SISHEN IRON ORE COMPANY (PTY) LTD

KATHU

BULK SERVICES AND INFRASTRUCTURE STATUS QUO REPORT AND RECOMMENDATIONS FOR THE SIMS AND UITKOMS PROJECT IN KATHU

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PREPARED FOR:

SISHEN IRON ORE COMPANY (PTY) LTD
MR J WALKER
PRIVATE BAG X 506
KATHU
8446

PREPARED BY:

MVD KALAHARI
CONSULTING ENGINEERS
P.O. BOX 580
KIMBERLEY
8300

MVD Kalahari

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BULK SERVICES AND INFRASTRUCTURE STATUS QUO REPORT AND RECOMMENDATIONS FOR THE SIMS AND UITKOMS PROJECTS IN KATHU

EXECUTIVE SUMMARY

This report investigated the availability of bulk services for the SIMS and UITKOMS developments only. (See *Appendices A & B* for layouts).

This report should be read in conjunction with previous reports done by Aurecon / WorleyParsons, Report Numbers 7733/108297/Report Version no: AA and 6115/ 108297/Report Version no: AC. This especially with the water situation for the SIMS project and the impact of this development on the availability of bulk water infrastructure within the greater Sesheng Area.

This report highlights the approach followed and findings that address the bulk services and infrastructure status quo for these two developments only.

It is important to note that there is long term planning envisaged for the greater Sesheng area as well as the greater Kathu area and that the recommendations provided in this report be seen as determining the pro-rata contribution which these two developments have to make re the bigger picture and the ultimate provision for bulk services being planned for by other consultants.

The proposed infrastructure upgrades include the following:

- Reservoir Storage 24 hours (SIMS): 3,6 Mℓ (To be jointly accommodated in the new proposed Kathu West and Sesheng South reservoirs)
- Reservoir Storage 24 hours (UITKOMS): 1,8 Mℓ (To be accommodated in the existing Kathu East reservoir)
- Elevated Tower (SIMS): 0,65 Mℓ (To be jointly accommodated in the new proposed Kathu West and Sesheng South towers)
- Elevated Tower (UITKOMS): 93 kℓ (To be accommodated in the existing Kathu East tower)
- Sewerage Pump Station (SIMS): 55 ℓ/s (New pump station)
- Sewerage Pump Station (UITKOMS): 6,85 ℓ/s (New pump station)
- Sewer Rising Main (SIMS): 200 mm uPVC Class 12 (New rising main)
- Sewer Rising Main (UITKOMS): 125 mm uPVC Class 12 (New rising main)
- Bulk Water Supply Line (SIMS): 355 mm uPVC Class 12 (New supply line)
- Bulk Water Supply Line (UITKOMS): 90 mm uPVC Class 12 (New supply line)
- Additional WTW Capacity (SIMS): 3,6 Mℓ/day (To be accommodated within the new proposed works next to Lategan Dam or from the existing softener plant in Sesheng)
- Additional WTW Capacity (UITKOMS): 1,8 Mℓ/day (To be accommodated within the new proposed works next to Lategan Dam)
- Additional WWTW Capacity (SIMS): 1,4 Mℓ/day (To be accommodated within the new propsed Phase 2 upgrade of 6,5 Mℓ/day)

- Additional WWTW Capacity (UITKOMS): 0,21 Mℓ/day (Can be accommodated in the existing WWTW)
- Upgrade of the R380 Road, Road to the Mine and Old Road to the north and Traffic Impact Assessment (SIMS) (Upgrade of existing roads)
- Traffic Impact Assessment for the intersection in Frikkie Meyer Street (UITKOMS) (Upgrade of existing intersection)

1. INTRODUCTION

1.1. BACKGROUND AND SCOPE

MVD Kalahari consulted with personnel of the Gamagara Municipality, WorleyParsons and reports we have received as previously mentioned.

Seeing that there is future planning in place for the greater Sesheng/ Kathu area and also other developments by other developers, the purpose of this report is to determine the pro-rata costs of the SIMS and UITKOMS development contributions re the upgrade of bulk services and to highlight any constraints.

It should be noted that this study does not include the detailed design of detailed internal reticulation networks within the SIMS and UITKOMS developments.

2. DESIGN REQUIREMENTS AND DESIGN CRITERIA

2.1. DESIGN CRITERIA: BULK WATER AND INTERNAL RETICULATION NETWORK

2.1.1. Design Requirements

The Guidelines for Human Settlement Planning and Design (CSIR, 2005), commonly referred to as the Red Book, was used to determine the minimum design requirements. Table 1 below lists the primary minimum design requirements used during the analyses (Refer to following sub section for the minimum fire requirements).

Table 1: Minimum design requirements

No	Description		Criterion	Source
1	Average annual daily demand	RES I RES II RES III	250 ℓ/c/d 197,5 ℓ/c/d 180 ℓ/c/d	MVD & WORLEY PARSONS
2	Peak factor for developed areas		4	RED BOOK
3	Maximum head under zero flow conditions		90 m	RED BOOK
4	Minimum head under instantaneous peak demand		24 m	RED BOOK
5	Reservoir storage capacity (recommended)		48 hours	RED BOOK
6	Reservoir storage capacity (taking into consideration the number of sources and the reliability of these sources)		24 hours	RED BOOK

7	Elevated storage capacity (supplied by a one duty and one standby pump configuration)	4 hours	RED BOOK
8	Elevated storage capacity (supplied by a one duty and one standby pump configuration with standby power generation)	2 hours	RED BOOK

2.1.2. Fire Requirements

The fire-risk category is based on the proposed zoning of the two developments. Although some of the development areas may be limited to Residential Zone I areas, the required fire water storage is determined by the highest category in the supply area. It was therefore decided to assume a medium risk for all the areas based on Residential Zone II and Zone III.

The difference in fire requirements between medium and high risk areas are highlighted below in Table 2. Based on the excessive fire requirements associated with high risk areas it was decided to assume a medium risk for SIMS and UITKOMS. These developments generally require a rational fire design based on their fire risk category in accordance with SANS 10400 and SANS 10090.

Table 2: Minimum design fire requirements

No	Description	Fire-Risk Category		Source
		Medium Risk	High Risk	
1	Minimum design fire flow	6 000 ℓ/min (100 ℓ/s)	12 000 ℓ/min (200 ℓ/s)	RED BOOK
2	Maximum number of hydrants discharging simultaneously	All hydrants within a radius of 270 m		RED BOOK
3	Minimum Hydrant flow rate for each hydrant	1 500 ℓ/min	1 500 ℓ/min	RED BOOK
4	Minimum residual head under fire flow conditions	15 m	15 m	RED BOOK
5	Duration of design fire flow	4 hours	6 hours	RED BOOK

2.1.3. Design Criteria

The design criteria that were implemented for the reservoir and tower sizing are shown in Table 3 below.

Table 3: Design criteria

No	Description	Criterion
	Reservoir and tower sizing	
1	Reservoir storage (AADD)	24 hours (AADD)
2	Tower storage (peak flow)	2 hours (Peak flow)
3	Fire water storage	Medium Risk
	Hydraulic of bulk supply lines	
1	Minimum pipe diameter	110 mm diameter
2	Pipe velocities	0.6 m/s
3	Maximum pipe velocities	1.2 m/s
4	Pipe material	uPVC
5	Pipe roughness Manning coefficient	0.012

2.2. DESIGN CRITERIA: BULK SEWER AND INTERNAL RETICULATION NETWORK

2.2.1. Design Requirements

The Guidelines for Human Settlement Planning and Design (CSIR, 2005), commonly referred to as the Red Book, was used to determine the minimum design requirements. Table 4 below lists the primary minimum design requirements used during the analyses.

