

FARM MORGEN, 542, REITZ

TOWNSHIP ESTABLISHMENT
TRAFFIC IMPACT ASSESSMENT

APRIL 2023



Project: 7551

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REPORT SHEET

Property Description:	<i>Farm Morgen, 542, Reitz</i>
Municipal Area:	<i>Nketoana Local Municipality</i>
Application:	<i>Township Establishment</i>
Type of Report:	<i>Traffic Impact Assessment</i>
Project Number:	<i>7551</i>
Declaration	<i>I, Koot Marais, author of this study, hereby certify that I am a professional traffic engineer (registration No 920023) and that I have the required experience and training in the field of traffic and transportation engineering as required by the Engineering Council of South Africa (ECSA), to compile traffic impact studies and I take full responsibility for the content, including all calculations, conclusions and recommendations made herein.</i>
Assessor Details	<i>As a Professional Engineer with a post graduate degree, I qualify as an Assessor of Traffic Impact Assessments of a High Level of Complexity and have undertaken in excess of 600 Traffic Impact Assessments of various complexity levels.</i>
Compiled by:	<i>Koot Marais Pr Eng 920023</i>
Signed:	
Date:	<i>April 2023</i>

PREPARED BY:



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1. INTRODUCTION

1.1 Aim of the Study

The aim of this study was to investigate and report on the traffic impact of a planned **Township Establishment on the Farm Morgen, 542, Reitz**

1.2 Background

It is the intention to develop the area with residential erven and streets

A study was also compiled in August 2022 to specifically investigate access. Findings can be summarised as follows:

- Although direct access from the A116 (Viljoen Street) might be possible, it is not recommended from a spacing point of view considering the classification of the road. Access is also unlikely to be approved by the Free State Province as the relevant road authority.
- Access from the lower order road network is recommended

The findings of this study were used to determine the Township Layout and this report deals with the traffic implications of the development.

The study was undertaken as per the requirements of the National Land Transport Act (Act 5 of 2009), and according to the procedures prescribed by *TMH 16 South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, COTO, 2018*.

1.3 Site Location

The site is located to the southeast of the A116, on the southern edge of the town.



Figure 1.1 Location Plan

1.4 Development

The development will consist of the following:

Proposed Zoning	Site Numbers	Total Area(sqm)	% of Total Area
Single Residential	1-6,8-30	48236	56,29
Town Houses(25 Units/Ha)	7,31	13060	15,24
Private Open Space	32-35	10477	12,23
Street	36	12482	14,57
Lane	37	1433	1,67
	37	85688	100,00

From a traffic point of view the development can be summarised as follows:

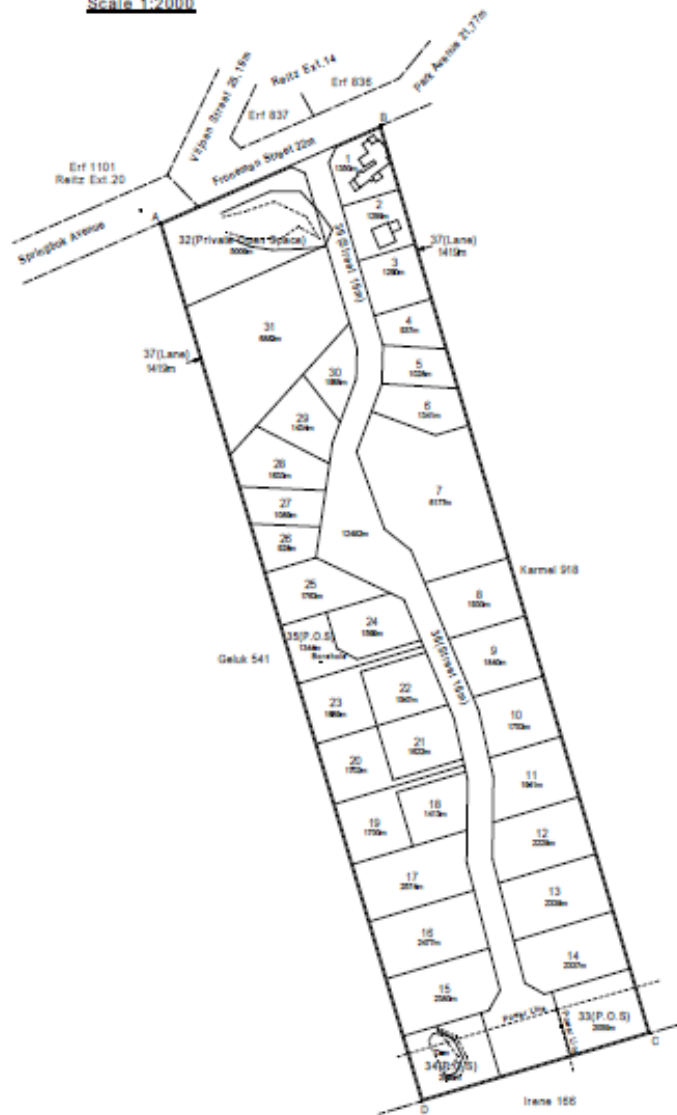
- 29 Single Residential Units
- 2 Townhouse erven on which 32 units can be developed
 - Erf 7 - 61777m² @ 25 units / ha = 15 units
 - Erf 31 – 6883m² @ 25units /ha = 17 units

The planned development is shown in the figure below.

Sketch Plan of subdivision of the farm Morgen No.542

Nkomoana Local Municipality
Administrative District : Reitz, Province : Free State

Scale 1:2000



Proposed Zoning	Site Numbers	Total Area(sqm)	% of Total Area
Single Residential	1-8,9-30	8672	56,26
Town Houses(25 Units)	7,31	1386	7,24
Private Open Space	32-35	10453	12,20
Street	36	12544	14,64
Lane	37	1419	1,66
	37	8568	100,00

1.1 Scope of Analysis

1.1.1 Period for Analysis

Given the type of development, both the morning and afternoon peak hours were investigated.

1.1.2 Warrants for a Traffic Impact Study

As the development can theoretically generate in excess of 50 new trips, a Traffic Impact Assessment is warranted.

1.1.3 Assessment Years

The base year and a five-year horizon were analysed. The base year was assumed to be 2023. A generally accepted 3% per annum traffic growth was assumed.

1.1.4 Extent of Analysis

TMH16 specify the following study area:

External roads. Elements from roads classified as external according to the Engineering Service Contribution Policy on which the development is likely to have an impact or which may not meet the requirements of the Traffic Assessment Standards and Requirements Manual.

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 the 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.

The A116 (Viljoen Street) can be regarded as a Class 3 road and the following intersections were investigated:



Figure 1.3: Intersections Investigated

- a) **Intersection A:** Sarel Cilliers Street / President Street / Viljoen Street Intersection
- b) **Intersection B:** Wilson Street / Park Avenue Intersection
- c) **Intersection C:** Access

1.2 Available Information

1.2.1 Traffic Counts

Traffic counts were undertaken on 9 November 2022.

2 BACKGROUND INFORMATION

2.1 Existing Road Network

The important roads in the area are the following:

a) A116 (Viljoen Street / Sarel Cilliers Street)

The A116 connects the town with the R26 (which links the area with Bethlehem to the south) and is a 2-lane road with rural shoulders . In the town the road becomes Viljoen Street, which is a 3-lane street with urban sidewalks. To the north of President Street, the road becomes Sarel Cilliers Street.



Photo 1: A116 as seen towards the south



Photo 2: Viljoen Street as seen towards the north

b) President Street

This undivided road links the residential areas with Viljoen Street. The street is a 2-lane road with access.



Photo 3: Street as seen towards the west

c) Park Avenue

The road connects the area of development with President Street and is a gravel road, becoming a poor condition paved road near President Street .



Photo 4: Street as seen towards the north

2.2 Existing Land Use

The development area is mostly vacant with two residences, which will be incorporated on erven. The site is surrounded by residential areas and vacant areas.



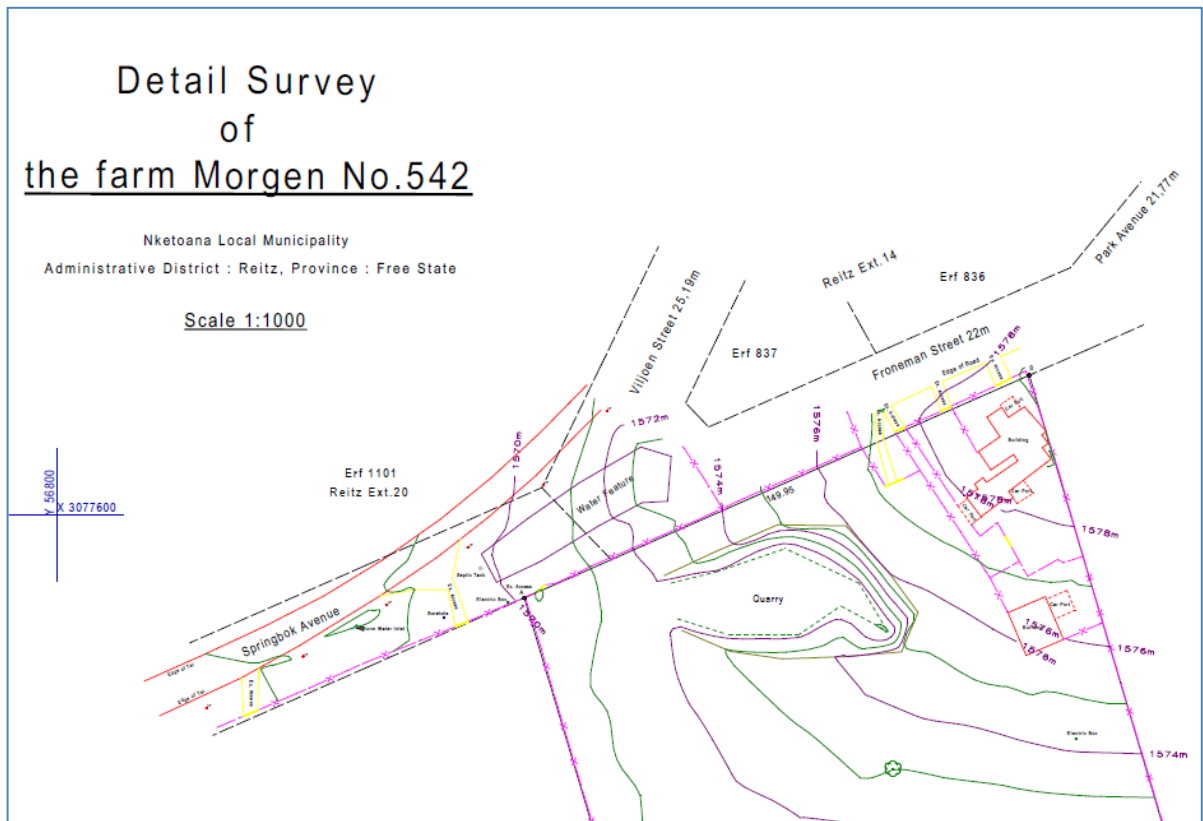
Photo 5: Development site as seen towards the south

2.3 Road Planning

There is no road planning that will directly affect the development. The plan of the Provincial Roads in the area below shows the A116 and also shows that Froneman Street should actually intersect with the A116



This is confirmed in the figure below.



