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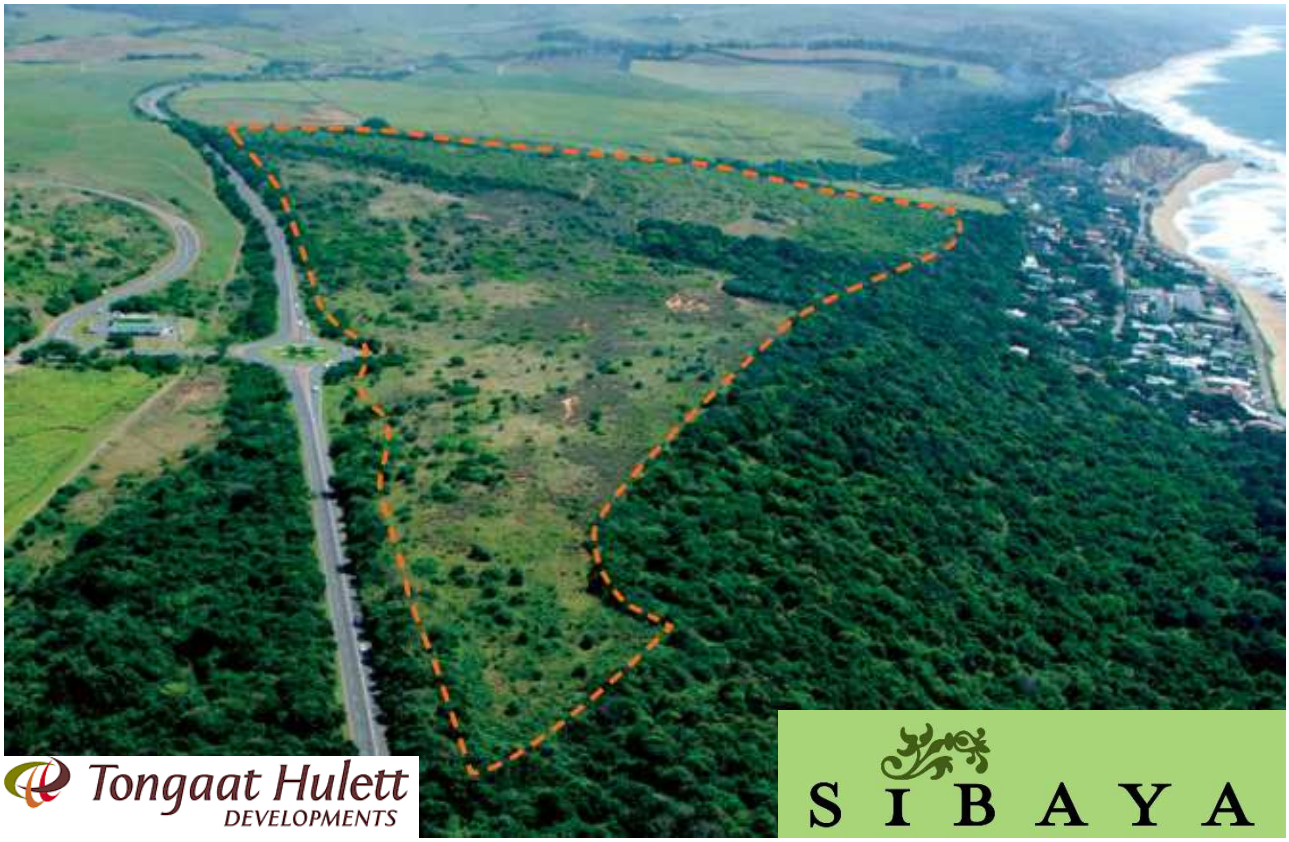
Project Description Report

Sibaya Precinct Bulk Services

700 mm Diameter Water Main

Date March 2016 Ref. DR 2016/12



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Project Name:	Sibaya Precinct Bulk Services
Project Number:	DH0013
Report for:	Project Description Report for 700 mm Diameter Water Main

REVISIONS

Revision #	Date	Change Overview	Prepared by	Reviewed by
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1. INTRODUCTION

SMEC South Africa has been appointed by Tongaat Hulett Developments to design the bulk services for the proposed new Sibaya Precinct, situated approximately 5 km north of Umhlanga in KwaZulu-Natal, South Africa. The precinct will be developed in stages. The first developments, contained in Node 1, is scheduled to commence in 2016, with subsequent phases to be developed to match market demand.