Table 4: Minimum design requirements

No	Description		Criterion	Source
1	Average annual dry weather flow	RES I RES II RES III	200 ℓ/c/d 157,5 ℓ/c/d 115 ℓ/c/d	MVD & WORLEY PARSONS
2	Self-cleansing velocity		0.7 m/s	RED BOOK
3	Minimum pipe diameter		160 m	GAMAGARA MUNICIPALITY
4	Flow depth		80%	MVD
5	Maximum spacing between manholes		80 m	GAMAGARA MUNICIPALITY

2.2.2. Design Criteria

The design criteria that were implemented for the sizing of pump stations and rising mains is shown in Table 5 below.

Table 5: Design criteria

No	Description		Criterion	Source
1	Peak factors	SIMS UITKOMS	3.12 2.5	HARMON RED BOOK
2	Storm water ingress		15%	RED BOOK
3	Pipe velocities: Minimum (Internal reticulation) Maximum (Rising Mains)		 0.7 m/s 2.5 m/s	 RED BOOK RED BOOK
4	Pipe materials	Rising mains Gravitational lines	uPVC, Class 12 uPVC, Class 34	-
5	Pipe roughness Manning coefficient		0.012	-

3. FUTURE INFRASTRUCTURE REQUIREMENTS FOR BULK WATER AND BULK SEWER

3.1. SIMS: BULK WATER

Table 6: Calculation of Average Annual Daily Demand (AADD)

Description	Unit	Quantity	Rate	AADD ℓ/day	Flow ℓ/s
Residential AADD					
Res I	ℓ/stand/day	538	1 250	672 500	7.78
Res II	ℓ/stand/day	851	790	672 290	7.78
Res III	ℓ/flat/day	274	360	98 640	1.14
Institutional AADD					
Bus I – Commercial Floor space ratio 75%	ℓ/100 m²/day	466	400	186 400	2.16
Open I – Park 25,890 ha	ℓ/ha/day	25,89	10 000	258 900	3.00
Inst II – Worship	ℓ/stand/day	6	2 000	12 000	0.14
Inst I – Education (1000 + 100 learners)	ℓ/pupil/day	1 100	20	22 000	0.25
Auth – Municipal	ℓ/stand/day	2	1 000	2 000	0.02
TOTAL AADD (ℓ/day)				1 924 730	22.27
Gross AADD = AADD + 10% losses				2 117 203	24.50
Summer Peak Demand (SPD) = AADD x 1,1 x 1,5				3 175 805	36.76
Instantaneous Peak Demand (IPD) = AADD x 4				7 698 920	89.11
Instantaneous Peak Demand + Fire Flow for Moderate Risk (4 Hours @ 100 ℓ/s)				9 138 920	105.77
Instantaneous Peak Demand + 20%				9 238 704	106.93
Reservoir Storage = Gross AADD + Fire Flow (4 Hours @ 100 ℓ/s)				3 557 203	41.17

3.1.1. Additional Storage Capacity Required for the Project

Reservoir:
Overall 24 hours (1 day storage): 3,6 Mℓ (3 557 203 ℓ/day) or
Overall 48 hours (2 days storage): 7,2 Mℓ (3 557 203 ℓ/day x 2 days)
Elevated tower (2 hrs of IPD): 0,65 Mℓ (7 698 920 ℓ/day x 2/24)

3.1.2. Main Water Supply Line to the Reservoir Required for the Project

Based on a maximum flow velocity of 1,2 m/s: 250 mm uPVC Class 12

3.1.3. Additional Water Treatment Capacity Required for the Project

Daily additional WTW capacity: 3,6 Mℓ/day

3.1.4. Supply Line Required between Reservoir, Elevated Tower and the Project

Based on a maximum flow velocity of 1,2 m/s and a flow of 106,93 ℓ/s: 355 mm uPVC Class 12

3.2. SIMS: BULK SEWER

Table 7: Calculation of Average Annual Dry Weather Flow (AADWF)

Description	Unit	Quantity	Rate	AADWF ℓ/day	Flow ℓ/s
Residential AADWF					
Res I	ℓ/stand/day	538	1 000	538 000	6.23
Res II	ℓ/stand/day	851	630	536 130	6.21
Res III	ℓ/flat/day	274	287.5	78 775	0.91
Institutional AADWF					
Bus I – Commercial	ℓ/100 m²/day	466	300	139 800	1.62
Inst II – Worship	ℓ/stand/day	6	1 500	9 000	0.10
Inst I – Education	ℓ/pupil/day	1 100	15	16 500	0.19
Auth – Municipal	ℓ/stand/day	2	750	1 500	0.02
TOTAL AADWF (ℓ/day)				1 319 705	15.28
ADD 3,12 Peak Hour Flow Factor (Harmon)				4 117 480	47.65
ADD 15% Storm Water Ingress				4 735 102	54.80

3.2.1. Outfall Sewer Required for the Project

The minimum diameter required is:

315 mm Class 34 uPVC pipe laid at a slope of 1:250 and design velocity of 1,130 m/s

Manhole spacing: Maximum at 80 m centres and at all changes in gradient and direction.

3.2.2. Additional Sewage Pump Station Capacity Required for the Project

Pump station: 55 ℓ/s

3.2.3. Additional Sewer Rising Main Required for the Project

Based on a maximum flow velocity of 2,5 m/s: 200 mm uPVC Class 12

3.2.4. Additional Waste Water Treatment Capacity Required for the Project

WWTW: 1,4 Mℓ/day

3.3. UITKOMS: BULK WATER

Table 8: Calculation of Average Annual Daily Demand (AADD)

Description	Unit	Quantity	Rate	AADD ℓ/day	Flow ℓ/s
Residential AADD					
Res I	ℓ/stand/day	163	1 250	203 750	2.36
Res II	ℓ/stand/day	65	790	51 350	0.59
Institutional AADD					
Open I – Park 1,403 ha	ℓ/ha/day	1,403	15 000	21 045	0.24
Inst I – Worship	ℓ/stand/day	1	2 000	2 000	0.02
TOTAL AADD (ℓ/day)				278 145	3.21
Gross AADD = AADD + 10% losses				305 960	3.54
Summer Peak Demand (SPD) = AADD x 1,1 x 1,5				458 940	5.31
Instantaneous Peak Demand (IPD) = AADD x 4				1 112 580	12.88
Instantaneous Peak Demand + Fire Flow for Moderate Risk (4 Hours @ 100 ℓ/s)				2 552 580	29.54
Instantaneous Peak Demand + 20%				1 335 096	15.45
Reservoir Storage = Gross AADD + Fire Flow (4 Hours @ 100 ℓ/s)				1 745 960	20.21

3.3.1. Additional Storage Capacity Required for the Project

Reservoir:
Overall 24 hours (1 day storage): 1,8 Mℓ (1 745 960 ℓ/day) or
Overall 48 hours (2 days storage): 3,5 Mℓ (1 745 960 ℓ/day x 2 days)
Elevated tower (2 hrs of IPD): 0,09 Mℓ (1 112 580 ℓ/day x 2/24)

3.3.2. Main Water Supply Line to the Reservoir Required for the Project

Based on a maximum flow velocity of 1,2 m/s: 110 mm uPVC Class 12

3.3.3. Additional Water Treatment Capacity Required for the Project

Daily additional WTW capacity: 1,8 Mℓ/day

3.3.4. Supply Line Required between Reservoir, Elevated Tower and the Project

Based on a maximum flow velocity of 1,2 m/s and a flow of 29,54 ℓ/s: 200 mm uPVC Class 12

3.4. UITKOMS: BULK SEWER

Table 9: Calculation of Average Annual Dry Weather Flow (AADWF)

Description	Unit	Quantity	Rate	AADWF ℓ/day	Flow ℓ/s
Residential AADWF					
Res I	ℓ/stand/day	163	1 000	163 000	1.89
Res II	ℓ/stand/day	65	630	40 950	0.47
Institutional AADWF					
Inst I – Worship	ℓ/stand/day	1	1 500	1 500	0.02

TOTAL AADWF (ℓ/day)	205 450	2.38
ADD 2,5 Peak Hour Flow Factor (Red Book)	513 625	5.94
ADD 15% Storm Water Ingress	590 669	6.85

3.4.1. Outfall Sewer Required for the Project

The minimum diameter required is:

160 mm Class 34 uPVC pipe laid at a slope of 1:150 and design velocity of 0,820 m/s

Manhole spacing: Maximum at 80 m centres and at all changes in gradient and direction.