Of importance, the intersecting angle of the street with the A116 will be in the order of 40 degrees. With a minimum prescribed angle of 70 degrees, an intersection in this position will not comply with the standards and will result in a hazardous situation, with the result that it can be accepted that the road will never be extended to intersect with the A116.

The aerial photograph below shows that the section of Froneman Street was not developed. The Detail Survey indicates that this section should be called Springbok Avenue. For the purposes of this study this section and the section linking with President Street is assumed to be part of Park Avenue. The official name of the section is not of critical importance for the purposes of the study.



There is thus no known road planning that will directly affect the development.

3 TRIP GENERATION

3.1 Trip Generation Descriptions

Relevant land uses for this development as described in the TMH 17 are as follows:

a) 210 Single Dwelling Units

Single dwelling units are detached houses on individual erven. The units usually have individual accesses to streets.

b) 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.

3.2 Reduction Rates

The following reduction rates were considered.

a) Mixed-Use Reduction

Mixed-use developments are defined as developments in an area that consist of two or more single-use developments between which trips can be made by means of non-motorised modes of transport (such as walking). This has the net effect of reducing the vehicle trip generation in the area. This is not typical of the area and was not assumed.

b) Vehicle Ownership Reduction

The purpose of this factor is to make provision for households that are to various degrees reliant on public transport (and where public transport is not available, to long distance walking)

This was not assumed.

c) Transit Corridor Reduction

No reduction was assumed.

3.3 Trip Generation

The following trip generation is expected.

Table 3.1: Expected trip generation of proposed development

No	Land Use	No	Unit	Reduction Factors					AM PEAK								PM PEAK									
				Pm	Pv	Pv	Pt	Pc	TGR	TGR	Split		PHF	AM	AM	In	Out	TGR	TGR	Split		PHF	PM	PM	In	Out
				Mixed	Low	V Low	Trans		Reduc	In	Out			Reduc			Reduc					Reduc				
	Residential																									
210	Single Dwelling		unit	10%	40%	70%	15%		1.00		25%	75%					1.00		70%	30%						
210	Single Dwelling	29	unit					0	1.00	1.00	25%	75%		29	29	7	22	1.00	1.00	70%	30%		29	29	20	9
231	Townhouses		unit	15%	30%	50%	15%		0.85		25%	75%					0.85		70%	30%						
231	Townhouses	32	unit					0	0.85	0.85	25%	75%		27	27	7	20	0.85	0.85	70%	30%		27	27	19	8
	Total													56	56	14	42						56	56	39	17

4 TRIP DISTRIBUTION & ASSIGNMENT

Trip distribution was based on the analogue method with consideration of gravitational distributions.

