PORTION OF THE FARM 312, PAMPIERSTAD.

ESTABLISHMENT OF FILLING STATION

TRAFFIC IMPACT ASSESSMENT

NOVEMBER 2022

CONSULTING ENGINEERS

Project: 7578

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REPORT SHEET

Property Description:	*Portion of the Farm 312, Pampierstad .*
Municipal Area:	*Frances Baard District Municipality*
Application:	*Establishment of Filling Station*
Type of Report:	*Traffic Impact Assessment*
Project Number:	*7578*
Declaration	*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.*
Compiled by:	*Koot Marais Pr Eng*
Signed:	
Date:	*November 2022*

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 the proposed establishment of a **Filling Station on a Portion of the Farm 312, Pampierstad.**

1.2 Background

It is the intention to develop a filling station on the development site and this study 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 the *Manual for Traffic Impact Studies, Report RR93/635, South African Department of Transport, Chief Directorate Roads* as well as *TMH 16: South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, COTO, 2018.*

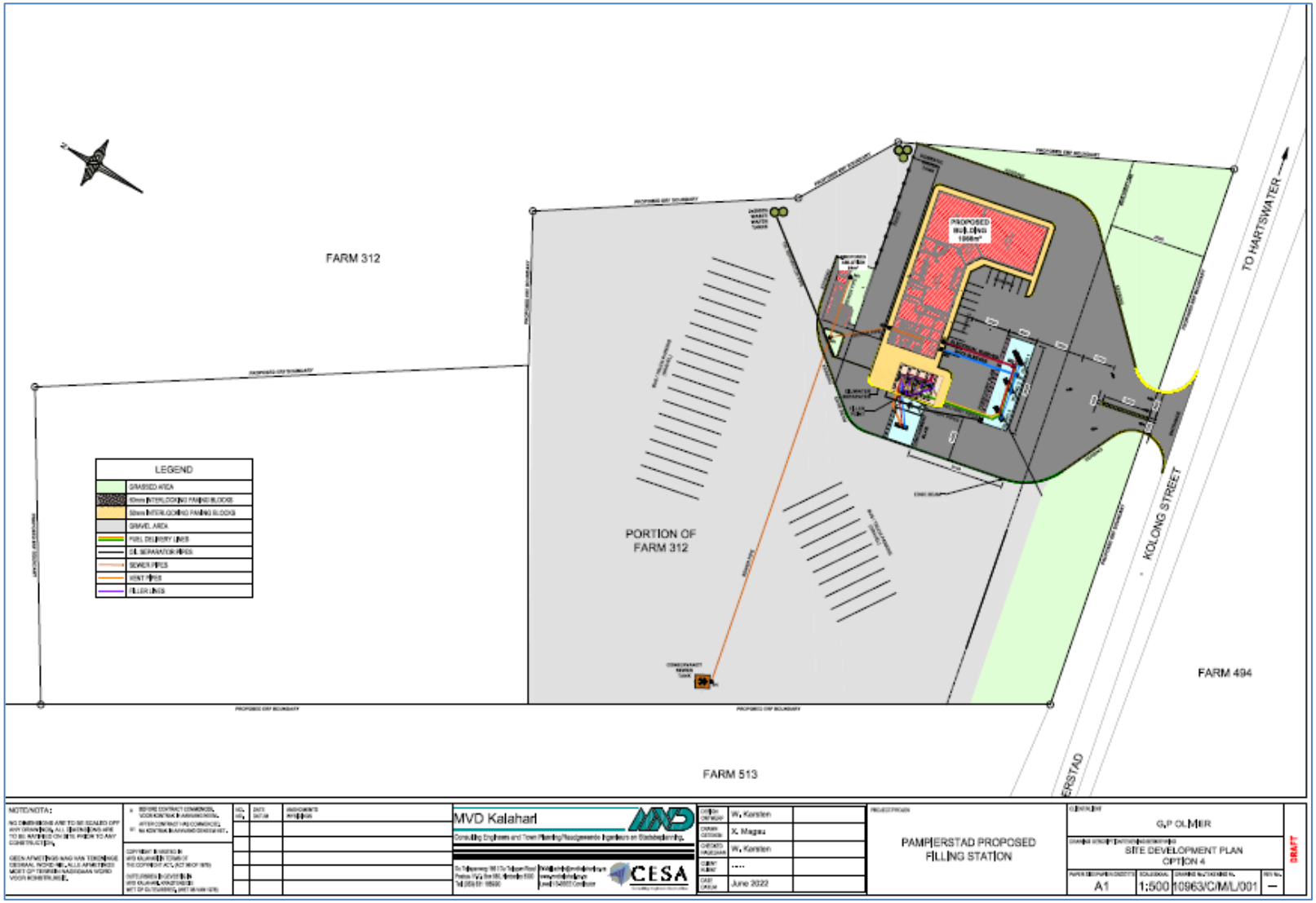
1.3 Site Location

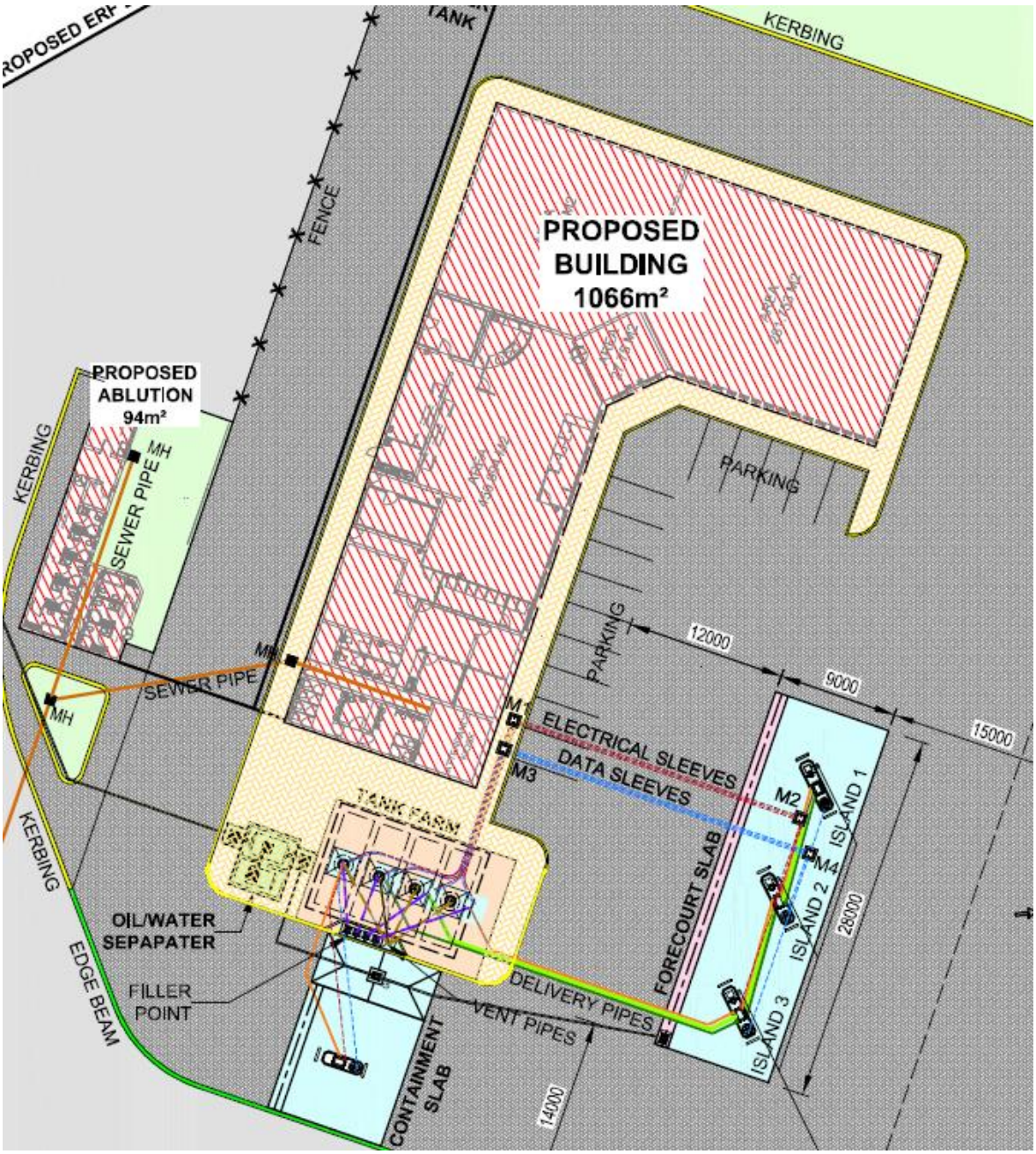
The site is located to the north of the MR933 road between Pampierstad and Hartswater.