1.1 Background

Proposals for the development of the Sibaya Precinct were conceived more than 15 years ago. The proposals included the existing Sibaya Casino as well as general residential development surrounding the casino. The area lieas west of the existing M4 and to the east of the N2.

Further planning extended the development across the M4, with Nodes 1 and 5 east of the M4 and Nodes 2, 3 and 4 to the west.

The purpose of this report is to provide insight into the design process for the proposed new 700 mm diameter water pipeline from the Waterloo Reservoir to the Sibaya Precinct.

2. EXISTING INFRASTRUCTURE

The existing 25 Ml Waterloo Reservoir, situated to the west of the Sibaya Precinct, currently supplies water to the Waterloo area, Umdloti, Sibaya Casino and Hammonds Farm.

An existing 250 mm diameter water main runs from the Waterloo reservoir to Umdloti, branching off to the Sibaya Casino via another 250 mm just east of the M4.

The current reservoir consists of a 10 Mℓ and a 15 Mℓ cell, which equates to a total storage of 25 Mℓ. Recent loggings of the Waterloo Reservoir, received from Mr N Nundall (EWS), indicates the reservoir operating at an average daily demand of 6.32 Mℓ/day (48 hours storage requirement of 12.64 Mℓ/day). Consequently, it is calculated that the reservoir currently has a spare capacity for an average daily demand of 6.18 Mℓ/day.

Through preliminary investigations, SMEC has established that at least another 10 Mℓ cell can be constructed at the existing Waterloo Reservoir.

3. MOTIVATION FOR SEPARATE ASSESSMENT

As a result of the precinct being developed in stages, several Environmental Impact Assessments (EIA) and/or Basic Assessments (BA) will be required for the development of the entire Sibaya Precinct.

Environmental Impact Assessments have thus far been conducted for the following Nodes:

- Nodes 1 & 5 – Approval Obtained; and
- Node 4 – Awaiting Approval.

Initial planning for the Sibaya Precinct included a Reservoir within Node 4 of the precinct. This reservoir would be the dedicated supply for the majority of the precinct, with the high lying areas serviced from the Waterloo Reservoir. A 355 mm diameter water main, from Waterloo Reservoir to the Sibaya Precinct was envisioned for this and included in the EIA for Node 4. This has since been found to be unfeasible.

Due to elevation constraints, a reservoir within Node 4 will not provide sufficient pressure head for development to take place. Consequently, a bulk water main from the Waterloo Reservoir, facilitating the full anticipated flow demands from the Sibaya Precinct, is required.

In order to develop Node 1 and Node 5, a separate BA is required for the proposed bulk water main, based on the updated design and alignment.

4. LAND USE AND WATER DEMAND PARAMETERS

Table 3-1 indicates the anticipated bulk land use for the Sibaya Precinct, as received from Iyer Urban Design Studio, urban designers for THD, on 14 January 2016, as well as a revised Bill of Rights for Node 1 from THD received on 28 January 2016, whilst Table 3-2 shows the demand parameters used in the calculations for this report.

