADD) for the proposed development area on erven 38, 40, 42, 52 & 193/2 of 837,2 kℓ/d.

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For this re-analysis, the AADD and fire flows for the proposed development was calculated as follows:

Development A:

•	± 3,0 ha Hospital @ 16,0 kl/d/ha	=	48,0 kl/d
•	± 10,5 ha business/commercial area @ 18,0 kl/d/ha	=	189,0 kl/d
•	± 14,2 ha light industrial/commercial area @ 18,0 kl/d/ha	=	<u>255,6 kl/d</u>
	sub-total	=	492,6 kl/d

Development B:

•	± 23 743 m ² business/commercial area @ 0,4 kl/d/100 m ²	=	95,0 kl/d
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Development C:

•	± 10,6 ha light industrial/commercial area @ 18,0 kl/d/ha	=	180,0 kl/d
	Total	=	767,6 kl/d
•	Fire flow criteria (Moderate risk)	=	25 l/s @ 10 m

1.3 Present situation

1.3.1 Network capacity

The proposed development areas are currently supplied with water from the Welvanpas reservoir zone. The existing Welvanpas reservoir zone has insufficient capacity to accommodate the proposed development and it is proposed in the water master plan that all phases of the proposed development area are accommodated in the existing Newton/Van Blerk reservoir zone. Adjustment to the zone boundaries between the existing Newton/Van Blerk reservoir and Welvanpas reservoir distribution zones will be required to supply the proposed development with water from the existing Newton and Van Blerk reservoirs.

The existing Newton/Van Blerk reservoir zone has only sufficient capacity to accommodate the domestic water demand of development B of the total development area. Upgrading of the existing system will be required to supply sufficient fire flow to development B of the total development area, or to accommodate any further development in the area.

The following link services items will be required to supply fire flow to the proposed development area, or to connect development areas A & C to the existing water system:

Link services

•	DWW1.30	: 75 m x 250 mm Ø new supply pipe	R	277 000 *
•	DWW1.31	: 815 m x 315 mm Ø new supply pipe	R	2 314 000 *
•	DWW1.32	: 284 m x 200 mm Ø new supply pipe	R	691 000 *
•	DWW1.33	: 550 m x 200 mm Ø new supply pipe	R	<u>1 630 000 *</u>
	Total		R	4 862 000 *

Provision should be made for a 3 m wide pipeline servitude (in favour of the Drakenstein municipality) to accommodate link services items DWW1.31, DWW1.32 & DWW1.33.

Note: Link services items DWW1.30 & DWW1.31 are required for development area B to comply with the fire flow criteria as set out in the water master plan and link services items DWW1.32 & DWW1.33 are required for development areas A & C to connect to the existing water system and to comply with the fire flow criteria as set out in the water master plan.

1.3.2 Reservoir capacity

The existing Newton, Van Blerk & Con Marine reservoirs have sufficient reservoir storage capacity available to accommodate the proposed development.

1.3.3 Bulk supply

Wellington

Wellington is supplied with bulk water from two sources, i.e. their own source in the adjacent mountains (the so-called Antoniesvlei source) and water purchased from the City of Cape Town from the Wemmershoek scheme. During peak summer conditions water is mainly supplied to Wellington from the Wemmershoek source through the 500 mm diameter Leliefontein pipeline (bulk gravity pipeline between the Leliefontein reservoir in Paarl and the Newton and Con Marine reservoirs in Wellington) and augmented during peak demand conditions through the 375 mm diameter (the so-called "Strawberry King") pipeline (bulk gravity pipeline from the Courtrai suburb in Paarl to the Newton suburb in Wellington). Upgrading of the "Strawberry King" pipeline is currently in progress by the Drakenstein Municipality.

Existing peak flow requirement

Monthly flow measurements of bulk water supply to Wellington from the Antoniesvlei source and the Wemmershoek source from July 2005 to June 2015 indicates that the current peak monthly demand for Wellington is 1,37 times the AADD and experienced in the month of January.