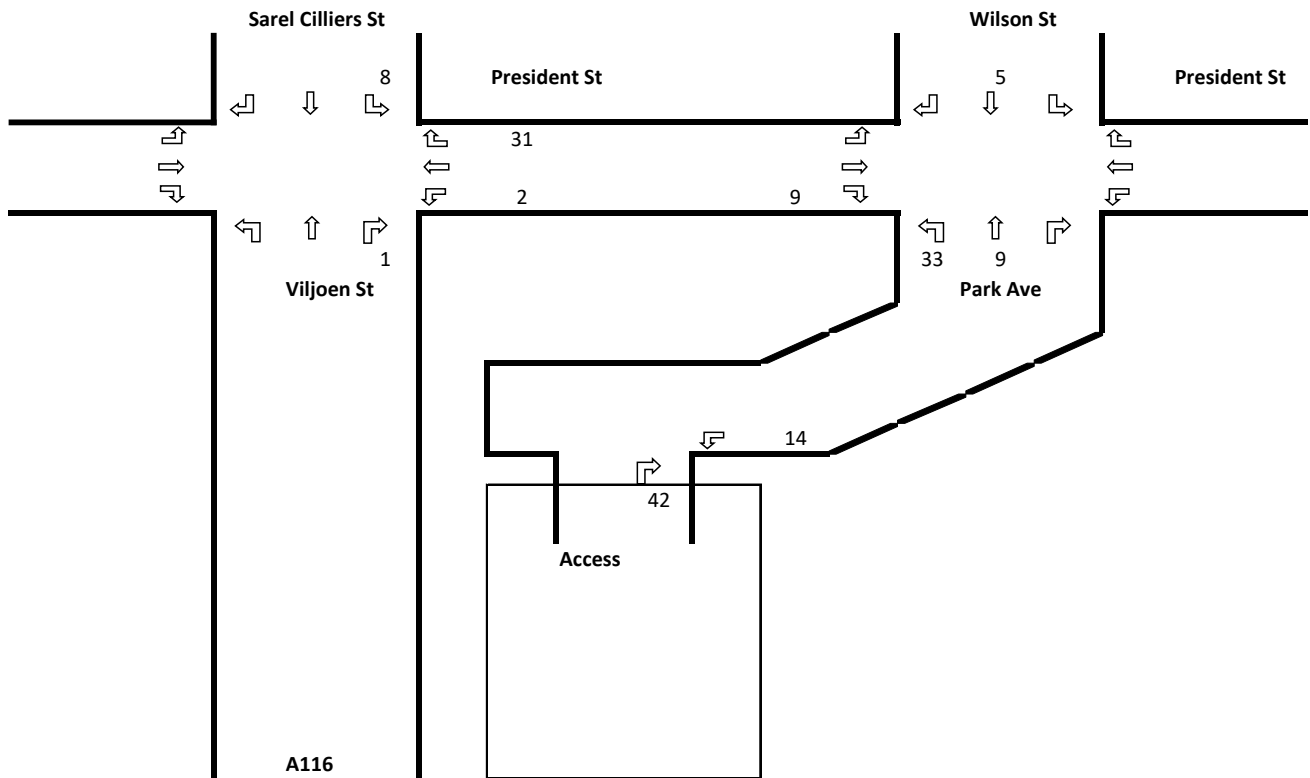


Figure 4.1a AM Trip Assignment

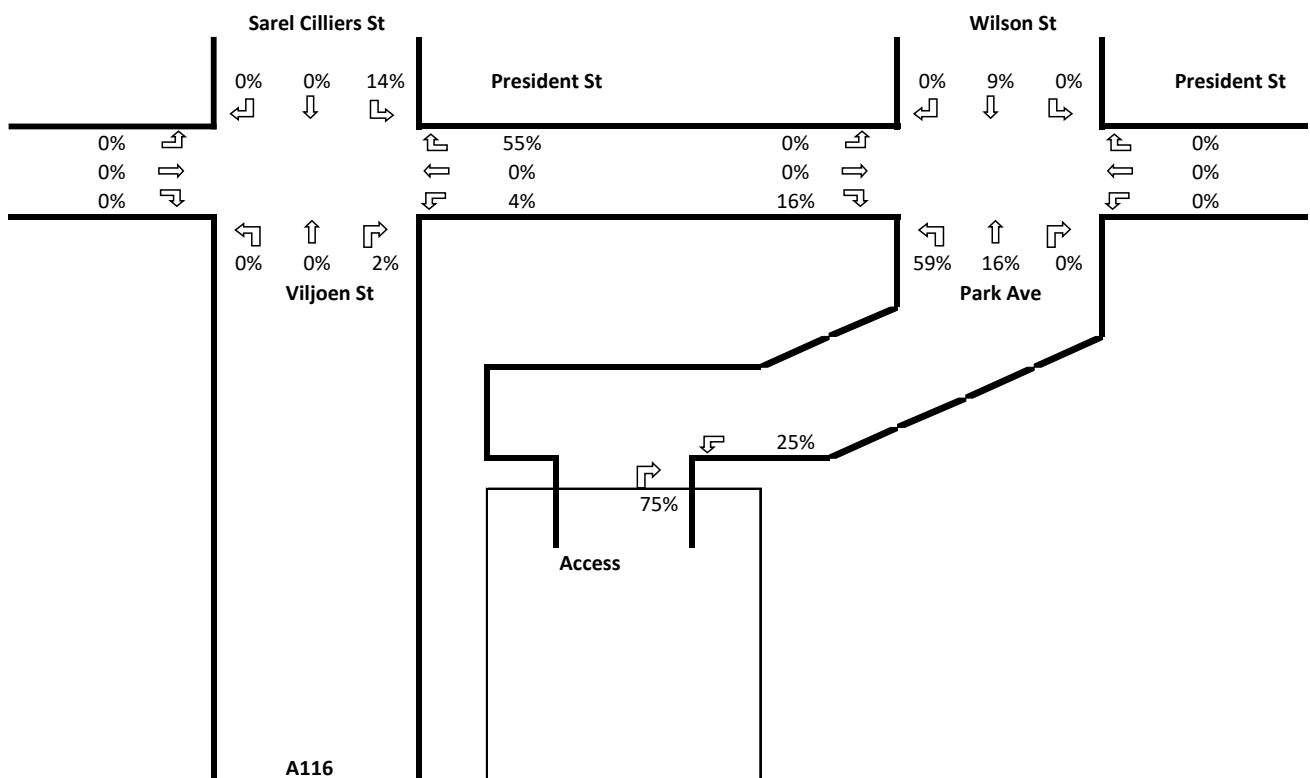


Figure 4.1b AM Trip Assignment

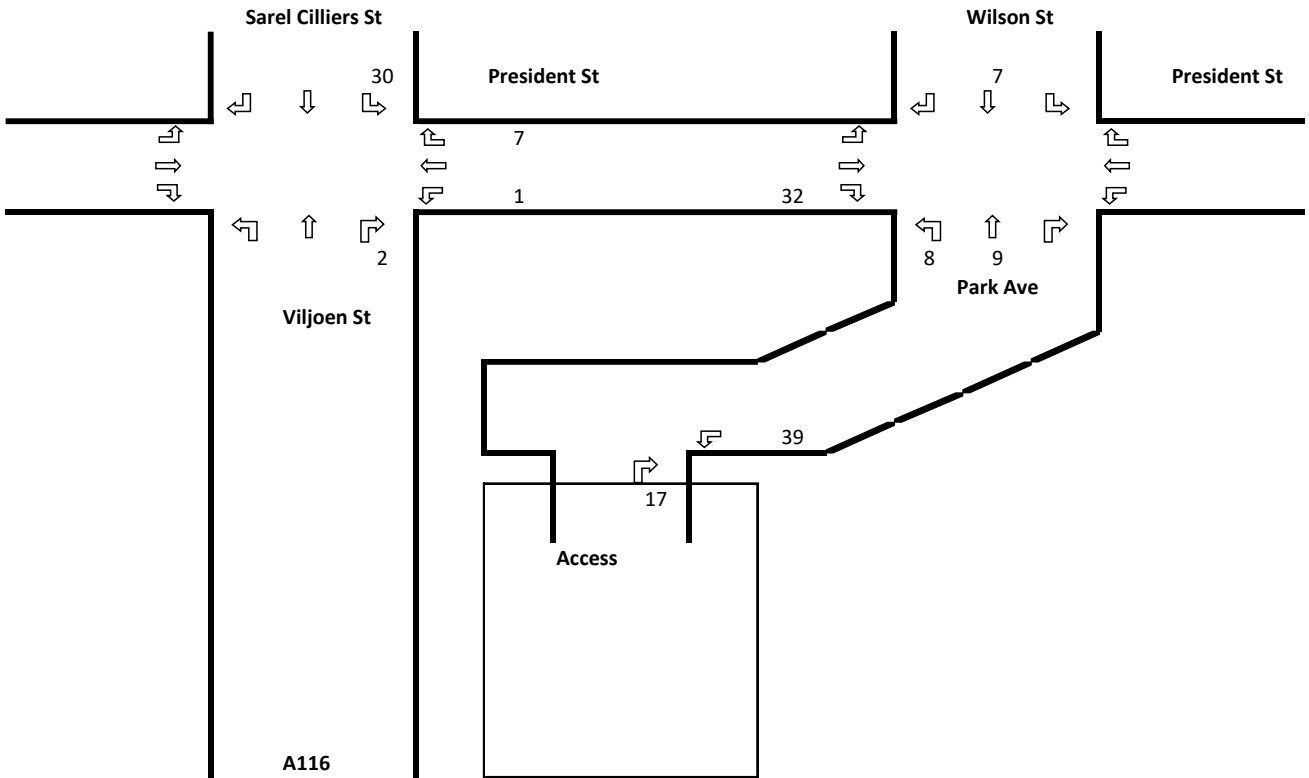


Figure 4.2a PM Trip Assignment

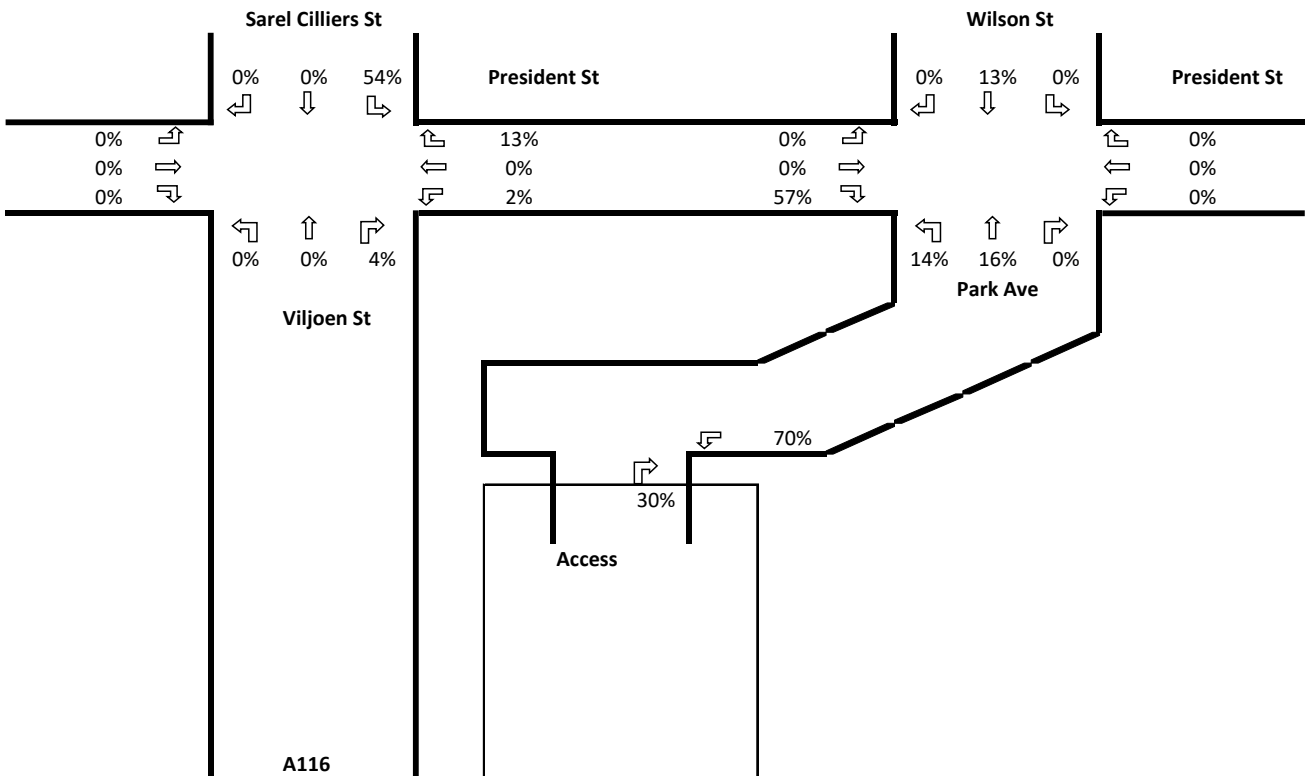


Figure 4.2b PM Trip Assignment

5 TRAFFIC SCENARIOS

The following figures show the traffic volumes for the different scenarios.

