TRAFFIC IMPACT ASSESMENT

PROPOSED DEVELOPMENT OF THE FARM ZANDHOOGTE NO. 139, TERGNIET, MOSSEL BAY

Report Number 20191111

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QUALITY ASSURANCE DATA

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Signature and date

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TIA	Traffic Impact Assessment
WCG	Western Cape Government
AMP	Access Management Plan
AMG	Access Management Guidelines (2016)
RAG	Road Access Guidelines (2002)
RDE	Roadside Development Environment
GLA	Gross Leasable Area
SATGRM	South African Trip Generation Rates Manual
LOS	Level of Service
DoT	Department of Transport
RDE	Roadside Development Environment
MR	Main Road
DR	Divisional Road
K&T	Kantey and Templer Consulting Engineers
RNIS	Road Network Information System
GRZ1	General Residential Zone 1
SRZ1	Single Residential Zone 1
BZIII	Business Zone 3

1 INTRODUCTION

1.1 Background

Urban Engineering (Pty) Ltd was appointed by Ideal Trading 301 CC to undertake a Traffic Impact Assessment for the proposed development of Zandhoogte No 139 in Tergniet, Mossel Bay, Western Cape. (refer to Figure 1-1 below for the locality plan).

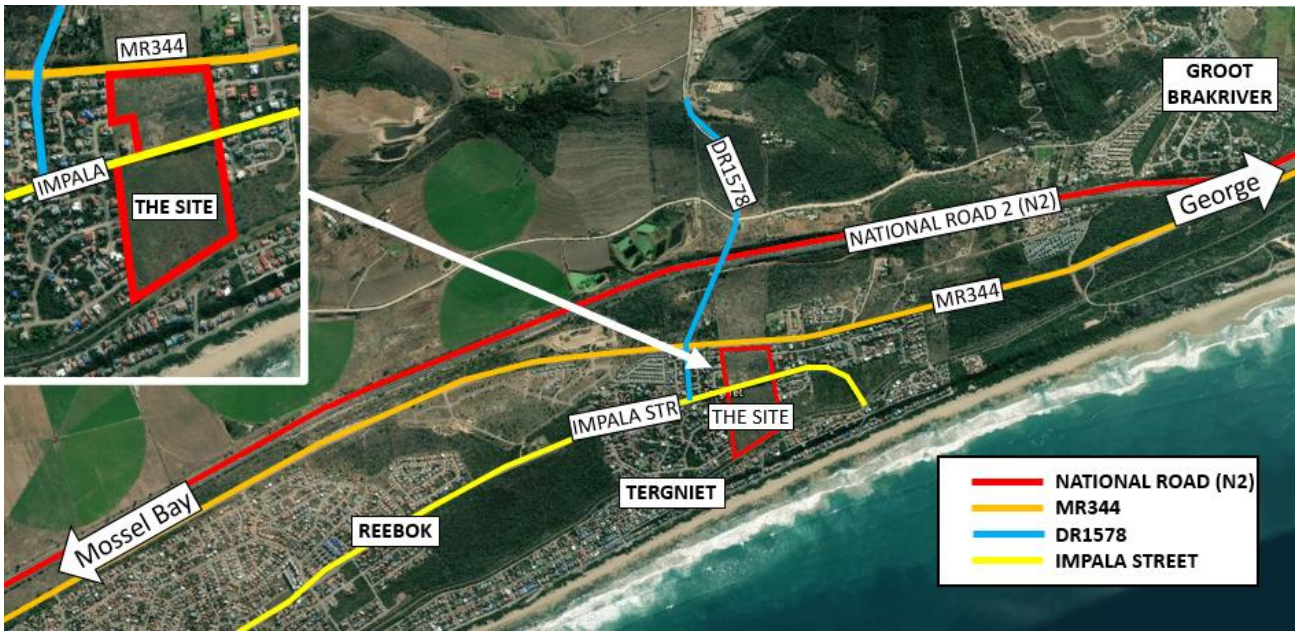


Figure 1-1 - Locality Plan

1.2 Objective of this report

The purpose of this TIA is to determine how the traffic, generated by the proposed development, will influence the road network within the immediate vicinity of the site. Based on capacity analysis of certain intersections, recommendations will be made to ensure that the network will operate smoothly in peak traffic times.

The following methodology was used to perform this TIA:

i. Assess the traffic conditions on the existing road network
ii. Assess the traffic generation effects of the proposed development
iii. Superimpose (ii) on (i) and reassess traffic operations on the road network
iv. Assess the interface conditions between the road network and the proposed development
v. Highlight any traffic concerns resulting from the proposed development
vi. Make recommendations

1.3 Terms of Reference

Transportation investigations essentially need to be undertaken in accordance with the following guidelines:

- Manual for Traffic Impact Studies RR 93/635 (DoT, 1995)
- South African Trip Generation Rates Manual (SATGRM – RR92/228, 2nd Edition)
- Access Management Guidelines (WCG Dept. Transport and Public Works, 2016)

Based on the Manual for Traffic Impact Studies, there are four (4) scenarios with regards to generation threshold values for Transportation Investigations (summarized in Table 1-1 below)

Scenario 1	More than 150 peak hour trips	Prepare a Traffic Impact Study (TIS)
Scenario 2	Less than 150 and more than 50 peak hour trips	Prepare a Traffic Impact Statement (TISm)
Scenario 3	Less than 50 peak hour trips	No study required, except if the surrounding road network is operating at or above capacity
Scenario 4	A study may be requested at the discretion of the responsible road authority	

Table 1-1 - Trip Generation Thresholds for Transportation Investigations

2 STATUS QUO

The full extent of the farm Zandhoogte No. 139 actually extends past National Road 2 (N2) and is divided into various land parcels by means of National Road 2, Provincial Road MR344 and Impala Street (a Municipal Road). This TIA will focus on the development of the two land parcels situated south of MR344. For ease of reference, this report will differentiate between the two parcels by referring to them as the Northern- and Southern Portions as indicated in Figure 2-1.

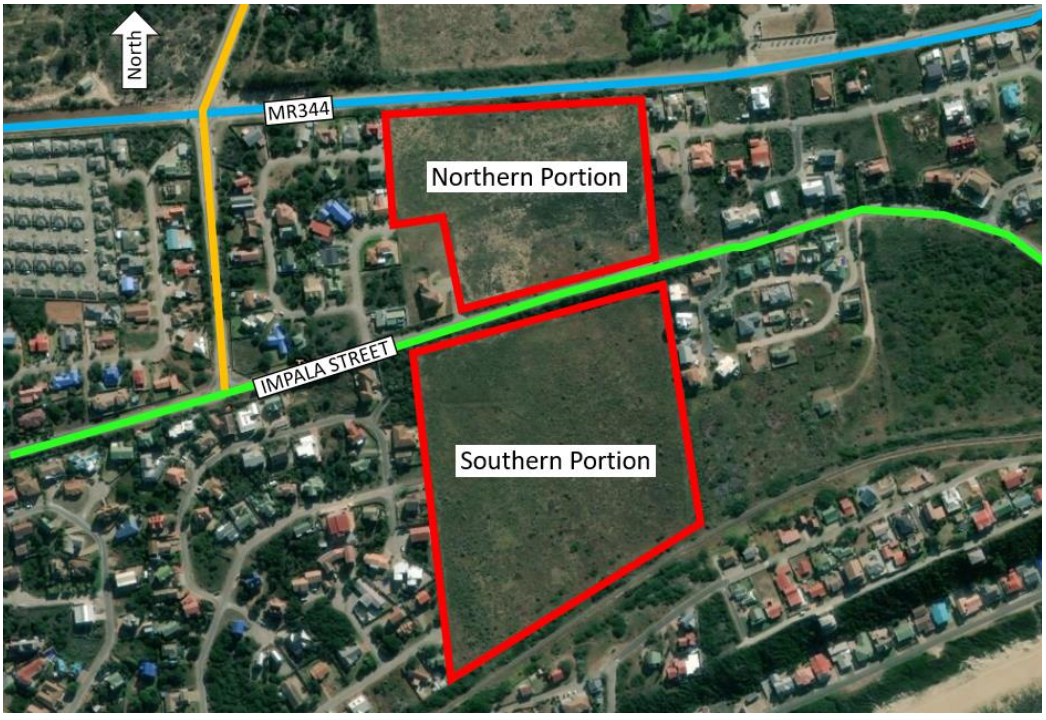


Figure 2-1 –Northern and Southern Portions of relevant sections of Zandhoogte 139.

Both Northern and Southern portions are currently undeveloped. They were previously used for grazing and are mainly covered in grass and isolated shrubbery.

Figure 2-2 – Current vegetation cover on the Northern and Southern Portions

The proposed development of both portions will mainly focus on residential dwellings and will be made up of group housing, townhouses and general residential apartments. Both development rights as well as an Environmental Authorisation was granted previously for a development (called Vista Bahia) on the Southern Portion, but both these approvals have already lapsed and hence new approvals are required. The approvals have however been included in various planning reports as will become evident further in this report.

Currently there is an existing farmhouse situated on the Northern Portion of the relevant site. The land on which the farmhouse is situated, is currently undergoing subdivision in order to separate the farmhouse property from the rest of the proposed development land. The existing farmhouse is however still relevant as the existing dwelling unit will share a combined access with the proposed Northern Development (to be elaborated on, later in this report)

Figure 2-3 - Existing Farmhouse on Northern Land Portion

2.1 The Surrounding Road Network

Kantey and Templer Consulting Engineers were appointed by the Provincial Government of the Western Cape to prepare an Arterial Management Plan relating to the MR344 & MR348 between Hartenbos and Glentana. The Final (Draft 3) version of this document was issued in January 2012. Based on the findings of this document, Kantey and Templer was appointed for the subsequent rehabilitation and upgrade of the MR344. Construction started in January 2018 and is expected to be completed by mid-2020. This MR344 upgrade included the upgrade of a couple of minor connecting roads, including the extension of DR1578 south of the MR344 (referred to as Rheebok Street in the Kantey and Templer AMP).

2.1.1 Rheebok Street (DR1578 Extension)

The upgrade of the MR344 includes Rheebok Street, between the MR344 intersection up to the Impala Street intersection. Part of the motivation for this upgrade was the approved Vista Bahia development on the Southern Portion. At the time of compiling the AMP, the Vista Bahia development consisted of more than 250 residential units and is clearly indicated in the MR344 access management plan as indicated in Figure 2-4 .

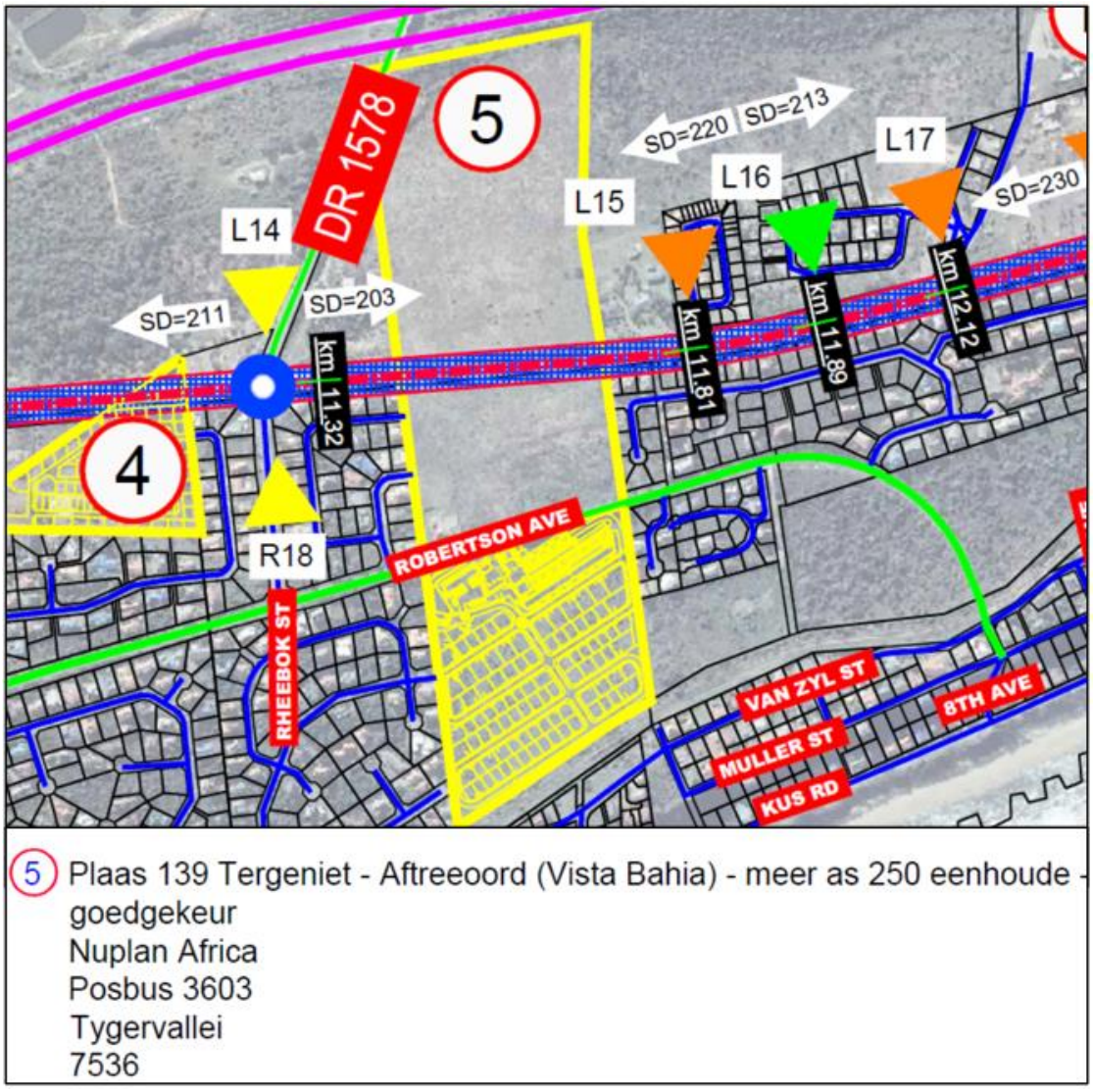


Figure 2-4 - Extract from MR344 AMP indicating Vista Bahia Development

At the time of writing this report, Power Construction have already started with the MR344 road upgrade and the Rheebok Street upgrade was well underway (refer to photo attached as Figure 2-5)

Figure 2-5 - Upgrade of Rheebok Street

The Rheebok Street upgrade entails the widening of the carriageway to accommodate a surfaced shoulder. When completed, the Rheebok Street approach to the Rheebok Street/MR344/DR1578 intersection will consist of a Dedicated right turn lane and a combined Left and Through lane. The intersection will be stop controlled on the Minor approaches (Rheebok Street and DR1578) with priority movement along MR344 (refer to Figure 2-6).

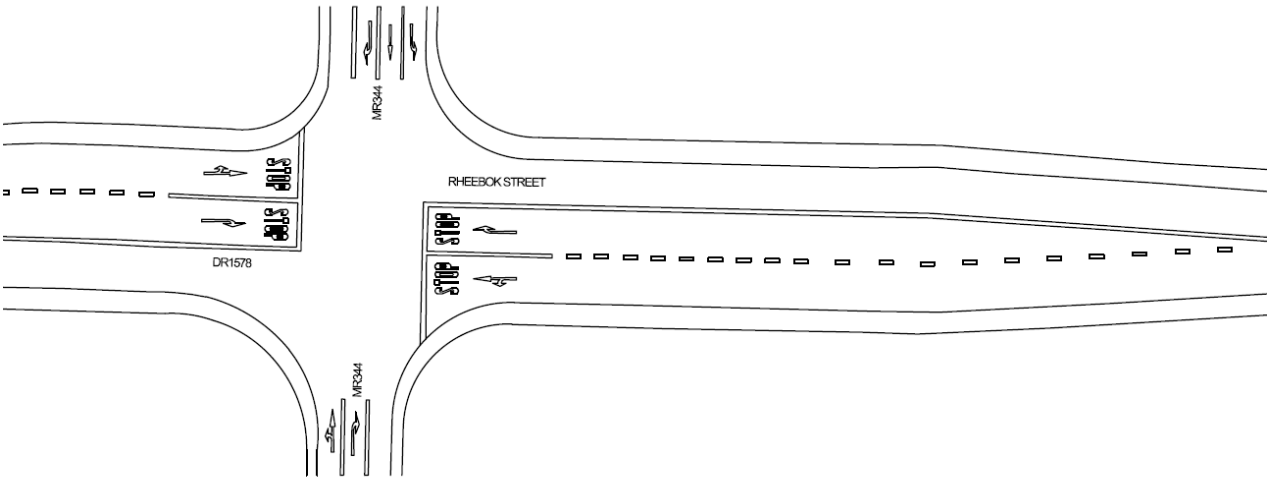


Figure 2-6 - Rheebok Street Layout Plan

2.2 Impala Street

Impala street seems to be known by various names, including Blesbok Street, Charles Keen Street and Robertson Street (from the MR344 AMP, refer to Figure 2-4). On the ground, the various small concrete street name signs along the street however refer to "*Impala*" and hence this report will also refer to the street as Impala Street.