If an assumed ratio of peak day to peak month of 1,25 is used, the current peak day factor for Wellington can be calculated as follows:

$$\begin{aligned}\text{Peak day factor (PDF)} &= \text{Peak month factor (PMF)} \times 1,25 \\ &= 1,37 \times 1,25 = 1,71\end{aligned}$$

The current peak daily flow required from the Wemmershoek source to the entire Wellington system (excluding the proposed development) is calculated as follows:

$$\begin{aligned}\text{Peak daily flow} &= \text{AADD} \times \text{PDF} \\ &= 12\,258 \text{ k\ell/d} \times 1,71 \\ &= 20\,961 \text{ k\ell/d (243 \ell/s)}\end{aligned}$$

Note: During summer months bulk water supply from the Antoniesvlei source in the adjacent mountains is not reliable and water is supplied mainly from the Wemmershoek scheme.

Existing capacity

The capacity of the existing bulk supply system from the Wemmershoek source to Wellington is as follows:

Leliefontein pipeline	=	15 725 kℓ/d (182 ℓ/s)
Strawberry King pipeline	=	<u>6 220 kℓ/d (72 ℓ/s)</u>
Total	=	21 945 kℓ/d (254 ℓ/s)

The existing 375 mm diameter Strawberry King bulk pipeline that is used in peak demand conditions to augment bulk water supply to Wellington is in a bad state of repair and requires urgent upgrading. It should however be noted that the Drakenstein Municipality is currently in process to upgrade this pipeline.

Without the capacity of the Strawberry King line (which is frequently the case in summer months when pipe failures occur on the line) the existing bulk supply system has insufficient capacity to accommodate any additional developments in Wellington.

When the Strawberry King bulk pipeline is however fully operational (together with the Leliefontein pipeline), the Wellington bulk system has spare capacity available to accommodate additional developments in Wellington with peak daily demands of up to 984 kl/d (AADD of 575 kl/d).

Additional peak flow required

The additional bulk supply capacity required from the Wemmershoek source during peak demand conditions in order to accommodate the proposed development on erven 38, 40, 42, 52 & 193/2 in Wellington is calculated at 2,5 l/s for development B and 14,9 l/s for developments A & C of the total development area.

1.4 *Implementation of the master plan*

1.4.1 *Network capacity*

The following master plan items will be required to reinforce the existing system and alter the zone boundaries between the existing Newton/Van Blerk reservoir and Welvanpas reservoir distribution zones in order to accommodate the proposed development together with other future developments in the area.

Welvanpas rezoning: Phase 1

•	DWW9.7	: Insert new 110 mm Ø valve and close	R	100 000 *
•	DWW9.13	: Open existing 110 mm Ø valve	R	0 *
		sub-total	R	100 000 *

After these items are implemented the proposed development area will be accommodated within the existing Newton/Van Blerk reservoir zone. The existing reticulation network of the Newton/Van Blerk reservoir zone has sufficient capacity to accommodate the domestic water demand of the first phase of the proposed development (development area B). Upgrading of the existing Newton/Van Blerk network will however be required to supply fire flow to the development, or to accommodate the other phases of the total development area.

The following network upgrades will be required to supply sufficient fire flow to development area B:

Newton/Van Blerk network upgrade: Phase 1

•	DWW1.4	: 925 m x 355 mm Ø Parallel reinforcement pipe	R	4 140 000 *
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The following master plan items will be required to reinforce the existing system in order to accommodate the second phase of the proposed development.

Welvanpas rezoning: Phase 2

•	DWW1.49	: 20 m x 110 mm Ø inter-connection pipe	R	55 000 *
•	DWW1.7a	: 20 m x 200 mm Ø inter-connection pipe	R	81 000 *
•	DWW9.1	: Open existing 150 Ø valve	R	0 *
•	DWW9.4	: Insert and close new 250 mm Ø valve	R	109 000 *
•	DWW9.5	: Insert and close new 300 mm Ø valve	R	450 000 *
•	DWW9.10	: 110 m x 315 mm Ø Parallel reinforcement pipe	R	339 000 *
•	DWW1.44d	: Open existing 300 Ø valve	R	0 *
		sub-total	R	1 034 000 *

Welvanpas rezoning: Phase 3

•	DWW.B27	: 240 m x 500mm Ø New bulk supply pipe	R	1 139 000 *
•	DWW9.2	: 1 205 m x 355 mm Ø upgrade of existing 250 Ø pipe	R	4 783 000 *
•	DWW9.3	: 360 m x 315 mm Ø upgrade of existing 100 Ø pipe	R	1 487 000 *
•	DWW1.9**	: 930 m x 160 mm Ø Parallel reinforcement pipe	R	2 883 000 *
		sub-total	R	10 292 000 *