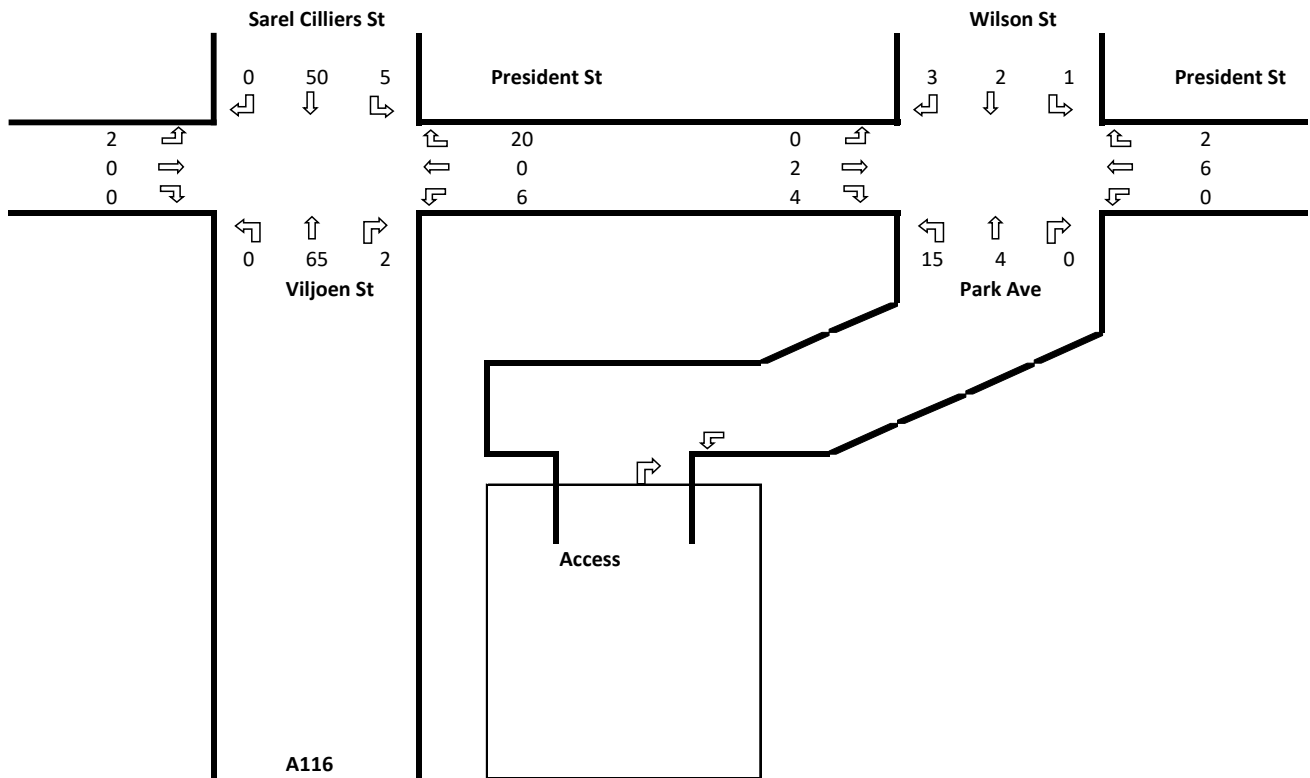


Figure 5.1: 2023 AM Peak Volumes

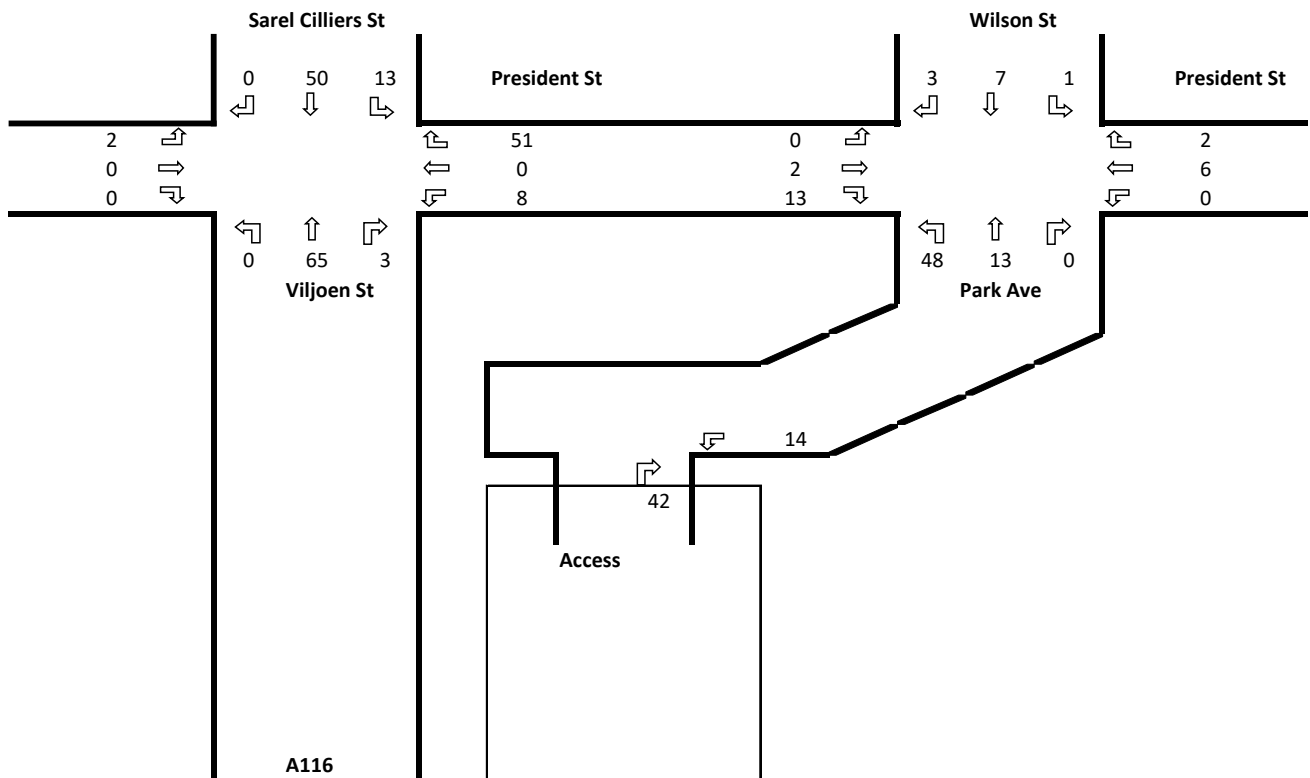


Figure 5.2: 2023 AM Peak Volumes with Development

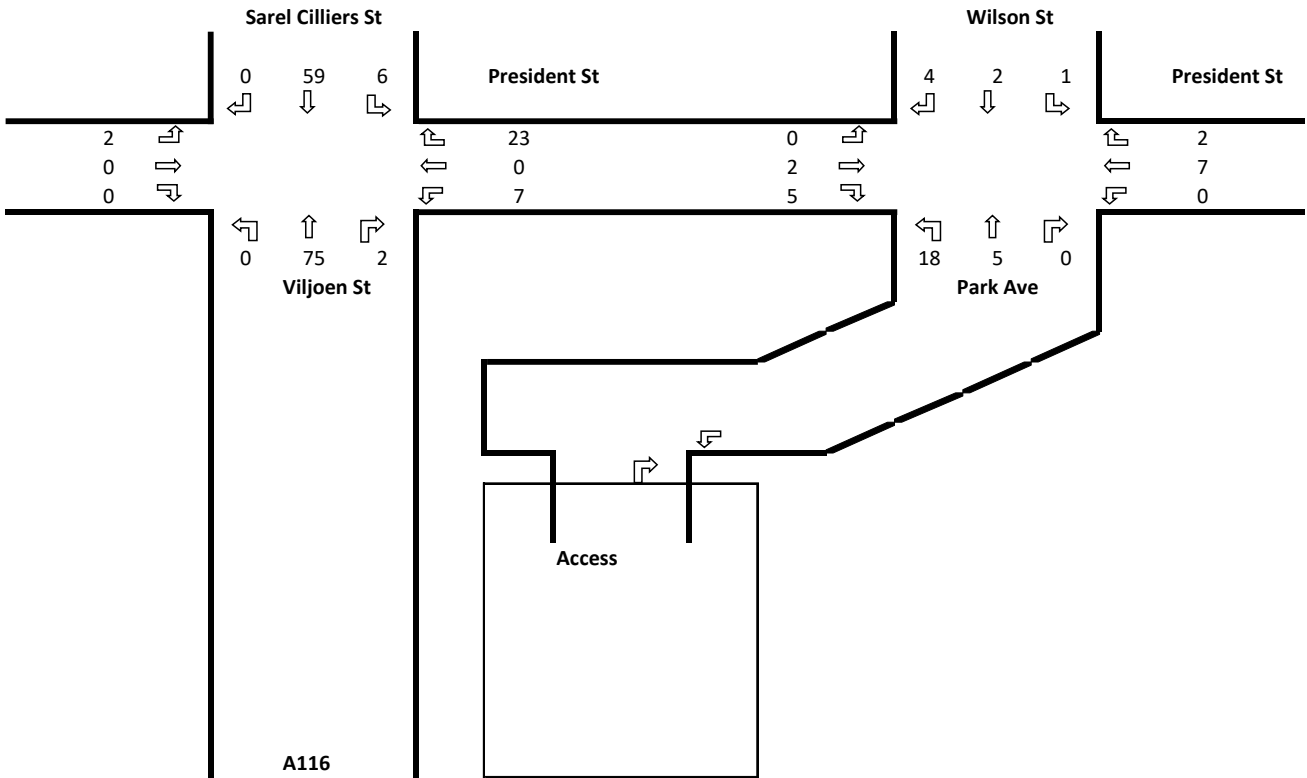


Figure 5.3: 2028 AM Peak Volumes

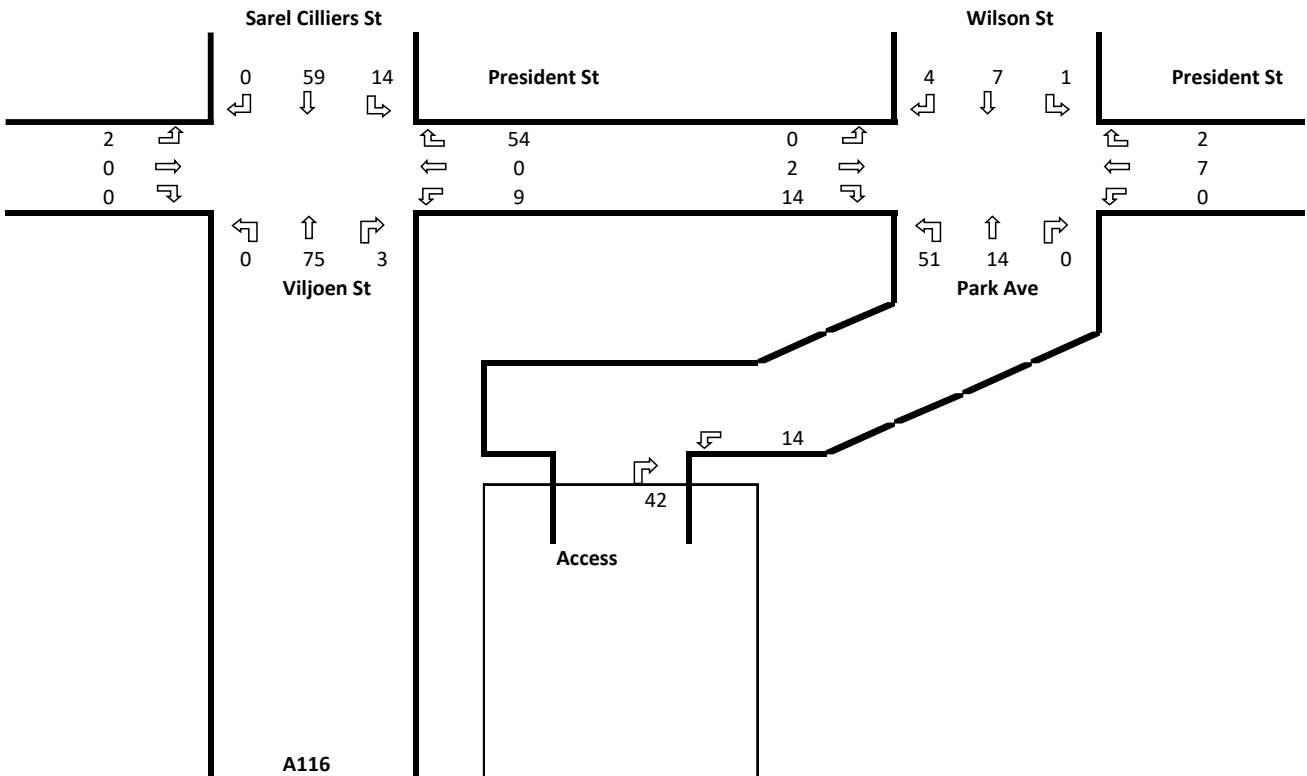


Figure 5.4: 2028 AM Peak Volumes with Development

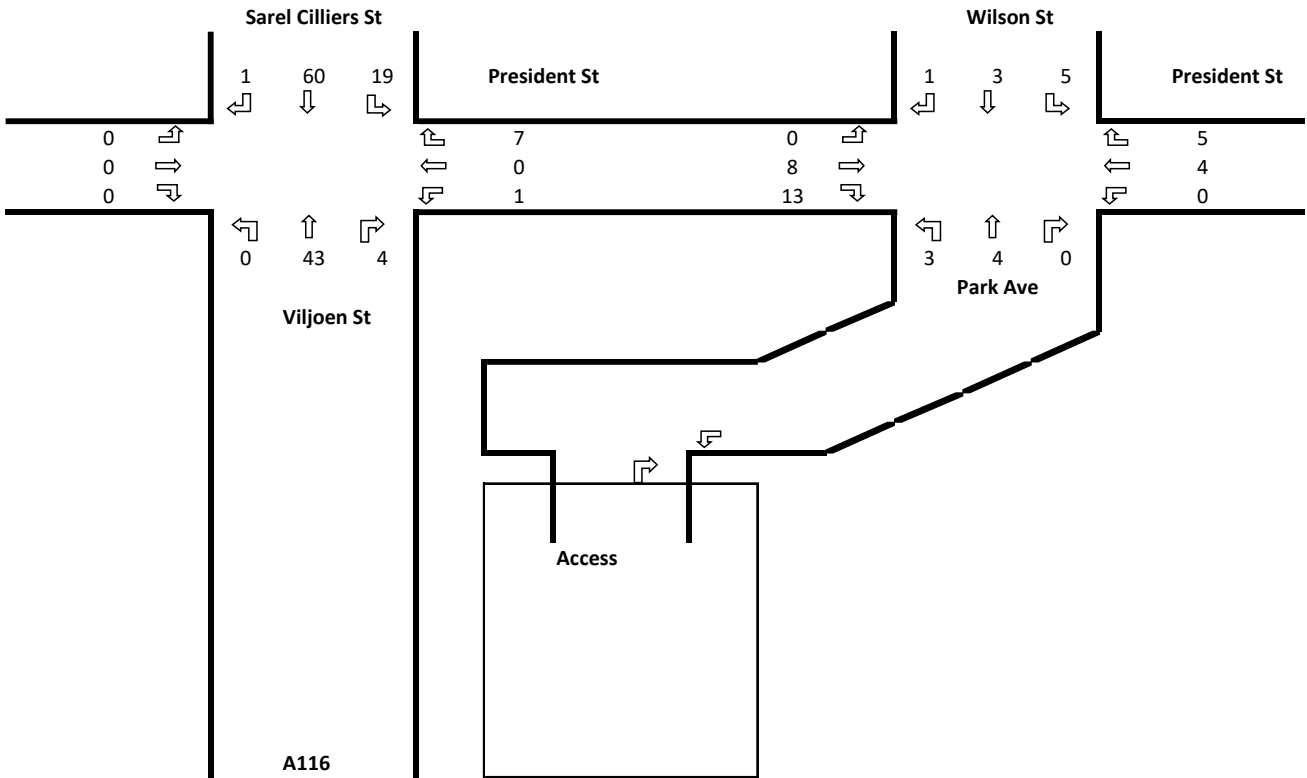


Figure 5.5: 2023 PM Peak Volumes

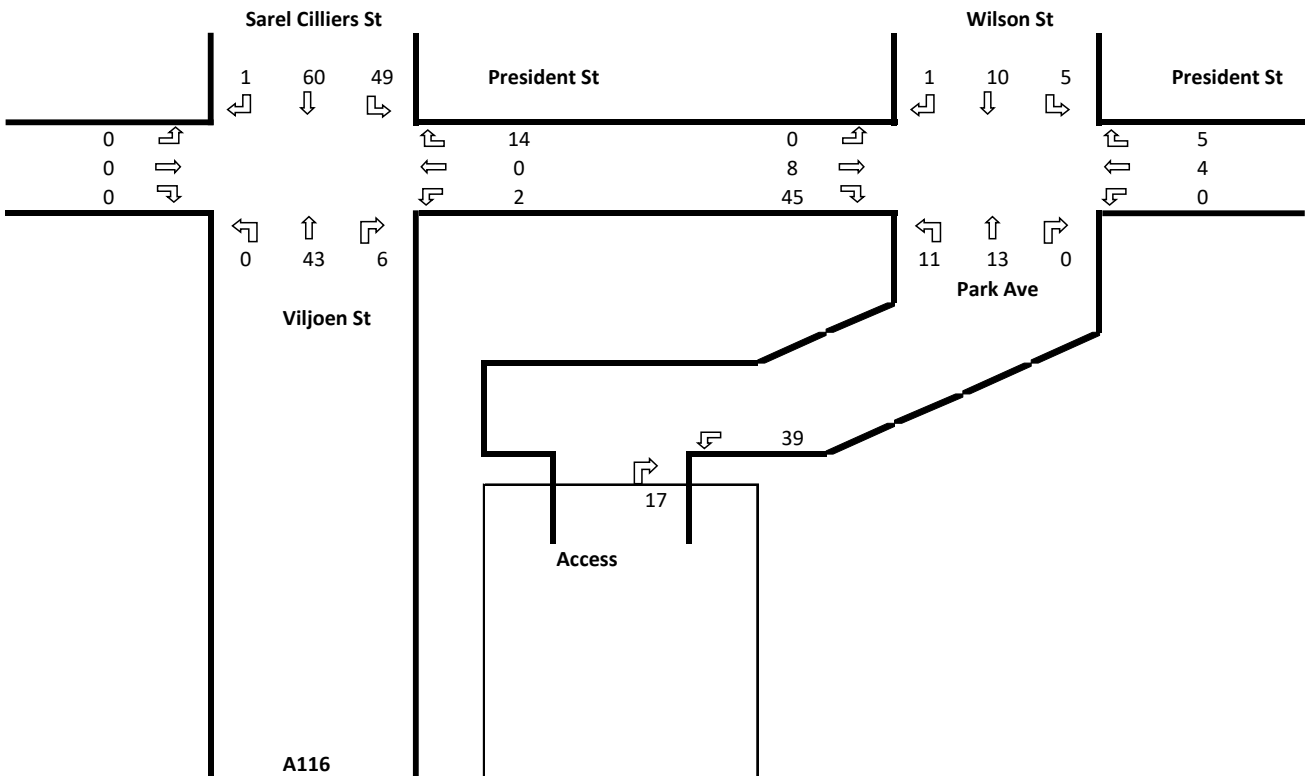


Figure 5.6: 2023 PM Peak Volumes with Development

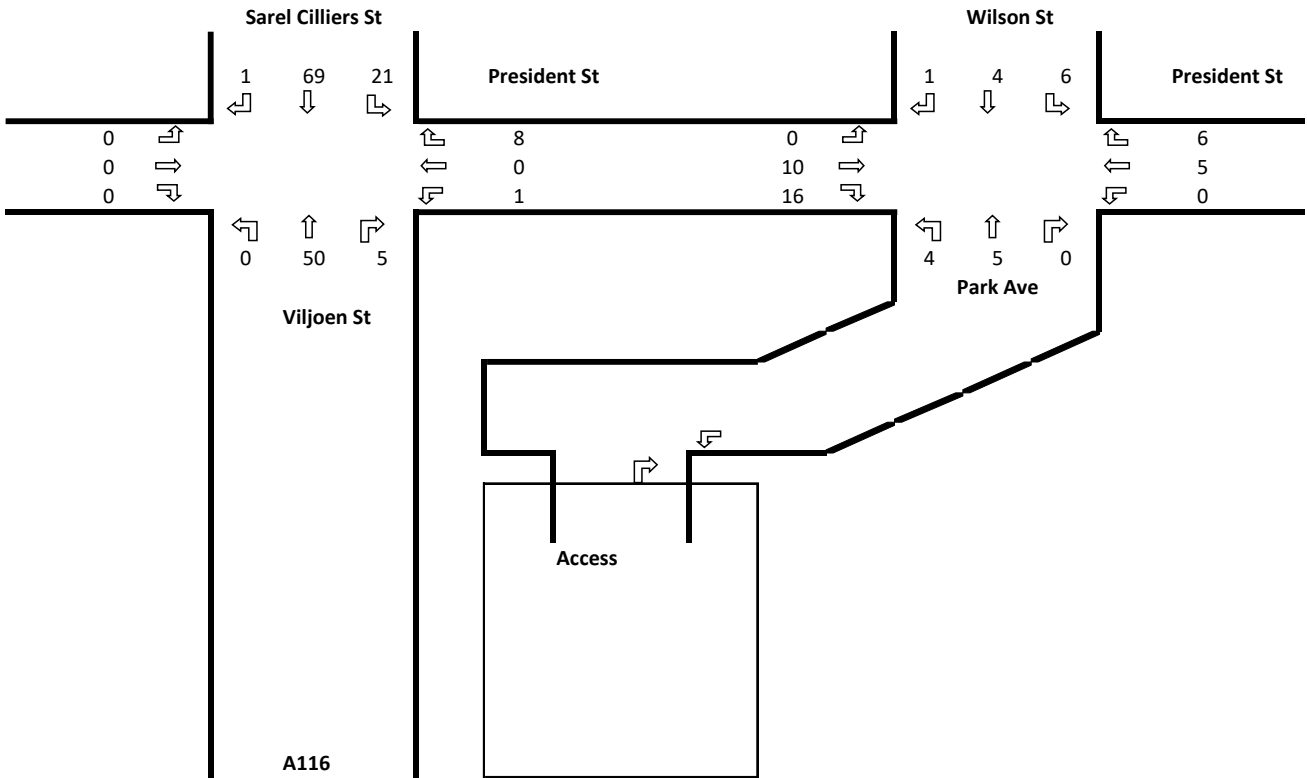


Figure 5.7: 2028 PM Peak Volumes

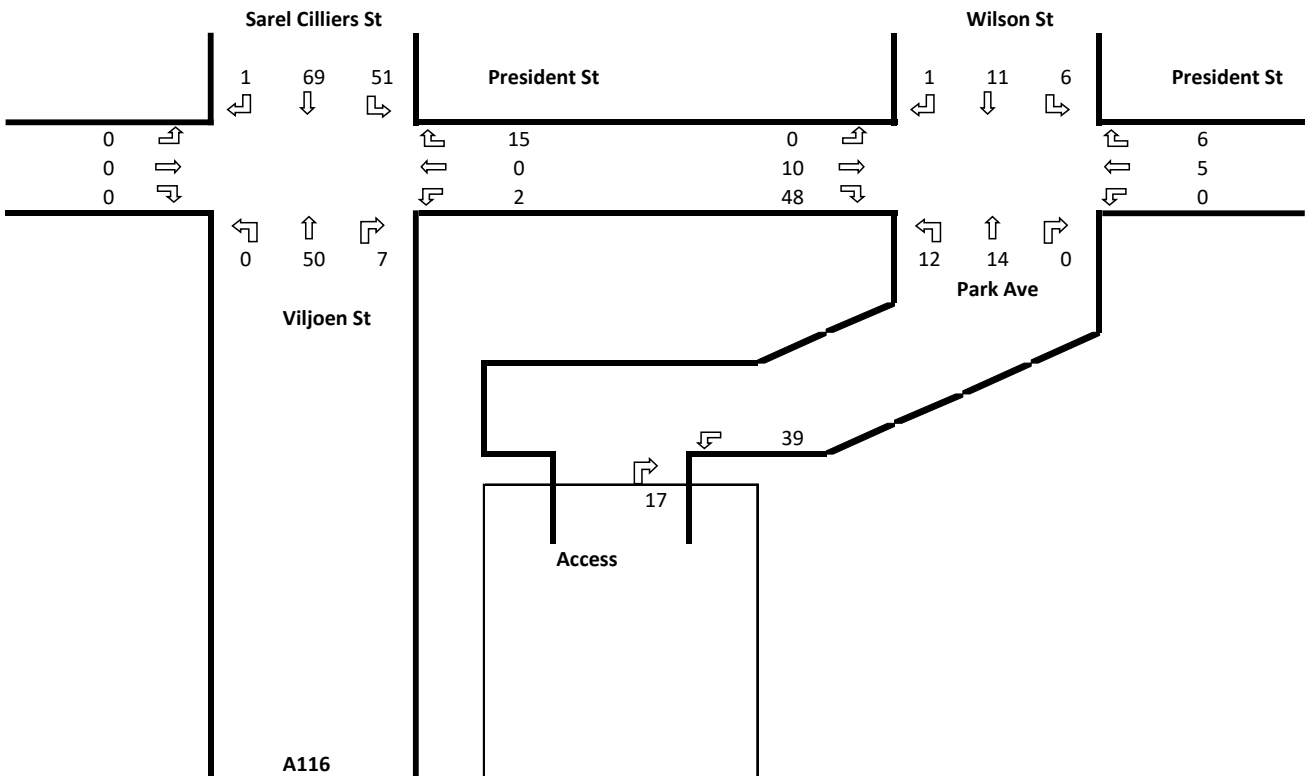


Figure 5.8: 2028 PM Peak Volumes with Development

6 CAPACITY ANALYSIS