Impala Street is a fairly important Residential Collector Street, providing a direct transportation link between the suburbs of Tergniet and Reebok. Even though the surrounding roadside environment is mainly residential, direct driveway access to Impala Street has been limited as far as possible in order to protect mobility along the road.

Based on its hierarchy within the surrounding road network, as well as the intermittent driveway and stop controlled intersection spacings along Impala Street, it's function within the network can be compared to that of a typical **Class 4 Urban Collector Street**.

Collector streets are used to penetrate local neighbourhoods with the purpose of collecting (and distributing) traffic between local streets and the arterial system. The streets are mainly intended to serve an access function with limited mobility and traffic volumes; trip lengths and continuity must be limited.

They should ideally not carry any through traffic but only traffic with an origin or destination along or near the street. The majority of the traffic using the collector street will have a destination in the street itself or in a local street leading off the collector. A collector street must not be quicker to use to pass through an area than a mobility road although it is recognized that in the absence of a mobility route, collectors must allow for some through traffic, albeit at low speeds.

The MR344 upgrade does not include any upgrades to the Rheebok/Impala Street Intersection and the Limit of Construction on the Rheebok Street upgrade is at the end of the bell mouth at the Impala Street junction (refer to Figure 2-7).

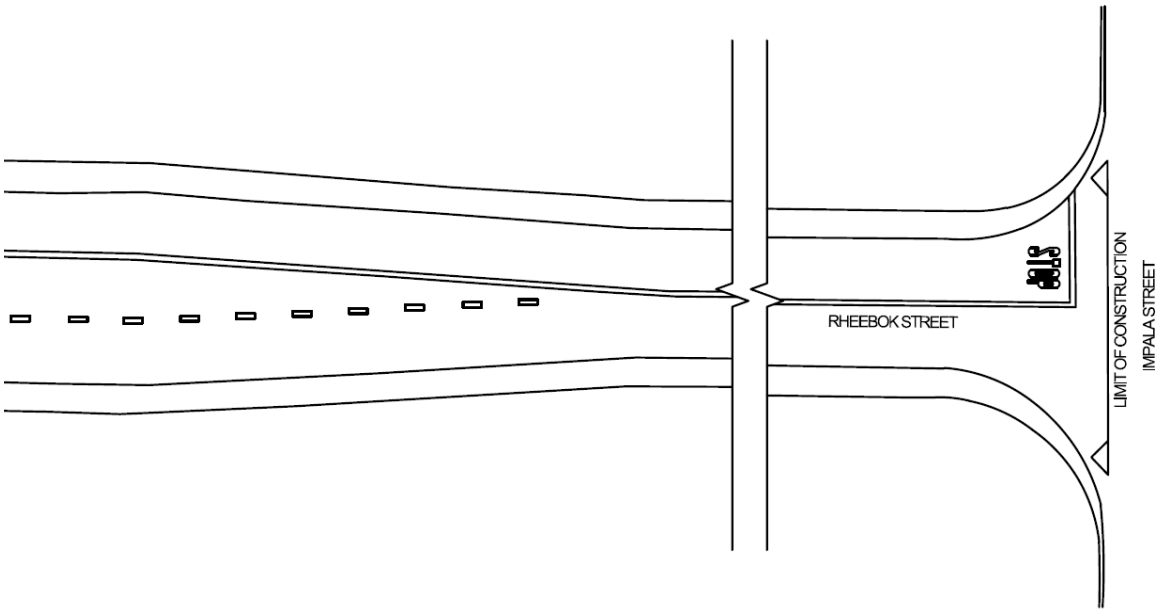


Figure 2-7 - Limit of Construction of MR344 upgrade at Impala Street Intersection

2.3 Background Traffic Volumes

Generally, a traffic count along the MR344 during the road upgrade process would not provide accurate data. The current road upgrades to the MR344 has a direct impact on the traffic volumes along this stretch of road, as motorists who typically use the MR344 as a scenic though route, or who do not have to explicitly use the MR344, will tend to try and avoid the MR344 or find alternative routes. This is however not true for the minor residential streets within Tergniet and Reebok. Here residents do not have the luxury to choose alternative routes, as the only way to reach their homes is via the minor street network. For this reason, a 12-hour (06:00 to 18:00) classified (Light and traffic count was conducted at two points along Impala Street on Tuesday, 05 November 2019. The two points are indicated in Figure 2-8 below.

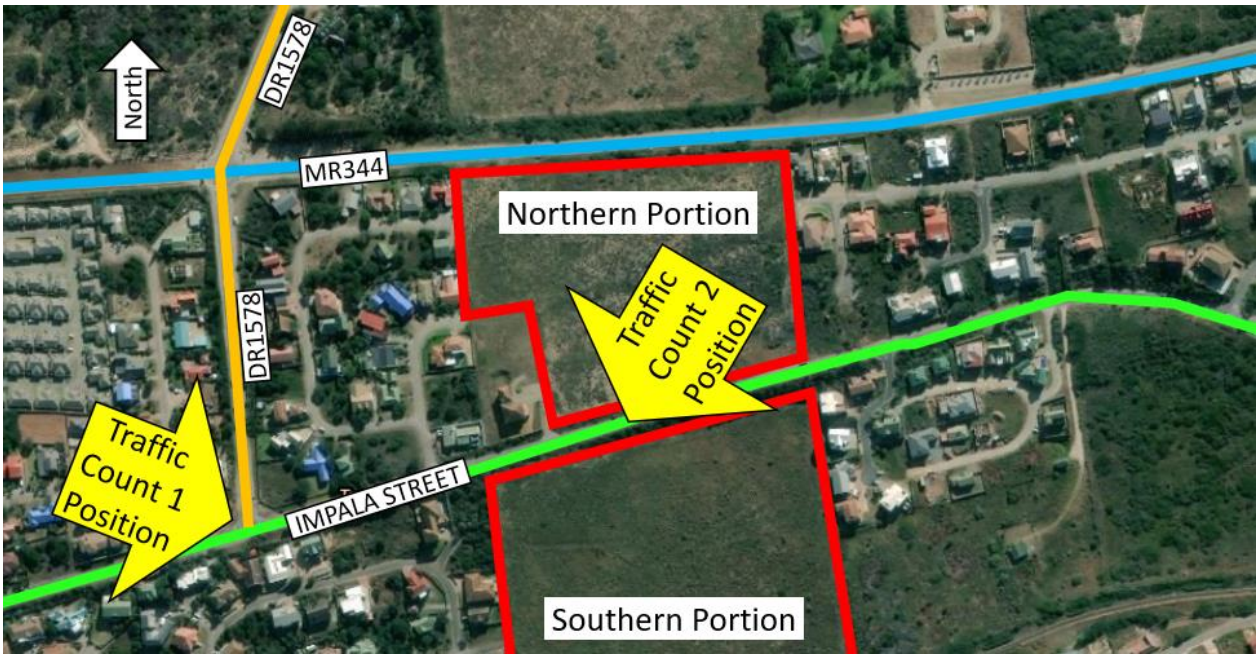


Figure 2-8 - Traffic Count Positions

The raw traffic count data has been attached as **ANNEXURE A** to this report. The data was analysed to extract the traffic flow profile for each intersection approach. The various flow profiles are important to gain a better understanding of the road's (and more precisely the specific approach to the intersection) function and operational environment.

2.3.1 Traffic Count 1 Position

At the time of the traffic count, the roadworks on the MR344 and DR1578 resulted in traffic accommodation at the DR1578/Impala Street intersection. The DR1578 was undergoing half-width construction, which means that only one-way traffic was allowed on the DR1578 between MR344 and Impala Street. The resultant traffic accommodation resulted in delays and irregular traffic flows through the intersection. Vehicles were stopped by traffic controllers at the intersection and had to wait for approaching traffic to clear the relevant section of the DR1578 before they could proceed. As explained earlier in this report, the impact of this annoyance on the background traffic volumes is that the flow profile is greatly affected (STOP/GO system resulting in long queues and then a sudden increase in traffic volume when the traffic is released) but the impact on the traffic volumes are not expected to be significant. Impala Street is not a through road and the bulk of the traffic is generated from the surrounding residential areas. These residents had no choice but to continue with their daily commute to schools and their respective places of work, in spite of the inconvenience and waiting times due to the

traffic accommodation. The traffic flow profile over the 12-hour period, can be seen from the graph included as Figure 2-9 below.

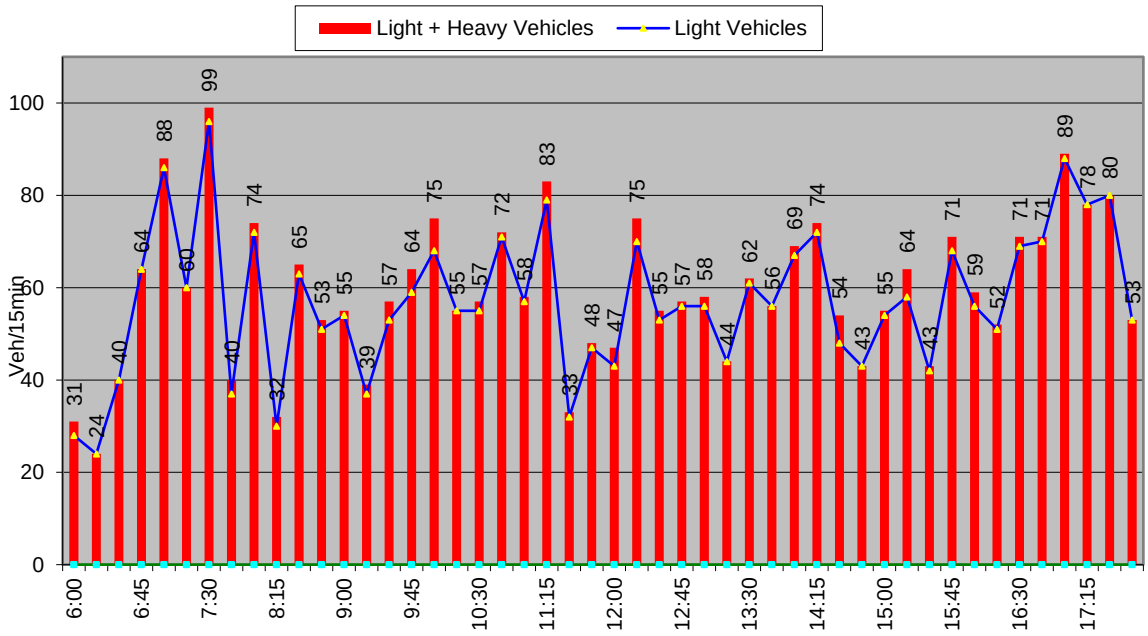


Figure 2-9 - Traffic Volumes at Position 1 (Junction of DR1578 Extension and Impala Street)

2.3.2 Traffic Count 2 Position

Traffic Count 2 was taken at the approximate position of the future development access points. The flow profile indicates that the volumes peaked during the NM and PM periods, and not during the traditional AM and PM periods. Traffic volumes were relatively low and very few heavy vehicles made use of the road on the day of the count. The traffic flow profile over the 12-hour period, can be seen from the graph included as Figure 2-10 below. Once again the sporadic ride and fall of traffic volumes is directly attributed to the STOP/GO traffic accommodation at the Impala/DR1578 Intersection.

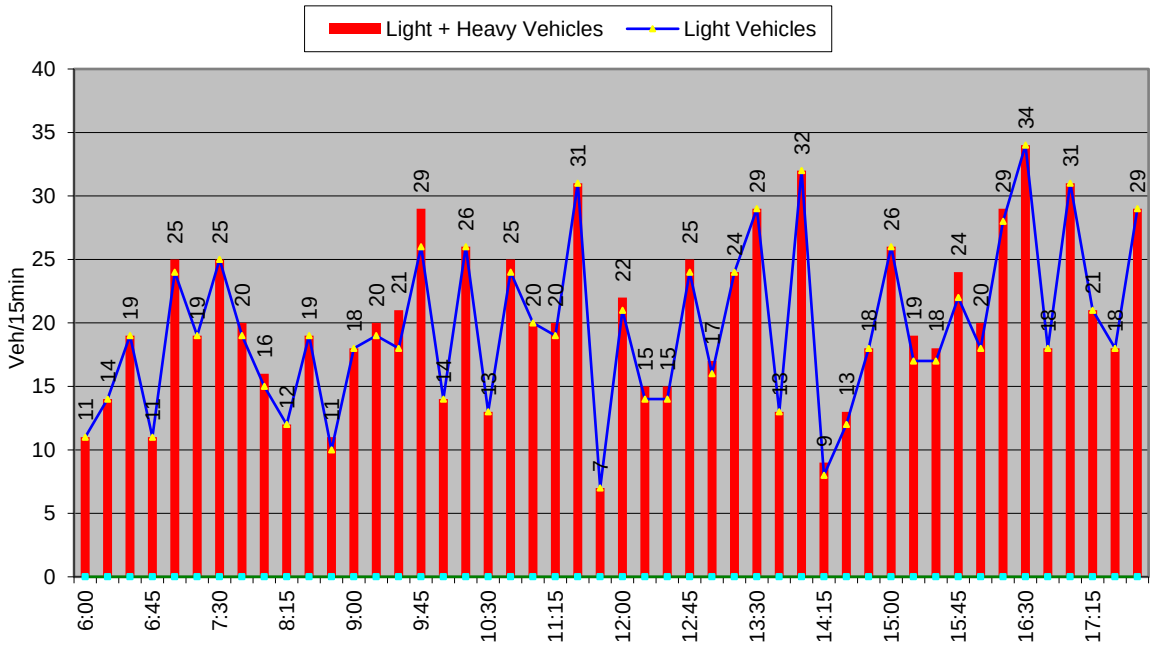


Figure 2-10 - Traffic Volumes at Position 2 (Impala Street)

2.4 Peak Hour Volumes

The traffic counts were further analysed to extract the 2019 Peak Hour Volumes for the morning (AM), midday (NM) and afternoon (PM) periods. The results are included in tabular format below:

Approach	AM	NM	PM
	(06:45 to 07:45)	(10:30 to 11:30)	(16:45 to 17:450)
DR1578 (Northern Approach)	288	226	292
Impala (Eastern Approach)	99	103	109
Impala (Western Approach)	235	211	235

Table 2-1 – DR1578/Impala intersection AM, NM and PM Peak Hour Volumes

Approach	AM	NM	PM
	(10:45 to 11:45)	(13:45 to 14:45)	(16:30 to 17:30)
Impala (Eastern Approach)	96	98	112
Impala (Western Approach)	96	98	112

Table 2-2 - Impala intersection AM, NM and PM Peak Hour Volumes

It is clear from the above tables that the peak hours at the two traffic count locations differ for all three (AM, NM and PM) scenarios. It can therefore be assumed that the "worst case" scenario will take place when the respective peak hour volumes, are experienced concurrently. This situation has been indicated schematically in Figure 2-11 below.