Welvanpas rezoning: Phase 4

•	DWW1.12	: 1 200 m x 315 mm Ø replace existing 225 Ø pipe	R	4 956 000 *
•	DWW1.44a	: Open existing 63 Ø valve	R	0 *
•	DWW1.44b	: Open existing 100 Ø valves	R	0 *
•	DWW1.44c	: Open existing 160 Ø valve	R	0 *
•	DWW9.6	: Insert and close two new 150 mm Ø valves	R	95 000 *
		sub-total	R	5 051 000 *

Newton/Van Blerk network upgrade: Phase 2

•	DWW1.36	: 620 m x 250 mm Ø Parallel reinforcement pipe	R	2 139 000 *
•	DWW9.11	: 320 m x 250 mm Ø Parallel reinforcement pipe	R	1 104 000 *
•	DWW9.12	: 1 370 m x 250 mm Ø New supply pipe	R	4 726 500 *
		sub-total	R	7 969 500 *
		Total	R	32 316 500 *

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2017/18 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

** If item DWW1.9 replaces the existing pipe it is proposed that the diameter is enlarged to 200 mm.

1.4.2 Bulk supply

It is proposed in the water master plan that bulk water supply to Wellington should be augmented in 3 phases, as shown on Figure 3 attached.

Phase 1

Construct a booster pump station on the Leliefontein pipeline in order to augment the capacity of the line from 182 l/s (15 725 kl/d) to 347 l/s (30 000 kl/d):

•	DWW.B5 **	: New 347 l/s @ 62 m booster PS on Leliefontein bulk pipeline	= R	51 319 731 *
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** Construction of this bulk PS is currently in progress. The detail analysis of the capacity of the existing 500/450 mm Ø bulk pipeline between the Leliefontein reservoir and the existing Newton & Con Marine reservoirs in Wellington should however be verified as part of the detail design of the PS.

When the booster pump station is implemented the existing bulk supply system will have sufficient capacity to accommodate the proposed development for a scenario where the Strawberry King line is not operational.

Upgrading of the Strawberry King pipeline is however crucial in order ensure the reliability of bulk water supply to Wellington and the completion of this project should be done as soon as possible and is required by the Drakenstein Municipality in order to accommodate any additional developments in Wellington.

Phase 2

Replace the existing Strawberry King pipeline with a new 560 mm diameter HDPE pipe (inside diameter = 473 mm). Upgraded capacity = 139 l/s (12 000 kl/d). Outstanding master plan items to complete this project are DWW.B23, DWW.B24 & DWW.B25.

It is also proposed in the master plan that a pressure reducing valve (PRV) with a sensor and controller is installed on the Strawberry King pipeline in order to reduce high static pressures (master plan item DWW.B26). Setting of the PRV should be set to an energy grade line (EGL) of ± 180 m.

•	DWW.B23b	: 3 085 m x 560 mm \varnothing upgrade existing 375 mm \varnothing bulk pipeline	= R 31 427 000 *
•	DWW.B24b	: 985 m x 560 mm \varnothing upgrade existing 375 mm \varnothing bulk pipeline	= R 9 939 000 *
•	DWW.B25	: 3 155 m x 560 mm \varnothing upgrade existing 375 mm \varnothing bulk pipeline	= R 31 357 000 *
•	DWW.B26	: New PRV with controller (Setting ± 180 m EGL)	= R 1 277 000 *
		Total	= R 74 000 000 *

When the phase 1 upgrade (new booster pump station) is implemented, the existing system will have sufficient capacity to supply bulk water to Wellington during summer months and upgrading of the Strawberry King pipeline could therefore also be done during the summer months.

Phase 3

Reinforce the existing 500 mm diameter Leliefontein bulk pipeline between Leliefontein reservoir and Wellington with a parallel 700 mm diameter pipeline between the Leliefontein reservoir and the Newton reservoir and a parallel 500 mm diameter pipeline between the Newton reservoir and the Con Marine reservoir, in order to augment the capacity of the line from 347 l/s (30 000 kl/d) to 694 l/s (60 000 kl/d).

