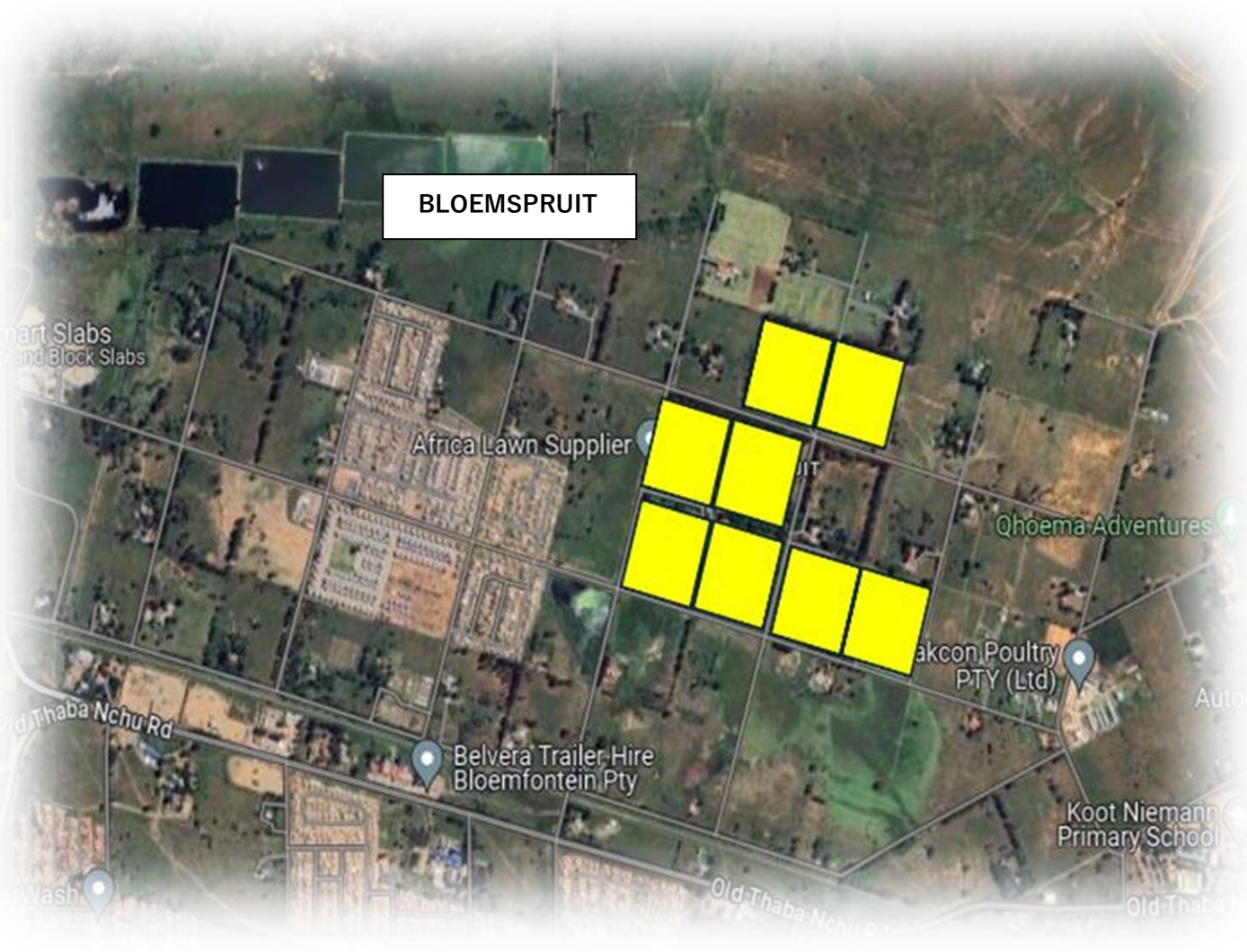

ARCATA PHASE 6: BLOEMSPRUIT

PLOTS: 185/186/136/141/176/177/135 & 199

TRAFFIC IMPACT STUDY VS 1

FOR THE PURPOSES OF TOWN ESTABLISHMENT

(Change in Landuse, >50 Peak Hour Trips Generated)

LENOVA
CONSTRUCTION AND DEVELOPMENT

6 AUGUST 2024

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Email: solomonz@lenovaconstruction.co.za

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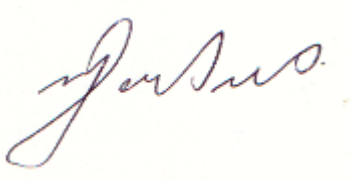
REPORT SHEET	
Property Description	ARCATA PHASE 6: BLOEMSPRUIT PLOTS: 185/186/136/141/176/177/135 & 199
Municipal Area	Mangaung Metro Municipality
Report Goal	Township Establishment
Type of report	Traffic Impact Study
Tshepega Reference	271
Compiled by	Willem Joubert PrEng PrCPM
Professional Registrations	ECSA: 2002098 SACPCMP: D2151/2015
Declaration	I, Willem Joubert, ID 5911125025083, author of this report, certify that I am a Professional Traffic Engineer. To compile this report, I have the required qualifications and experience in Traffic and Transportation Engineering, as required by the Engineering Council of South Africa (ECSA). I take full responsibility for the content, including all calculations, conclusions and recommendations made herein.
Signed	
Date	19 August 2024

2. INTRODUCTION

2.1. Aim of the Study

The primary objective of this study was to analyse and present findings regarding the traffic repercussions stemming from the Site Development Plan concerning the extension of the residential developments in Bloemspruit to include another 8 plots. (PLOTS: 185/ 186/ 136/ 141/ 176/ 177/ 135 & 199).

The aim is to provide traffic engineering inputs for the approval of the SDP and construction drawings.

2.2. Background

The Township Establishment process aims to have the plots all zoned as "Residential 1", single residential. This document reports on the best practice traffic operational arrangement for the SDP, STA, and the possible traffic implications on the road network of the planned development. as per the Site Development Plan and deals explicitly with:

Reference Drawing: Drawing name: COMPOSITE LAYOUT PLAN 0374/01/04

The Developer: LENOVA

Contact Person: Solomon Zhu

Cell: 076 117 0899

Email: solomonz@lenovaconstruction.co.za

Architect: N/A

Traffic Engineer: Tshepega Civil Engineering (Willem Joubert PrEng PrCPM)

Town planning/Structural: Urban Dynamics

Relevant authorities:

- **Level 1(National):** N/A
- **Level 2 (Provincial):** Free State Province
- **Level 3 (Local Municipality):** Mangaung Metro
- **Other:** Transnet

2.3. Site Location

The development is on the southern side of the N8 in Bloemspruit, Bloemfontein, see Figure 1.

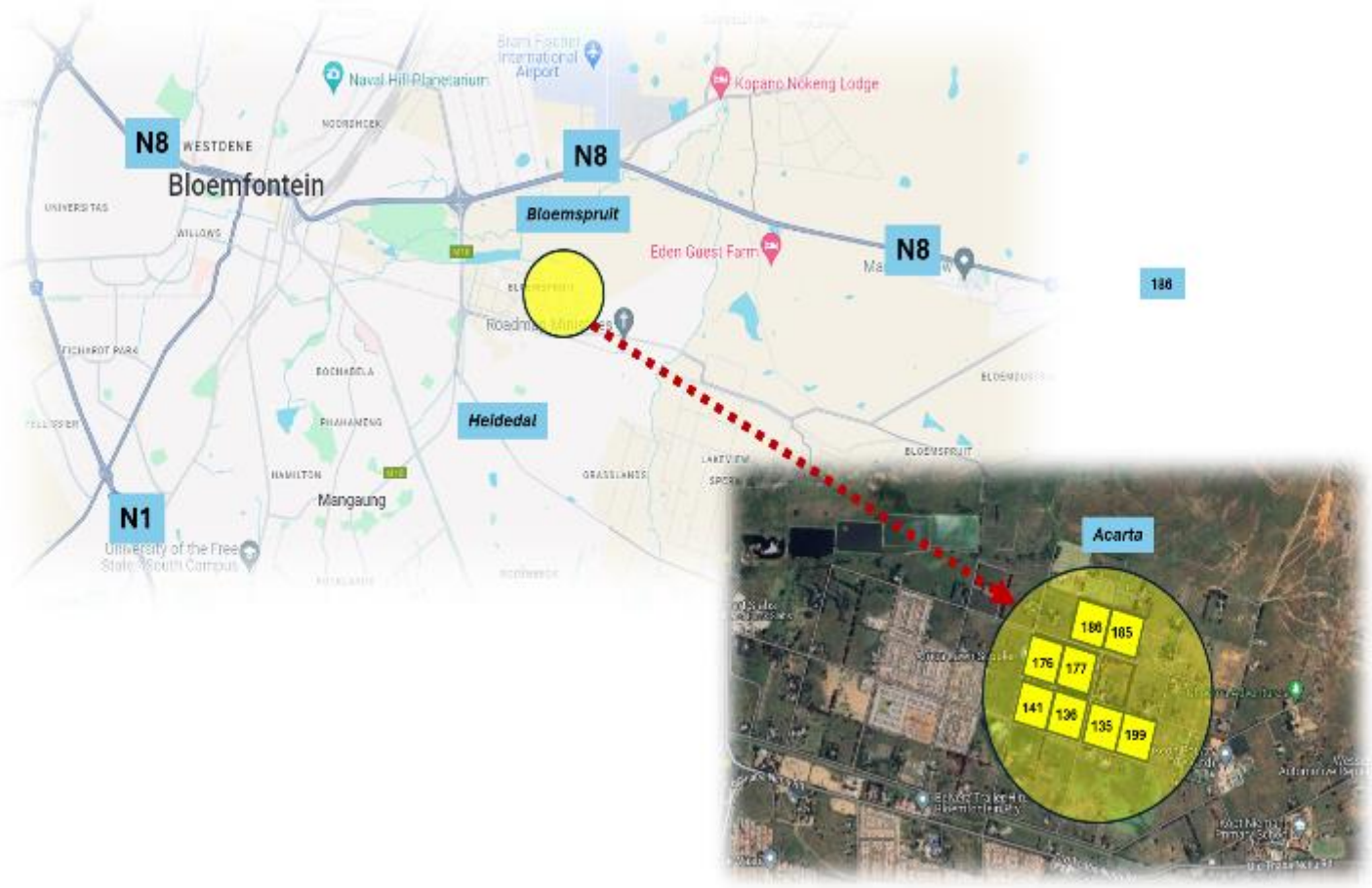


Figure 1: Site Location: Acarta

3. EXTEND OF THE DEVELOPMENT

3.1. The Development (Annexure A)

The planned Town Establishment, Figure 2, will consist 4 separate developments:

a) Phase 2: Plots 185 & 186: to be Zoned Residential 1 (176 ervens)

b) Phase 3: Plots 136, 141, 176 & 177 to be Zoned Residential 1 (363 ervens)

c) Phase 4: Plots 135 & 199 to be Zoned Residential 1 (180 ervens)