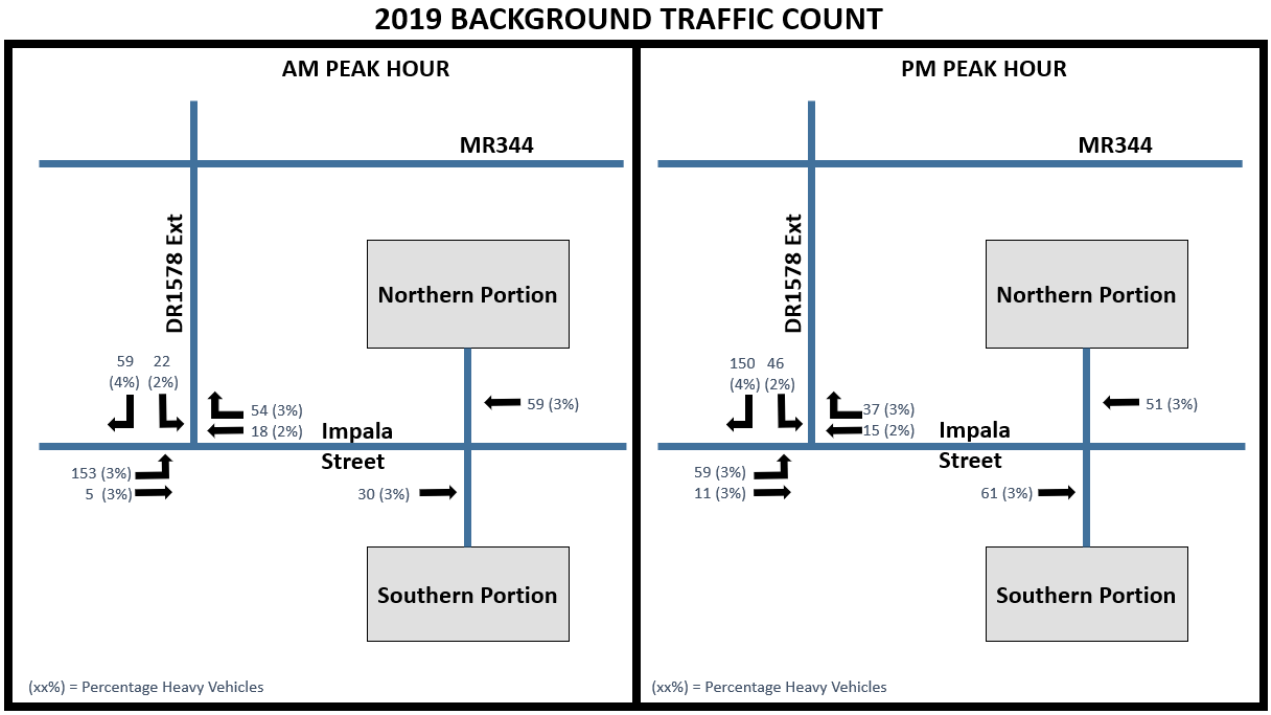


Figure 2-11 - Peak Hour Volumes for Specific Turning Movements

3 THE PROPOSED DEVELOPMENT

The proposed Site Development Plan (SDP) was included in the *Specialist Planning Report for NEMA Authorisation Purposes*, prepared by Marike Vreken Urban and Environmental Planners in September 2019. Based on the Planning Report, the preferred development consists of a "*gated group housing development with a mixture of housing typologies*". The complete SDP has been attached as **ANNEXURE B** to this report, but for ease of reference, the SDP is also divided into a Northern- and Southern Portion and discussed in detail below:

3.1 Northern Portion

The relevant section of the SDP has been included as Figure 3-1 below.

Figure 3-1 - Proposed SDP for Northern Portion

The housing typologies identified for the northern portion are listed below:

Zoning	Quantity
General Residential Zone I erven	48 Dwelling Units
General Residential Zone III (Flats)	48 Flats (2/3-Bedroom units, flats 3 stories high)

3.2 Southern Portion

The relevant section of the SDP has been included as Figure 3-2 below.

Figure 3-2 - Proposed SDP for Southern Portion

The housing typologies identified for the southern portion are listed below:

Zoning	Quantity
General Residential Zone I erven	75 Dwelling Units
General Residential Zone I erven	16 units at 35u/ha
General Residential Zone I erven	22 Duplex Units
Total	113 Units

In total, the combined Northern - and Southern Portion will provide approximately 209 Dwelling Units.

The complete SDP (both Northern - and Southern Portion) has been include as Figure 3-3below:

Figure 3-3 - Complete SDP (Both Northern - and Southern Portion)

4 TRAFFIC GENERATION EFFECTS OF THE PROPOSED DEVELOPMENT.

4.1 Trip Generation

Currently there are two widely accepted documents pertaining to trip generation in South Africa. The first document is the "*South African Trip Generation Rates, 2nd Edition*," (SATGR) document published in 1995 by the Department of Transport. The second document is the TMH17 Volume 1, published by Committee of Transport Officials (COTO), published in 2012. Comparing the trip generation potential of the proposed development, according to these two documents reveals the following:

SOUTH AFRICAN TRIP GENERATION RATES DOCUMENT

The SATGR manual categories that best fit the proposed residential development are defined below:

Residential (Cluster Housing)

"*Cluster Housing refers to a number of individual dwelling units, which are planned and built as a complex. This type of housing is also referred to as simplexes, duplexes or townhouses and is generally occupied by either young couples or retired people."*

Residential (Middle Income)

"This land use category includes residential houses in the middle income areas."

The trip generation values for these two land uses are indicated in Table 4-1below

Land Use	Unit	Trip Generation Rate		
		Period	Rate	Split In/Out
Residential – Middle Income	Dwelling Unit	am/pm	1.1	75:25
Residential – Cluster Housing	Dwelling Unit	am/pm	1.1	75:25

Table 4-1 – Trip Generation According to the SATGR Manual

Since both middle income and cluster housing has the exact same trip generation properties, it can be assumed that based on the SATGR document, a trip generation potential of 1.1 trips per Dwelling Unit should suffice. This document does however not clearly specify a trip generation rate for flats and hence it must be assumed that the same rate of 1.1 should be used.

TMH 17 VOLUME 1, SOUTH AFRICAN TRIP DATA MANUAL

The TMH 17 category that best fit the proposed residential development ethos is defined below:

220 Apartments and Flats

"*Dwelling units located in one building. Buildings are normally multi-stories while dwelling units are relatively small in size.*"

231 Townhouses (Simplexes and Duplexes)

"*Dwelling units typically provided in clusters or in complexes. Units could be detached or provided within one building structure. Parking is often provided within a communal area.*"

Land Use	Unit	Trip Generation Rate		
		Period	Rate	Split In/Out
Apartments and Flats	Dwelling Unit	AM	0.65	25:75
		PM	0.65	70:30
Townhouses	Dwelling Unit	AM	0.85	25:75
		PM	0.85	70:30

Table 4-2 - Trip Generation According to the THM17 Manual

Since the suburbs of Tergniet and Reebok are very popular for recreational (holiday) homes as well as homes for retired persons, it was decided to apply the slightly more relaxed trip generation rates recommended within the COLTO THM17 Document.

The resultant trip generation volumes for the Northern and Southern developments, are indicated in Table 4-3 below.

Portion	Type	Units	Trip Rate	Total Trips	Split In/Out	AM		PM	
						In	Out	In	Out
North	Flats	48	0.65	32	75:25 AM	8	24	22	10
	Townhouse	48	0.85	41	75:25 AM	10	31	29	12
South	Townhouse	113	0.85	96	75:25 AM	24	72	68	28
Total						42	127	119	50

Table 4-3 - Trip Generation Values (2019)

4.2 Trip Distribution

It can be safely assumed that the bulk of the trips generated by the proposed development, will exit the site in a Westerly Direction (towards the MR344) during the AM Peak hour period, and return again during the PM Peak Hour period from the same direction. This assumed traffic distribution pattern is indicated schematically in Figure 4-1.

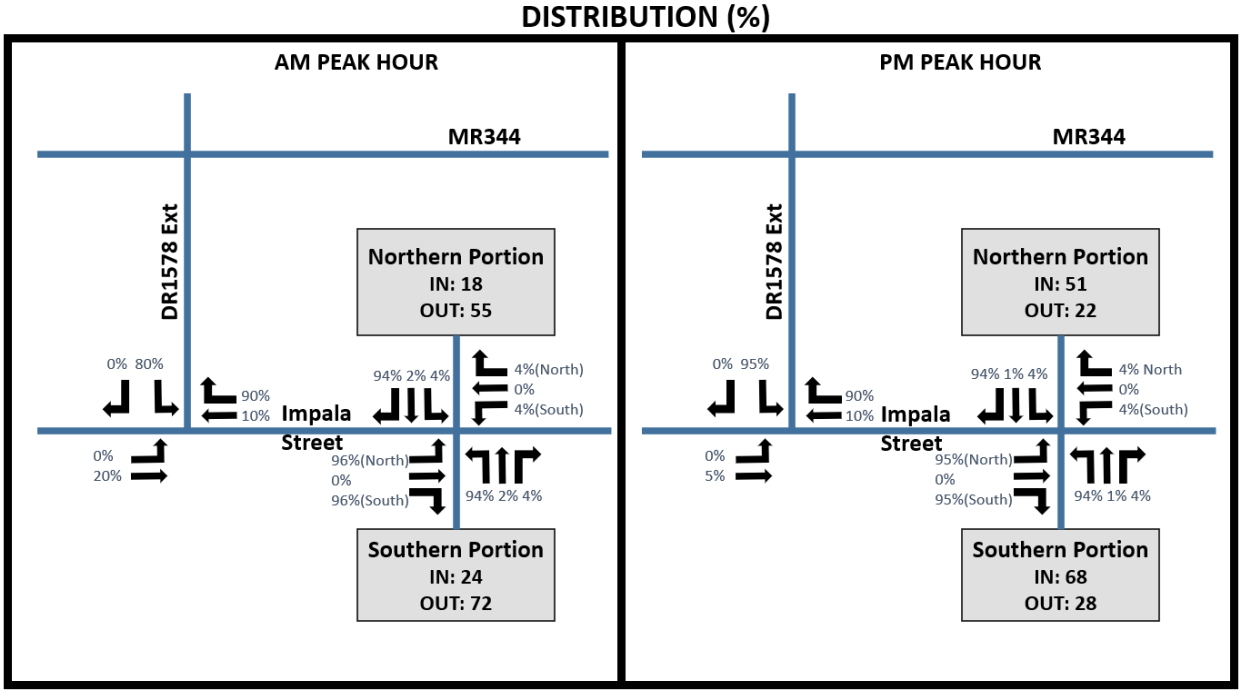


Figure 4-1 - Assumed Distribution of Generated Traffic

Applying the Distribution percentages in Figure 4-1 to the trip volumes from Table 4-3, it is possible to estimate the volumes for the AM and PM Peak hour periods as indicated in Figure 4-2.

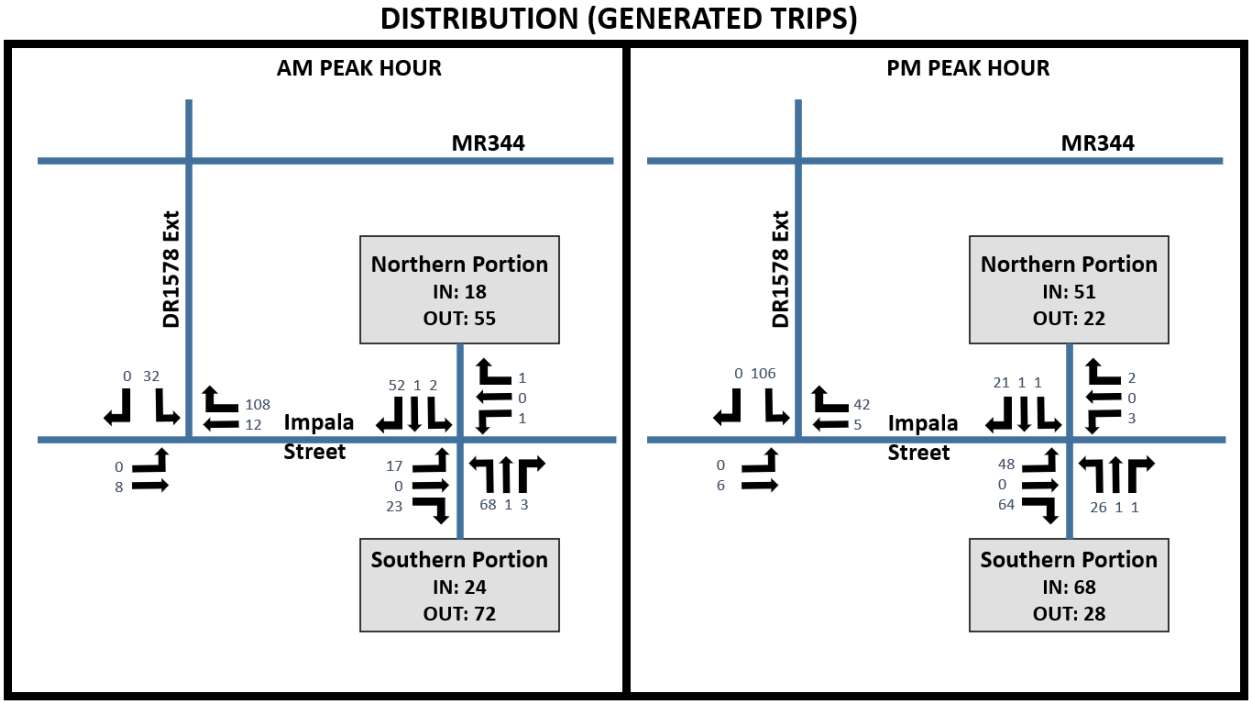


Figure 4-2 - Estimated Distribution of Trips Generated during the Peak Hour Periods

4.3 Future Traffic Volumes

In order to estimate the future (5 years from the date of this report) traffic volumes, the actual counted (2019) traffic volumes (refer to Figure 2-11) are escalated with an annual growth factor. Reference is made to the South African Department of Transport's Manual for Traffic Impact Studies (DoT, October 1995) which provides a table with typical growth rates. This document recognises that the method for determining traffic growth is important, but also states that there are a number of factors which influence the traffic growth rate. The approach is therefore to classify the study area with a low, average, high or extremely high growth rate. The typical growth rates are indicated in Table 4-4 below:

Category	Yearly Growth Rate (%)
Low	0-2.5
Average	2.5-3.5
High	3.5-6
Exceptionally high	>6

Table 4-4 - Typical Traffic Growth Rates

Once completed, the upgrade of the MR344 will help to stimulate the economy of the Rheebok/Tergniet/Kleinbrak area. Since the MR344 is the main through road from this area, this upliftment in economy will inadvertently lead to a direct increase in the traffic volumes along MR344. This increase in traffic volumes is however expected to reduce as one move further away from the MR344. For this reason it can be assumed that the background traffic volumes at the position of the two traffic counts, will increase with an average to high yearly growth rate of 3.5%. Using this growth factor, it is possible to escalate the 2019 background traffic volumes, in order

to estimate what the background traffic volumes will be 5 years from the date of this report (i.e. 2024) by means of the formula below:

$$F = P \times (1 + i)^n$$

Where: F = Future Trips
P = Present Trips
n = 5 years
i = 3.5% Growth

The resultant (2024) background traffic volumes for the various turning movements are indicated schematically in Figure 4-3.

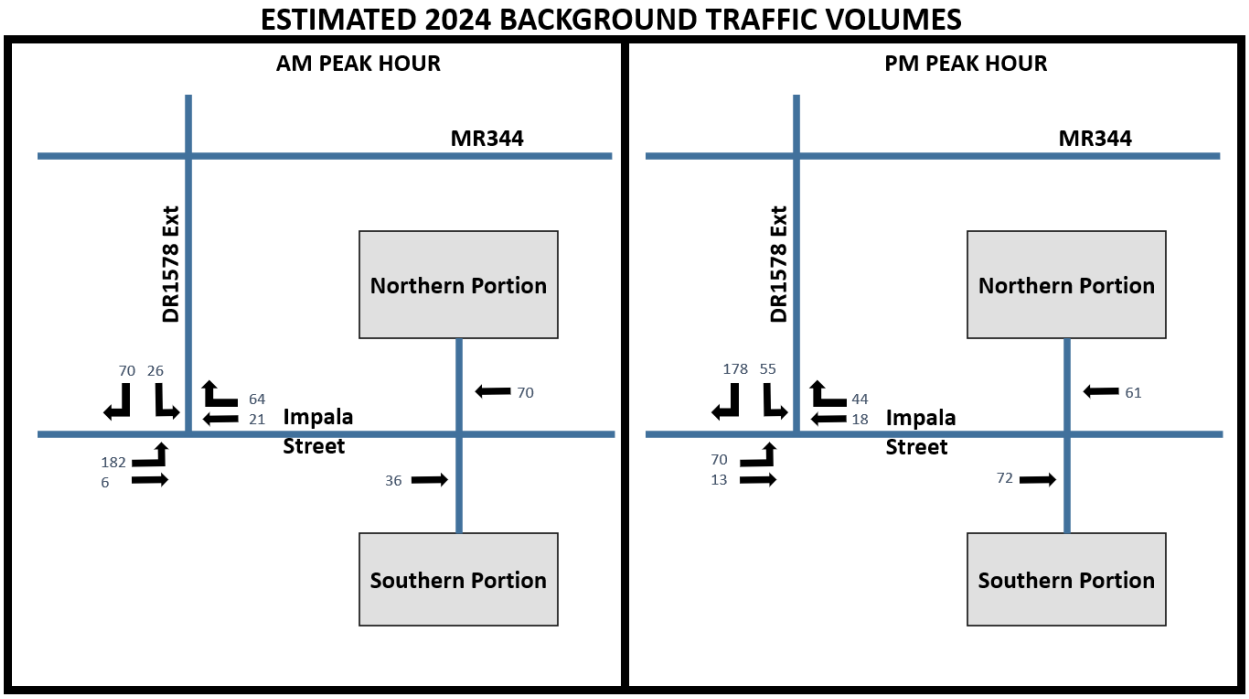


Figure 4-3 - Estimated 2024 /background Traffic Volumes

In order to estimate the all-inclusive traffic volumes for the 2024 scenario, the calculated trip generation volumes (Figure 4-2) need to be added to the escalated 2024 background traffic volumes (Figure 4-3). The result of the unification is indicated in Figure 4-4.