(Upgrading required in future when phase 1 & phase 2 upgrades reaches capacity. Master plan items DWW.B9 & DWW.B12 in the master plan, estimated cost of \pm R 60 000 000*.)

(* Including P & G, Contingencies and Fees, but excluding VAT – Year 2016/17 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

Take note that the routes of the proposed pipelines are schematically shown on Figures 1 to 3 attached, but have to be finalised subsequent to detail pipeline route investigations.

1.5 Minimum upgrades

Reticulation network:

Development B:

The minimum upgrades required in order to accommodate the domestic water demand of development B in the existing water system are master plan items DWW9.7 & DWW9.13 (required to accommodate development A of the proposed development area within the existing Newton/Van Blerk reservoir zone).

Link services items DWW1.30 & DWW1.31 and master plan item DWW1.4 will however be required to comply with the fire flow criteria as set out in the water master plan.

Developments A & C:

The minimum upgrades required in order to accommodate development areas A & C in the existing water system are:

- all the link services and master plan items required to accommodate development area B of the larger development,
- all the water master plan items associated with Welvanpas rezoning phases 2, 3 & 4,
- all the water master plan items associated with Newton/Van Blerk network upgrade phase 2,
- and link services items DWW1.32 & DWW1.33

Bulk supply:

Items DWW.B5, DWWB23b, DWWB24b, DWWB25 and DWWB26 are required to augment bulk water supply to Wellington town in order to accommodate any additional development in Wellington.

Notes:

- Although the existing Wellington bulk supply system has spare capacity available when the Strawberry King line is operational, the bulk supply through the pipeline is unreliable and upgrading of the Wellington bulk system is therefore proposed to accommodate any additional developments in Wellington
- Master plan item DWW.B5 is required as an important first phase to augment bulk water supply to Wellington. Construction of this project is currently in progress.
- The implementation of master plan item DWW.B5 will augment the Wellington bulk supply system (excluding the capacity of the Strawberry King line) to a peak day demand of $\pm 30\,000$ kl/d (AADD of $\pm 17\,500$ kl/d).
- The completion of the project to upgrade the Strawberry King pipeline (master plan items DWW.B23, DWW.B24 & DWW.B25) are required to improve the redundancy of the Wellington bulk water supply system (Wellington can be supplied from a second bulk supply pipeline for a scenario where supply problems are experienced on the Leliefontein supply).
- When master plan items DWW.B23, DWW.B24 & DWW.B25 are constructed, the capacity of the Wellington bulk supply system will improve to:
 - a peak day demand of $\pm 12\,000$ kl/d (AADD of $\pm 7\,000$ kl/d) for the pipeline alone.
 - a peak day demand of $\pm 27\,700$ kl/d (AADD of $\pm 16\,000$ kl/d) for the total system without upgrading to the existing Leliefontein bulk supply (excluding master plan item DWW.B5).
 - a peak day demand of $\pm 42\,000$ kl/d (AADD of $\pm 24\,500$ kl/d) for the total system with upgrading of the existing Leliefontein bulk supply (including master plan item DWW.B5).

2. SEWER NETWORK

2.1 Drainage area

The development falls within the Future PS W2 drainage area, as shown on Figure 4 attached.

The development is inside the sewer priority area.

2.2 Sewer flow

The sewer analysis for the master plan (existing scenario) was done with a peak day dry weather flow (PDDWF) for development on erven 38, 40, 42, 52 & 193/2 of 620,4 kl/d.

For this re-analysis, the PDDWF for the proposed development was calculated as follows:

Development A :	394,8 kℓ/d
Development B :	76,0 kℓ/d
Development C :	144,0 kℓ/d
Total :	614,8 kℓ/d

2.3 Present situation

It is proposed that the development connects to the existing Wellington sewer system in Stokery Road, as shown on Figure 4 attached. There is sufficient capacity in the existing bulk collector sewer downstream of the proposed connection point in Stokery Road to accommodate the development.

There is however no sewer infrastructure between the proposed development and the existing sewer network, and new bulk sewer infrastructure will be required to connect the proposed development to the existing Wellington sewer network

The following link services items will be required to connect the proposed development to the existing sewer system.