3.4.2. Additional Sewage Pump Station Capacity Required for the Project

Pump station: 6,85 ℓ/s

3.4.3. Additional Sewer Rising Main Required for the Project

Based on a maximum flow velocity of 0,7 m/s: 125 mm uPVC Class 12

3.4.4. Additional Waste Water Treatment Capacity Required for the Project

WWTW: 0,21 Mℓ/day

4. BULK WATER AND BULK SEWER INFRASTRUCTURE STATUS QUO, CONSTRUCTION AND COST ESTIMATES

4.1. SIMS DEVELOPMENT

4.1.1. Bulk Water Status Quo and Constraints

After having read all the water reports made available to MVD Kalahari, it is assumed that the future bulk water for the SIMS development will be supplied via the new proposed Sesheng South Reservoir and Tower for the area south of the R308 and from the new proposed Kathu West Reservoir and Tower for the area to the north of the R308. (See *Appendix C*)

The biggest constraint within the larger Sesheng area for the SIMS development is that no existing bulk water infrastructure may be utilised unless the two new reservoirs and towers, as mentioned in the previous paragraph, have been constructed, together with the linking pipework, and all accompanying infrastructure as mentioned in the Aurecon/WorleyParsons report: Report 6115/108297/Report Version no: AC.

4.1.2. Cost Estimates

To arrive at an acceptable and fair figure for the financial contribution to be made by the SIMS development towards the new envisaged future bulk water upgrades, we refer you to the Aurecon/WorleyParsons report 6115/108297/Report Version no: AC.

The financial contribution is based on the current demands of:

Kathu Central	:	130,0 ℓ/s	(468 m³/h)
Kathu East	:	15,9 ℓ/s	(57,2 m³/h)
Kathu West	:	5,4 ℓ/s	(19,6 m³/h)
Sesheng	:	19,9 ℓ/s	(71,7 m³/h)
TOTAL CURRENT DEMAND	:	171,2 ℓ/s	

The SIMS development calculated Gross AADD demand = **24,5 ℓ/s**

The pro-rata contribution by the SIMS development and using the overall high level cost estimate as per the Aurecon/Worley-Parsons report may then be calculated as follows:

Pro-rata contribution from
the SIMS development = 24,5 / 171,2 x R 225 700 000.00
= R 32 299 357-48
≈ R 32 300 000.00

Within the proposed SIMS development there is 1663 housing opportunities (538 Res I, 851 Res II and 274 Res III).

The calculated contribution = $\frac{\text{R 32 300 000.00}}{\text{1663 units}}$
= **R 19 422.73** per housing opportunity for bulk water infra-structure.

A further differentiation could be applied to differentiate between Res I, Res II and Res III erven.

Please note that the cost estimate should be treated as indicative only and may be significantly influenced by several factors. Cost estimates above exclude VAT, but include contingencies (10%) and professional fees and are based on estimates in the said report with a base month of September 2012. Escalation should still be added at an average of 10% per annum.

4.1.3. Bulk Sewer Status Quo and Constraints

According to the Gamagara Municipality the existing capacity within their Waste Water Treatment Works (WWTW) is

3,5 Mℓ/day for the old works and 6,5 Mℓ/day for the existing Phase I upgrade. This gives a total capacity of 10 Mℓ/day.

Current inflow peaks on average at 6,14 Mℓ/day as measured during September 2014.

When the existing new Sewer Pump Station EX 06 in Sesheng comes full on line, it will produce an AADWF of ± 36,5 ℓ/s or 3,15 Mℓ/day.

As can be seen from the above, the existing WWTW then will operate very close to the current capacity of 10 Mℓ/day. The old WWTW (capacity 3,5 Mℓ/day) is currently out of production and undergoing refurbishments. According to WorleyParsons a Phase 2 upgrade of the WWTW of 6,5 Mℓ/day is in planning stage.

The existing bulk sewer pump station next to the R308/Mall intersection, although designed for 140 ℓ/s pumping capacity, no inflow rates have been measured and existing inflow could not be determined. For the purposes of this report we accepted that we cannot utilise this existing pump station as the SIMS development drains away from this pump station towards the north of the SIMS development. A dedicated pump station and rising main to the WWTW are allowed for in the cost estimates.

The calculated 1,4 Mℓ/day from the SIMS project has to be accommodated in the new Phase 2 upgrade of the WWTW as the existing WWTW (10 Mℓ/day) will not be able to cope with the inflow from the SIMS development.

4.1.4. Cost Estimates

To arrive at cost estimates the following publication was used namely *"An Industry Guide to Infrastructure Service Delivery Levels and Unit Costs – Version 6.0"* as published by the Department of Cooperative Governance and Traditional Affairs as well as MVD Kalahari's knowledge about recent development costs in Kathu.

Provision of a pump station to pump 55 ℓ/s Peak Wet Weather Flow (PWWF), inclusive of the structure, Mechanical and Electrical Equipment but excluding Electrical Connection	R	9 700 000.00
Provision of sewer rising main to WWTW: 200 mm uPVC, Class 12, Length ± 2300 m	R	4 500 000.00

Provision of additional 1,4 Mℓ/day capacity at the WWTW — R 21 800 000.00

Total contribution from the SIMS development — R 36 000 000.00

Contribution per housing opportunity
= R 36 000 000.00
1663 units
= **R 21 647.63** per housing opportunity

Please note that the cost estimate should be treated as indicative only and may be influenced significantly by several factors.

Cost estimates above exclude VAT, but include contingencies (10%) and professional fees and are based on October 2014 rates.

4.1.5. Summary of Costs for Bulk Water and Sewer Services Contributions for the SIMS Development

Bulk Water Contribution (Escalated to October 2014)	R 39 083 000.00
Bulk Sewer Contribution	R 36 000 000.00
Total Contribution	R 75 083 000.00

Cost per housing opportunity
= R 75 083 000.00
1663 units
= **R 45 149.13** per housing opportunity

PLEASE NOTE:

i) The above contribution excludes VAT @ 14%
ii) The above includes contingencies (10%) and professional fees
iii) Estimates based on October 2014 rates

4.2. UITKOMS DEVELOPMENT

4.2.1. Bulk Water Status Quo and Constraints

Information as received from the Geohydrologist at the mine in Kathu indicated that there are two possible boreholes that may be utilized on the Racecourse (Equestrian Centre), namely borehole SW380 and borehole KM9. (See *Appendix C*)

The utilizing of borehole SW380 is not advisable as this borehole is also being used by the Kathu Golf Club. This poses a risk for the UITKOMS development. Borehole KM9 capacity will be

insufficient to provide the UITKOMS development with a sustainable supply.