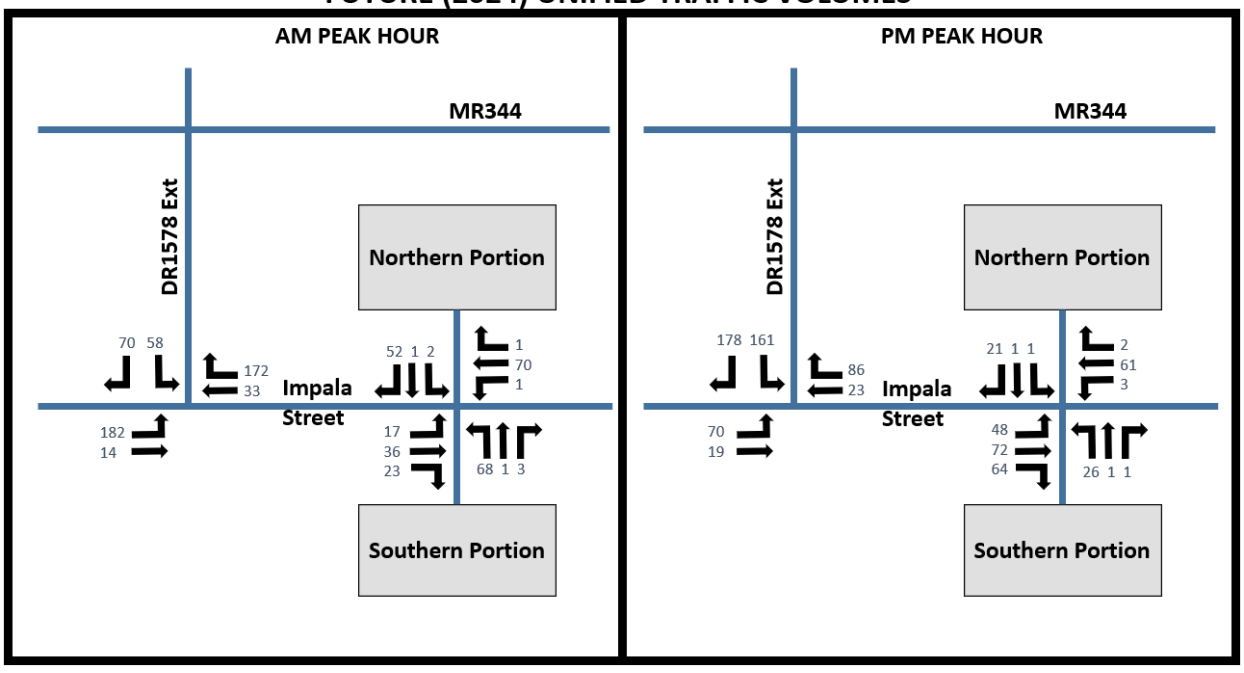


Figure 4-4 - Unified 2024 Traffic Volumes

5 OPERATIONAL ANALYSIS

The operational analysis was done with the "SIDRA INTERSECTION 8" (version 8.0.5) computer aided software that is developed specifically for traffic engineering capacity analysis. When elements of a road network such as intersections are analysed, their operating conditions are described in terms of Level of Service (LOS). The six letters from A to F are used to indicate different LOS. LOS A indicates very low traffic flows with correspondingly low delays. LOS E reflects capacity conditions, with high delays and unstable flow. LOS F reflects conditions where traffic demand exceeds capacity and traffic experiences congestion and delays. Generally, LOS A to D is considered acceptable in accordance with international standards. LOS E and F on the other hand are considered to be unacceptable.

The Average Delay is the delay in seconds that a motorist is likely to experience on an approach to the junction, while waiting for the junction to clear or other vehicles to maneuver. A further measure of the operating conditions at any point in a road network is the volume to capacity ratio (v/c). As the name implies it is the traffic demand volume divided by the available capacity of the road element. Generally, ratios of up to approximately 0.9 are internationally considered acceptable. Values exceeding 1.0 implies saturation of the facility.

5.1 Status Quo Scenario

The LOS of the status quo scenario (Both AM and PM) was calculated by using the actual traffic count data recorded on 05 November 2019. A distinction was made between heavy and light vehicle volumes and they were imported separately based on the actual percentages identified on the date of the count (refer to Figure 2-11). Detailed SIDRA results have been attached as **ANNEXURE C**, but a summary of the findings are included in Table 5-1 and Table 5-2.

APPROACH	MOVEMENT	2019 AM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	B	11.2	0.098
	Right	B	11.0	
DR1578 EXTENSION (Northern Approach)	Left	B	13.3	0.139
	Right	B	12.8	
IMPALA STREET (Western Approach)	Left	C	21.0	0.392
	Through	C	20.7	

Table 5-1 - SIDRA Results for Status Quo - AM Peak Hour Period

The analyses indicated that the intersection is operating at a fairly good overall Level of Service during the AM Peak Hour period. The Level of Service along the Impala Street Western approach is the worst affected and returned a LOS C for the Status Quo AM period.

Volume/Capacity ratios indicate that all three approached to the the intersection are operating well below saturation levels for the AM Peak hour period. The maximum average delay (assuming there was no traffic accommodation due to roadworks) is expected to be approximately 20 seconds.

APPROACH	MOVEMENT	2019 PM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	B	14.4	0.124
	Right	B	14.2	
DR1578 EXTENSION (Northern Approach)	Left	B	10.2	0.229
	Right	A	9.9	
IMPALA STREET (Western Approach)	Left	F	600.1	1.167
	Through	F	600.0	

Table 5-2 - SIDRA Results for Status Quo – PM Peak Hour Period

The analyses of the Status Quo PM Peak Hour Period once again indicated that the western approach to the intersection is under the most strain. A Level of Service of F was returned for this approach, which is totally unacceptable. This is mainly attributed to the large delay (average of 600s) experienced on this leg, due to the increase in PM traffic volumes along the Northern approach to the intersection. The large delay results in an unacceptable high saturation level of 1.130 experienced on the Western Approach. It is important to note once again that the traffic count was conducted at a time when traffic accommodation and roadworks to the MR344 were underway and hence the Status Quo could be affected by this situation.

5.2 Future (2023) Scenario

Using the all-inclusive "*Future (2024) Unified Traffic Volumes*" from Figure 4-4 in the SIDRA operational analysis, the LOS for the future (post development) scenario can be calculated for both the AM and PM peak hour periods. Detailed SIDRA results have been attached as **ANNEXURE C**, but a summary of the findings are included in Table 5-3 to Table 5-4.

APPROACH	MOVEMENT	2024 AM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	B	11.0	0.230
	Right	B	10.8	
DR1578 EXTENSION (Northern Approach)	Left	C	17.5	0.289
	Right	C	17.0	
IMPALA STREET (Western Approach)	Left	C	20.1	0.432
	Through	C	19.8	

Table 5-3 - SIDRA Results for Future (2024) Scenario – AM Peak Hour Period

The analyses indicated that the increase in AM peak hour traffic volumes as a result of the proposed development, reduced the degree of saturation along the Eastern approach from 0.392 to 0.432. This v/c ratio is however still within the acceptable limit and does not have an impact on the Level of Service along this approach. The biggest impact is seen on the right turn movement from the Northern approach, where the Level of Service reduced from B to C.

APPROACH	MOVEMENT	2024 PM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	B	12.5	0.194
	Right	B	12.2	
DR1578 EXTENSION (Northern Approach)	Left	B	12.4	0.420
	Right	B	12.0	
IMPALA STREET (Western Approach)	Left	F	57.2	0.570
	Through	F	57.1	

Table 5-4 - SIDRA Results for Future (2024) Scenario - PM Peak Hour Period

Once again, the addition of the additional traffic generated by the proposed development, resulted in a slight deterioration of the Level of Service (from A to B) of the right turn movement along the Northern approach. Level of Service B is however still considered fairly good and hence this slight deterioration is not considered a problem. The Impala Street Western Approach remains at a totally unacceptable poor Level of Service F.

5.3 Mitigation measures

It is clear from the above analyses that the Impala Street Western approach to the intersection is currently (Status Quo) operating at an unacceptable poor level of service, especially during the PM peak hour periods. The inclusion of the additional trips generated by the proposed Zandhoogte development, does not seem to have such a large impact on the status quo situation. This can mainly be attributed to the relatively low traffic volumes recorded on the day of the traffic count. In an effort to improve the current poor LOS on the western approach, two possible intersection upgrades were analysed (for the worst case PM Peak Hour Period) in SIDRA. The first is the introduction of a dedicated right turn lane on the Northern approach and the second a dedicated left turn lane on the Western intersection approach. Both options are discussed in detail below.

5.3.1 Option 1 – Dedicated Left Turn Lane on DR1578 Approach

This option is indicated schematically in Figure 5-1.

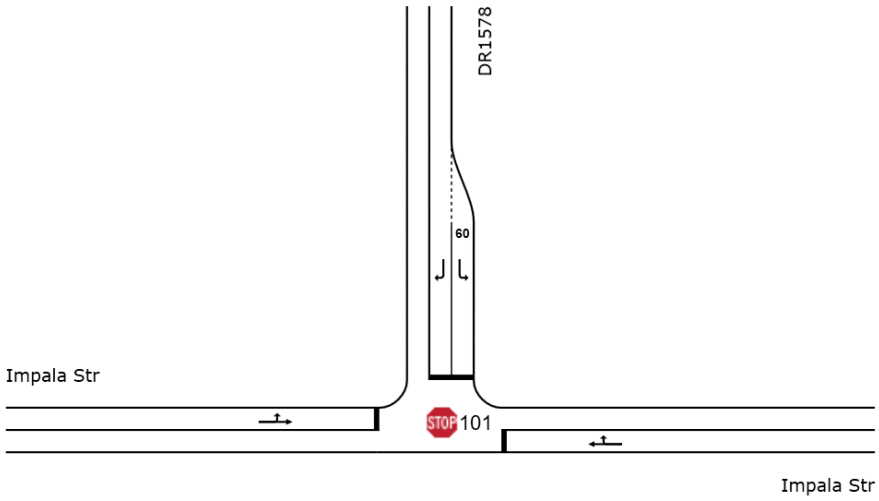


Figure 5-1 - Mitigation Measures - Option 1

The motivation for the additional right turn lane on the Northern approach, is to increase capacity for the large number of vehicles entering the intersection from the north, during the PM Peak Hour period. The increased capacity should lead to a faster cycle time through the intersection, which could help alleviate the pressure along the Western intersection approach. The resultant SIDRA results are attached as Table 5-5.

APPROACH	MOVEMENT	2024 PM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	B	12.7	0.198
	Right	B	12.7	
DR1578 EXTENSION (Northern Approach)	Left	B	12.1	0.349
	Right	B	11.8	
IMPALA STREET (Western Approach)	Left	F	60.6	0.586
	Through	F	60.4	

Table 5-5 - Option 1 - SIDRA Analyses

The SIDRA analyses indicated that the addition of a dedicated right turn lane on the Northern Approach, will not result in a markable improvement in the LOS of the intersection as a whole. The LOS of the Western approach remains at an unacceptable LOS F.

5.3.2 Option 2 – Dedicated Left Turn Lane on Impala Western Approach

This option is indicated schematically in Figure 5-2.

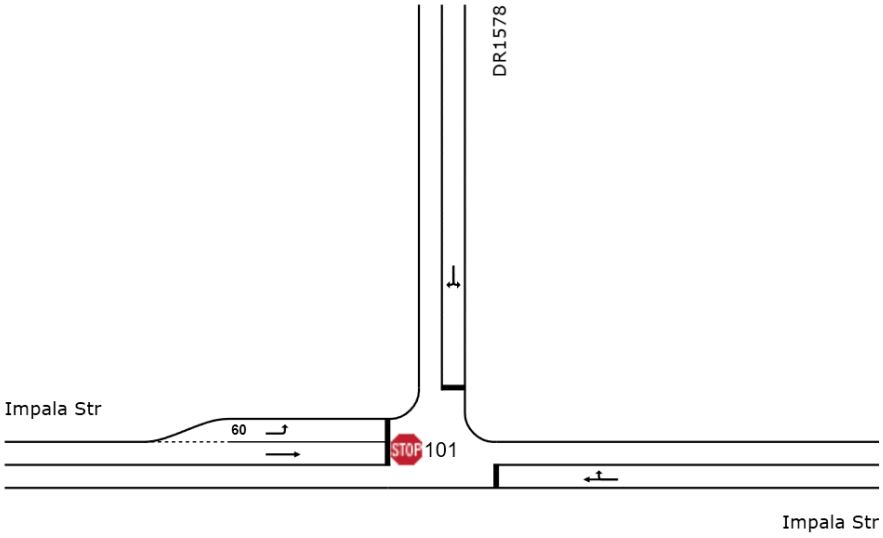


Figure 5-2 - Mitigation Measures - Option 2

This option consists of the construction of a dedicated left turn lane along the Impala Street Western approach to the intersection. Once again, the detailed SIDRA results have been attached as **ANNEXURE C**, but a summary of the relevant parameters have been included as Table 5-6

APPROACH	MOVEMENT	2024 PM PEAK HOUR		
		LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds)	VOLUME / CAPACITY RATIO
IMPALA STR (Eastern Approach)	Through	C	15.0	0.240
	Right	B	14.8	
DR1578 EXTENSION (Northern Approach)	Left	B	12.6	0.426
	Right	B	12.5	
IMPALA STREET (Western Approach)	Left	D	26.6	0.376
	Through	C	17.9	

Table 5-6 - Option 2 - SIDRA Analyses

This geometric upgrade resulted in a markable improvement in the overall LOS of the intersection. Level of Service for all six turning movements returned acceptable results. Degree of Saturation also indicated sufficient capacity within the intersection as a whole.

The results of the proposed upgrades on the Level of Service on the three approaches are indicated schematically in Figure 5-3 below.

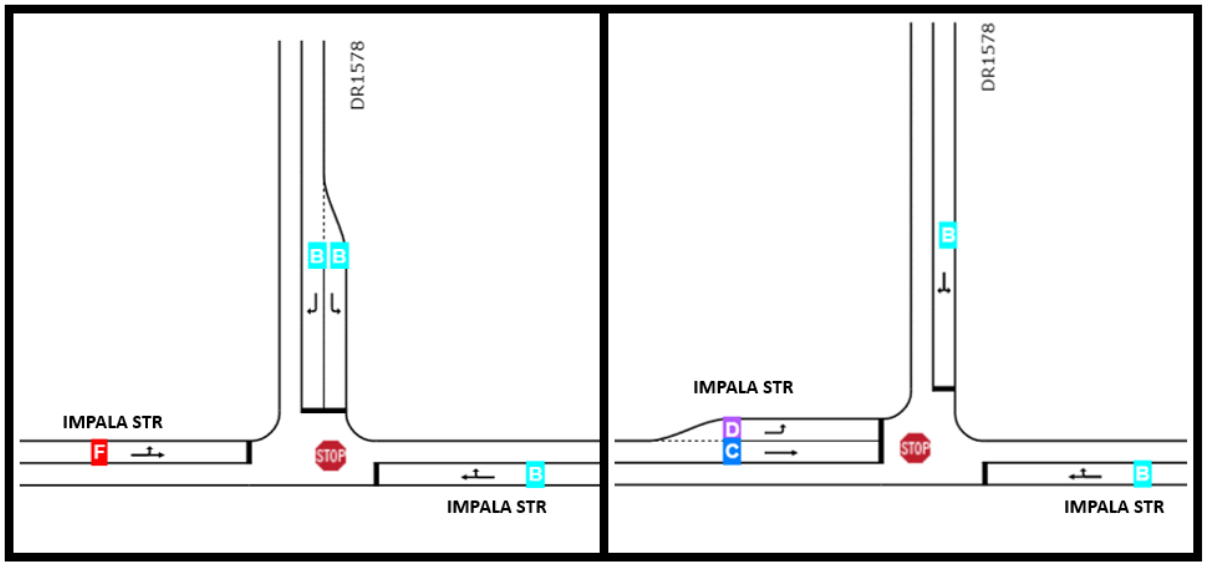


Figure 5-3 - Comparison of Option 1 and 2 Results

6 GEOMETRIC CONSTRAINTS

6.1 Road Widths

Roadway width includes all the cross-sectional elements between the faces of the kerbs on either side. The principle variables accounting for the width of roadways are the number of lanes and the width of each lane. The actual number of lanes supplied, depends on the projected traffic volumes.