Link service items

Development B:

• DWS6.3	: 340 m x 315 mm Ø New outfall sewer	R	1 735 000 *
• DWS6.4	: New Future PS W2 (initial capacity of 25 l/s)	R	3 094 000 *
• DWS6.5	: 1 230 m x 250 mm Ø New rising main	R	3 633 000 *
	sub-total	R	8 462 000 *

Developments A & C:

• DWS6.1	: 180 m x 160 mm Ø New outfall sewer	R	772 000 *
• DWS6.2	: 365 m x 160 mm Ø New outfall sewer	R	803 000 *
• Item 1	: 660 m x 250 mm Ø New outfall sewer (including R44 road-crossing)	R	2 215 000 *
• Item 2	: New pumping station	R	1 477 000 *
• Item 3	: 420 m x 90 mm Ø New rising main	R	358 000 *
	sub-total	R	5 629 000 *
	Total	R	14 083 000 *

Notes:

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2017/18 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

The routes of the proposed pipelines are schematically shown on Figure 4, but have to be finalised subsequent to detail pipeline route investigations.

Provision should be made for pipeline servitude (in favour of Drakenstein Municipality) to accommodate link services items 1, 2, 3 & DWS6.1 to DWS6.5.

The minimum requirements to accommodate development area B of the larger development area in the existing sewer system are link services items DWS6.3, DWS6.4 & DWS6.5 to connect to the existing Wellington sewer system. Link services items 1, 2, 3 & DWS6.1 & DWS6.2 will be required to accommodate development areas A & C of the larger development area.

3. CONCLUSION

Development areas A, B & C of the proposed development on erven 38, 40, 42,52 & 193/2 in Wellington may be liable for the payment of a Development Contribution (as calculated by the Drakenstein Municipality) as per Council Policy.

There is insufficient capacity in the existing water reticulation and bulk supply systems to accommodate the proposed development. The existing Newton, Van Blerk & Con Marine reservoirs have however sufficient reservoir storage capacity available to accommodate the proposed development.

The minimum upgrades required in order to accommodate the domestic water demand of Development B of the proposed development in the existing water system are master plan items DWW9.7 & DWW9.13 (required to accommodate development B of the proposed development area within the existing Newton/Van Blerk reservoir zone). Link services items DWW1.30 & DWW1.31 and master plan item DWW1.4 will however be required to comply with the fire flow criteria as set out in the water master plan.

The minimum upgrades required in order to accommodate development areas A & C of the proposed development in the existing water system are all the link services and master plan items required to accommodate development area B of the development, all the water master plan items associated with Welvanpas rezoning phases 2, 3 & 4, all the water master plan items associated with Newton/Van Blerk network upgrade phase 2 and link services items DWW1.32 & DWW1.33 to connect to the water infrastructure of development area B.

Master plan items DWW.B5, DWWB23b, DWWB24b, DWWB25 and DWWB26 are required to augment bulk water supply to Wellington town in order to accommodate any additional development in Wellington.

There is sufficient capacity in the existing bulk collector sewer downstream of the proposed connection point in Stokery Road to accommodate the development. There is however no sewer infrastructure between the proposed development and the existing sewer network.

The minimum requirements to accommodate development area B of the proposed development in the existing sewer system are link services items DWS6.3, DWS6.4 & DWS6.5 to connect to the existing Wellington sewer system. Link services items 1, 2, 3, DWS6.1 & DWS6.2 will be required to accommodate development areas A & C of the proposed development.

Also find attached hereto Appendix A which includes general notes from Drakenstein Municipality regarding development approvals and conditions.

We trust you find the above of value.

Yours sincerely

GLS CONSULTING (PTY) LTD
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Per: PC DU PLESSIS

cc: Triple Three Engineering Solutions
18 Main Street
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Attention: Mr Gawie le Roux

GENERAL NOTES FROM DRAKENSTEIN MUNICIPALITY ATTACHED TO GLS SERVICES REPORT

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.
2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.
3. Costs for network upgrades, etc. As mentioned in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.
4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Drakenstein Municipality's Development Contribution Calculator.
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.
6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.
7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.
8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be off-set against the Development Contribution monies payable
9. If the developer is requested to provide bridging finance for the development, the outstanding amount will be repaid within a five year period at an interest rate determined by the Head: Finance of Drakenstein Municipality.
10. The above conditions are subject to any approved Council policies, which may be amended from time to time.