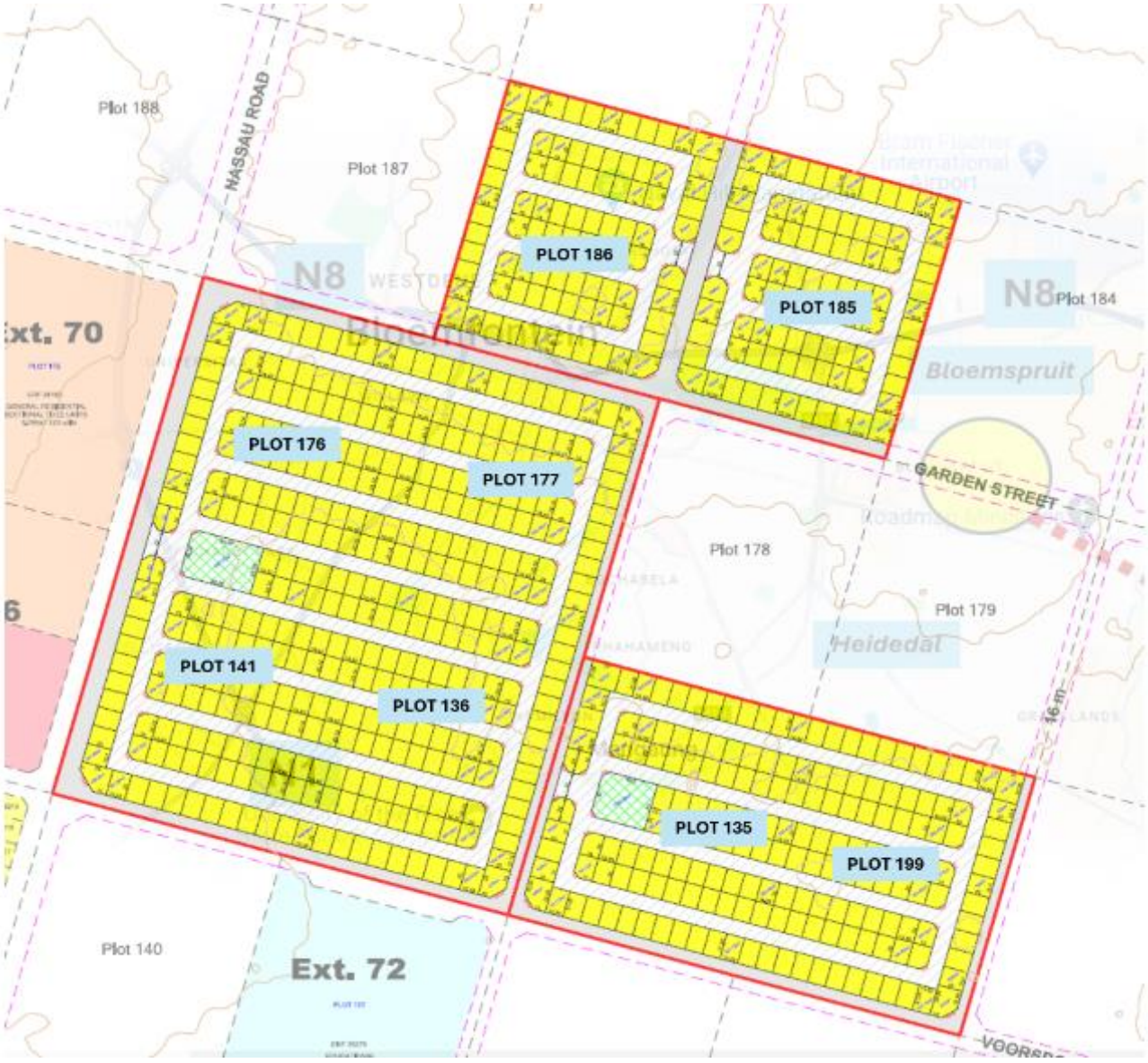


Figure 2: Plots due for Town Establishment

d) Parking bays provided:

Provide: 2 Bays/erf, provided on each the erf.

e) Design vehicle: Refuse trucks

(TMH 16, Table 13: SU Truck: Rt=12m, Re=10m, Wr=6m)

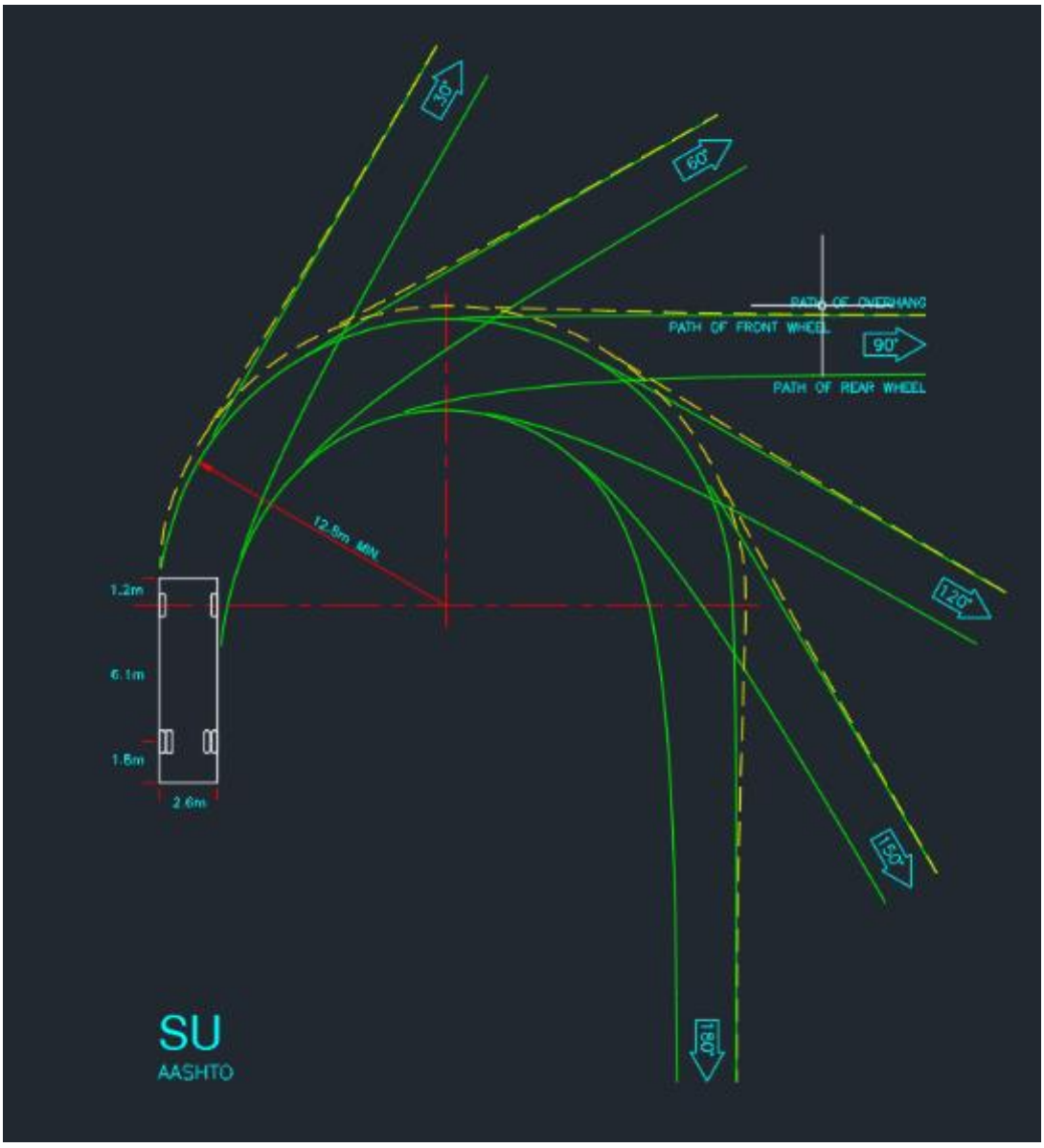


Figure 3: Design Vehicle

f) Proposed Site Development Plan, SDP PLOT 186 – 88 Ervens (Annexure B)