Table 4-1 Anticipated Land Use

	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)
Node 1	59 183	2 520	45	21 236
Node 2	60 912	1040	0	0
Node 3	15 007	2660	0	0
Node 4	97 322	2576	0	209032
Node 5	35 367	1124	483	195327
Total	267 791	9 921	511	425 595

Table 4-2 Water Demand Design Parameters

	Daily Water Demand (ℓ/Unit/day)	Allowance for losses	Total Average Daily Water Demand (Mℓ/Unit/day)
High Density Residential	750	20%	0.0009
Low Density Residential	1000	20%	0.0012
Medium Density Residential	750	20%	0.0009
PUD Sites	750	20%	0.0009
Residential (Mixed Use)	750	20%	0.0009
Residential (Resort)	750	20%	0.0009
Resort Hotel	600	20%	0.0007
Commercial	4 ℓ/m^2/day	20%	0.048 Mℓ/ha/day

5. SIBAYA PRECINCT DEVELOPMENT DEMANDS

Table 4-1 indicates the anticipated demands expected from the Sibaya Precinct, calculated using the planned Land-Uses and the demand parameters agreed with eThekwini Water and Sanitation. A breakdown of the anticipated demands have been included in ***Annexure A*** of this report.

Node	ADD (Ml/day)	ADD + Losses (Ml/day)	Average Flow (l/s)	Peak Flow (l/s)
Node 1	2.16	2.59	30.01	71.07
Node 2	1.06	1.27	14.70	32.70
Node 3	2.06	2.47	28.54	70.41
Node 4	2.39	2.87	33.22	76.56
Node 5	1.3	1.56	18.10	42.89
Total	**8.97**	**10.76**	**124.57**	**293.63**

6. BULK INFRASTRUCTURE REQUIRED

Modelling of the anticipated flows indicates that a 700 mm diameter pipeline will be required from the Waterloo Reservoir to the Sibaya Precinct. This 700 mm diameter pipeline will have sufficient capacity to service the entire Sibaya precinct as well as the existing demands for uMdloti and the Sibaya Casino.

6.1 Proposed Layout

Refer Drawing DH0013-WATER PDR-01 in ***Annexure B***

The proposed layout for the new 700 mm diameter closely follows the existing servitude registered for the existing 250 mm water main, currently servicing uMdloti and the Sibaya Casino. In order to cross the N2 and the M4, pipe jacking will be required. A 6 m servitude will be registered along the proposed alignment, making provision for a possible future pipeline to be installed next to it to service the future Cornubia North, uMdloti North and Mt Moreland developments.

6.2 Alternatives considered

Refer Drawing DH0013-Water PDR-02 in ***Annexure B***

Alternative layouts for the 700 mm diameter pipeline were considered during the preliminary design phase of this project.

The alternative layout indicated in DH0013-Water PDR-02 indicates the 700 mm water pipeline closely following the existing 250 mm diameter pipeline alignment from the Waterloo Reservoir to just west of the N2. From this location, the pipe follows the pre-existing road reserve for the previous uMdloti access road to the delivery point on the border of Node 5. Pipe jacking will be required at the N2 and M4 crossings.

This layout will entail the crossing of the N2 at a section where the N2 is in cut. This will entail deep excavations in the cut embankments, to accommodate the pipe jacking equipment. Working space will also need to be excavated to provide space in order to weld pipes together before pushing it into position in the installed sleeve. This will increase construction costs considerably.

It is anticipated that an overpass bridge will need to be installed at this location in future. Since the alternative layout provides no environmental, or other, benefits and will entail higher installation costs as well as possibly complicating the future construction of the overpass, this option is deemed less feasible.

6.3 Wetland Crossings

Based on the wetland assessment carried out for this development, there will be two wetland crossings along the alignment of the 700 mm diameter pipeline.

These are indicated on the respective layout drawings found in ***Annexure B*** as WC1 - WC2 and WC3 - WC4. Wetland crossings, in line with the Water Use License Application (WULA) for Sibaya Node 1 & 5, will be done by implementing trenching and/or pipe bridges.

Disturbance of the wetlands during construction will be kept to a minimum where possible.