Capacity analyses were performed by means of the SIDRA program. The table below shows the Levels of Service of the different traffic movements. Levels of Service (LOS) give an indication of operational characteristics in a traffic stream and their perception by motorists and passengers. Levels of service A to D are usually assumed to be acceptable, with LOS E regarded as the maximum flow rate, or capacity of the facility.

Standard SIDRA parameters were used.



Figure 6.1: Intersections Investigated

- d) **Intersection A:** Sarel Cilliers Street / President Street / Viljoen Street Intersection
- e) **Intersection B:** Wilson Street / Park Avenue Intersection
- f) **Intersection C:** Access

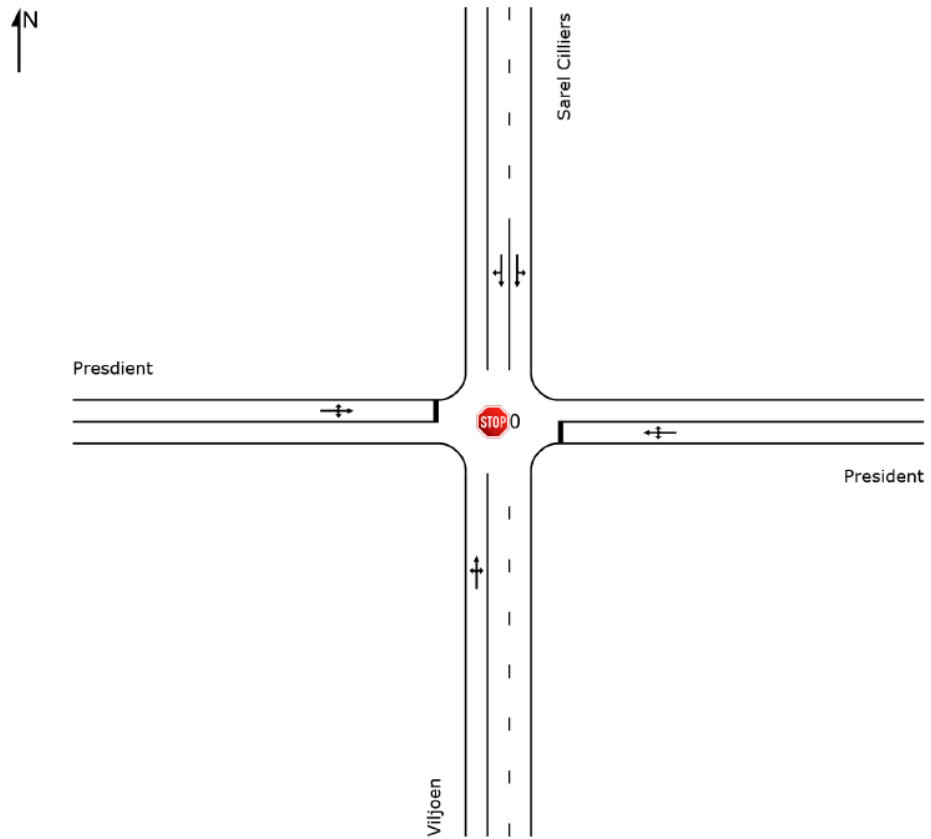