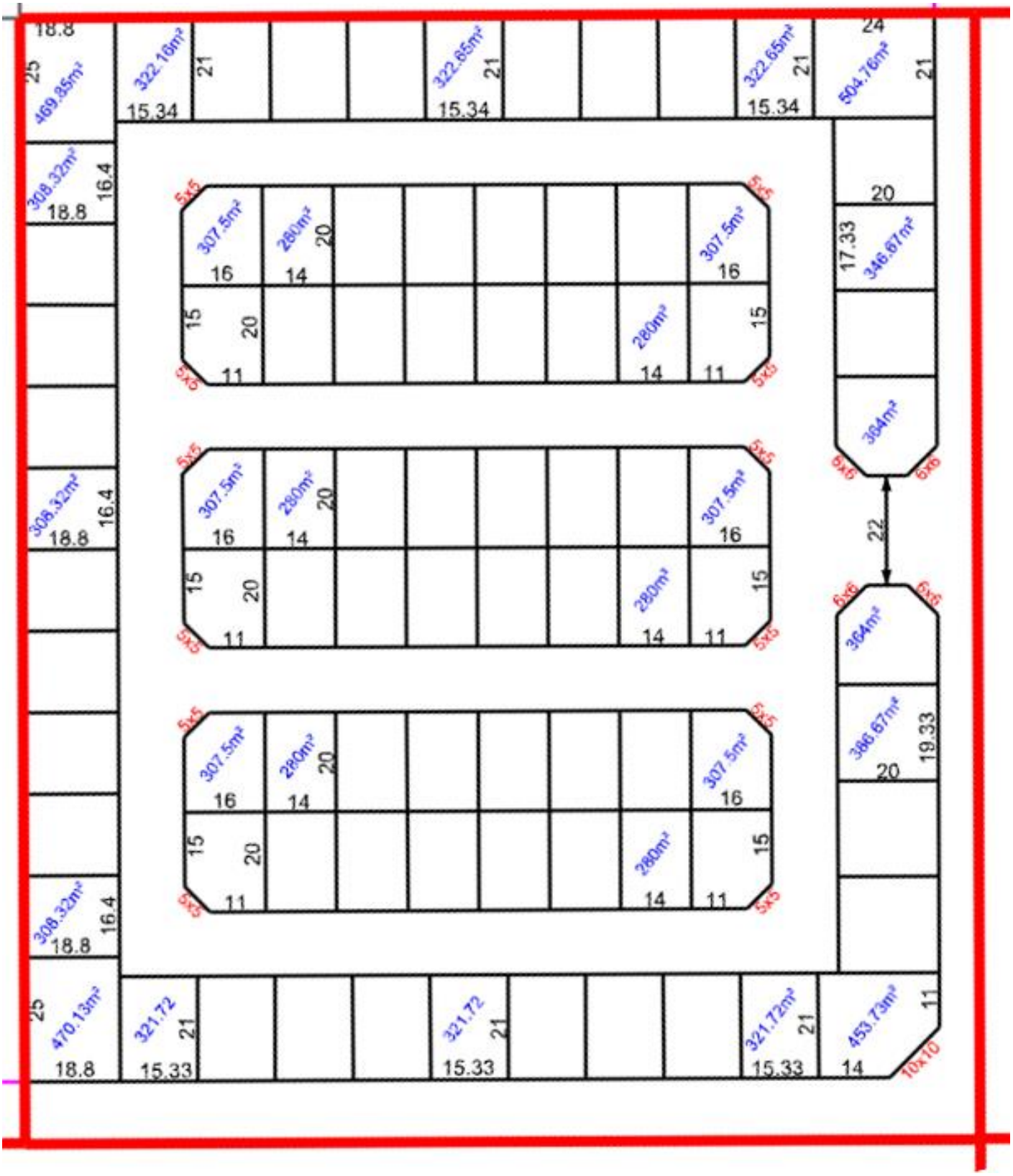


Figure 4: Plot 186 Layout

g) Proposed Site Development Plan, SDP PLOT 185 – 88 Ervens. (Annexure B)

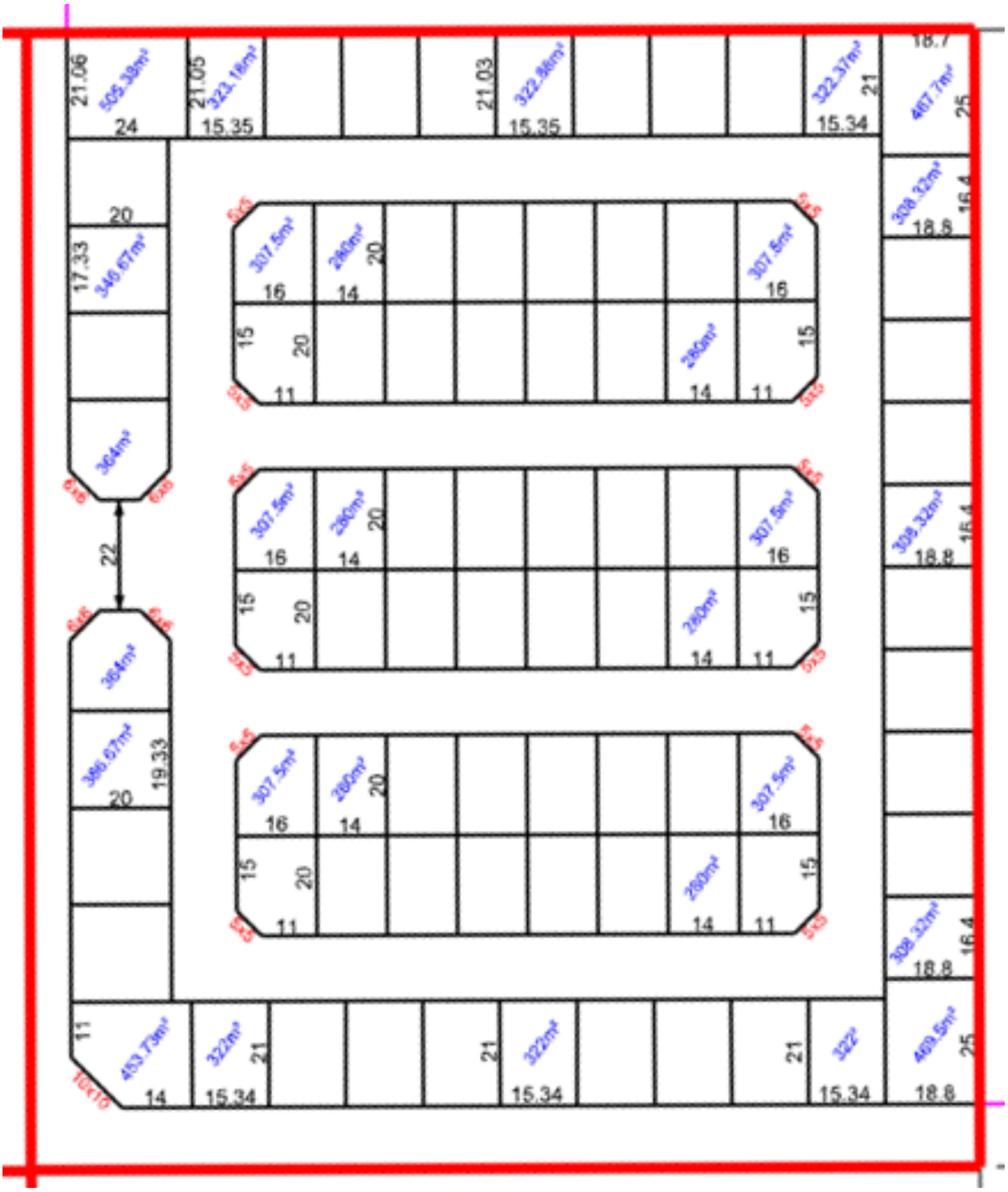


Figure 5Plot 185 Layout

h) Proposed Site Development Plan, SDP PLOTs 176,177,141 & 136 – 363 Ervens.

(Annexure B)

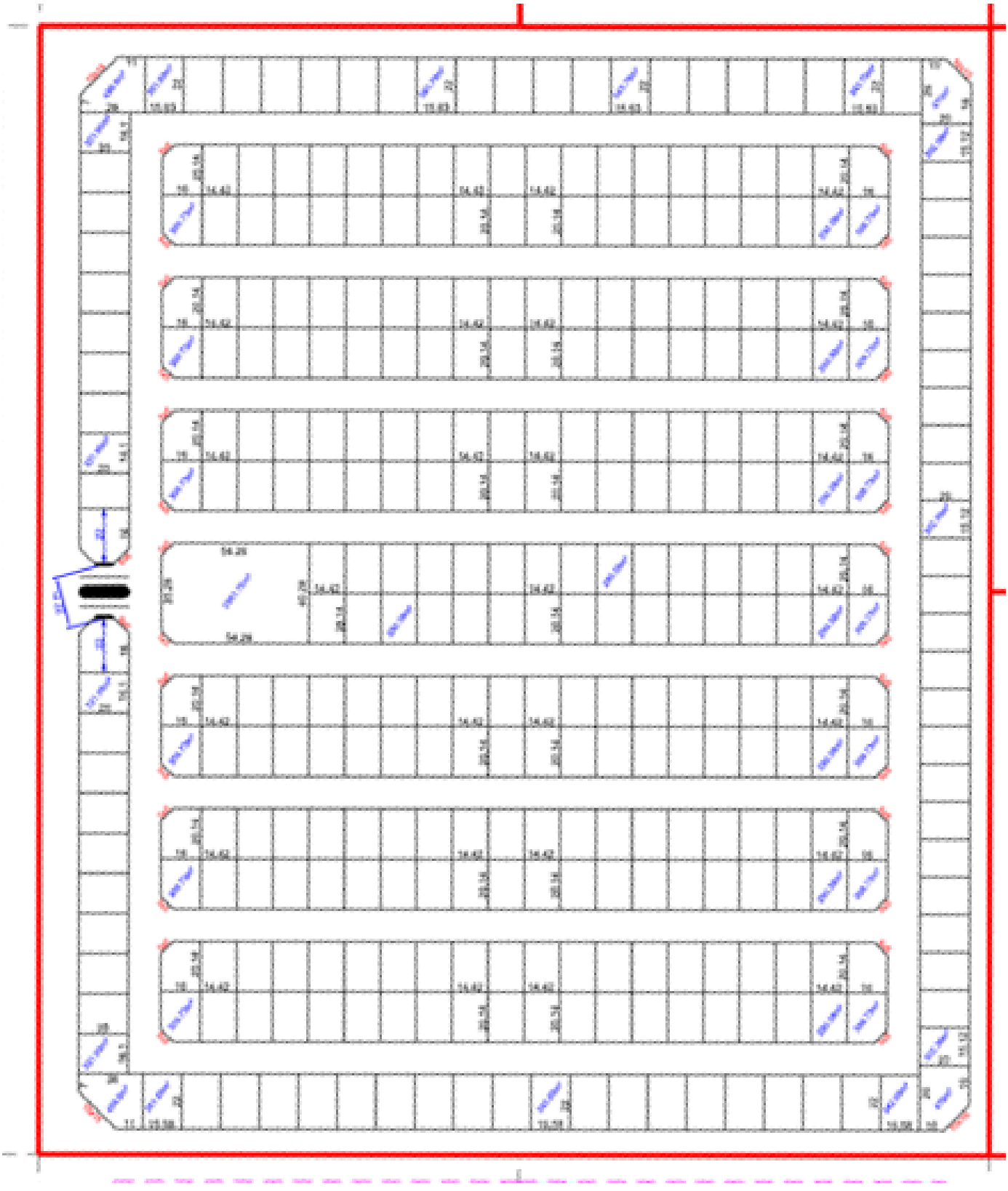


Figure 6: PLOTs 176,177,141 & 136

i) Proposed Site Development Plan, SDP PLOTs 135 & 199 – 180 Ervens. (Annexure B)