Wetland crossings will be conducted by either:

1. Trenching;

   A trench, just wide enough to provide adequate workspace either side of the pipeline will be excavated though the wetland, after which the pipeline will be installed and the wetland soil material be reinstated. Extra care will be taken to ensure that the area of wetland that is affected be reinstated properly, leaving the wetland in an improved or at least the same state as before construction. This will entail:

   - Removing wetland vegetation and preserving it at a nursery;
   - Removing soil to stockpiles;
   - Laying the pipe;
   - Replacing soil, in reverse, to ensure that the soil strata is maintained; and
   - Reinstating wetland vegetation.

2. Pipe Bridges.

   Should trenching not be permitted, pipe bridges will be constructed over the wetlands. This will entail excavations in the wetlands for the pipe bridge piers' foundations, after which the wetland soils will be reinstated to minimum the condition it was in before construction.

Temporary shutterboards will be laid down in adjacent areas to protect wetland vegetation from traffic during construction.

The preferred wetland crossings option is the using of trenching, since it is both cost and time effective. This option also does not account for any wetland losses, since the wetland gets reinstated after construction.

7. CONCLUSION

A 700 mm diameter water pipeline needs to be constructed from the Waterloo Reservoir to the Sibaya precinct in order to provide the precinct with a bulk water supply. Although only Node 1 and Node 5 will be developed within the next 2 years, the 700 mm diameter pipeline will be sufficient for the ultimate development.

The proposed alignment of the 700 mm diameter pipeline follows the existing servitude for the existing 250 mm diameter pipeline to Umdloti and the Sibaya Casino for the majority of the route. Two possible layout routes were investigated, with the most feasible of the two selected as the preferred option.

Two wetlands, currently cultivated as sugarcane lands, will be crossed during the construction of the proposed 700 mm diameter pipeline. An option to cross these wetlands with the 700 mm pipeline would be to construct pipe bridges. This will entail constructing piers on concrete pad footings in the wetland. Access to the wetland will be required for the construction of these piers. The preferred option for crossing these wetlands would be trenching through the wetland, installing the pipeline and reinstating the wetland soils. Care will be taken with the reinstatement of the wetland soils to ensure the wetlands are left in a better or at least similar condition to the condition of the wetland prior to construction. No wetland losses will be acquired through this option, since the wetland will be reinstated after construction.

ANNEXURE A – ANTICIPATED DEMANDS

WATER DEMAND - NODE 1

Land Use	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)	LU Designation	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Factor	Peak Flow (l/s)
Commercial	0	0	0	0	Commercial	0.00	0.00	0.00	0.00	1.30	0.00
Mixed Use - Commercial	59 183	0	0	0	Commercial	0.24	0.28	0.57	3.29	1.30	4.27
Mixed Use - Residential	0	893	0	0	Residential (Mixed Use)	0.67	0.80	1.61	9.30	2.50	23.26
Residential	0	1627	0	0	Residential	1.22	1.46	2.93	16.95	2.50	42.37
Transport	0	0	0	8506	Transport	0.00	0.00	0.00	0.00	0.00	0.00
Recreational	0	0	0	12730	Recreational	0.00	0.00	0.00	0.00	0.00	0.00
Residential (Resort)	0	0	0	0	Residential	0.00	0.00	0.00	0.00	2.50	0.00
Residential (Resort)	0	0	45	0	Residential (Resort)	0.03	0.04	0.08	0.47	2.50	1.17
Total	**59 183**	**2 520**	**45**	**21 236**		**2.16**	**2.59**	**5.19**	**30.01**		**71.07**

Water Base Data

Commercial	4	$l/m^2/day$
High Density Residential	750	l/unit/day
Medium Density Residential	750	l/unit/day
Low Density Residential	1000	l/unit/day
Residential (Mixed Use)	750	l/unit/day
Residential (Resort)	750	l/unit/day
Resort Hotel	600	l/unit/day
Water Losses	20	%