6.1 Intersection A: Sarel Cilliers / President Street Intersection

The layout is as follows.



Photo 6: Intersection as seen from the East

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



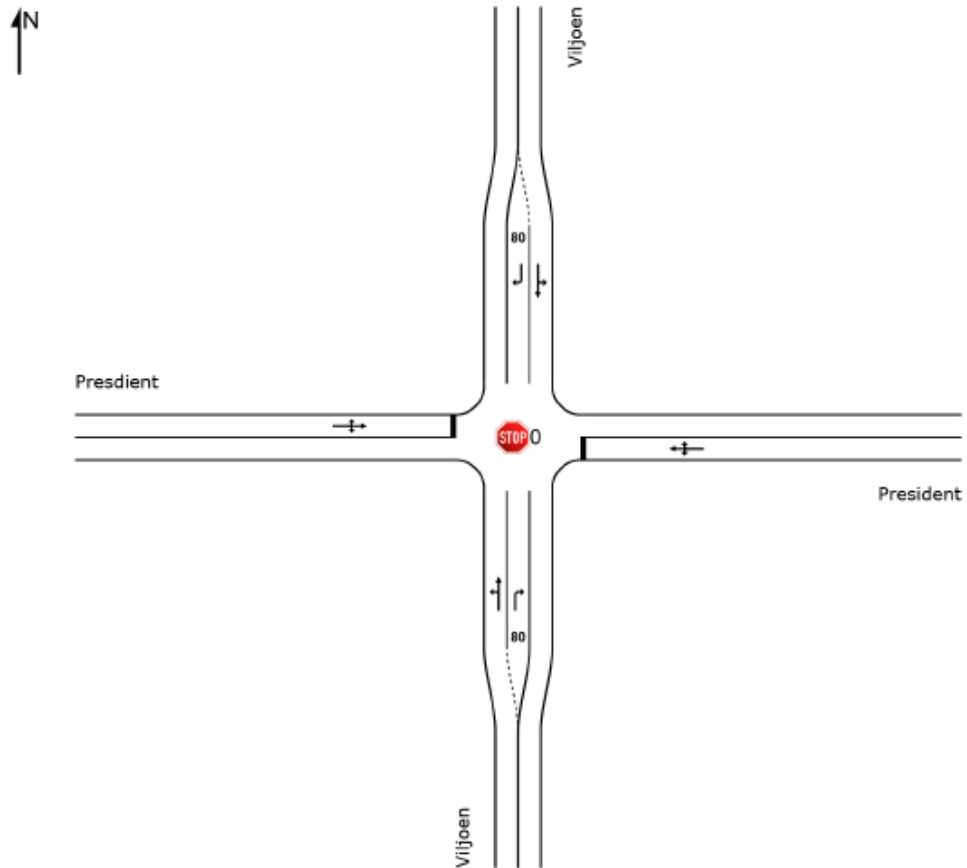
Current Layout

Worst case levels of service with this layout will be as follows:

Intersection: Viljoen / President		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
4	2028 AM Peak with development	A	A	A	A	A	A	A	A	A	A	A	A
8	2028 PM Peak with development	A	A	A	A	A	A	A	A	A	A	A	A

The intersection will continue to operate at high levels of service and no improvement is required from a capacity point of view. From a road safety point of view a change to the road markings would have been preferable as shown below.