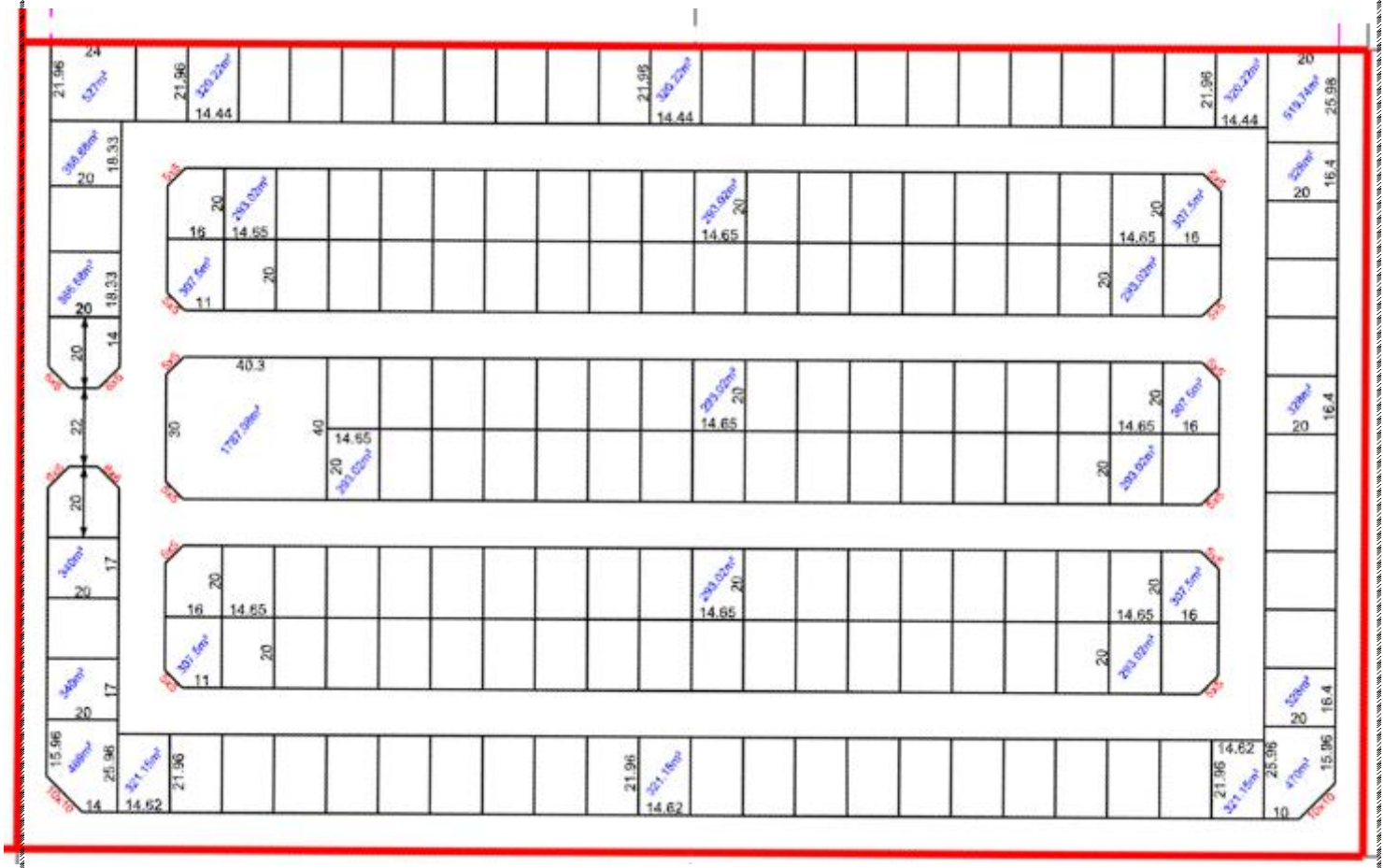


Figure 7: PLOTs 135 & 199 Layout

3.2. Comparison between Development and Zoning

The current process to apply for Wown Establishment will apply for Resiential 1 for all ervens, singe residential.

In comparing the development zoning with the actual executed development, it becomes evident that the latter demonstrates a commendable level of adherence to the prescribed zoning regulations. The development seamlessly aligns with the established zoning parameters, showcasing a harmonious integration within the designated land use and development guidelines. This alignment ensures that the project conforms to the legal and regulatory framework and contributes positively to the surrounding community. By adhering to the development zoning, the project maximises its potential while minimising potential conflicts, thereby illustrating a successful synthesis of urban planning principles and real-world implementation.

3.3. Previous Traffic Impact Studies

No Previous studies were done for this application; however, several studies next to this development need to be taken into consideration; these include:

a) Service Agreement Plot 146 – Traffic Impact Statement – April 2019
b) Township Establishment TIS- PLOTS 142, 148, 149, 152 & 155 – March 2020
c) Township Establishment TIS – PLOTs 153, 171 and 172 Bloemspruit – February 2016

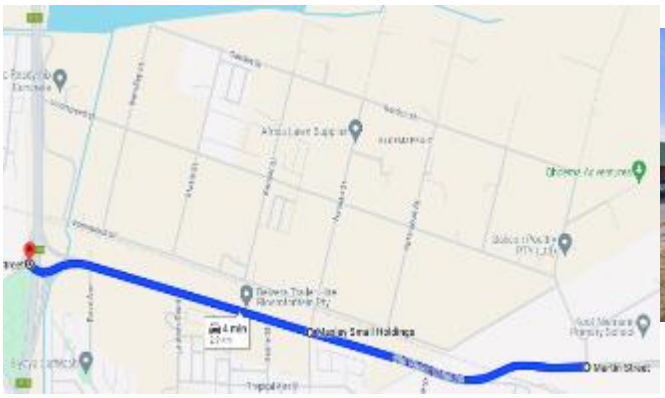
3.4. Operation of the Development

The development is a normal single residential development; it is expected that peak traffic flows will correspond with current peak traffic, which makes it essential to do a capacity analysis..

3.5. Existing Road Network

The most important roads in the area are the following:

Street I Road	Description	Geometry	Class	Functional Class	Jurisdiction
M10 Inner Ring Road	This north-south road connects the different roads, including the N8, Dr Belcher, Oliver Thambo and Curie Avenue.	Currently Various. Future: 4+ lane divided.	Major Arterial Speed limit 60km/h	Class 2 Major Arterial	Mangaung Metro Municipality
Old Thaba Nchu Road (A57)	Connect Plots to M10	Undivided 2-lane semi-rural road.	Rural Collector Street (Prov Access Road) Design Speed: 60km/h	Class R4	Free State Province



Street I Road	Description	Geometry	Class	Functional Class	Jurisdiction
Nassau Street	This road links the southern and northern portions of the Bloemspruit, via railway level crossing.	Undivided 2-lane urban/rural paved road	Residential Collector Street	Class 4b	Mangaung Metro Municipality
					
Voorspoed Street	This east-west road provides access to adjacent properties	Undivided two-lane road	Residential Collector Street	Cl ass 4b	Mangaung Metro Municipality
					

3.6. Existing Road Planning in the immediate vicinity.

Several new developments are currently currnetly planned in Bloemspruit. Lenova developed a substantial part.

The need to open up the area for development is evident. The area requires links in North to south and east-west directions. Although planning might change over time, of importance for this development, Nassau Street will play an important role, and Voorspoed Street will only serve a local function in the future. However, the function of Nassau Street is limited due to the railway level crossing.

Although an urban character, the A57, old Thaba Nchu Road, is still the property of the Free State Province and has not been transferred to Mangaung.

Figure 8: Future Road Network

3.7. Proposed Access to the Development.

Figure 9: Access to the Development Area

The area is currently accessible via three roads:

- Voorspoed Street (From the M10)
- Nassau Street (From Old Thaba Nchu Road, via Railway Lvel Crossing)
- Sunnyside Road

Town establishment is now requested for Eight plots combined into 4 development areas:

- Plot 185
- Plot 186
- Plots 136, 141, 176 & 177
- Plots 135 & 199

3.8. Site Photos

Figure 10: Voorspoed Street: Access from M10

Figure 11: Voorspoed Road: East of Wendy Street

Figure 12: Crossing Nassau Street and Voorspoed Street

Figure 13: Nassau Street

Figure 14: Nassau Street Intersection with Old Thaba Nchu Road

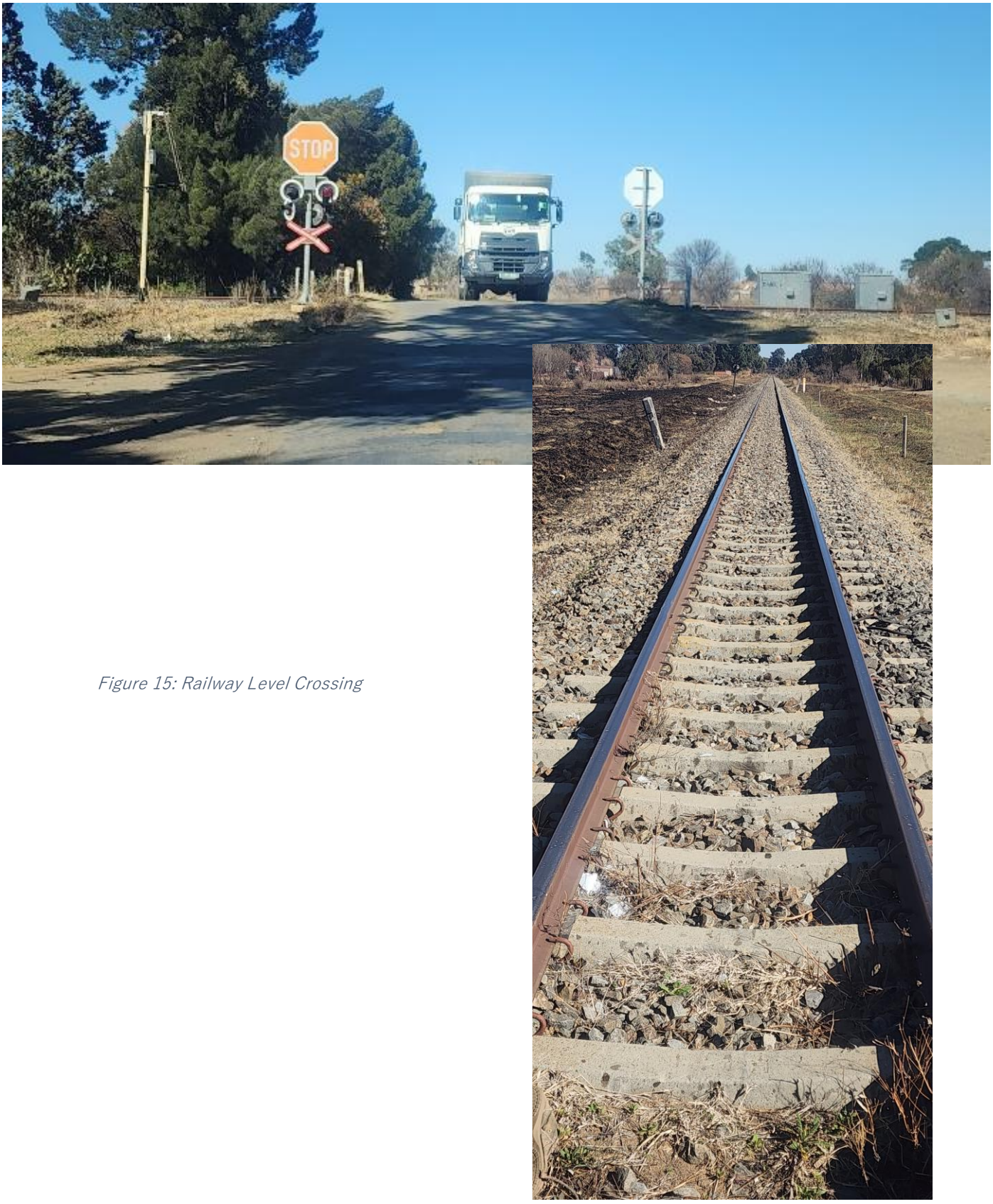


Figure 15: Railway Level Crossing

3.9. Trip Generation

Single Dwelling: (Land Use 210, TMH 17)

Site No	Land Use	Land Use	Unit	Base Size	Size	Number of units		Pm	Pv	Pvl	Pt	Pc
								Mixed	Low	V Low		
Plots 185	210	210 Single Dwelling Units	D/Unit	1	88,00	88	Max	10%	40%	70%	15%	40%
							Claim	0%	40%	0%	0%	
Plots 186	210	210 Single Dwelling Units	D/Unit	1	88,00	88	Max	10%	40%	70%	15%	40%
							Claim	0%	40%	0%	0%	
Plots 136/141/176/177	210	210 Single Dwelling Units	D/Unit	1	361,00	361	Max	10%	40%	70%	15%	40%
							Claim	0%	40%	0%	0%	
Plots 135/199	210	210 Single Dwelling Units	D/Unit	1	180,00	180	Max	10%	40%	70%	15%	82%
							Claim	0%	40%	70%	0%	

TGR AM	TGR PM	AM		PM		AM		PM	
		In	Out	In	Out	In	Out	IN	OUT
1	1	25%	75%	70%	30%	13	40	37	16
1	1	25%	75%	70%	30%	13	40	37	16
1	1	25%	75%	70%	30%	54	162	152	65
1	1	25%	75%	70%	30%	8	24	123	10

Peak Traffic Summary

	AM		PM	
	In	Out	IN	OUT
Sub Total	89	266	248	106
TOTAL		355		355

355 Trips are generated during the morning peak hour. According to the TMH 16 Vol 1, item 1.8.2, a Traffic Impact Assessment, TIA and a Site Traffic assessment, STA, are required.

1) This development does not have passerby traffic; operations and traffic generated are development-orientated.
2) The development will not divert of background traffic.
3) No Transfer trips.
4) Growth rates used: 3%.
5) Trip distribution: Analogy model.
6) **Intersection to be analysed (See Figure 8):**

    a. M10 & Voorspoed Street
    b. Nassau Street & Voorspoed Street
    c. Springbok & Voorspoed Street
    d. Eeufees & Voorspoed Street
    e. Nassau Street & Old Thaba Nchu Road
    f. Sunnyside & Old Thaba Nchu Road
    g. Nassau Street & Garden Street

Figure 8: Access to development Area

"TMH 16 Vol 1, Item 2.5.3 : These elements shall be restricted to Class 4 and 5 roads in the vicinity of the development up to the first Class 1 to 3 roads that can be reached by the Class 4 and 5 road network from the development, up to and including the first connection(s) on Class 1 to 3 roads. The elements shall be restricted to those within a maximum distance of 1.5 km from the accesses to the site, measured along the shortest routes to the accesses, provided that there is at least one intersection within this distance. Where there is no such intersection, the distance will be extended to include at least one intersection."

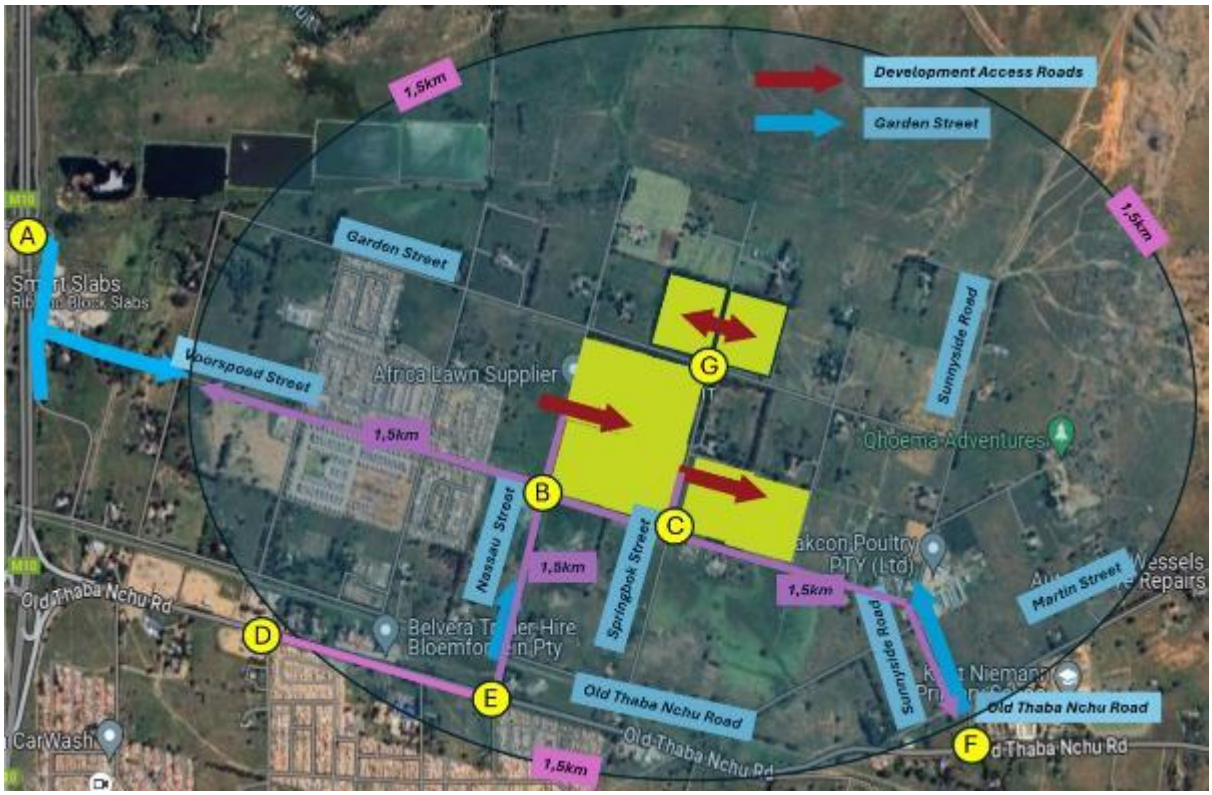


Figure 16: Access to the Development Area

3.10. Trip Distribution and Level of Service on the Roads/Intersections.

The trips generated by the development were added to the base year traffic, and analysis was done for (Annexure C).

"TMH 16, Table 5: Acceptable level of Service Urban Roads: Normal days: LOS D & Abnormal days LOS E".

- Base year, 2024, before development.
- The base year with the development.
- 2024 escalated for five years = 2029 - Excluding Latent rights
- 2024 escalated for five years = 2029 - Including Latent rights

Trip generation/ distribution is included in Annexure C. A summary of LOS is shown in Figures 6&7 (AM) and 8&9 (PM). (These figures present LOS with the 2029 analysis, including the Latent Rights).

Although level "D" is the worst situation experienced, it will be important to implement upgrades to intersections to maintain and roads to keep the Los on an acceptable level.