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WATER DEMAND - NODE 2

Land Use	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)	LU Designation	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Factor	Peak Flow (l/s)
Medium Density Residential	0	901	0	0	Medium Density Residential	0.68	0.81	1.62	9.39	2.50	23.46
Low Density Residential	0	139	0	0	Low Density Residential	0.1393	0.17	0.33	1.93	2.50	4.84
Tourism	60 912	0	0	0	Tourism	0.24	0.29	0.58	3.38	1.30	4.40
Total	**60 912**	**1 040**	**0**	**0**		**1.06**	**1.27**	**2.54**	**14.70**		**32.70**

Water Base Data

Commercial	4	$l/m^2/day$
High Density Residential	750	l/unit/day
Medium Density Residential	750	l/unit/day
Low Density Residential	1000	l/unit/day
Residential (Mixed Use 250 m^2)	750	l/unit/day
Residential (Resort)	750	l/unit/day
Resort Hotel	600	l/unit/day
Water Losses	20	%

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WATER DEMAND - NODE 3

Land Use	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)	LU Designation	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Factor	Peak Flow (l/s)
Mixed Use - Commecial	4 734	0	0	0	Mixed Use - Commecial	0.02	0.02	0.05	0.26	1.5	0.39
Mixed Use - Residential	0	655	0	0	Mixed Use - Residential	0.49	0.59	1.18	6.82	2.5	17.06
Medium Density Residential	0	1375	0	0	Medium Density Residential	1.03	1.24	2.48	14.32	2.5	35.81
PUD Sites	0	630	0	0	PUD Sites	0.47	0.57	1.13	6.56	2.5	16.41
Tourism	10 273	0	0	0	Tourism	0.04	0.05	0.10	0.57	1.3	0.74
Total	**15 007**	**2 660**	**0**	**0**		**2.06**	**2.47**	**4.93**	**28.54**		**70.41**

Water Base Data

Commercial	4	$l/m^2/day$
High Density Residential	750	l/unit/day
Medium Density Residential	750	l/unit/day
Low Density Residential	1000	l/unit/day
Residential (Mixed Use)	750	l/unit/day
Residential (Resort)	750	l/unit/day
Resort Hotel	600	l/unit/day
Water Losses	20	%

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WATER DEMAND - NODE 4

Land Use	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)	LU Designation	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Factor	Peak Flow (l/s)
Commercial	4 853	0	0	0	Commercial	0.02	0.02	0.05	0.27	1.30	0.35
Educational	0	0	0	18321	Educational	0.00	0.00	0.00	0.00	0.00	0.00
High Density Residential	0	193	0	0	High Density Residential	0.14	0.17	0.35	2.01	2.50	5.03
Low Density Residential	0	282	0	0	Low Density Residential	0.28	0.34	0.68	3.92	2.50	9.79
Medium Density Residential 1	0	1057	0	0	Medium Density Residential	0.79	0.95	1.90	11.01	2.50	27.53
Medium Density Residential 2	0	479	0	0	Medium Density Residential	0.36	0.43	0.86	4.99	2.50	12.47
Mixed Use - Commercial	12 726	0	0	0	Commercial	0.05	0.06	0.12	0.71	1.30	0.92
Mixed Use - Residential	0	239	0	0	Medium Density Residential	0.18	0.22	0.43	2.49	2.50	6.22
Office Park	79 743	0	0	0	Commercial	0.32	0.38	0.77	4.43	1.30	5.76
Open Spaces	0	0	0	155833	Open Space	0.00	0.00	0.00	0.00	0.00	0.00
Parks	0	0	0	34878	Parks	0.00	0.00	0.00	0.00	0.00	0.00
PUD sites	0	326	0	0	PUD sites	0.24	0.29	0.59	3.40	2.50	8.49
Total	**97 322**	**2 576**	**0**	**209 032**		**2.39**	**2.87**	**5.74**	**33.22**		**76.56**