Lane width is measured from the centre of the lane line to the centre of the adjacent lane line for inside lanes, and to the edge of the channel or to the edge of the concrete offset from the kerb, for a Kerbside lane.

Based on the UTG 5, *Design of Urban Collector Roads*, (Department of Transport, October 1988) lane widths have to be sufficient to accommodate the widths of the design vehicles and provide clearance between vehicles and in the case of kerbside lanes, clearance to kerbside objects. An appropriate vehicle-to-vehicle clearance for vehicles traveling in the same direction is 1,2m. A further 0.3m width at the centre of the road is desirable for safety in the separation of heavy opposing traffic flows.

The relationship between lane width and clearance between vehicles is indicated in Table 6-1.

Lane width (m)	Vehicle Types	Clearances (m)
3,0	Car to Car	1,2
	Car to Truck	0,8
	Truck to Truck	0,5
3,4	Car to Car	1,6
	Car to Truck	1,2
	Truck to Truck	0,9
3,7	Car to Car	1,9
	Car to Truck	1,5
	Truck to Truck	1,2

Table 6-1 - Lane Width and Clearance Between Vehicles

The UTG recommends a basic lane width of 3.7m for two-lane collector roads carrying a nominal percentage of heavy vehilces and local bus services. For lower order collectors such as those defined as residential access collectors where heavy vehilces are not common, a roadway width of 7,0m is however deemed adequate.

Impala Street at the point of the proposed access into the Zandhoogte developments, is approximately 6,0m wide, which translates to lane widths of approximately 3.0m.

6.2 Sight Distances

Sight distances in excess of 225m were measured on site in both directions along Impala Road.

Figure 6-1 - Sight Distance in a Easterly Direction

Figure 6-2 - Sight Distance in a Westerly Direction

Since Impala Street has a posted speed limit of 60km/h, the minimum required sight distance is equal to approximately 110m as indicated in Figure 6-3 below.

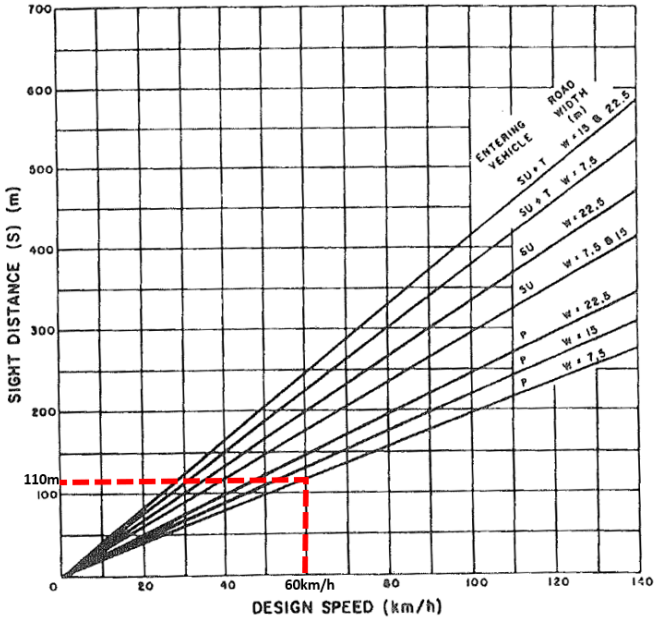


Figure 6-3 - Sight Distance for a 60km/h Design Speed

6.3 Driveways

Driveways connect public roadways to both private and public properties. Geometric design details of driveways vary considerably in relation to traffic demand and vehicle type. In locating and designing driveway connections to the public street system, attention should be given to the town planning scheme or regulations applying for the local area. The guideline document UTG 5, *Guidelines for the Geometric Design of Urban Collector Roads* (Department of Transport, October 1988), defines five different types of driveways:

1. **Low-Volume, Motor-Car Driveways** refer to the normal driveway serving low density residential properties, up to approximately 20 residential units per driveway.
2. **High-Volume, Motor-Car Driveways** refer to access roads to parking lots and garages related to shopping centres, major residential complexes or offices.
3. **Low-Volume, Truck Driveways** refer to accesses which require the free flow of large trucks, even though the traffic demand is relatively low. Driveways to service areas of shopping centres and industrial driveways are typical.
4. **High Volume Mixed Driveways** are major driveways to shopping centres and industrial plants which carry motor cars and trucks.
5. **Petrol Station Access**, although catering mainly for motor cars, must handle large petrol tankers breakdown vehicles and normal trucks.

Based on the above, it follows that the driveways pertaining to the Zandhoogte developments, can be classified as High-Volume Motor Car Driveways. The UTG 5 goes one step further and specifies that spacing relating to High Volume Driveways, should be handled in the same manner as that of formal "street/road" intersections. Since the minimum recommended distance between four-legged intersections on collector roads is 80m, it follows that this requirement will also be applicable to the spacing between the Zandhoogte development and the immediate road network.

The proposed SDP makes provision for the current driveway to the existing farm house, to be consolidated into the Northern Portion driveway. The resultant intersection/driveway spacing is therefore in excess of 100m (Western approach) and 200m (Eastern approach) as indicated in Figure 6-4.

Figure 6-4 - Intersection/Driveway spacing

6.4 Throat Length Calculations

The SDP (**ANNEXURE B**) makes provision for a gatehouse structure at the entrance to both the Northern and Southern Portions. This is an indication that the proposed development will be in the form of a security village, with access to the development controlled by means of a boom and/or security guard. Where some form of control is provided on an access, the ingress throat must be of sufficient length to prevent queue spillback onto the surrounding public road or street system. Even though the finer details regarding the gatehouse was not yet available at the time of writing this report, it was quite clear from the SDP that the gatehouse will make provision for dual entrance and exit channels. In order to determine the 90th percentile queue length (for a gate/boom) the following formula can be used:

$$Traffic\ Ratio = \frac{Total\ Traffic\ Volume/PHF}{Service\ Flow\ Rate}\ 100$$

The Peak Hour Factor (PHF), is the factor required to convert the hourly volume to a peak 15-minute volume. Service Flow Rate for various types of access control are indicated in Table 6-2

Service flow rates (veh/h) fo different control types	
Control type	Service flow (vph)
Swipe magnetic card	480
Remote controlled gates	450
Ticket dispenser: Automatic	390-450
Ticket dispenser: Push button	220-360
Pin number operated gates	150
Pay fee on entry	120
Cell-phone operated gates(gate opens when a call is receieved)	100
Manual recording, Visitor completes form	80
Intercom operated gates(visitor contacts resident by intercom)	50

Table 6-2 - Service Flow Rates for Different Control Types

For worst case planning purposes, it is assumed that the control type will be in the form of Intercom Operated gates, where visitors need to contact residents by some sort of intercom operated system.

For the Northern Development Portion, the relevant throat length formula variables are as follows:

- Total Traffic Volume ($_{PM\ ingress}$) : 51
- PHF : 4
- Service Flow Rate ($_{Visitors\ Contact\ Residents\ by\ intercom}$) : 50

Thus, populating the throat length formula with the above variables yield, the following:

$$Traffic\ Ratio = \frac{\left(\frac{51}{4}\right)}{50(Intercom\ Operated)}\ 100$$

From which it follows that the Traffic Ratio = 25.5 $_{(Northern\ Portion)}$.

For the Southern Development Portion, the relevant throat length formula variables are as follows:

- Total Traffic Volume ($_{PM\ ingress}$) : 68
- PHF : 4
- Service Flow Rate ($_{Visitors\ Contact\ Residents\ by\ intercom}$) : 50

Thus, populating the throat length formula with the relevant variables, yields the following:

$$Traffic\ Ratio = \frac{\left(\frac{68}{4}\right)}{50(Intercom\ Operated)}\ 100$$

From which it follows that the Traffic Ratio = 34 (Southern Portion)

Comparing the calculated traffic ratios for the Northern and Southern Portion, to Table 6-3 (2-Channel scenario), it follows that a minimum storage length (N_{Que}) of one (1) vehicles is required in front of the respective gatehouses.

95th Percentile queue length (vehicles per channel) at controlled accesses						
Storage (Vehs)	Traffic ratio (Pecentage) for different Numbers of Channels					
N_{Que}	1 Channel	2 Channel	3 Channel	4 Channel	5 Channel	6 Channel
1	23	58	97	140	188	235
2	39	94	155	220	292	363
3	49	115	186	261	341	421
4	56	128	205	283	367	449
5	61	137	216	297	382	466
6	65	143	22	306	392	476
7	68	147	229	312	399	484
8	70	151	233	317	403	489
9	71	153	236	321	407	493
10	73	155	239	324	410	496

Table 6-3 - 95th Percentile Queue Length at Controlled Accesses

Measured from the SDP, the current throat length is in excess of 20m on both sides, and makes provision for dual entry and exit channels. The proposed throat lengths are therefore more than adequate to accommodate the ingress traffic volumes. It is important to note that the original farm house situated west of the Northern Portion, will also make use of the combined driveway into the Northern Portion, but since the farmhouse is a single residential dwelling, the impact is assumed to be negligible. The proposed throat length design does make provision for the farmhouse driveway to use the same egress channels, without having to first enter the gated development.

Based on the UTG 5, *Design of Urban Collector Roads* (Department of Transport, October 1988) the safe sight distance for motor cars entering driveways by right turns are indicated in Figure 6-4 below.

Design Speed (km/h)	Safe Sight Distance (m)		
	Two-Lane	Four-Lane	Six-Lane
40	60	65	70
50	75	80	85
60	105	110	115
70	130	140	145
80	160	170	180

Measured from the point where a right-turning vehicle stops to a vehicle in the outside lane

Table 6-4 - Safe Sight Distance for Motor Cars Entering Driveways by Right Turns

6.5 Turning Lanes

The Road Access Guideline document (Western Cape Government, 2002) is generally used to determine whether left and/or right turning lanes are warranted as a result of the additional generated traffic. Since the bulk of the traffic is expected to make their way towards (AM) and from (PM) MR344 via Impala Street, the warrant was applied to the Western approach for both the Northern and Southern developments. The red dashed lines in Figure 6-5 indicate the future 2024 expected AM peak hour volumes and the blue line the PM Peak Hour Period.

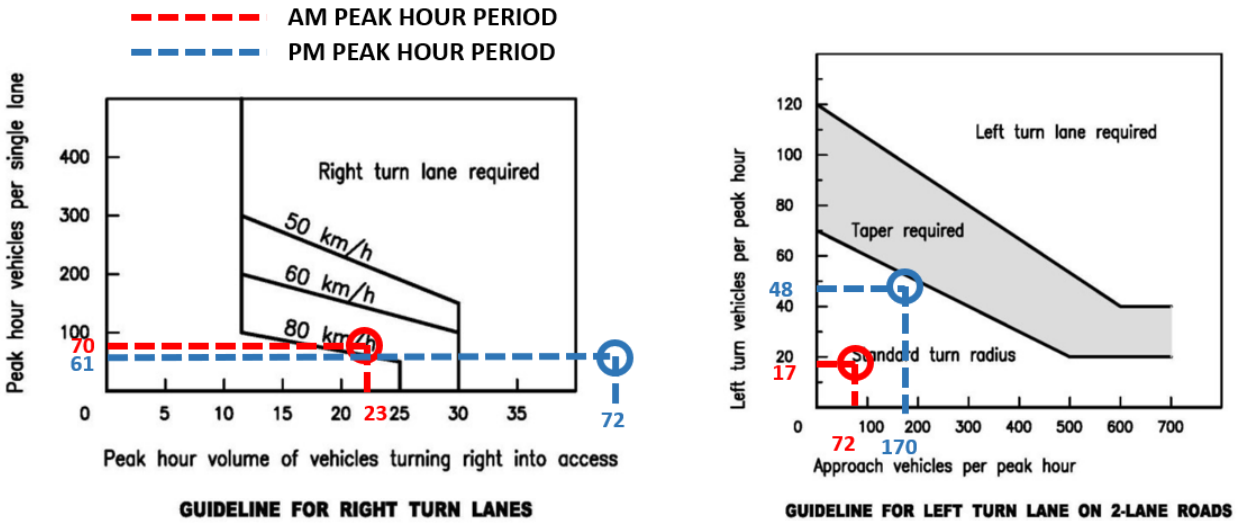


Figure 6-5 - Warrant for Left and Right Turn Lanes

From Figure 6-5 it follows that the large volume (72) of motorist expected to turn right towards the Southern Portion of the development during the PM Peak hour period, warrants a dedicated right turn lane. The warrant for a left turn taper or lane is not satisfied and hence this is not deemed necessary.

According to the UTG 5, (Department of Transport, October 1988), the length of the right turn lane should be between 13m and 19,5m (recommended 15m) as indicated in Figure 6-6.

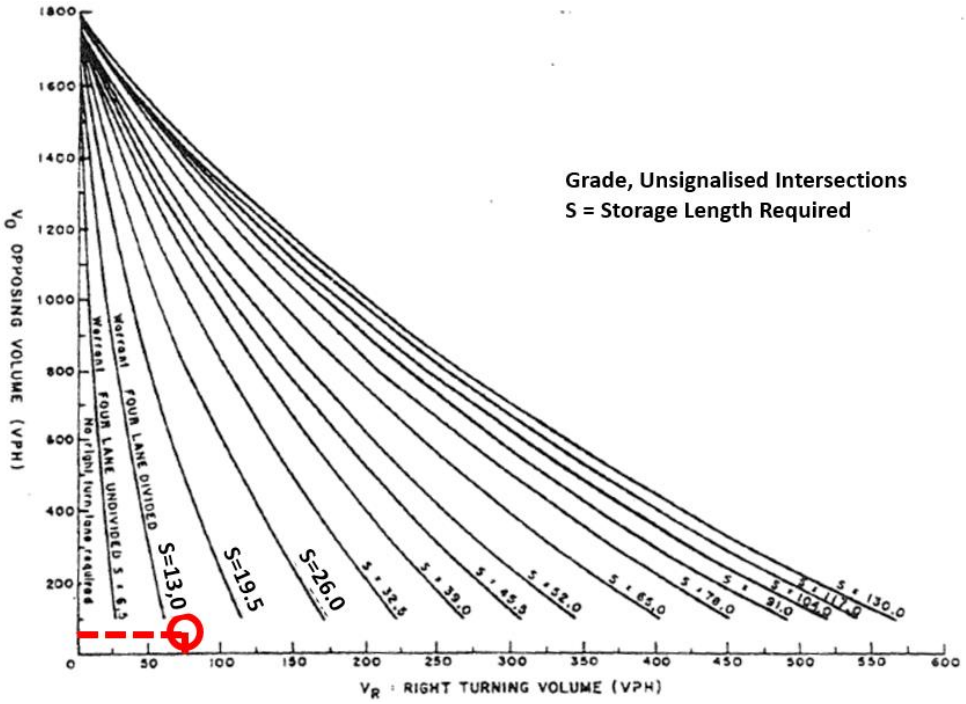


Figure 6-6 - Right Turn Lane Length

6.6 Parking

Since there were no detail regarding the layout of the flats at the time of preparing this report, the parking requirements will only be stated but compliance cannot be checked.

The parking requirements specified in the Mossel Bay's Integrated Zoning Scheme By-Law specifies the following minimum off-street parking requirements for residential units.