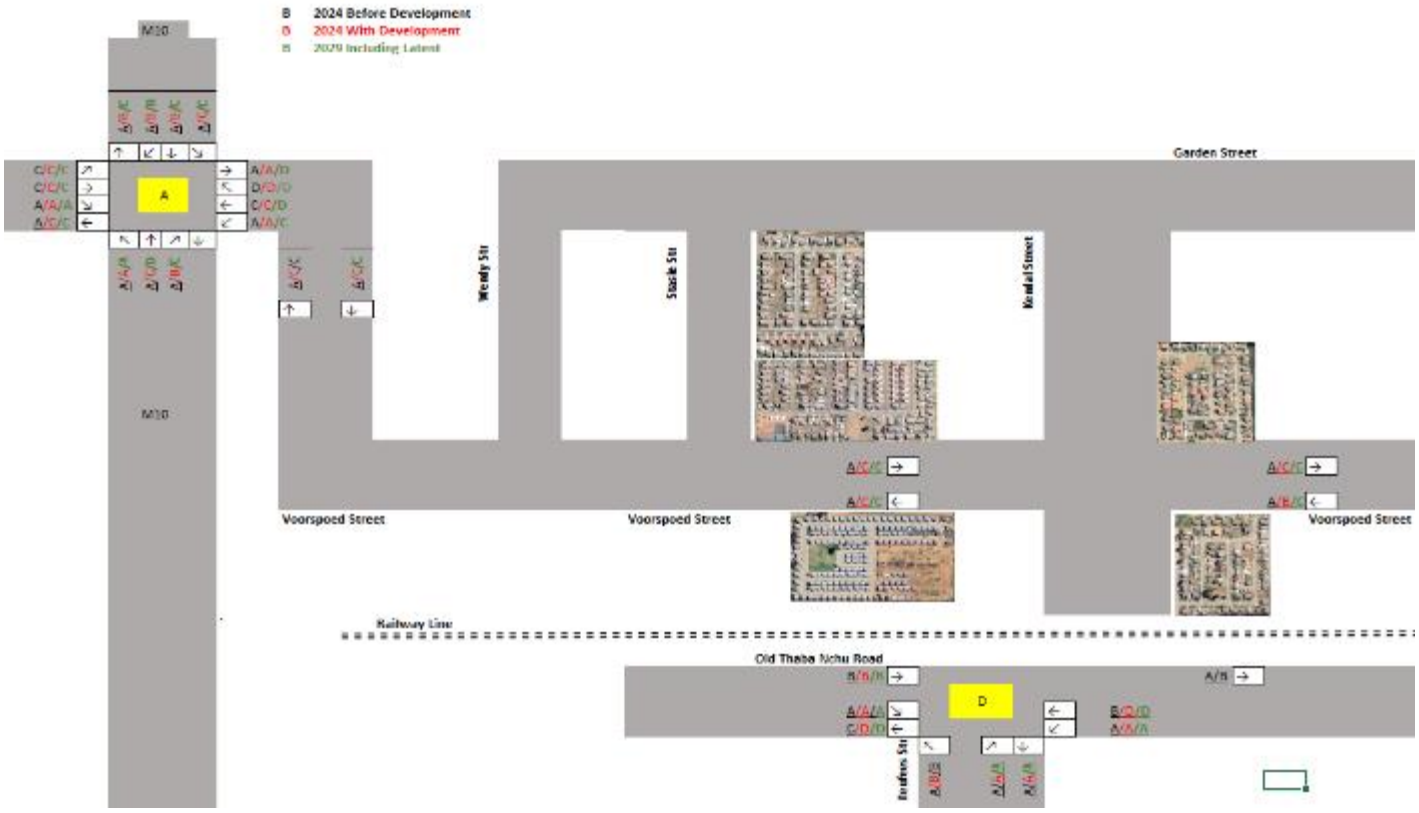


Figure 17: AM LEVEL OF SERVICE (WESTERN PART)

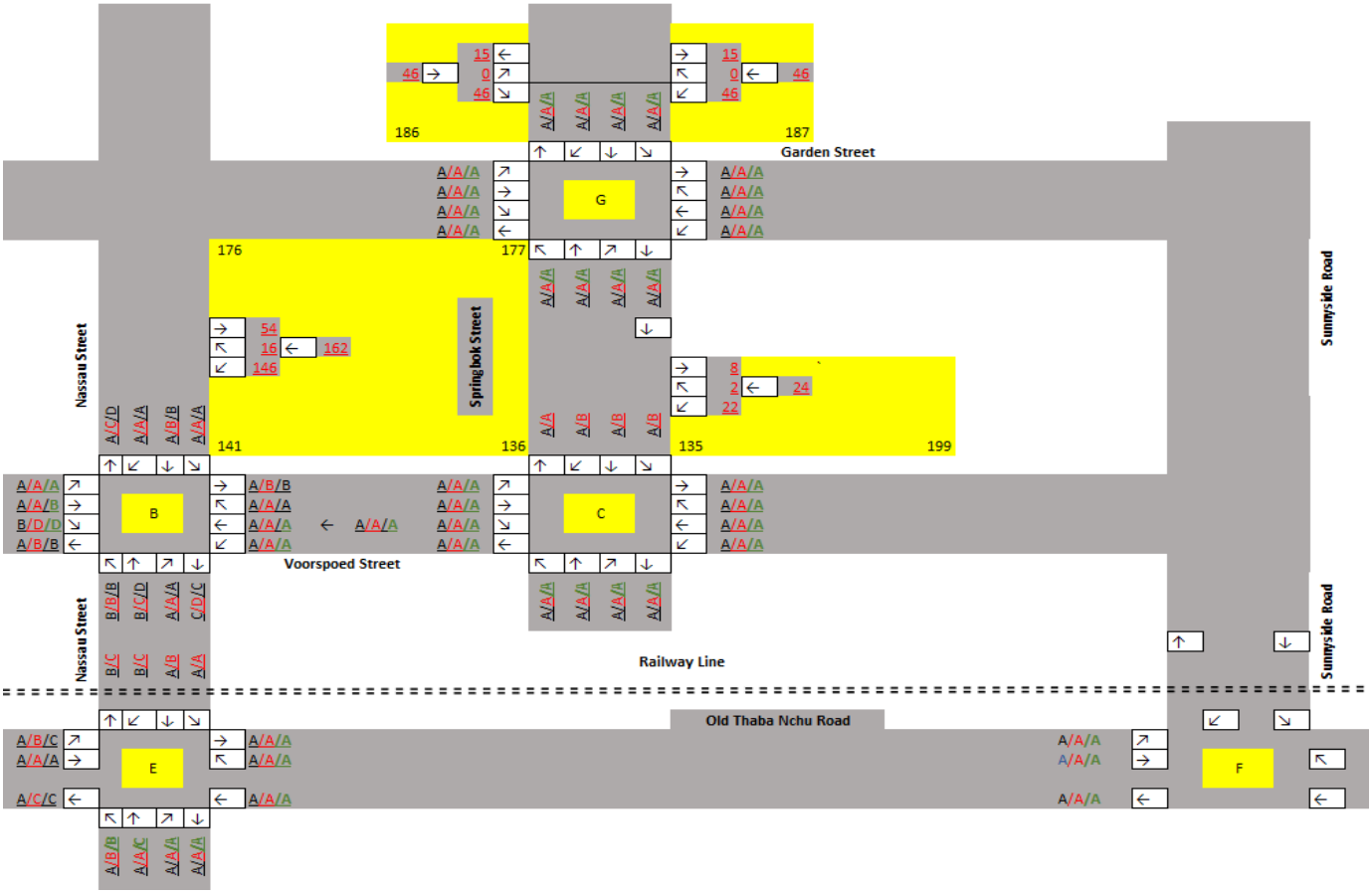


Figure 12: AM Level Of Service (EASTERN PART)

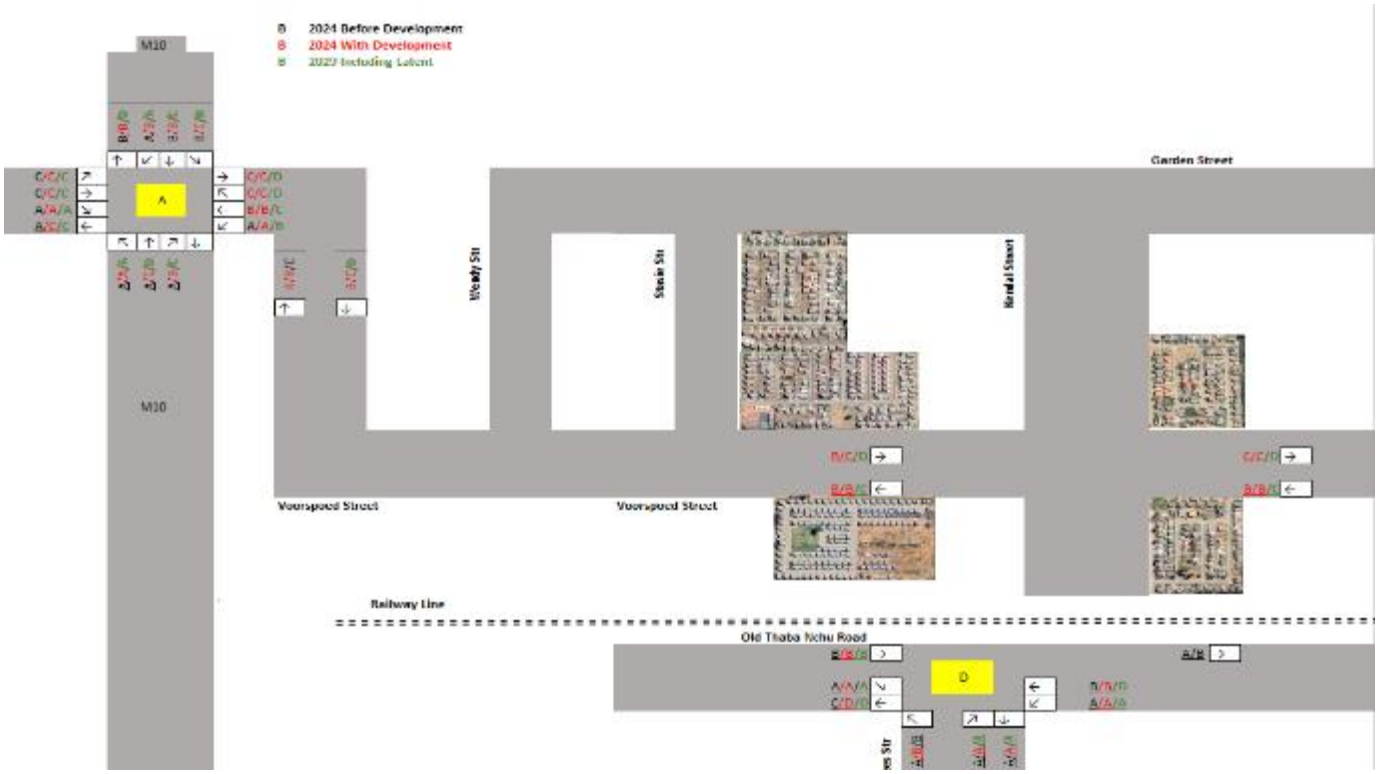


Figure 19: PM LEVEL OF SERVICE (WESTERN PART)