Water Base Data

Commercial	4 $l/m^2/day$
High Density Residential	750 l/unit/day
Medium Density Residential	750 l/unit/day
Low Density Residential	1000 l/unit/day
Residential (Mixed Use)	750 l/unit/day
Residential (Resort)	750 l/unit/day
Resort Hotel	600 l/unit/day
Water Losses	20 %

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WATER DEMAND - NODE 5

Land Use	Commercial Bulk (m^2)	Residential Bulk (Units)	Hotel Bulk (Units)	Other Bulk (m^2)	LU Designation	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Factor	Peak Flow (l/s)
Mixed Use - Commer	35 367	0	0	0	Commercial	0.14	0.17	0.34	1.96	1.30	2.55
Mixed Use - Residen	0	173	0	0	Residential (Mixed Use 250 m^2)	0.13	0.16	0.31	1.80	2.50	4.51
High Residential	0	786	0	0	High Density Residential	0.59	0.71	1.41	8.19	2.50	20.47
High Residential	0	0	193	0	Resort Hotel	0.14	0.17	0.35	2.01	2.50	5.03
Medium Residential	0	165	0	0	Medium Density Residential	0.12	0.15	0.30	1.72	2.50	4.30
Educational Facility	0	0	0	11073	Educational	0.00	0.00	0.00	0.00	0.00	0.00
Public Open Space	0	0	0	184254	Open Space	0.00	0.00	0.00	0.00	0.00	0.00
Resort Hotel	0	0	290	0	Resort Hotel	0.17	0.21	0.42	2.42	2.50	6.04
Total	**35 367**	**1 124**	**483**	**195 327**		**1.30**	**1.56**	**3.13**	**18.10**		**42.89**

Water Base Data

Commercial	4	$l/m^2/day$
High Density Residential	750	l/unit/day
Medium Density Residential	750	l/unit/day
Low Density Residential	1000	l/unit/day
Residential (Mixed Use)	750	l/unit/day
Residential (Resort)	750	l/unit/day
Resort Hotel	600	l/unit/day
Water Losses	20	%

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TOTAL WATER DEMAND - SIBAYA

NODE	ADD (Ml/day)	ADD + Losses (Ml/day)	48hr Storage Required (Ml)	Average Flow (l/s)	Peak Flow (l/s)
Node 1	2.16	2.59	5.19	30.01	71.07
Node 2	1.06	1.27	2.54	14.70	32.70
Node 3	2.06	2.47	4.93	28.54	70.41
Node 4	2.39	2.87	5.74	33.22	76.56
Node 5	1.30	1.56	3.13	18.10	42.89
Total	**8.97**	**10.76**	**21.53**	**124.57**	**293.63**

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ANNEXURE B – LAYOUT DRAWINGS

WATERLOO RESERVOIR
25 ML CAPACITY
TWL 156m

(A)

EXISTING 250 mm WATER MAIN

PROPOSED 700 mm DIA. PIPELINE

M27

UMHLANGA

N2

BALLITO

(B)

SIBAYA DRIVE

4

2

M4

(C)

SIBAYA CASINO

250 mm

5

1

3

(E)

UMDLOTI RESERVOIR
12ML CAPACITY
TWL 110 m

(D)

UMDLOTI WTW

UMDLOTI

INDIAN OCEAN

LEGEND

- EXISTING WATER
- PROPOSED WATER
- EXISTING RESERVOIR
- EXISTING WTW
- NODE BOUNDARIES
- 1 NODE NO
- PROPOSED SIZING
- EXISTING SIZING