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Preferred Layout

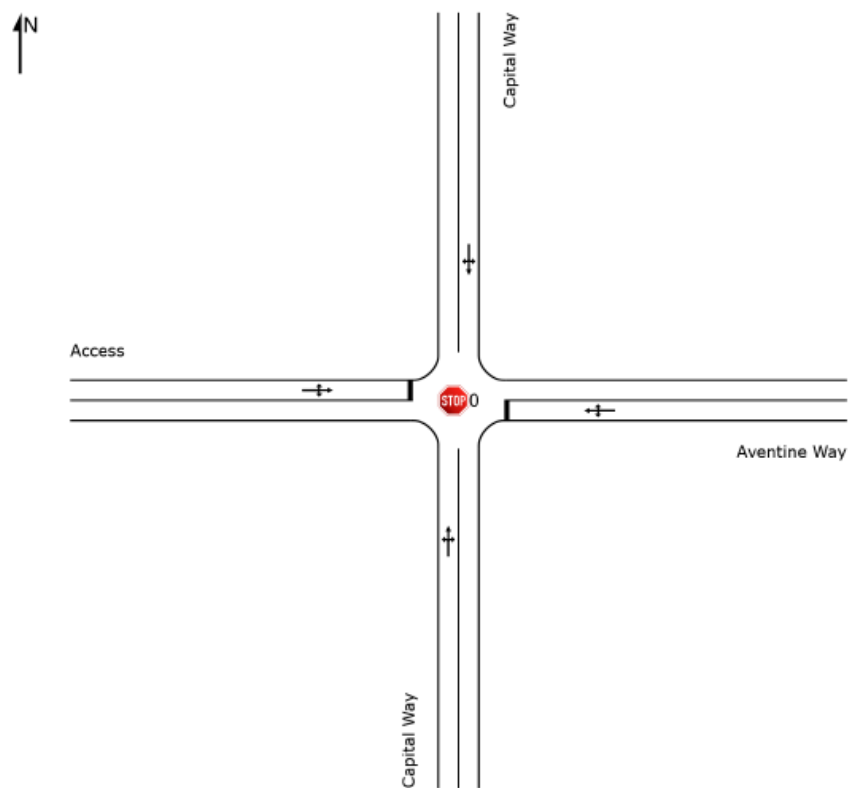
6.2 Intersection B: Wilson Street / President Street Intersection

The layout is as follows.



Photo 7: Intersection as seen from the South

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Current Layout

Worst case levels of service with this layout will be as follows:

Intersection: Wilson / President		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
4	2028 AM Peak with development	A	A	A	A	A	A	A	A	A	A	A	A
8	2028 PM Peak with development	A	A	A	A	A	A	A	A	A	A	A	A

The intersection will continue to operate at acceptable levels of service.

6.3 Intersection C: Access

With negligent apposing traffic, the access will operate at high levels of service.

6.4 Impact on Road Links

Even though the development will not result in significant trip generation, and there is not a need to upgrade any road link due to capacity considerations, note must be taken of the poor condition of some of the roads and the fact that the additional traffic volumes could potentially further affect road conditions.

Note must be taken of the following:



Photo 8: Unsurfaced Portion



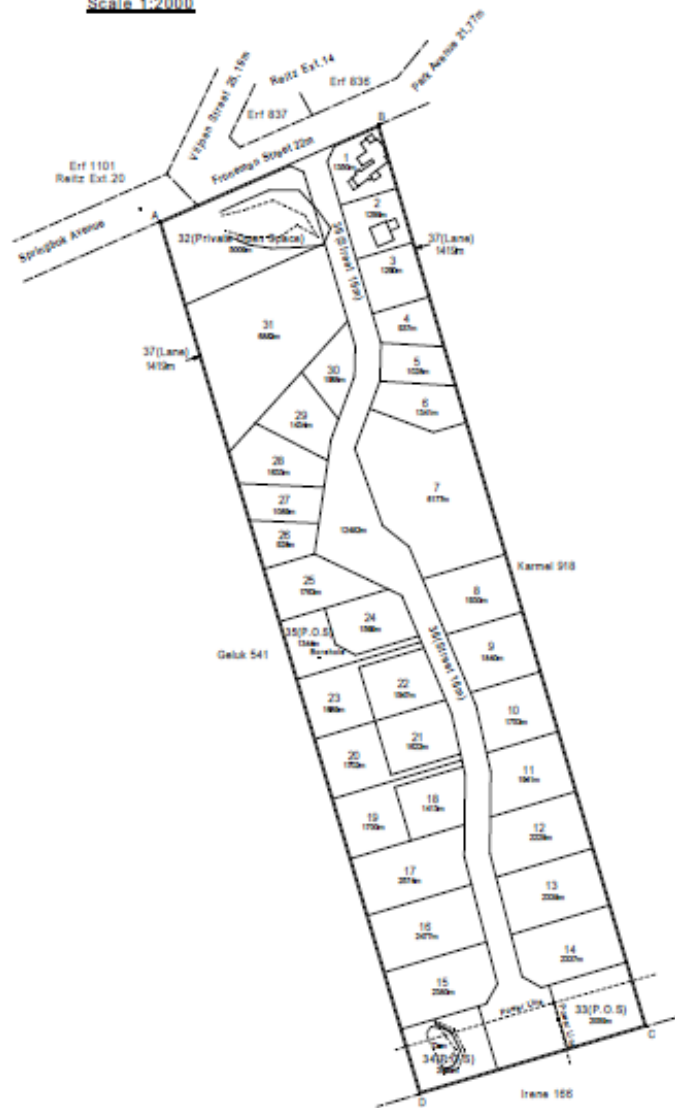
Photo 9: Poor condition of Wilson Street / President Street Intersection

7 TOWNSHIP LAYOUT

Sketch Plan of subdivision of the farm Morgen No.542

Nketoana Local Municipality
Administrative District : Reitz, Province : Free State

Scale 1:2000

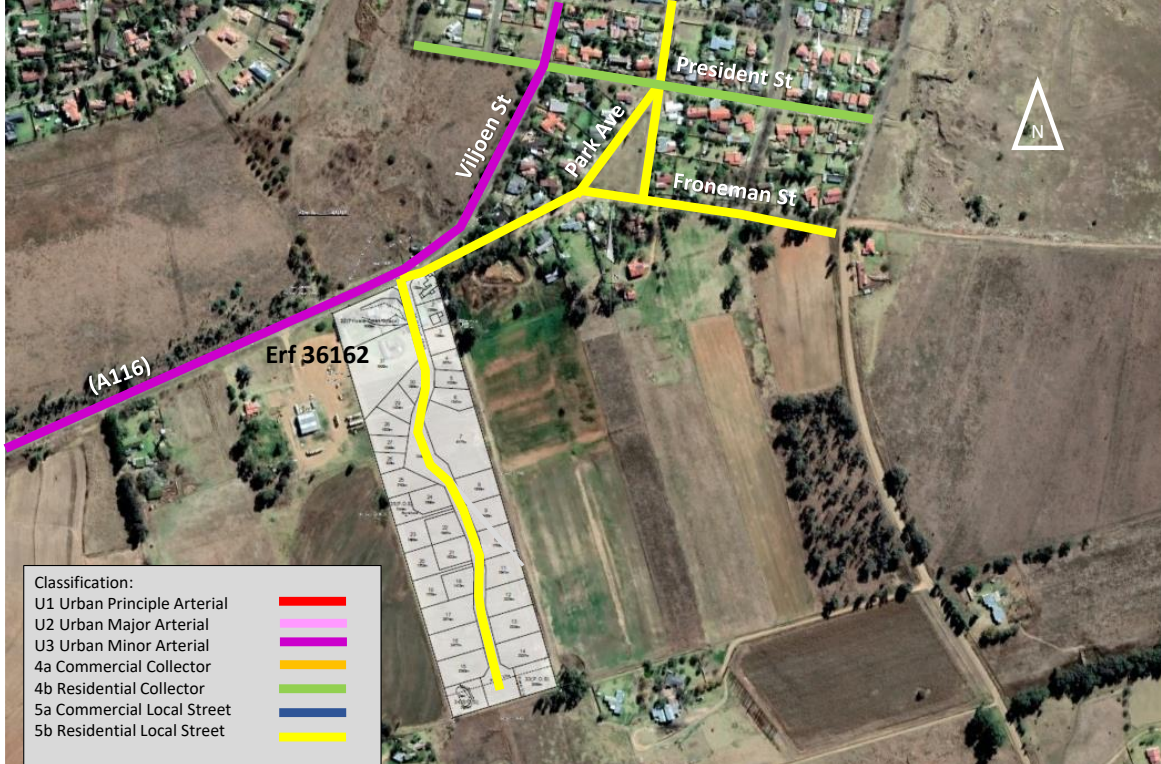



Proposed Zoning	Site Numbers	Total Area(sqm)	% of Total Area
Single Residential	1-5,8-30	4072	56,26
Town Houses(25 Units/10)	7,31	13080	15,24
Private Open Space	32-36	10463	12,20
Street	36	12544	14,54
Lane	37	1419	1,66
	37	85688	100,00

The following aspects of the site development plan are of relevant.

Of importance, it is the intention to make provision for access control to the area, which might affect the status of the internal street. This is regarded as a Town Planning / Legal consideration and from a traffic point of view the same principles are applicable for a public - or private street and the layout is evaluated as a public street network. Where necessary, possible implications are referred to.