When using boreholes a suitable water purification package plant has to be incorporated with the resultant extra operational and maintenance costs.

For the purposes of this report we have accepted that the UITKOMS development, being a small development, will be able to utilize the new Kathu East Reservoir and Tower, which are in close proximity from the UITKOMS development.

4.2.2. Cost Estimates

The same rationale will be followed as for the SIMS development in the calculation of the bulk water services contribution for the UITKOMS development.

Total current demand Kathu = **171,2 ℓ/s**

The UITKOMS development calculated Gross AADD = **3,54 ℓ/s**

Pro-rata contribution from
the UITKOMS development = 3,54 / 171,2 x R 225 700 000.00
= R 4 666 927.57
≃ R 4 667 000.00

Within the proposed UITKOMS development there is 228 housing opportunities (163 Res I and 65 Res II).

The calculated contribution = $\frac{\text{R 4 667 000.00}}{\text{228 units}}$
= **R 20 468.98** per housing opportunity for bulk water infrastructure.

A further differentiation could be applied to differentiate between Res I and Res II erven.

Please note that the cost estimate should be treated as indicative only and may be significantly influenced by several factors. Cost estimates above exclude VAT, but include contingencies (10%) and professional fees and are based on estimates in the said report with a base month of September 2012. Escalation should still be added at an average of 10% per annum.

4.2.3. Bulk Sewer Status Quo and Constraints

WorleyParsons has done a report on the temporary connection from Bestwood via the Rooisand sewer infrastructure and the Kathu East Outfall Sewer. The peak flow from Bestwood was

reported as being 6,1 ℓ/s, this temporary connection to be decommissioned during December 2014, thus making this capacity available again.

The peak flow from UITKOMS is 6,85 ℓ/s and it is assumed that the current infrastructure in Rooisand can accommodate this flow as was in the case of Bestwood.

The AADWF of 0,21 Mℓ/day from UITKOMS can be accommodated within the existing WWTW, but for the purposes of this report we have accepted that a financial contribution should be made as with all other current developments.

A dedicated sewage pump station and rising main are allowed for in the cost estimates. The rising main to link up to a suitable point within the Rooisand development from where the sewage will gravitate.

4.2.4. Cost Estimates

To arrive at cost estimates the following publication was used namely *"An Industry Guide to Infrastructure Service Delivery Levels and Unit Costs – Version 6.0"* as published by the Department of Cooperative Governance and Traditional Affairs as well as MVD Kalahari's knowledge about recent development costs in Kathu.

Provision of a pump station to pump 6,85 ℓ/s Peak Wet Weather Flow (PWWF), inclusive of the structure, Mechanical and Electrical Equipment but excluding Electrical Connection	R 2 210 000.00
Provision of sewer rising main to Rooisand: 125 mm uPVC, Class 12, Length ± 1500 m	R 1 722 000.00
Crossing of Frikkie Meyer Street	R 150 000.00
Provision of additional 0,21 Mℓ/day capacity at the WWTW	R 3 270 000.00
Total contribution from the SIMS development	R 7 352 000.00

Contribution per housing opportunity
= R 7 352 000.00
228 units
= **R 32 245.61** per housing opportunity

Please note that the cost estimate should be treated as indicative only and may be influenced significantly by several factors.

Cost estimates above exclude VAT, but include contingencies (10%) and professional fees and are based on October 2014 rates.

4.2.5. Summary of Costs for Bulk Water and Sewer Services Contributions for the UITKOMS Development

Bulk Water Contribution (Escalated to October 2014)	R 5 650 000.00
Bulk Sewer Contribution	R 7 352 000.00
Total Contribution	R 13 002 000.00

Cost per housing opportunity
= R 13 002 000.00
228 units
= **R 57 026.32** per housing opportunity

PLEASE NOTE:

i) The above contribution excludes VAT @ 14%
ii) The above includes contingencies (10%) and professional fees
iii) Estimates based on October 2014 rates

5. BULK ROAD INFRASTRUCTURE STATUS QUO, CONSTRAINTS AND COST ESTIMATES

5.1. SIMS DEVELOPMENT

The SIMS development will be serviced by the R380 from the Kathu Mall intersection for a length of 1,540 km, the road towards Kathu Mine, from the same intersection, for a length of 1,100 km and the old road to the north of the SIMS development, for a length of 1,300 km. (See *Appendix D*)

All three these roads need to be upgraded and a traffic impact assessment needs to be done. Recommendations re slip lanes, turning radaii of bell mouths, shape of intersections / circles and form of traffic signalling and calming measures will emanate from such a traffic impact assessment.

The cost of such an assessment can be budgeted for R 200 000.00, excluding VAT.

A geotechnical survey also needs to be done at an estimated cost of R 95 000.00, excluding VAT.

An environmental impact assessment needs to be done at an estimated cost of R 85 000.00, excluding VAT.

5.1.1. Proposed Design Criteria

The design criteria are based on the information as set out in the *Red Book* as well as the relevant *TRH* (Technical Recommendations for Highways) documents.

5.1.1.1. R380 Proposed Upgrade

The provision of a 7,4 m wide tarred riding surface with 1,0 m wide tarred shoulders on either side, including 1,0 m wide gravel shoulders. The total tarred width would then be 9,4 m with 1,0 m wide gravel shoulders.

The removal of ± 400 mm of the existing top layers (dependant on the geotechnical investigation recommendations).

The utilizing of the removed material to widen the existing shoulders and the reconstruction of same.

The provision of the following layer works:

175 mm sub-base G4 material
225 mm base G1 material
19 mm aggregate "Cape Seal" tarred surface

All slipways to be provided with 80 mm interlocking blocks.

The provision of all road signs and road markings.

The R380 to be upgraded in half sections so as to accommodate traffic during the construction phase.

The approval from the Department of Roads and Public Works, Telkom and Eskom to be sought.

5.1.1.2. Kathu Mine Road

As per the R380 upgrade in paragraph 5.2.1.

5.1.1.3. Old Road North of SIMS

The provision of a 7,4 m wide tarred surface and 1,0 m wide gravel surfaces.

The rest as per the R380 upgrade in paragraph 5.2.1.

5.1.2. Cost Estimates

R380 upgrade (Length = 1,54 km)	R 17 850 000.00
Kathu Mine Road upgrade (Length = 1,10 km)	R 12 750 000.00
Old Road North upgrade (Length = 1,3 km)	R 11 900 000.00
Traffic impact assessment	R 200 000.00
Geotechnical survey	R 95 000.00
EIA	R 85 000.00
Total Estimated Cost of Upgrades	R 42 880 000.00

PLEASE NOTE:

i) The above contribution excludes VAT @ 14%
ii) The above includes contingencies (10%) and professional fees
iii) Estimates based on October 2014 rates

5.2. UITKOMS DEVELOPMENT

The entrance to this development will be off Frikkie Meyer Street and slip lanes and a bell mouthed T-intersection have to be provided for. (See *Annexure E*)

A traffic impact assessment also needs to be done for this intersection with the necessary recommendations as previously mentioned. The cost of such an assessment can be budgeted for R 50 000.00, excluding VAT.

A geotechnical survey also needs to be done at an estimated cost of R 10 000.00, excluding VAT.

Frikkie Meyer Street is in the planning stage of a total upgrade and it is assumed that the EIA for this project covers the existing entrance to the Equestrian Centre.