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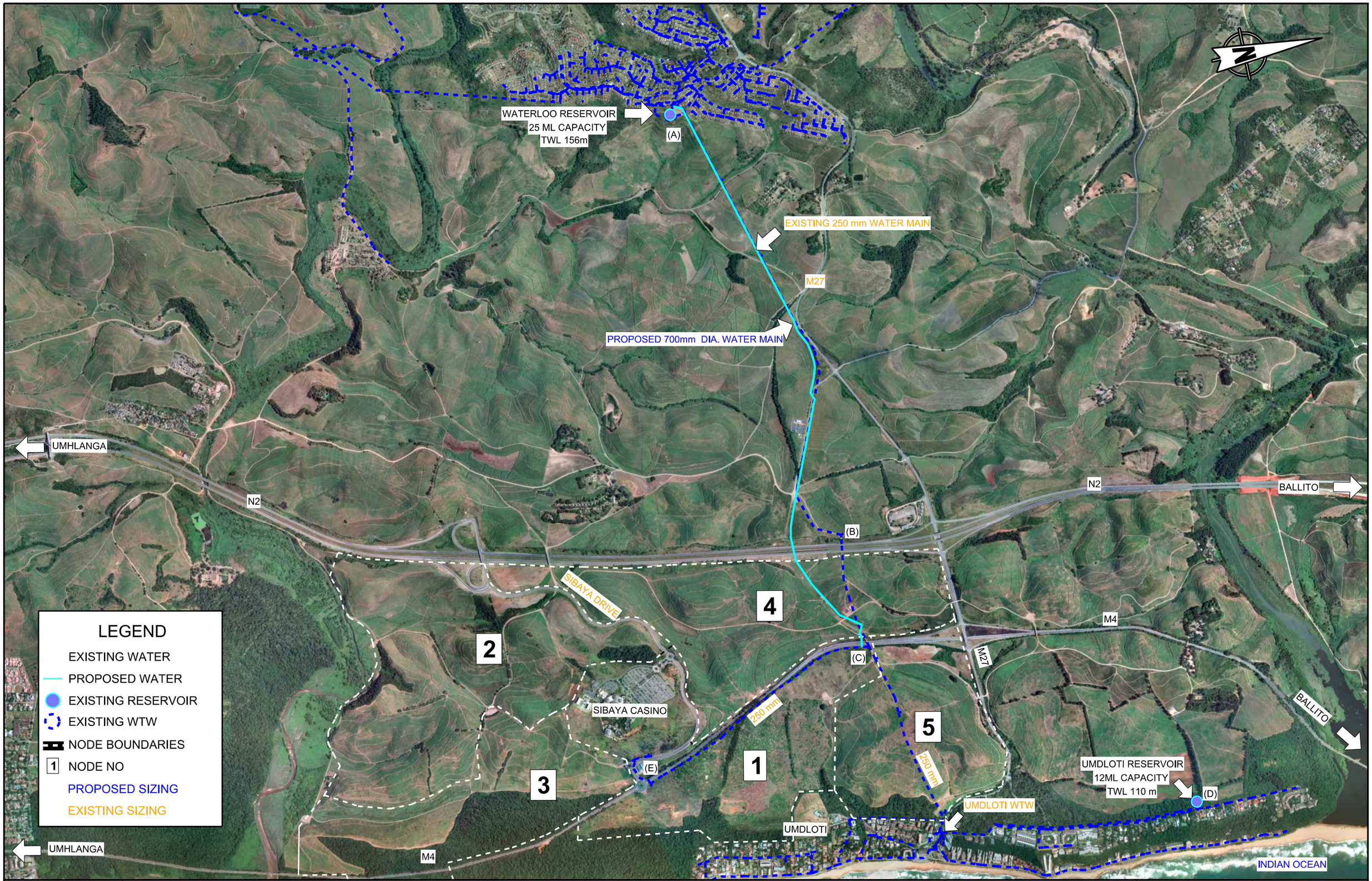
SIBAYA - BULK WATER LAYOUT (PREFERRED)

Client: Tongaat Hulett DEVELOPMENTS

Scale: 1:20 000

Sheet: 1 Of 1

Drawing No: DH0013-WATER PDR-01



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SIBAYA - BULK WATER LAYOUT (ALTERNATIVE)

Client: Tongaat Hulett DEVELOPMENTS

Scale: 1:20 000

Sheet 1 Of 1

Drawing No: DH0013-WATER PDR-02