No	Basic Aspects
1	Intersections
a	Number of intersections
	<i>Discussion:</i>
	One new intersection will be established. (Access to the area)
b	Intersection Spacing
	<i>Discussion:</i>
	The nearest intersection is the Park Avenue / Froneman Street intersection which is located at a spacing of approximately 100m. Based on TMH16 Table 8, spacing should be 30 to 50m for a Class 5b Residential Local Street.
	Spacing is thus acceptable.
c	Traffic Control Measures
	<i>Discussion:</i>
	The new intersection can be developed as a priority-controlled intersection with priority to Park Avenue
d	Traffic Capacity
	<i>Discussion:</i>
	See Section 6.3
e	Provision of deceleration lanes and turning lanes
	<i>Discussion:</i>
	Given the nature of the roads, no deceleration- or turning lanes are required.
f	Storage space at intersection versus queue lengths
	<i>Discussion:</i>
	95th percentile queue lengths will not exceed available storage space.
g	Continuity of Road Reserve Boundaries
	<i>Discussion:</i>
	The road reserve is relatively non-standard with a widening near erf 7. This is less ideal from a traffic point of view than a constant reserve, but given the low traffic volumes and speeds, the layout should function acceptably.
h	Required Improvements
	<i>Discussion:</i>
	As discussed elsewhere
i	Phasing of Required Improvements
	<i>Discussion:</i>
	Not relevant
j	Vertical alignment of intersections
	The area has a reasonable slope towards the south as can be seen in Photo 5. This will however not affect the vertical alignment of intersections is not of a concern.

2	Internal Roads																					
a	Road Classification																					
	<i>Discussion:</i>																					
	<p>The proposed classification of the new street as well as the surrounding streets is as follows:</p>  <p>If the internal street is a private road, the street might possibly not be formally classified</p>																					
b	Width of Road Reserves																					
	<i>Discussion:</i>																					
	<p>TMH 16 prescribes the following road reserve widths.</p> <table border="1" data-bbox="499 1283 1257 1529"> <thead> <tr> <th>Road Class</th> <th>Minimum width (m)</th> <th>Clear zone width (m)</th> </tr> </thead> <tbody> <tr> <td>Class 2</td> <td>40 – 60</td> <td>6.0</td> </tr> <tr> <td>Class 3</td> <td>30 - 40</td> <td>5.0</td> </tr> <tr> <td>Class 4a</td> <td>25</td> <td>3.5</td> </tr> <tr> <td>Class 4b</td> <td>20</td> <td>3.0</td> </tr> <tr> <td>Class 5a</td> <td>20</td> <td>2.5</td> </tr> <tr> <td>Class 5b</td> <td>10 - 16</td> <td>2.0</td> </tr> </tbody> </table> <p>The access road reserve is 16m, which is acceptable for a local street with services.</p>	Road Class	Minimum width (m)	Clear zone width (m)	Class 2	40 – 60	6.0	Class 3	30 - 40	5.0	Class 4a	25	3.5	Class 4b	20	3.0	Class 5a	20	2.5	Class 5b	10 - 16	2.0
Road Class	Minimum width (m)	Clear zone width (m)																				
Class 2	40 – 60	6.0																				
Class 3	30 - 40	5.0																				
Class 4a	25	3.5																				
Class 4b	20	3.0																				
Class 5a	20	2.5																				
Class 5b	10 - 16	2.0																				
c	Splays																					
	<i>Discussion:</i>																					
	Splays will be provided.																					

d	Road widths																								
	<i>Discussion:</i>																								
	TMH 16 prescribes the following road widths																								
	<table border="1"> <thead> <tr> <th>Classification</th> <th>Description</th> <th>Road Width</th> </tr> </thead> <tbody> <tr> <td>U1</td> <td>Urban Principle Arterial</td> <td>8m</td> </tr> <tr> <td>U2</td> <td>Urban Major Arterial</td> <td></td> </tr> <tr> <td>U3</td> <td>Urban Minor Arterial</td> <td></td> </tr> <tr> <td>4a</td> <td>Commercial Major Collector</td> <td>9m</td> </tr> <tr> <td>4b</td> <td>Residential Minor Collector</td> <td>9m</td> </tr> <tr> <td>5a</td> <td>Commercial Local Street</td> <td>7m</td> </tr> <tr> <td>5b</td> <td>Residential Local Street</td> <td>7m</td> </tr> </tbody> </table>	Classification	Description	Road Width	U1	Urban Principle Arterial	8m	U2	Urban Major Arterial		U3	Urban Minor Arterial		4a	Commercial Major Collector	9m	4b	Residential Minor Collector	9m	5a	Commercial Local Street	7m	5b	Residential Local Street	7m
Classification	Description	Road Width																							
U1	Urban Principle Arterial	8m																							
U2	Urban Major Arterial																								
U3	Urban Minor Arterial																								
4a	Commercial Major Collector	9m																							
4b	Residential Minor Collector	9m																							
5a	Commercial Local Street	7m																							
5b	Residential Local Street	7m																							
	In principle the internal street should be 7m wide. With access control and possibly a private street, street widths can possibly be reduced to 6m, which is in line with UTG 7: Geometric Design of Urban Local Residential Streets .																								
e	Road Curves																								
	<i>Discussion:</i>																								
	The road reserve has a number of curves and with low operating speeds should function acceptably.																								
f	Super elevation																								
	<i>Discussion:</i>																								
	No super elevation would be required.																								
g	Gradient of Roads																								
	<i>Discussion:</i>																								
	The area has a relatively significant gradient (See Photo 5) but the gradient on the internal street should still comply with the following requirements.																								
	<table border="1"> <thead> <tr> <th>Classification</th> <th>Maximum Gradient as per TMH 16 Tables 21 & 22</th> <th>Maximum Gradient as per TMH 16 Tables 21 & 22</th> <th>Short Section Gradients as per TMH 16 Table 22</th> <th>Short Section Length (m)</th> </tr> <tr> <td></td> <th>Flat Topography</th> <th>Rolling Topography</th> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>5b Residential Local Street</td> <td>10%</td> <td>10%</td> <td>12%</td> <td>70</td> </tr> </tbody> </table>	Classification	Maximum Gradient as per TMH 16 Tables 21 & 22	Maximum Gradient as per TMH 16 Tables 21 & 22	Short Section Gradients as per TMH 16 Table 22	Short Section Length (m)		Flat Topography	Rolling Topography			5b Residential Local Street	10%	10%	12%	70									
Classification	Maximum Gradient as per TMH 16 Tables 21 & 22	Maximum Gradient as per TMH 16 Tables 21 & 22	Short Section Gradients as per TMH 16 Table 22	Short Section Length (m)																					
	Flat Topography	Rolling Topography																							
5b Residential Local Street	10%	10%	12%	70																					
	A quarry is located on Erf 32 as shown below. The erf will be used as a Private Open Space.																								
																									
	As shown in the layout plan, the quarry might affect the street and it is important that this does not affect road gradients.																								

h	Traffic Circulation
	<i>Discussion:</i>
	The layout makes provision for a relatively long cul-de-sac, which is not ideal. Two turn around areas will however be provided. Given the dimensions of the site, an open circulation is not viable. One of the concerns of a long cul-de-sac is that the road can for some reason be blocked and emergency services are not able to access the area. Provision can possibly be made for an emergency gate on the southern boundary at the turn around area, which, although not to be used under normal circumstances, can be used in an emergency.
i	Capacity of Road Links
	<i>Discussion:</i>
	No road link is expected to carry traffic volumes that would require more than one lane per direction.
j	General Sight Distances
	<i>Discussion:</i>
	Sight distances are in general unrestricted and stopping sight distances will exceed 50m for Class 5b roads (Table 36)
k	Pedestrian Movements
	<i>Discussion:</i>
	Limited pedestrian movement is expected and within the layout this will be accommodated on sidewalks. In accordance with sections 13.4.1 to 13.4.8 of TMH16 at least 1.8m paved sidewalks (with a buffer strip) should preferably be provided on one side of the Class 5b local street. Care should also be taken in the vicinity of Erf 32 to ensure safe pedestrian movement adjacent to the quarry.
l	Illumination of Streets
	<i>Discussion:</i>
	Internal street illumination should be provided where necessary.
m	Refuse Removal
	<i>Discussion:</i>
	It is uncertain how refuse removal will be implemented. Refuse removal vehicles should be able to move throughout the area.
n	Public Transport
	<i>Discussion:</i>
	No specific provision is required for public transport facilities
o	Emergency Vehicle Access
	<i>Discussion:</i>
	Emergency vehicles should be able to access all areas. Also see 2h.
p	Potential Conflict Areas
	<i>Discussion:</i>
	The internal layout does not have any particular conflict areas.
q	Heavy Vehicle Usage
	<i>Discussion:</i>
	Low heavy vehicle volumes are expected.

3	Access Control
	<i>Discussion:</i>
	<p>Detail of access control is not available at the zoning stage, but it is important that a number of aspects are taken into consideration in the final planning.</p> <ul style="list-style-type: none"> • With the location of the access, it should be ensured that the access is constructed as a standard intersection with the new street appearing as a proper street and not a lower order access. • Considering the road classification, a throat (distance between erf boundary and gates) of at least 10m should be provided. • Depending on the type of access control, a median of at least 500mm will have to be provided to accommodate access control infrastructure. • Access lanes should be at least 3m wide, and with a median, 3.2m lanes should be provided. • Proper provision should also be made for a pedestrian gate.

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the study, the following conclusions and recommendations are made:

- a) The development can potentially generate 56 new trips during the morning and afternoon peak hours.
- b) The additional trip generation will not significantly affect levels of service and no improvements are required at existing intersections to accommodate the additional trips.
- c) The site development plan is in principle acceptable with consideration of the following:
 - Even if the internal streets will be a private road, from a traffic point of view the street should still be designed and constructed based on accepted public street standards
 - Care should be taken with access control to ensure that the development function acceptably, and queueing or other activities do not affect the public street.

In summary, the planned change in land use can in principle be recommended for approval from a traffic point of view.

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