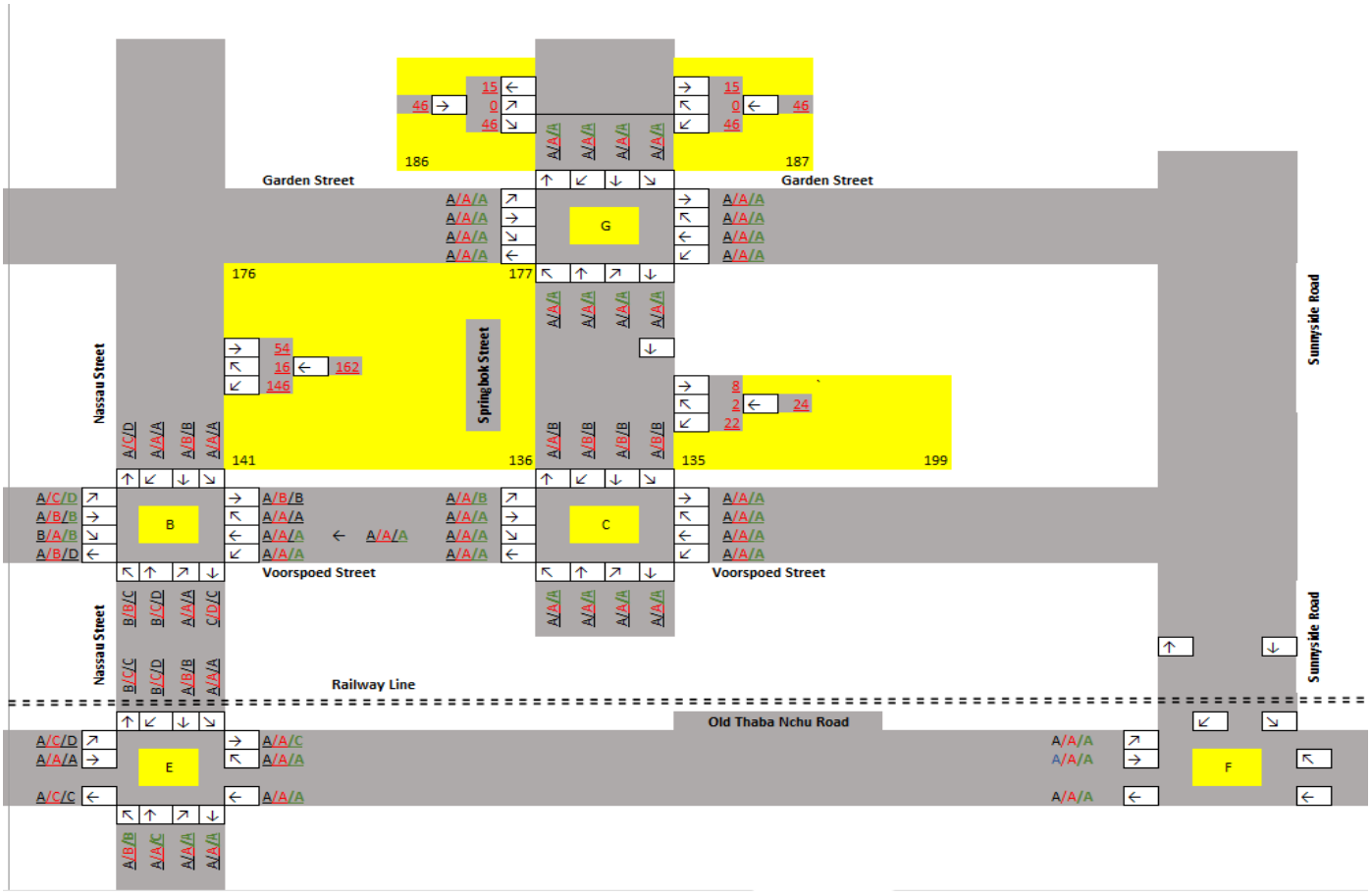


Figure 20: PM LEVEL OF SERVICE (EASTERN PART)

3.11. Summary of Capacity Analysis.

The Bloemspruit infrastructure requires some updates to support the development of PLOTS:185/186/136/141/176/177/135 & 199.

The analysis of the expected traffic generated on the network, with LOS as shown in Figures 17 to 20, is an indication that the network can accommodate the development. However, the infrastructure required updates.

3.12. Recommended network changes.

3.12.1. M10 & Voorspoed Street

This intersection already operates at low levels of service and warrants signalisation, irrespectively of the development. The following layout is recommended, subject to further investigation:

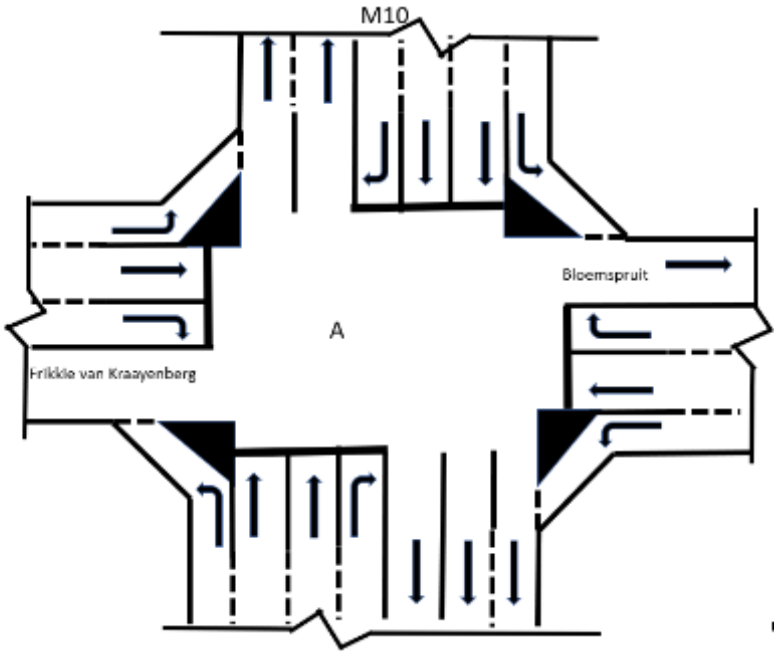


Figure 13: Layout intersection Frikkie van Kraayenberg and M10

3.12.2. Nassau Street & Voorspoed Street

This intersection of highly influenced by the development and will require upgrades. The following layout is recommended.

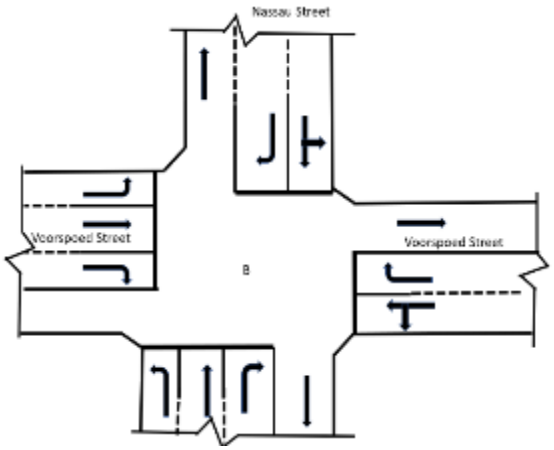


Figure 14: Intersection Voorspoed & Nassau

3.12.3. Springbok & Voorspoed Street

Although not required due to capacity, it is recommended to consider dedicated right-turn lanes.

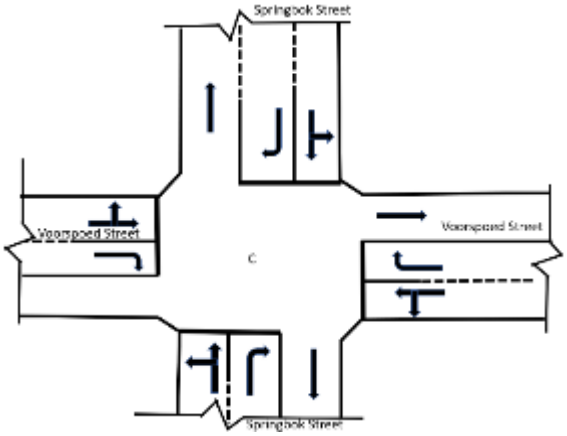


Figure 15: Intersection Springbok & Voorspoed

3.12.4. Old Thaba Nchu Road & Eeufees Str

Turning movements are currently unsafe, and although not influenced by this development it is recommended to provide turning lanes.

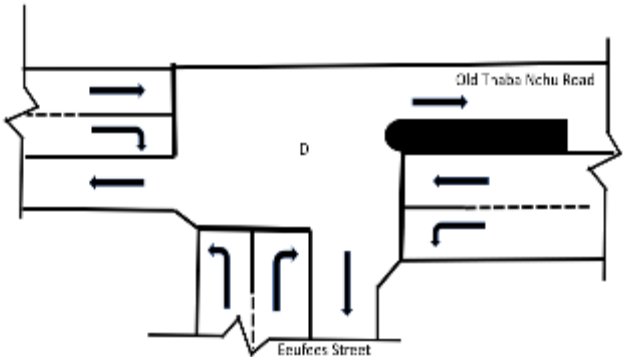


Figure 16: Intersection Old Thaba Nchu Road & Eeufees Str

3.12.5. Nassau Street & Old Thaba Nchu Road

This intersection will be influenced directly by the development and will require upgrades.