5.2.1. Proposed Design Criteria

The design criteria are based on information as set out in the *Red Book* as well as the relevant *TRH* (Technical Recommendations for Highways) documents.

5.2.1.1. Frikkie Meyer Street Intersection Upgrade

The entrance to this development to be provided with a 6,0 m wide tarred riding surface with 1,0 m wide gravel shoulders, kerbing in the bell mouth, storm

water culvert and 80 mm interlocking block surface for the slipways.

The layer works for this intersection to be the same as for the SIMS bulk roads upgrade.

5.2.2. Cost Estimates

Intersection upgrade	R	1 200 000.00
Traffic impact assessment	R	50 000.00
Geotechnical survey	R	10 000.00
EIA	R	0.00
Total Estimated Cost of Upgrades	R	1 260 000.00

PLEASE NOTE:

i) The above contribution excludes VAT @ 14%
ii) The above includes contingencies (10%) and professional fees
iii) Estimates based on October 2014 rates

6. BULK STORM WATER INFRASTRUCTURE STATUS QUO, CONSTRAINTS AND COST ESTIMATES

Traditionally all storm water in the greater Kathu area has been allowed to run off road surfaces and to drain into the high permeable sands.

In the Sesheng area, where there are hard calcrete formations present near the surface, the status quo becomes a challenge for design engineers. The area in Sesheng has a very flat topography and excavations are very expensive due to the hard calcretes present.

Little or no formal major (bulk) storm water infrastructure is in place and all storm water run-off eventually finds its way towards the mining area via small localised channels, open shallow trenches and the odd box culverts.

For the purposes of this report and the little information available re storm water infrastructure, we would recommend that Gamagara Municipality seriously consider the draughting of a Storm Water Master Plan (SWMP) for a the greater Kathu Area and as a Phase 1 of such a SWMP, to look at the Sesheng Area west of the existing Extension 3 development.

With the rate of developments in Kathu and the growth of Kathu over the last ± 14 years, such a SWMP is warranted.

In view of the above no cost estimates were done re bulk storm water infrastructure.

7. REFUSE REMOVAL

The following information has been received from Gamagara Municipality re the contributions to be made by the developments for refuse removal and contributing to the upgrade of the bulk solid waste disposal site.

R 3 624.00 per housing unit
R 51.50 per m² for businesses
R 17.25 per m² for schools and churches

7.1. COST ESTIMATE

7.1.1. SIMS Development

Housing Units – R 3 624.00 x 1663 units	R 6 026 712.00
Businesses – R 51.50 x 62 141 m²	R 3 200 262.00
Schools & Churches – R 17.25 x 94 948 m²	R 1 637 853.00
Total Contribution	R 10 864 827.00

7.1.2. UITKOMS Development

Housing Units – R 3 624.00 x 228 units	R 826 272.00
Church – R 17.25 x 8 213,2 m²	R 89 928.00
Total Contribution	R 916 200.00

PLEASE NOTE:

i) The above contribution excludes VAT @ 14%

8. SUMMARY OF ALL BULK SERVICES CONTRIBUTIONS

8.1. SIMS DEVELOPMENT

No	Description	Amount
1.	Bulk Water Contribution	R 39 083 000.00
2.	Bulk Sewer Contribution	R 36 000 000.00
3.	Bulk Roads Contribution	R 42 880 000.00
4.	Bulk Refuse Contribution	R 10 865 000.00
5.	Bulk Storm Water Contribution	R 0.00
		R 128 828 000.00

8.2. UITKOMS DEVELOPMENT

No	Description		Amount
1.	Bulk Water Contribution	R	5 650 000.00
2.	Bulk Sewer Contribution	R	7 352 000.00
3.	Bulk Roads Contribution	R	1 260 000.00
4.	Bulk Refuse Contribution	R	916 200.00
5.	Bulk Storm Water Contribution	R	0.00
		R	15 178 200.00

8.3. PLEASE NOTE

8.3.1. For the purposes of this report it has been accepted that the developer of the two projects has to contribute towards the bulk water, sewer and refuse (solid waste disposal site) upgrades.

8.3.2. As for the road upgrades, being utilized by other consumers besides those living within the said two developments, an outside source for funding to be found.

8.3.3. All cost estimates exclude VAT @ 14% but include 10% contingencies and professional fees.

8.3.4. All cost estimates and contributions to be ratified once final designs of all bulk infrastructure have been completed.

9. CONCLUSION

9.1. The intention of this report was to first determine what minimum bulk services were needed for the two said developments and then assess this against future development proposals/planning as proposed by other consultants.

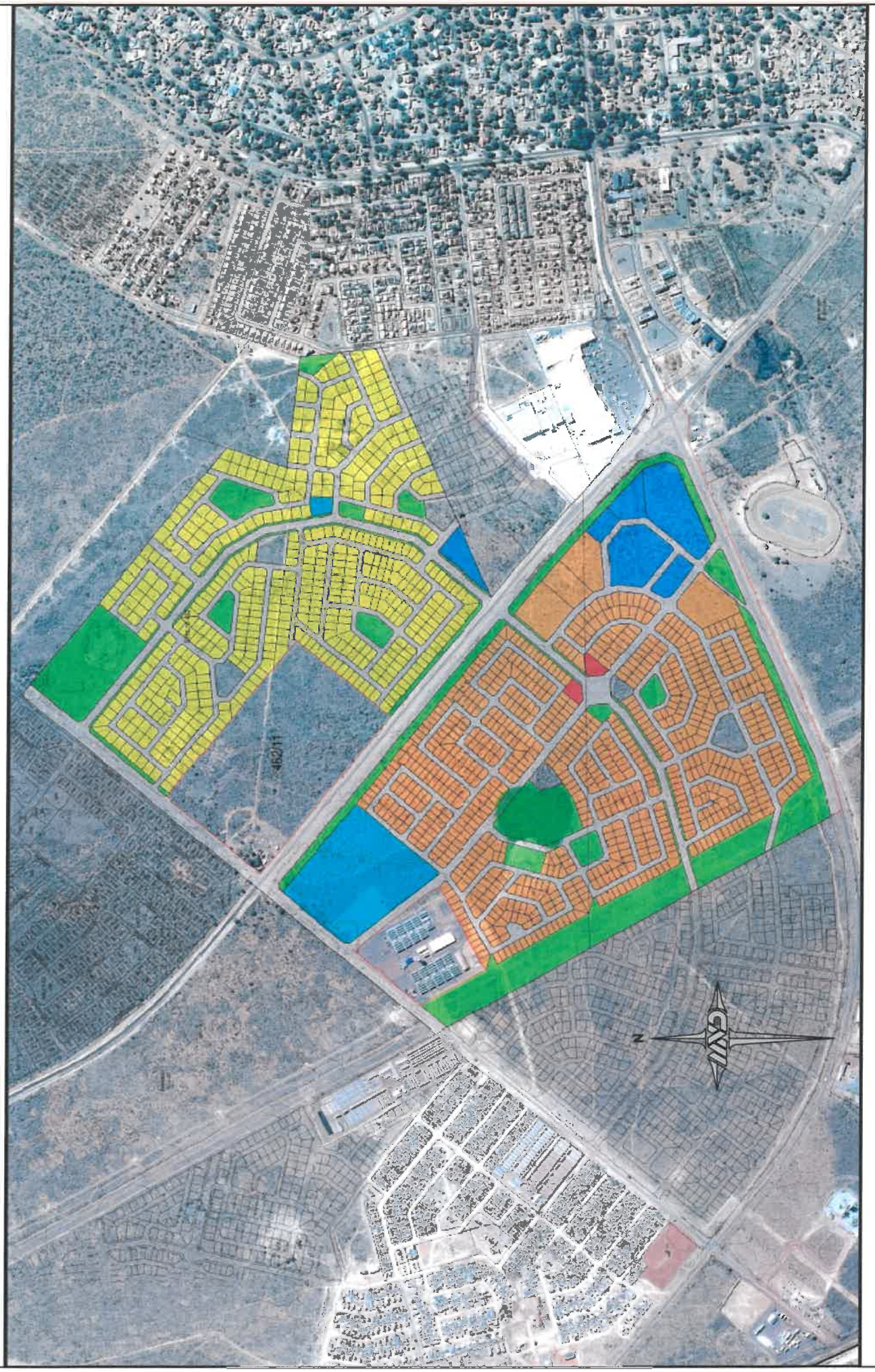
9.2. Looking at all future development/planning proposals of bulk infrastructure as per the Aurecon/WorleyParsons reports it is clear that the SIMS development cannot come into operation before the proposed upgrades have been implemented. This especially in the case of water and sewer bulk infrastructure. This may be considered as the biggest constraint and hindrance.