Land Use	Normal Areas
Flats	1 bay per dwelling, plus 0.25 bay per unit for visitors
Dwelling House	2 bays per dwelling Erven <350m2: 1 bay per dwelling Erven <100m2: Nil per dwelling
Group Housing	2 bays per dwelling unit

Table 6-5 - Minimum off-street parking requirements

7 NON MOTORISED TRANSPORT

According to the SA Department of Social Development's White Paper on the Rights of Persons with Disabilities (December 2015), **Universal Access** is defined as: *"The removal of cultural, physical, social and other barriers that prevent people with disabilities from entering, using or benefiting from various systems of society that are available to other citizens & residents".*

The same document defines **Universal Design** as: *"The design of products, services and environments to be usable by all people, to the greatest extent possible, without the need for personal adaptation or special design".*

At the heart of Universal Accessibility (UA) compliance, is a concept that moves away from a single car, single driver situation, towards a more pedestrian friendly environment that is safe for use by all road users (including and especially special needs persons). Where possible, special attention should be given to residential developments and they should aim to create safer and more pedestrian friendly verges along its transportation corridors, and within residential developments.

Where practically possible, the walkway should not be placed directly up against the road edge, but a furniture zone should be created between the road edge and the sidewalk, increasing the safety of those making use of the walkways. The various road verge components are indicated in Figure 7-1, and the recommended dimensions for the various road verge components indicated in Figure 7-2.

Possible ways of increasing pedestrian safety within the proposed developments include:

- Pedestrians must be made as visible as possible by installing adequate street lighting
- Paving palettes should reflect colour & texture contrasts that are suitable for partially sighted persons, & persons with other special needs.
- Ensure road crossings are visible with clear lines of sight (for motorists & pedestrians)
- Limit crossing distance / time pedestrians are exposed to traffic
- Reducing curve radii (taking note of vehicle turn requirements)
- Reduce traffic lane widths and remove road shoulders
- Add bump-outs and pedestrian barriers where relevant

- Setting of appropriate speed limits

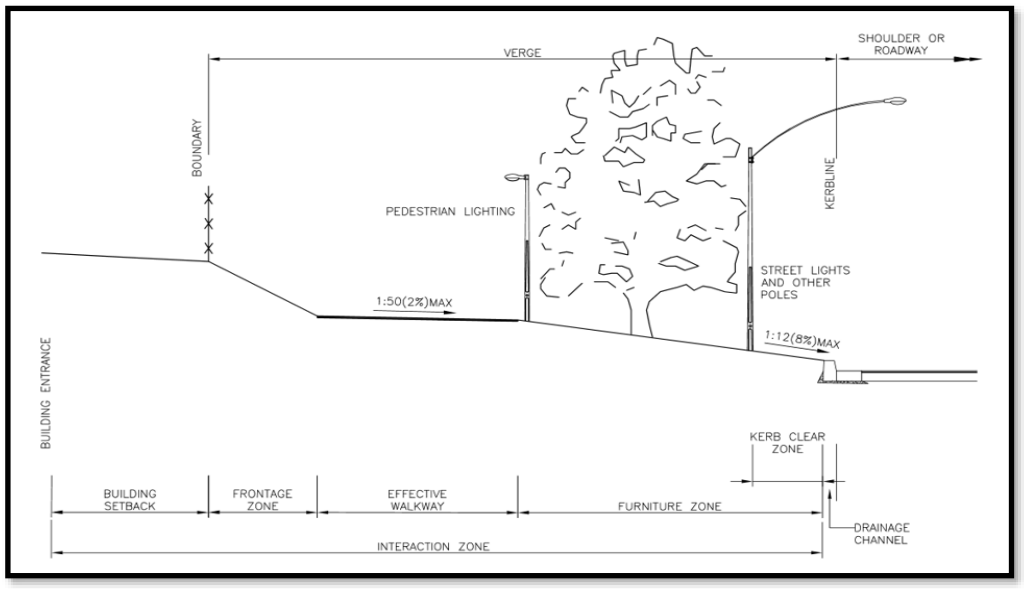


Figure 7-1 - Road Verge Components

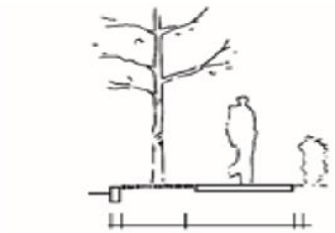
Verge or Sidewalk Corridor	Application	Recommended configuration
≈ 3.7 m	**Recommended** for walkways along main bus routes, or for local streets in pedestrian active areas and for streets where the reserve is some 18.0m wide	 Kerb zone: 150 mm; Furniture zone: 1.2 m; Through pedestrian zone: 1.8m; Frontage zone: 450 mm
≈ 3.4 m	**Recommended** for access roads where reserve width is say 15.0 m **Accepted** for verges where the road reserve width is 15.0 m provided that the *effective through pedestrian zone* is 1.8 m	 Kerb zone: 150 mm; Furniture zone: 1.2 m; Through pedestrian zone: 1.8 m; Frontage zone: 150 mm
≈ 3.0 m	**Recommended** for local area walkways in residential zones of R-7 or less dense where ROW width is less than 15.0 m	 Kerb zone: 150 mm; Furniture zone: 1.2 m; Through pedestrian zone: 1.5 m; Frontage zone: 150 mm

Figure 7-2 - Road Verge Component Dimensions

8 SUMMARY

In short, the various components of this Transportation Investigation can be summarised as follows:

- The proposed development consists of a Northern and Southern Portion.
- The Northern Portion consists of 48 Dwelling Units and 48 Flats.
- The Southern Portion consists of 113 Residential units, made up of 75 dwelling units, 16 units at 35du/ha and 22 Duplex units.
- At the time of writing this report, the MR344 upgrade was well underway, and extended up to the intersection of Impala and DR1578. It is assumed that the traffic accommodation at the Impala Street/DR1578 intersection will have an impact on the traffic flow profile, but the AADT volumes should still be fairly accurate.

Background traffic volumes

- Background traffic volumes were recorded during a 12-hour classified traffic count which was undertaken on Tuesday, 05 November 2019. In order to estimate the future background traffic volumes, the 2019 traffic counts were escalated by 3.5% per annum, to the year 2024 (5 years from date of this report)

Status Quo

- SIDRA intersection of the status quo situation indicates that the Western approach to the Impala/DR1578 Intersection is currently operating at an unacceptable poor Level of Service.

Trip Generation

- The worst-case trip generation scenario is expected to take place during the Weekday AM and PM Peak Hour Periods. It is expected that combined, both portions will generate approximately 42 trips (IN) and 127 trips (OUT) during the AM Peak Hour Period and 119 tips (IN) and 50 trips (OUT) during the PM Peak Hour Period.

Future Scenario

- SIDRA intersection of the post development (2024) scenario indicates that the Western approach to the Impala/DR1578 Intersection remains at a an unacceptable poor Level of Service, while the other two approaches operated at acceptable Levels of Service.

Geometric Constraints

- Sight distances were measured on site and exceeds the requirements
- Intersection spacings exceeds the requirements.
- Throat lengths exceed the requirements
- Parking bays are not indicated on the SDP, but the requirements are specific in this report.
- Since the relevant section of Impala is not a through road, and only limited heavy vehicles are expected, the road width is deemed acceptable
- The large number of right turn movement expected during the PM Peak Hour period at the access into the Southern Portion, necessitates a dedicated Right Turn Lane.

9 RECOMMENDATIONS

The proposed development of farm Zandhoogte No. 139 in Tergniet, Mossel Bay can be allowed to continue, from a traffic and transportation point of view, subject to the implementation of the following recommendations:

9.1 Right Turn Lane

A new, dedicated right turn lane should be constructed on the Western Approach to the proposed development. This right turn lane will exclusively serve the motorist wanting to turn right into the Southern Portion of the development. The purpose of the right turn lane to provide access to the Southern Portion, without negatively impacting on the mobility along Impala Street. The right turn lane should be 15m long to allow for at least 3 vehicles to stack within the lane without impacting through movement. Since the current road width at the point of the access is only 6m wide, the right turn should also be approximately 3.4m wide, to compensate for the fact that the overall road width is not optimum.

9.2 Intersection Alignment

From the SDP, it seems as if the two accesses to the Northern and Southern development portions are situated at a slight off-set from each other (refer to Figure 9-1)

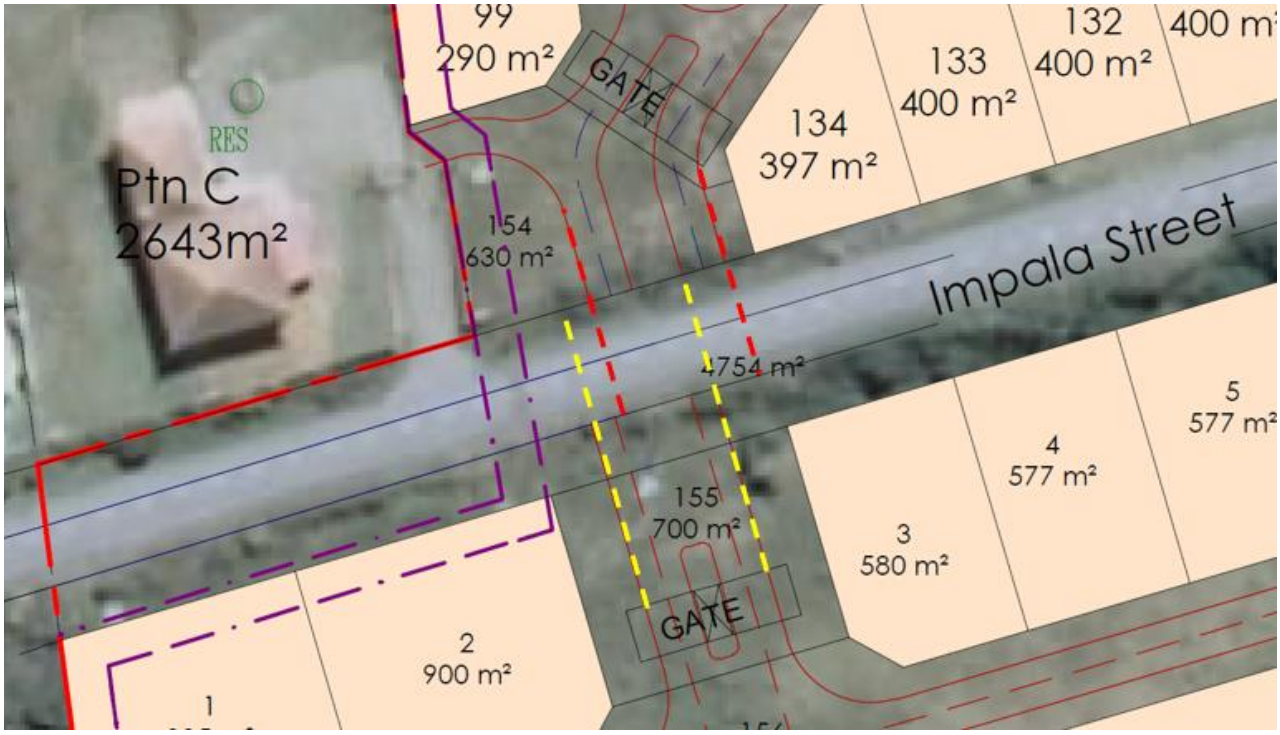


Figure 9-1 - Current Driveway Configuration

Off-set intersections tend to cause confusion among motorists as drivers are not always sure who has the right of way at an off-set intersection. It is recommended that the off-set configuration be changed in order to align both driveways. Since there are sufficient sight distances in both directions, it does not matter whether the Northern Driveway aligns with the Southern Driveway, or vice versa.

9.3 Intersection of DR1578 and Impala Street

The status Quo analyses of the intersection of DR1578 and Impala Street indicated that the intersection is currently operating above capacity and that the Level of Service along the Impala Street Western approach to the intersections is at an unacceptable poor LOS F. As indicated in the relevant sections of this report, this poor LOS could possibly be attributed to the current MR344 upgrade and its associated traffic accommodation.

It is therefore recommended that updated traffic counts be taken at this specific intersection once the MR344 upgrade has been completed and traffic accommodation measures have been removed. The updated traffic counts should be used to analyse the intersection with SIDRA software to ascertain whether the current poor LOS is still prevalent.

If the LOS is still unactable, the intersection should undergo the necessary geometric upgrade to improve the Level of Service. Since the poor Status Quo LOS is not as a result of the proposed development, some sort of agreement should be made between the developer of Zandhoogte No. 139 and the local Mossel Bay Municipality, with regards to the cost implications of the possible upgrade.

9.4 Parking

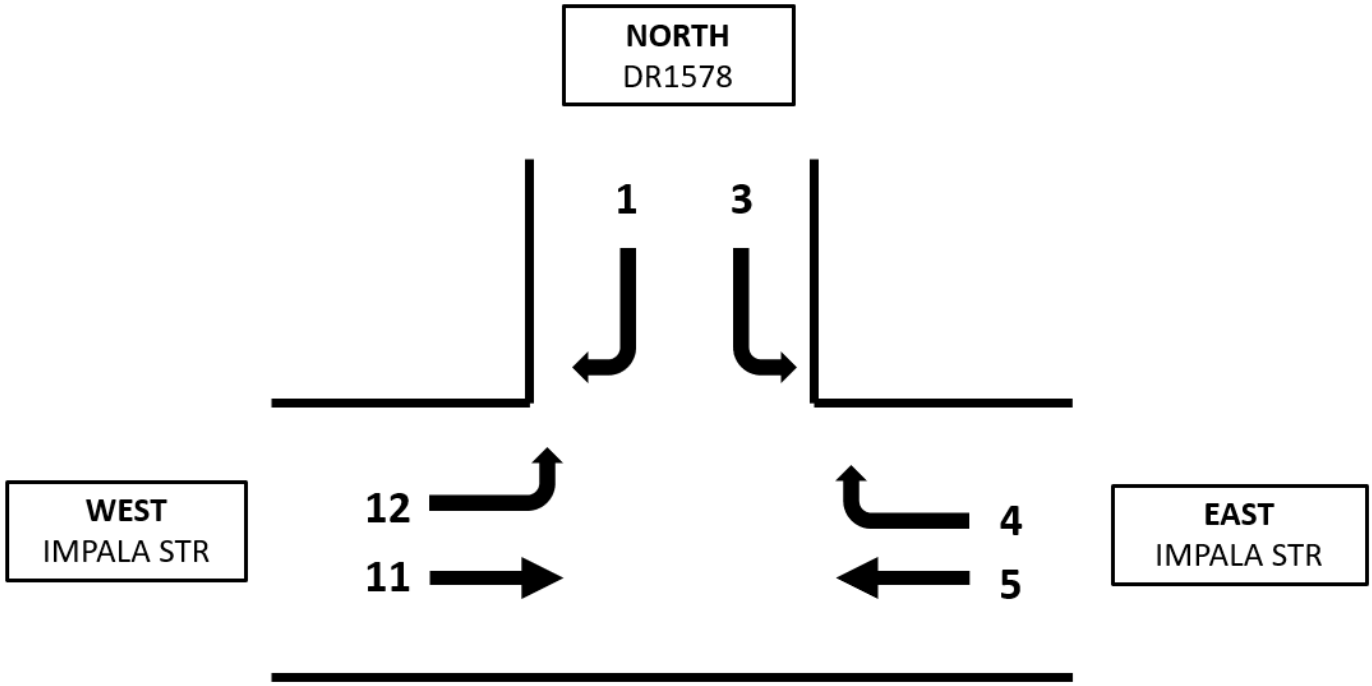
Parking bays should be provided based on the minimum recommendations specified in Section 6.6 of this report.

9.5 Non Motorised Transport.

Where possible, the development should make provision for pedestrian friendly sidewalks within the development. The sidewalks should be offset a minimum of 1.2m from the back of the kerb face, in order to allow for an unsurfaced furniture zone. Sidewalks should be 1.8m wide along the collector roads, but could be as narrow as 1.2m within the development. Adequate lighting of the sidewalks should be provided.

Gatehouses should be designed in such a manner that taxi's dropping people off at the entrance to the developments, can safely turn around and join the exit lane without having to back up into the surrounding public road network.