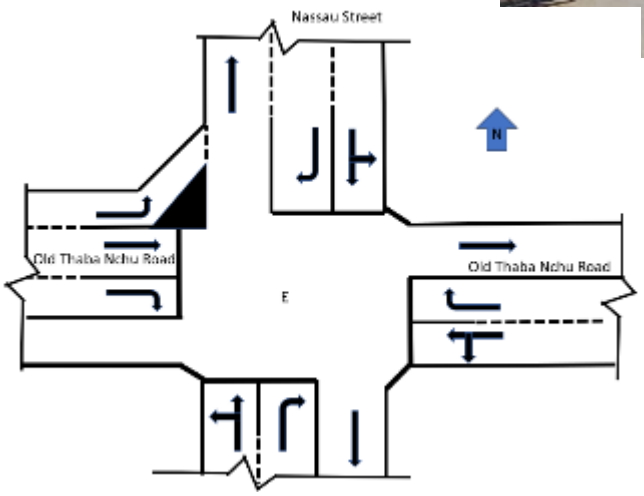


Figure 17: Nassau & Old Thaba Nchu Road

3.12.6. Springbok & Garden Street

The recommended layout is indifcated in figure ?

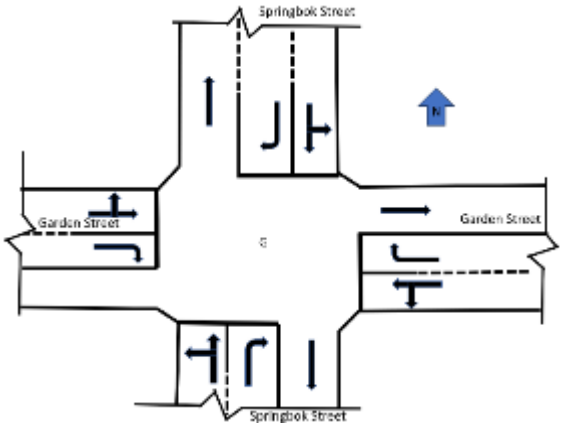


Figure 18: Garden & Springbok Str

3.12.7. Voorspoed Street

Voorspoed is partly upgraded, from Wendy Street east, and it is essential that the remainder of the road also be upgraded to the same standard. The current road conditions seriously influence the road capacity and will not be able to carry this development.

The upgrade of Voorspoed Street will have to be extended in an eastern direction up to at least Springbok Road, but preferably up to Sunnyside Street.

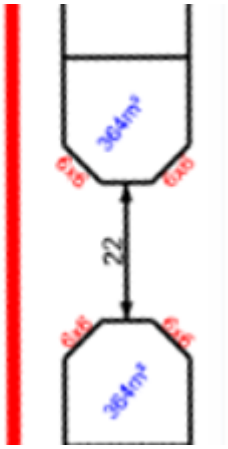
3.12.8. Nassau Street

Nassau Street will become one of the major accesses to the development. The current condition of the road is very bad, and the street will need to be upgraded.

A railway level crossing is also located to the south on Nassau Street. Although the railway line is not that busy, it is still in use. Control systems at the railway line are not currently functional and will require upgrades.

4. SITE DEVELOPMENT PLAN

NUMBER	ASPECTS
4.1.	ACCESS
4.1.1	Accesses
	Plots 185, 186, 135 & 199 will have access from Springbok Street. Plots 136, 141, 176 & 177 will have access from Nassau Road. 
4.1.2.	Access spacing
	The access to the site is spaced: Plots 185, 186, 135 & 199 access from Springbok Street are spaced 130m from both Voorspoed and Garden Street, respectively) Plots 136, 141, 176 & 177 accesses from Nassau Road. (Spaced midblock, 230m from both Voorspoed and Garden Street). These spacings comply with minimum standards. *"TRH26, Table 4: Priority Control spacing> 100m* *TMH16 Table 8: Intersection Spacing >100m*

4.1.3.	Width of accesses
	22m is reserved for the accesses, which provide sufficient space for the driveways of at least 7.5m to make provision for the trucks. "*TMH16 Table 26: 7.5m".* 
4.1.4.	Provision of deceleration lanes
	Not required for development
4.1.5.	Traffic capacity
	A detailed analysis was done and is included in Annexure C.
4.1.6.	Right and left turning lanes.
	Not required at the developments.
4.1.7.	Medians and median openings

	Not relevant
4.1.8.	Access control
	24-hour security to each development. Access with remote control/Cell-to-Gate.
4.1.9.	Weaving distance
	Not relevant
4.1.10.	Throat length and storage space *"TMH 16, Table 28"*
	Throat length = 10m for Class 5b road.
4.1.11.	Expected queue lengths *"TMH 16, Table 29"*
	Plots 185, 186, 135 & 199: V/C = 58%, queue = 5, sufficient space onsite available Plots 136, 141, 176 & 177: V/C less than 10%: queue = 1
4.1.12.	Sight distances to and from new accesses *"TMH 16, Table 34"* Stopping distance 60km/h 0%gradient: Unobstructed sight distances >85m.

4.1.13.	Geometric layout and standard
	Normal priority-controlled access can be provided. (Already approved).  *Figure 19:Priority Control*
4.1.14.	Impact on existing on-street parking, trees, traffic signs or other infrastructure
	Trees to be trimmed/cut. Overhead lines to close to the road surface. 

4.2.	**INTERNAL ROADS**
4.2.1.	Width of roadways
	All internal roads comply with requirements, road reserve 13m.
4.2.2.	Radii of active curves
	Active radii = 12m (provision for refuse truck/emergency vehicles).
4.2.3.	Traffic circulation
	Roads are provided in such a way that the designed vehicle can access all areas.
4.2.4.	Pedestrian movement and pathways
	No sidewalks are provided for pedestrians, not required for this type of development.
4.2.5.	Standard of vehicle ramps
	Accesses to all ervens < 3%. Access to the development <3% Gradients comply with standards.

4.3.	**PARKING**
4.3.1.	Number of bays provided versus number required.
	Required parkings Provide: 2 Bays will be provided for each erf. **REQUIRED PARKING: Comply with requirements**
4.3.2.	Dimensions of parking bays *(TMH16 Table 23)*
	• All parking bays comply with minimum requirements, 2.5m x 5m, 90°.

DESCRIPTION	Longitudinal direction		Cross-slope	
	Preferred MAX	Absolute MAX	Preferred MAX	Absolute MAX
Standard parking bay		3% (1:33)	4%	5% (1:20)
Parking for persons with disabilities		2% (1:50)		2% (1:50)
Pedestrian/wheelchair ramps		8.3% (1:12)		0%
Roadways and aisles	4% (1:25)	5% (1:20)		3% (1:33)
On-site vehicle ramps (excluding final 5m)	10% (1:10) (high-volume)	15% (1:6.7) (low-volume)		3% (1:33)
On-site vehicle ramps (final 5m)		4% (1:25)		3% (1:33)
Driveway over sidewalk and first 5m on either side of road reserve boundary		4% (1:25)		3% (1:33)
On-site driveways: Residential Other developments	12% (1:8.3) 5% (1:20)	15% (1:6.7) 8% (1:12.5)		3% (1:33) 3% (1:33)
Delivery/loading bay		2% (1:50)	1% (1:100)	2% (1:50)

- Sources: SANS10400-S, TMH16, Parking Standards (PG 3/85), U12/7/4/23
- A roadway with a longitudinal gradient in excess of 5% is regarded as a vehicle ramp, requiring blending distances at gradient changes
- Unless a traffic engineering motivation is approved for a relaxation of "Absolute MAX" requirements, designs must comply with "Preferred MAX" requirements

4.3.3.	Aisle widths and manoeuvring space
	Sufficient on-site manoeuvring space is available.
4.3.4.	Length of parking aisles
	Not Applicable

4.3.5.	Parking for disabled persons *(Mangaung Parking Standards, figure 6, SANS 10400-S:2011, Mangaung LUS item 14bii)*
	No special parkings is provided for disabled persons, which is not required by this type of development.
4.3.6.	Position of parking relative to building and building accesses
	N/A
4.3.7.	Reservation of parking bays
	Each erf has own parking.
4.3.8.	Parking tariffs
	Not relevant.
4.4.	SITE CIRCULATION AND TRAFFIC CONTROL
4.4.1.	Possible vehicular conflict situations
	No traffic conflicts are foreseen.
4.4.2.	Potential vehicular/pedestrian conflict
	No relevant
4.4.3.	Facilities for disabled persons
	Provided as stipulated in the "*Mangaung LUS Item14b ii"*

4.4.4.	Guiding of motorists
	Not relevant
4.4.5	Width and design of pedestrian spaces
	Not relevant.
4.4.6.	Internal roads are sufficient for emergency vehicles, and firefighting vehicles can access all parts of the development. "*Mangaung LUS Item14b vii*"
	Emergency vehicles and firefighting vehicles will be easily able to access all areas of the site.
4.4.7.	Accessibility of refuse areas
	No special area is provided, refuse truck to collect on site.
4.4.8.	Illumination of site
	The development will be illuminated during nighttime.
4.5.	DELIVERY FACILITIES
4.5.1.	The design makes provision for SU trucks.
4.5.2.	Dimensions of loading bays
	N/A
4.5.3.	Manoeuvring space for delivery vehicles

	Sufficient on-site manoeuvring space is provided.
4.5.4.	Standard of delivery routes
	Delivery routes are self-explanatory given the utilisation of the premises.

4.6.	**LEGAL PROCEDURES**
4.6.1.	Registration of right-of-way servitudes
	N/A
4.6.2.	Legal procedures to protect the status of aspects over/on adjacent properties
	Not relevant.
4.6.3.	Building line relaxation
	None required
4.7.	OTHER ASPECTS
	None

5. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made from the study:

a) The planned development can be accommodated within the requirements of the infrastructure.

b) The preliminary site development plans can accommodate development-orientated traffic.

Based on the study, it is recommended that the Town Planning be approved from a traffic point of view.

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6. REFERENCES

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7. ANNEXURE A: DEVELOPMENT LAYOUT

8. ANNEXURE B: DEVELOPMENTS SDP

9. ANNEXURE C: TIP GENERATION AND DISTRIBUTION