As for the UITKOMS development there are no major constraints other than permission to be given for connections to the existing Kathu East water tower and the sewer network in the existing Rooisand Development.

C B DE WIT Pr.Eng.
MVD KALAHARI
Consulting Engineers and Town Planners
Level 4 B-BBEE Contributor
ISO 9001:2008 Certified Company
/ee/10170/71 Report

5 November 2014

APPENDIX A
SIMS LAYOUT



NOTENOTA :
NO DIMENSIONS ARE TO BE SCALED OFF ANY DRAWINGS. ALL DIMENSIONS ARE TO BE RATIFIED ON SITE PRIOR TO ANY CONSTRUCTION.
GEEN AFMETINGS MAG VAN TEKENINGE GESKAAL WORD NIE. ALLE AFMETINGS MOET OP TERREIN NAGEGAAN WORD VOOR KONSTRUKSIE.

A BEFORE CONTRACT COMMENCES. VOOR KONTRAK IN AANVANG NEEM.
A1 AFTER CONTRACT HAS COMMENCED. NA KONTRAK IN AANVANG GENEEM HET.

CLIENT/KLIENT

DRAWING DESCRIPTION/TEKENING BESKRYWING
LAYOUT

PROJECT/PROJEK
KATHU:
SIMS DEVELOPMENT

DESIGN ONTWERP	DRAWN GETEKEN	CHECKED NAGEGAAN	CLIENT KLIENT	SCALE SKAAL
B DE WIT	C. Limburgh	B DE WIT	—	—

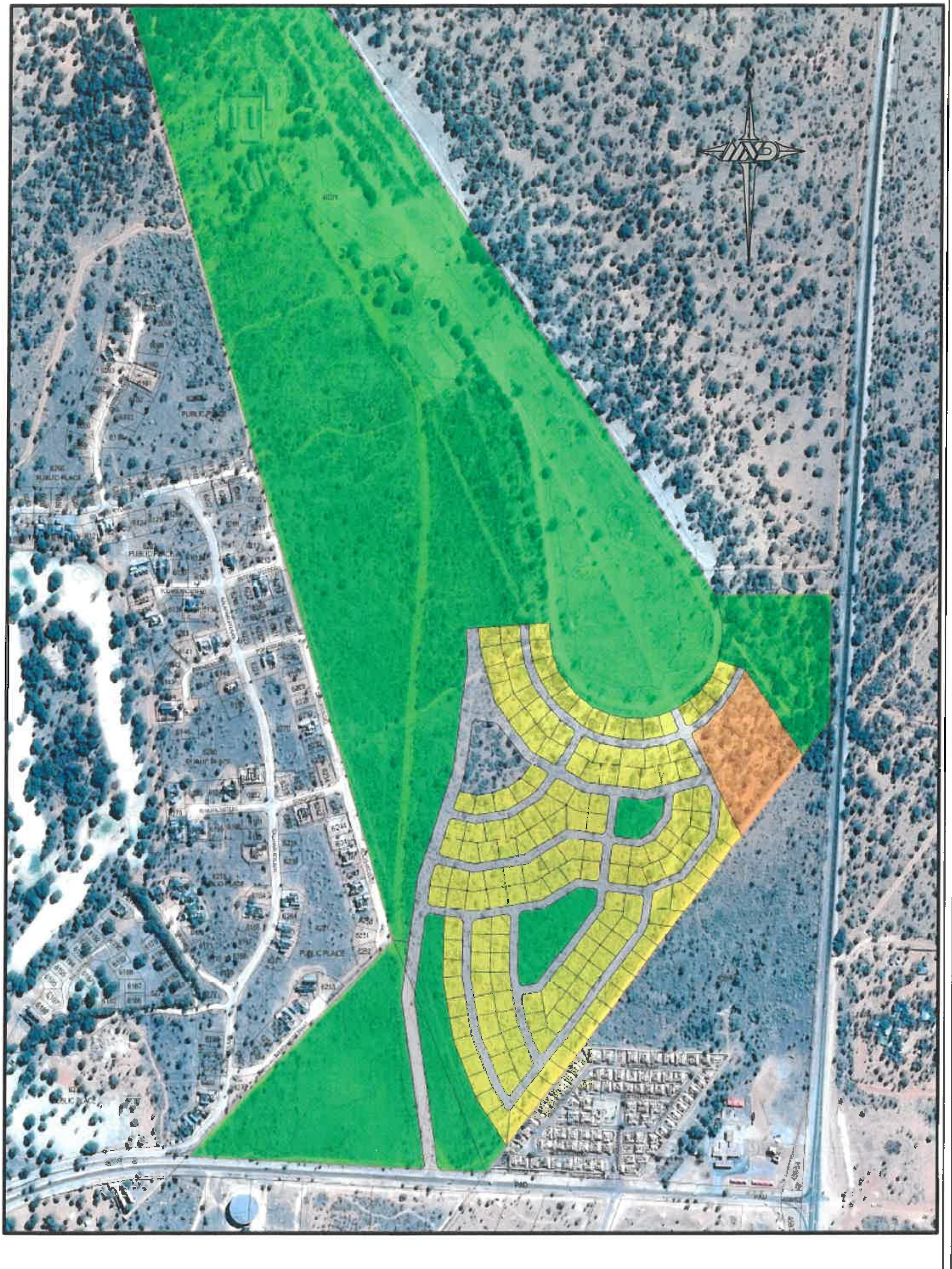
DATE DATUM Nov 2014

Du Toitspanweg 1A/3 Du Toitspan Road
Postnet / P.O. Box 580, Kimberley 8300
Tel: (053) 831 1636/90
Fax: (053) 832 4491
E-Mail: mvdkim@iafrica.com
CESA Level 3 BBBEE Contributor ISO 9001:2008 Certified Company

DRAWING NO/TEKENING NR.
10170/001

MVD Kalahari
Registered Civil & Structural Engineers.
Consulting Civil and Structural Engineers.

APPENDIX B
UITKOMS LAYOUT



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A BEFORE CONTRACT COMMENCES
VOOR KONTRAK IN AANVANG NEEM
A1 AFTER CONTRACT HAS COMMENCED.
NA KONTRAK IN AANVANG GENEEM HET.