ANNEXURE A
RAW TRAFFIC COUNT DATA


NORTH
DR1578
1
3
WEST
IMPALA STR
12
11
4
5
EAST
IMPALA STR

Verkeerstelling/Traffic Count

Projek Naam: Cobra Fuel
Plek/Location: Tergniet
Datum/Date: 11-Nov-19
Teller/Counter: JE Giewelaar

URBAN ENGINEERING

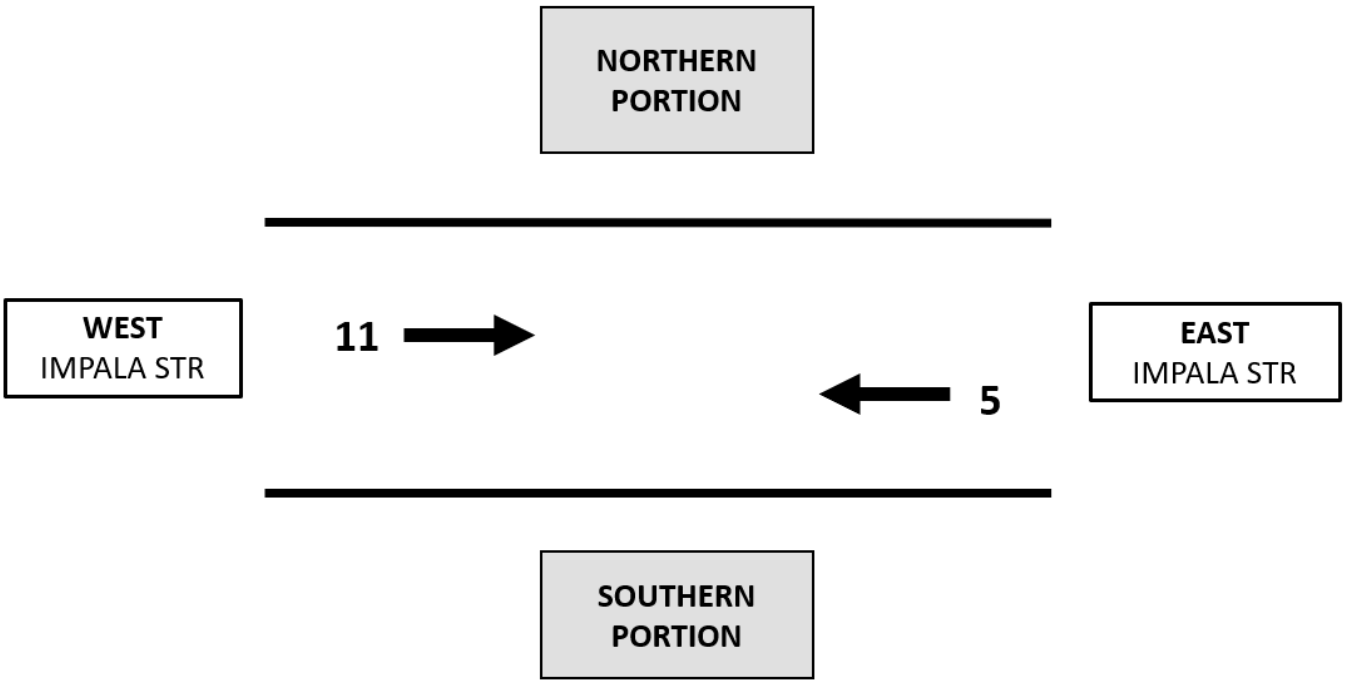
Tyd	DR1578				Impala Street				Impala Street			
	1		3		4		5		11		12	
	L	S	L	S	L	S	L	S	L	S	L	S
06:00 - 06:15	5	3	2	0	7	0	2	0	0	0	12	0
06:15 - 06:30	12	3	4	0	11	0	5	0	2	0	18	0
06:30 - 06:45	18	3	9	0	15	0	11	0	2	0	37	0
06:45 - 07:00	26	3	9	0	27	0	16	0	3	0	75	0
07:00 - 07:15	39	3	13	1	45	0	20	0	3	0	122	1
07:15 - 07:30	53	3	19	1	52	0	22	0	5	0	151	1
07:30 - 07:45	75	5	30	1	69	0	29	0	7	0	188	2
07:45 - 08:00	78	7	33	1	74	1	36	0	10	0	204	2
08:00 - 08:15	95	8	38	2	91	1	39	0	14	0	230	2
08:15 - 08:30	104	9	40	2	96	1	40	0	16	0	241	3
08:30 - 08:45	124	10	48	2	103	1	44	0	19	0	262	4
08:45 - 09:00	137	10	50	2	111	1	48	0	24	1	281	5
09:00 - 09:15	151	11	55	2	121	1	52	0	28	1	298	5
09:15 - 09:30	161	12	59	3	127	1	58	0	31	1	306	5
09:30 - 09:45	173	12	62	3	134	2	63	0	34	2	329	7
09:45 - 10:00	189	14	69	3	140	3	69	1	44	3	343	7
10:00 - 10:15	211	18	74	3	149	3	77	2	49	3	362	9
10:15 - 10:30	228	18	82	3	156	3	80	2	55	3	376	9
10:30 - 10:45	252	19	87	3	162	4	84	2	56	3	391	9
10:45 - 11:00	264	19	94	3	174	5	92	2	62	3	417	9
11:00 - 11:15	281	20	101	3	183	5	97	2	65	3	433	9
11:15 - 11:30	309	22	108	4	186	5	106	2	73	3	457	10
11:30 - 11:45	318	22	115	4	191	5	111	2	74	3	462	11
11:45 - 12:00	333	22	119	4	195	5	118	2	75	3	478	12

Verkeerstelling/Traffic Count

Projek Naam: Cobra Fuel
Plek/Location: Tergniet
Datum/Date: 11-Nov-19
Teller/Counter: JE Giewelaar

URBAN ENGINEERING

Tyd	DR1578				Impala Street				Impala Street			
	1		3		4		5		11		12	
	L	S	L	S	L	S	L	S	L	S	L	S
12:00 - 12:15	348	25	126	5	201	5	119	2	79	3	488	12
12:15 - 12:30	384	27	133	5	207	6	124	2	83	3	500	14
12:30 - 12:45	398	29	138	5	213	6	125	2	87	3	523	14
12:45 - 13:00	422	29	149	6	218	6	129	2	91	3	531	14
13:00 - 13:15	448	29	156	6	223	7	130	2	99	3	540	15
13:15 - 13:30	464	29	164	6	224	7	134	2	105	3	549	15
13:30 - 13:45	477	30	167	6	233	7	142	2	109	3	573	15
13:45 - 14:00	504	30	174	6	238	7	146	2	111	3	584	15
14:00 - 14:15	530	31	183	6	242	7	149	2	120	3	600	16
14:15 - 14:30	559	32	194	6	248	7	153	2	122	3	620	17
14:30 - 14:45	574	34	200	6	249	9	154	2	126	4	641	18
14:45 - 15:00	586	34	208	6	257	9	156	2	128	4	652	18
15:00 - 15:15	609	34	217	6	265	9	161	2	132	4	657	19
15:15 - 15:30	629	37	226	7	269	9	167	2	135	5	673	20
15:30 - 15:45	645	37	230	7	276	9	170	3	136	5	684	20
15:45 - 16:00	669	37	245	7	283	9	173	4	141	5	698	22
16:00 - 16:15	684	37	253	7	286	10	173	4	147	6	722	23
16:15 - 16:30	701	37	264	7	290	10	181	4	153	6	727	24
16:30 - 16:45	729	37	277	7	299	11	184	4	157	6	739	25
16:45 - 17:00	748	38	285	7	311	11	190	4	163	6	758	25
17:00 - 17:15	805	39	300	7	315	11	192	4	166	6	765	25
17:15 - 17:30	831	39	309	7	330	11	196	4	167	6	788	25
17:30 - 17:45	877	39	323	7	336	11	199	4	168	6	798	25
17:45 - 18:00	898	39	334	7	337	11	207	4	170	6	808	25


NORTHERN PORTION
WEST IMPALA STR
11
5
EAST IMPALA STR
SOUTHERN PORTION

Verkeerstelling/Traffic Count

Projek Naam: Cobra Fuel
Plek/Location: Tergniet
Datum/Date: 11-Nov-19
Teller/Counter: JE Giewelaar

Tyd	Impala Street			
	5 ←		11 →	
	L	S	L	S
06:00 - 06:15	9	0	2	0
06:15 - 06:30	19	0	6	0
06:30 - 06:45	34	0	10	0
06:45 - 07:00	44	0	11	0
07:00 - 07:15	64	0	15	1
07:15 - 07:30	75	0	23	1
07:30 - 07:45	88	0	35	1
07:45 - 08:00	102	1	40	1
08:00 - 08:15	112	1	45	2
08:15 - 08:30	119	1	50	2
08:30 - 08:45	129	1	59	2
08:45 - 09:00	135	1	63	3
09:00 - 09:15	148	1	68	3
09:15 - 09:30	159	1	76	4
09:30 - 09:45	171	3	82	5
09:45 - 10:00	182	5	97	6
10:00 - 10:15	190	5	103	6
10:15 - 10:30	204	5	115	6
10:30 - 10:45	210	5	122	6
10:45 - 11:00	226	6	130	6
11:00 - 11:15	239	6	137	6
11:15 - 11:30	244	6	151	7
11:30 - 11:45	262	6	164	7
11:45 - 12:00	268	6	165	7

Verkeerstelling/Traffic Count

Projek Naam: Cobra Fuel
Plek/Location: Tergniet
Datum/Date: 11-Nov-19
Teller/Counter: JE Giewelaar

Tyd	Impala Street			
	5 ←		11 →	
	L	S	L	S
12:00 - 12:15	278	6	176	8
12:15 - 12:30	286	7	182	8
12:30 - 12:45	292	8	190	8
12:45 - 13:00	302	8	204	9
13:00 - 13:15	307	9	215	9
13:15 - 13:30	319	9	227	9
13:30 - 13:45	332	9	243	9
13:45 - 14:00	339	9	249	9
14:00 - 14:15	349	9	271	9
14:15 - 14:30	354	9	274	10
14:30 - 14:45	358	10	282	10
14:45 - 15:00	362	10	296	10
15:00 - 15:15	380	10	304	10
15:15 - 15:30	386	10	315	12
15:30 - 15:45	393	11	325	12
15:45 - 16:00	400	13	340	12
16:00 - 16:15	405	14	353	13
16:15 - 16:30	419	15	367	13
16:30 - 16:45	433	15	387	13
16:45 - 17:00	442	15	396	13
17:00 - 17:15	455	15	414	13
17:15 - 17:30	466	15	424	13
17:30 - 17:45	475	15	433	13
17:45 - 18:00	483	15	454	13

ANNEXURE B
SITE DEVELOPMENT PLAN

LEGEND:

	ZONING	LAND USE	QTY	AREA (HA)	%
	General Residential Z1	Group Housing	146	5,1271	50.24
	General Residential Z3	Flats	3	0,8701	8.53
	Open Space Zone II	Private Open Space	3	1,1939	11.70
	Transport Zone II	Public Street	1	0,4754	4.66
	Transport Zone III	Private Street	4	2,5391	24.87
	TOTAL		**157**	**10,2056**	**100**

SG A1632/1924

37/136
PORTION 37

SG 1395/1942

N

SCALE 1: 2 000

REMAINDER OF PORTION 27 (DUINLAAGTE)
SG A229/1924

Main Road 344

TERGNIET TOWNSHIP
SG 2960/1991

ROAD

STEENBRAS STREET 10,00m

SEEKAT STREET 16,00m

Impala Street

ROAD

COWRIES CRESCENT 10,00m

PANSY CLOSE

LIMPET CLOSE 10,00m

NAUTILUS AVENUE 13,00m

SCALLOP CLOSE 10,00m

SEESTER AVENUE

SNOEK CLOSE 10,00m

(DOLPHIN CRESCENT)

7th AVENUE 9,45m

RAILWAY LINE

587 ROAD 13,00m

TUCKHOF STREET 5,67m

587 PARK

926 PARK

PORTION 30 (THE VALE)
SG 4585/1934

Ptn A
1001m²

Ptn B
728m²

Ptn C
2643m²

108
2822 m²
(12x Flats)

117
3290 m²
(24x Flats)

118
2590 m²
(12x Flats)

35
4571 m²
(35 u/ha = 16 units)

150
1408 m²

153
6395 m²

154
630 m²

155
700 m²

156
700 m²

151
2465 m²

152
8066 m²

4754 m²

GATE

RES

MH

Graphic Scale
75m 50m 25m 0 25m 50m 75m

NOTES

1. Sizes and dimensions are approximate and subject to final survey.
2. For Erf data: Refer SG A1832/1924
3. For Servitude info, refer SG5192/1998; SG1591/85 SG9314/1991 & SG2658/2012
4. 1m aerial photo surveyed contours
5.

DRAWN:	MV	**CHECKED:**	MV
PLAN NO:	Pr1926Layout08		
PLAN DATE:	Oct 2019		
STORED:	*z:\drawings\App\Pr1926 Rem139MBL08.drg*		

REMAINDER OF THE FARM ZANDHOOGTE NO 139, TERNIET, MUNICIPALITY AND DIVISION OF MOSSEL BAY

LAYOUT PLAN

APPROVED IN TERMS OF SECTION 23(1) OF THE MOSSEL BAY MUNICIPALITY'S BY-LAW ON MUNICIPAL PLANNING AS PUBLISHED IN P.N. 7473/2015 ON 21 AUGUST 2015

MUNICIPAL MANAGER

DATE: _____

Marike Vreken
STADS & OMGEWINGSBEPLANNERS
URBAN & ENVIRONMENTAL PLANNERS

21 Trotter Street, PO Box 2180
KNYSNA 6570

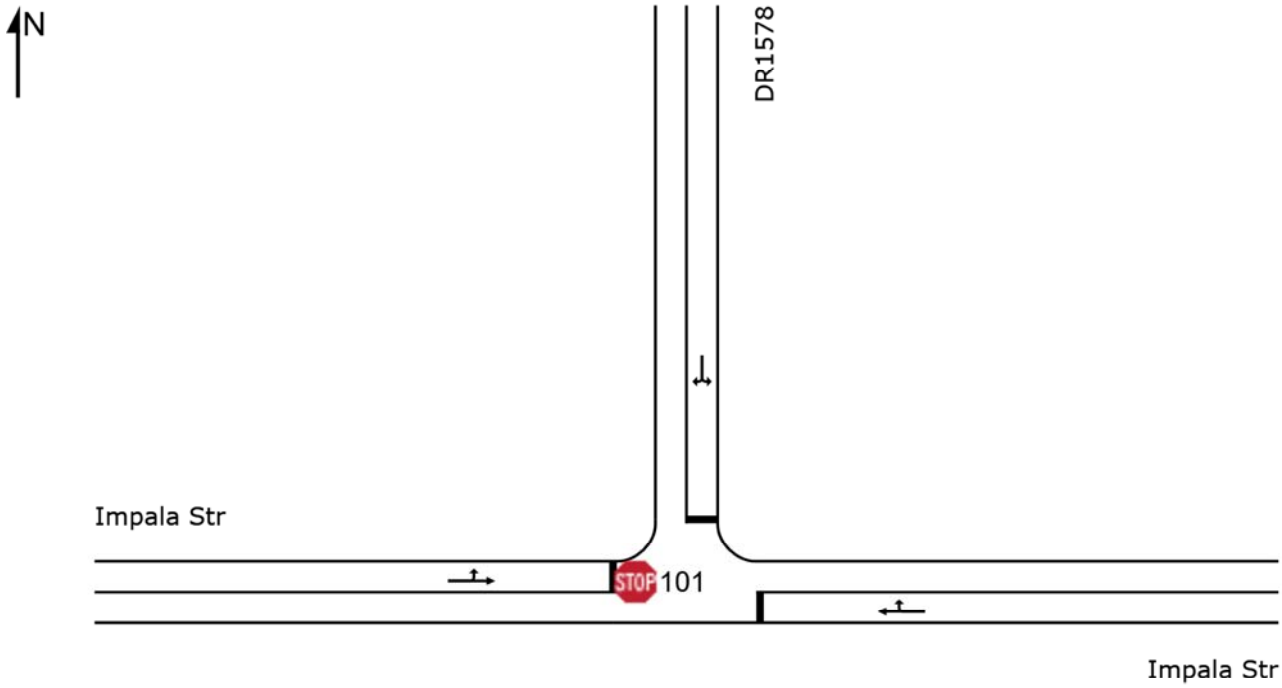
(044) 382 0420
086 459 2987
e-mail: marike@vreken.co.za
www.vreken.co.za

ANNEXURE C
SIDRA ANALYSIS RESULTS

SITE LAYOUT

Site: 101 [DR1578/Impala Status Quo AM]

New Site
Site Category: (None)
Stop (All-Way)



MOVEMENT SUMMARY

Site: 101 [DR1578/Impala Status Quo AM]