CLIENT/KLIENT

DRAWING DESCRIPTION/TEKENING BESKRYWING
LAYOUT

PROJECT/PROJEK
KATHU:
UITKOMS DEVELOPMENT

DESIGN ONTWERP	DRAWN GETEKEN	CHECKED NAGEGAAN	CLIENT KLIENT	SCALE SKAAL
B DE WIT	C. Limburgh	B DE WIT	---	---

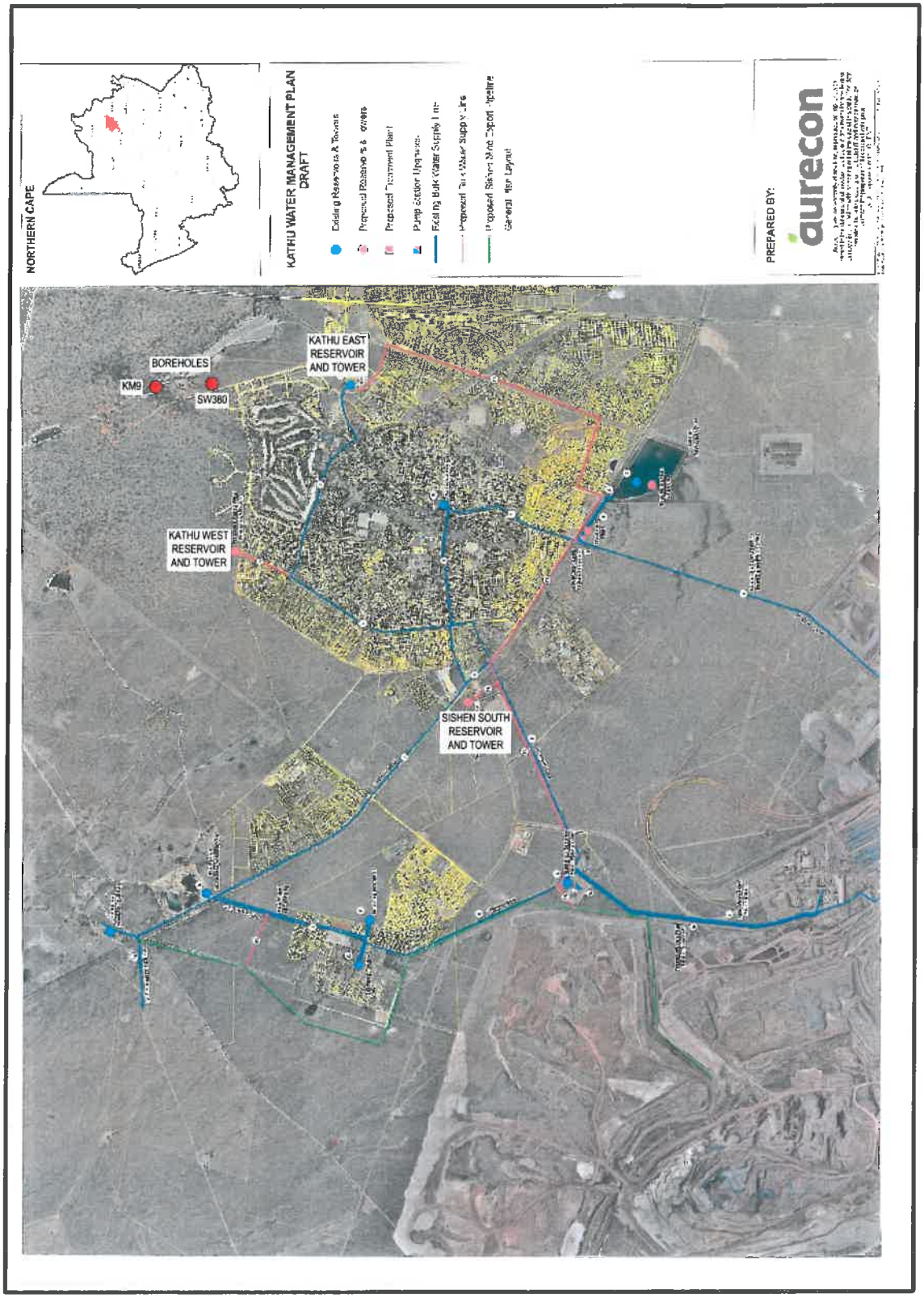
DATE DATUM: Nov 2014

Du Toitspanweg 185 Du Toitspan Road
Posbus / P.O. Box 580, Kimberley 8300
Tel: (053) 831 1030/90
Fax: (053) 833 4431
E-Mail: mvdkm@iafrica.com
CESA
Level 4 B-BBEE Contributor | ISO 9001:2008 Certified Company

DRAWING NO./TEKENING NR.
10171/001

MVD Kalahari
Raadgewende Siviele en Strukturele Ingenieurs.
Consulting Civil and Structural Engineers.

APPENDIX C
FUTURE PLANNED BULK WATER SERVICES



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A BEFORE CONTRACT COMMENCES.
VOOR KONTRAK IN AANVANG NEEM.
A1 AFTER CONTRACT HAS COMMENCED.
NA KONTRAK IN AANVANG GENEEM HET.