New Site
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	18	2.0	0.098	11.2	LOS B	0.3	2.1	0.68	1.26	1.79	50.2
6	R2	54	3.0	0.098	11.0	LOS B	0.3	2.1	0.68	1.26	1.79	50.0
Approach		72	2.8	0.098	11.1	LOS B	0.3	2.1	0.68	1.26	1.79	50.0
North: DR1578												
7	L2	22	2.0	0.139	13.3	LOS B	0.5	3.2	0.78	1.27	1.94	49.3
9	R2	59	4.0	0.139	12.8	LOS B	0.5	3.2	0.78	1.27	1.94	48.8
Approach		81	3.5	0.139	12.9	LOS B	0.5	3.2	0.78	1.27	1.94	49.0
West: Impala Str												
10	L2	153	3.0	0.392	21.0	LOS C	1.7	12.1	0.94	1.38	2.57	44.8
11	T1	3	3.0	0.392	20.7	LOS C	1.7	12.1	0.94	1.38	2.57	44.6
Approach		156	3.0	0.392	21.0	LOS C	1.7	12.1	0.94	1.38	2.57	44.8
All Vehicles		309	3.1	0.392	16.6	LOS C	1.7	12.1	0.84	1.32	2.22	47.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [DR1578/Impala Status Quo PM]

New Site
Site Category: (None)
Stop (All-Way)

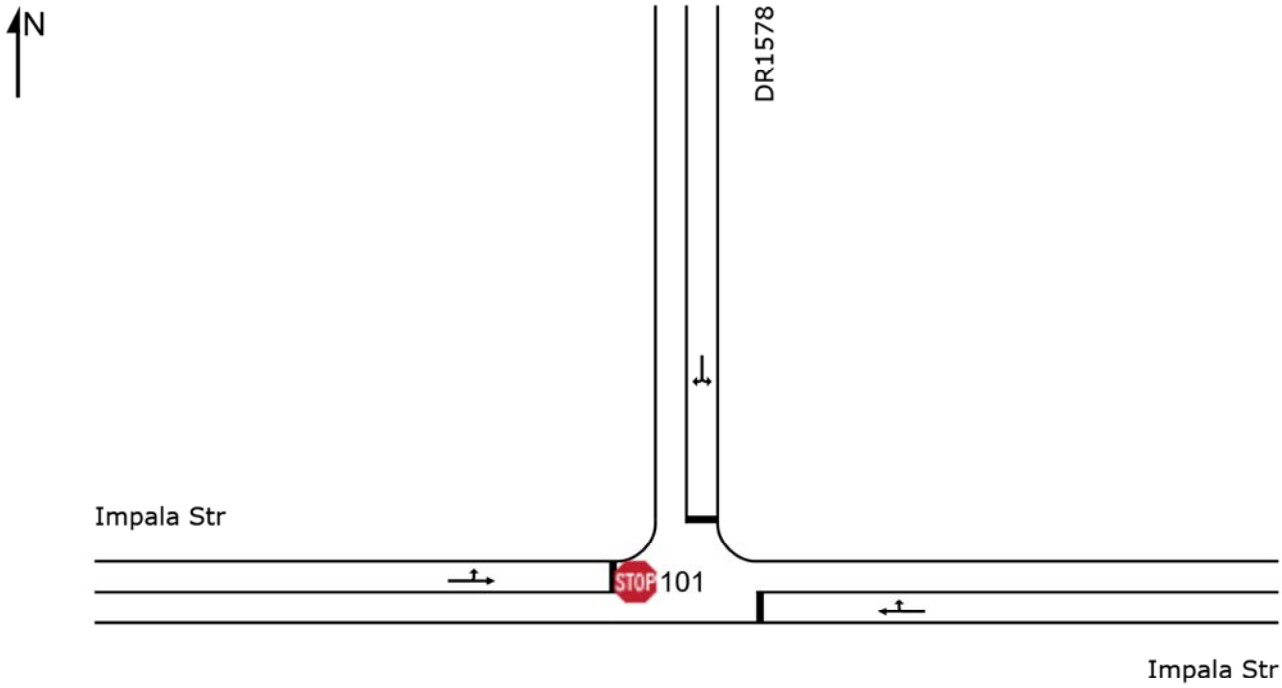
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	15	2.0	0.124	14.4	LOS B	0.4	3.0	0.87	1.37	2.01	35.1
6	R2	37	3.0	0.124	14.2	LOS B	0.4	3.0	0.87	1.37	2.01	35.0
Approach		52	2.7	0.124	14.2	LOS B	0.4	3.0	0.87	1.37	2.01	35.1
North: DR1578												
7	L2	46	2.0	0.229	10.2	LOS B	0.7	5.4	0.65	1.42	1.94	36.7
9	R2	150	4.0	0.229	9.9	LOS A	0.7	5.4	0.65	1.42	1.94	36.4
Approach		196	3.5	0.229	9.9	LOS A	0.7	5.4	0.65	1.42	1.94	36.4
West: Impala Str												
10	L2	59	3.0	1.167	600.1	LOS F	17.1	122.8	1.00	3.40	8.53	5.3
11	T1	11	3.0	1.167	600.0	LOS F	17.1	122.8	1.00	3.40	8.53	5.3
Approach		70	3.0	1.167	600.1	LOS F	17.1	122.8	1.00	3.40	8.53	5.3
All Vehicles		318	3.3	1.167	140.6	LOS F	17.1	122.8	0.76	1.84	3.40	15.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [DR1578/Impala Future AM]

New Site
Site Category: (None)
Stop (All-Way)



Organisation: URBAN ENGINEERING | Created: Monday, November 11, 2019 9:28:20 AM
Project: C:\Users\user\OneDrive - Urban Engineering (Pty) Ltd\Projects\2019-02-20 Cobra Fuel\3_Working\SIDRA\Zandhoogte.sip8

MOVEMENT SUMMARY

Site: 101 [DR1578/Impala Future AM]

New Site
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	33	2.0	0.230	11.0	LOS B	0.7	5.3	0.63	1.31	1.93	50.3
6	R2	172	3.0	0.230	10.8	LOS B	0.7	5.3	0.63	1.31	1.93	50.0
Approach		205	2.8	0.230	10.9	LOS B	0.7	5.3	0.63	1.31	1.93	50.1
North: DR1578												
7	L2	58	2.0	0.289	17.5	LOS C	1.1	8.0	0.89	1.32	2.30	46.8
9	R2	70	4.0	0.289	17.0	LOS C	1.1	8.0	0.89	1.32	2.30	46.3
Approach		128	3.1	0.289	17.3	LOS C	1.1	8.0	0.89	1.32	2.30	46.5
West: Impala Str												
10	L2	182	3.0	0.432	20.1	LOS C	1.9	13.9	0.92	1.40	2.67	45.2
11	T1	14	3.0	0.432	19.8	LOS C	1.9	13.9	0.92	1.40	2.67	45.0
Approach		196	3.0	0.432	20.1	LOS C	1.9	13.9	0.92	1.40	2.67	45.2
All Vehicles		529	3.0	0.432	15.8	LOS C	1.9	13.9	0.80	1.35	2.29	47.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [DR1578/Impala Future PM]

New Site
Site Category: (None)
Stop (All-Way)

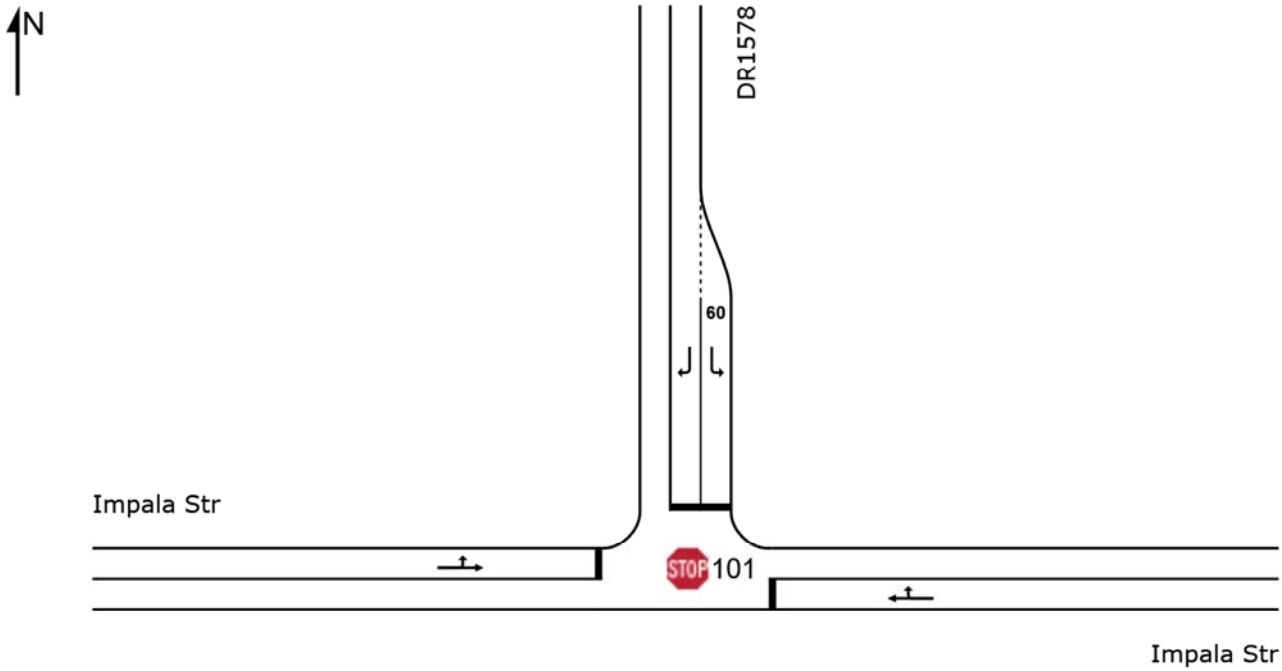
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	23	2.0	0.198	12.7	LOS B	0.7	4.9	0.81	1.40	2.06	35.7
6	R2	86	3.0	0.198	12.5	LOS B	0.7	4.9	0.81	1.40	2.06	35.6
Approach		109	2.8	0.198	12.5	LOS B	0.7	4.9	0.81	1.40	2.06	35.6
North: DR1578												
7	L2	161	2.0	0.426	12.6	LOS B	1.8	12.8	0.76	1.55	2.49	35.8
9	R2	178	4.0	0.426	12.3	LOS B	1.8	12.8	0.76	1.55	2.49	35.6
Approach		339	3.1	0.426	12.5	LOS B	1.8	12.8	0.76	1.55	2.49	35.7
West: Impala Str												
10	L2	70	3.0	0.586	60.6	LOS F	3.3	23.7	1.00	1.74	3.31	24.5
11	T1	19	3.0	0.586	60.4	LOS F	3.3	23.7	1.00	1.74	3.31	24.4
Approach		89	3.0	0.586	60.6	LOS F	3.3	23.7	1.00	1.74	3.31	24.4
All Vehicles		537	3.0	0.586	20.4	LOS C	3.3	23.7	0.81	1.55	2.54	33.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [DR1578/Impala DR1578 Lane]

New Site
Site Category: (None)
Stop (All-Way)



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MOVEMENT SUMMARY

Site: 101 [DR1578/Impala DR1578 Lane]

New Site
Site Category: (None)
Stop (All-Way)

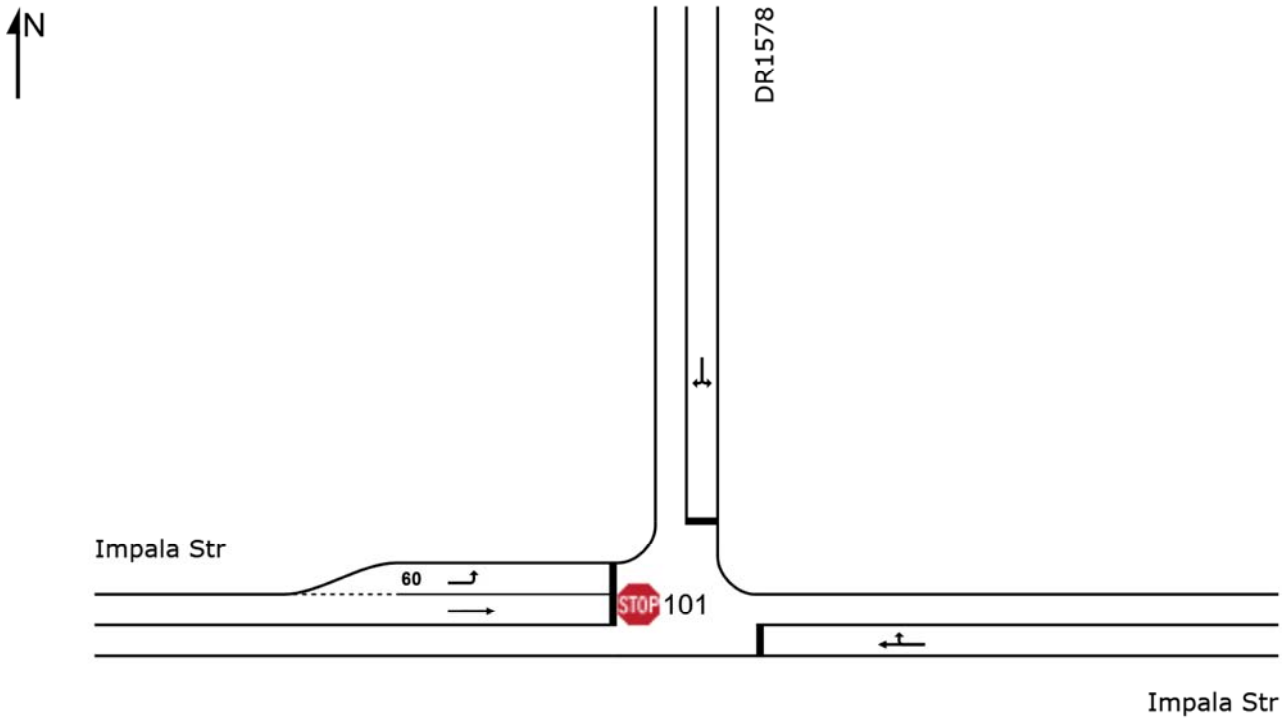
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	23	2.0	0.198	12.7	LOS B	0.7	4.9	0.81	1.40	2.06	35.7
6	R2	86	3.0	0.198	12.7	LOS B	0.7	4.9	0.81	1.40	2.06	35.7
Approach		109	2.8	0.198	12.7	LOS B	0.7	4.9	0.81	1.40	2.06	35.7
North: DR1578												
7	L2	161	2.0	0.334	12.1	LOS B	1.3	9.5	0.88	1.48	2.38	36.1
9	R2	178	4.0	0.349	11.8	LOS B	1.4	10.2	0.87	1.49	2.41	35.8
Approach		339	3.1	0.349	12.0	LOS B	1.4	10.2	0.88	1.48	2.39	36.0
West: Impala Str												
10	L2	70	3.0	0.586	60.6	LOS F	3.3	23.7	1.00	1.74	3.31	24.5
11	T1	19	3.0	0.586	60.4	LOS F	3.3	23.7	1.00	1.74	3.31	24.4
Approach		89	3.0	0.586	60.6	LOS F	3.3	23.7	1.00	1.74	3.31	24.5
All Vehicles		537	3.0	0.586	20.2	LOS C	3.3	23.7	0.89	1.51	2.48	33.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [DR1578/Impala Impala Lane]

New Site
Site Category: (None)
Stop (All-Way)



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MOVEMENT SUMMARY

Site: 101 [DR1578/Impala Impala Lane]

New Site
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Impala Str												
5	T1	23	2.0	0.240	15.0	LOS C	0.9	6.3	0.88	1.42	2.19	34.9
6	R2	86	3.0	0.240	14.8	LOS B	0.9	6.3	0.88	1.42	2.19	34.8
Approach		109	2.8	0.240	14.9	LOS B	0.9	6.3	0.88	1.42	2.19	34.8
North: DR1578												
7	L2	161	2.0	0.426	12.6	LOS B	1.8	12.8	0.76	1.55	2.49	35.8
9	R2	178	4.0	0.426	12.5	LOS B	1.8	12.8	0.76	1.55	2.49	35.7
Approach		339	3.1	0.426	12.6	LOS B	1.8	12.8	0.76	1.55	2.49	35.8
West: Impala Str												
10	L2	70	3.0	0.376	26.6	LOS D	1.6	11.8	1.00	1.50	2.59	31.6
11	T1	19	3.0	0.117	17.9	LOS C	0.4	3.0	1.00	1.36	2.13	34.2
Approach		89	3.0	0.376	24.8	LOS C	1.6	11.8	1.00	1.47	2.49	32.1
All Vehicles		537	3.0	0.426	15.1	LOS C	1.8	12.8	0.82	1.51	2.43	34.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.