CLIENT/KLIENT

DRAWING DESCRIPTION/TEKENING BESKRYWING
WATER MANAGEMENT PLAN

PROJECT/PROJEK
KATHU:
SIMS DEVELOPMENT

DESIGN ONTWERP	DRAWN GETEKEN	CHECKED NAGEGAAN	CLIENT KLIENT	SCALE SKAAL
B DE WIT	C. Limburgh	B DE WIT	—	—

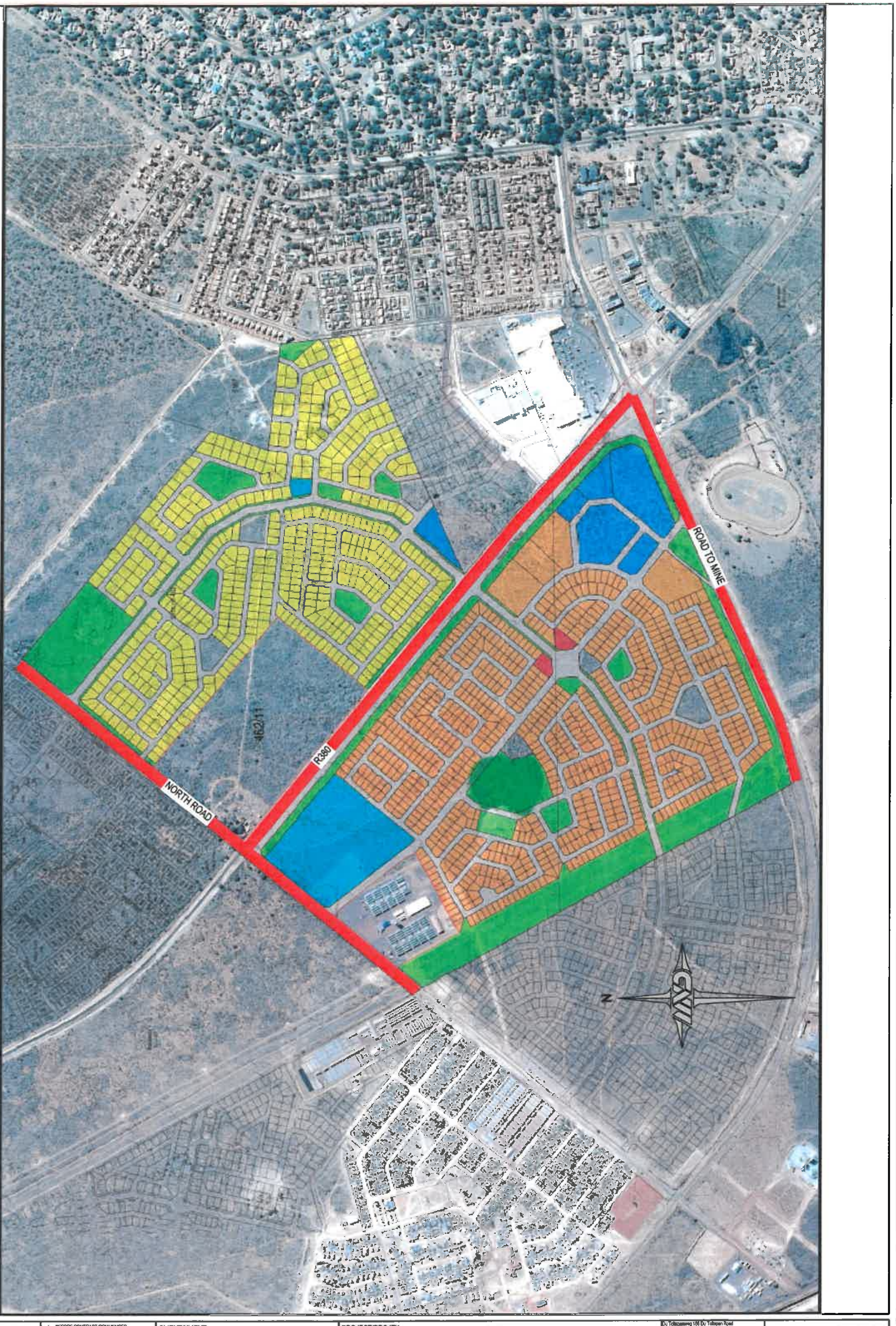
DATE DATUM Nov 2014

Du Toitspanweg 186 Du Toitspan Road
Postbus / P.O. Box 549, Kimberley 8300
Tel: (053) 831 1630/33
Fax: (053) 833 4491
E-Mail: mvdkim@lantic.com
Level 2 BBBEE Contributor ISO 9001:2008 Certified Company

DRAWING NO./TEKENING NR.
10170/003

MVD Kalahari
Registered Civil and Structural Engineers.
Consulting Civil and Structural Engineers.

APPENDIX D
SIMS PROPOSED ROAD UPGRADES



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A BEFORE CONTRACT COMMENCES. VOOR KONTRAK IN AANVANG NEEM.
A1 AFTER CONTRACT HAS COMMENCED. NA KONTRAK IN AANVANG GENEEM HET.

CLIENT/KLIENT: ------

DRAWING DESCRIPTION/TEKENING BESKRYWING: ROAD INFRASTRUCTURE UPGRADE

PROJECT/PROJEK: KATHU: SIMS DEVELOPMENT

DESIGN ONTWERP	DRAWN GETEKEN	CHECKED NAGEGAAN	CLIENT KLIENT	SCALE SKAAL
B DE WIT	C. Limburgh	B DE WIT	—	—

DATE DATUM: Nov 2014

Du Toitspanweg 156 Du Toitspan Road
Posbus / P.O. Box 580, Kimberley 8300
Tel: (053) 831 1538/90
Fax: (053) 833 4401
E-Mail mvdkim@iafrica.com

CESA

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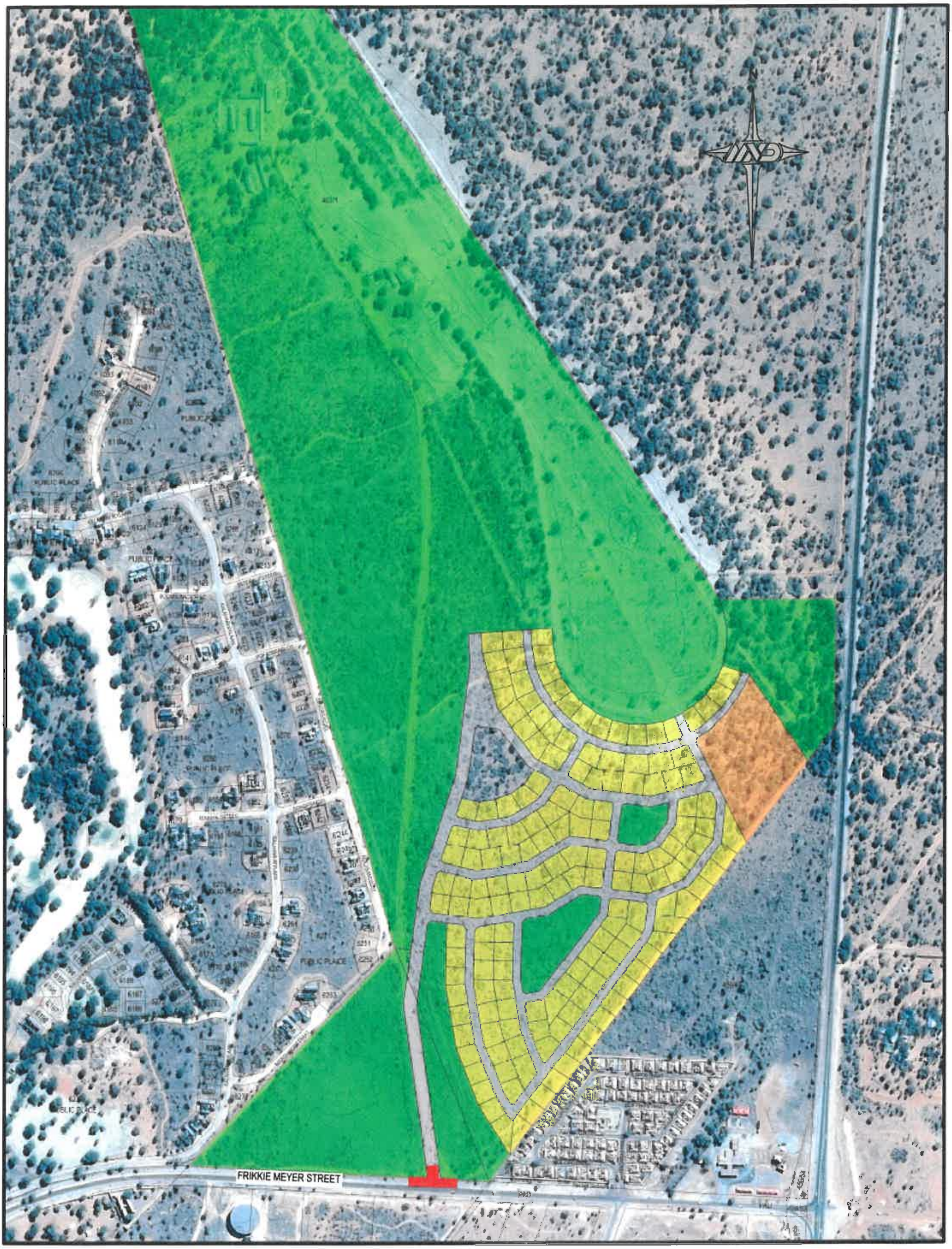
MVD Kalahari
Raadgewende Siviele en Strukturele Ingenieurs.
Consulting Civil and Structural Engineers.

APPENDIX E
UITKOMS PROPOSED ROAD UPGRADES



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Du Toitspanweg 186 Du Toitspan Road
Posbus / P.O. Box 580, Kimberley 8300
Tel: (053) 831 1336/90
Fax: (053) 833 4491
E-Mail: mvdkim@iafrica.com
CESA

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10171/002

MVD Kalahari
Raadgewende Siviele en Struktuele Ingenieurs.
Consulting Civil and Structural Engineers.