Figures 1.1 & 1.2 Location Plans

1.4 Development

The planned development is shown in the figure below. .





The above SDP contains a building of 1066m², which is obviously not a normal filling station building with a standard convenience store. It can be assumed that the development will consist of a standard filling station (with convenience store) and additional shops of approximately 700m².

Based on information received, the retail component might only be developed as a second phase, but for the purposes of this study it has to be assumed.

Given the location 2.7km from the nearest higher density area, it is highly unlikely that the retail component will generate noticeable primary trips and will mainly serve passing traffic. Although not expected, to ensure a conservative approach for capacity analyses purposes, additional trip generation was assumed.

1.5 Scope of Analysis

1.5.1 Period for Analysis

Given the type of development, both the morning and afternoon peak hours were investigated, although the road does not display significant peak periods.

1.5.2 Warrants for a Traffic Impact Study

As the development can potentially generate in excess of 50 new trips, according to the TMH16 Volume 1, a Traffic Impact Assessment is warranted.

1.5.3 Extent of Analysis

Given the specific location and type of development, only the access was investigated.

Figure 1.3: Intersections Investigated

1.5.4 Assessment Years

Current traffic volumes and a five-year horizon were analysed. A generally accepted 3% per annum traffic growth was assumed.

1.6 Available Information

1.6.1 Traffic Counts

Long term traffic counts were undertaken between 18 July 2022 and 5 August 2022. A site visit was undertaken on 17 November 2022

2 BACKGROUND INFORMATION

2.1 Existing Road Network

The only road of importance is the following:

a) MR933 (Extension of Kolong Street)

This Main Road links Pampierstad with the N18 near Hartswater and is a two-lane undivided road.

Photo 1: Road as seen towards Hartswater

2.2 Existing Land Use

The site was previously used as a shop but the facility is not functioning at this time.

Photo 2: Current building on site

2.3 Road Planning

There is 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:

3.1.1 820 Shopping Centre

A shopping centre is an integrated (mixed-use) group of commercial establishments that operate as a unit. May include small components of other land uses, such as restaurants, hardware and paint shops, etc.

3.1.2 946 Filling Station

Filling Stations at which the primary business is the fuelling of motor vehicles. Related facilities such as a convenience shop, service facilities and a car wash are not included.

TMH 17 however does not provide any indication of trip generation rates. The South African Trip Generation Rates document provides the following information.

3.1.3 Filling Station

According to the “The South African Trip Generation Rates” [2] a filling station is expected to attract 4% of passing traffic with 16% of the attracted traffic expected to be new trips.

3.2 Trip Generation

The expected trip generation is as shown below. Filling station specific trip generation is shown in Chapter 4.

No				Reduction Factors					AM PEAK									PM PEAK								
	Land Use	No	Unit	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		
	Retail																									
820	Shopping Centre		100m²	10%	30%	60%	15%		0.60		65%	35%						3.40		50%	50%					
820	Shopping Centre	700	100m²	10%	30%		15%	0.465	3.60	1.93	65%	35%		25	13	9	5	20.40	10.92	50%	50%		143	76	38	38
	Pass-by								13%									38%		50%	50%			29	15	15
	Diverted								12%									29%		50%	50%			22	11	11
	Services																									
946	Filling Station		Station	0%	0%	0%	0%		0.00		50%	50%						0.00		50%	50%					
946	Filling Station	1	Station	0%	0%	0%	0%	0	0.00	0.00	50%	50%		0	0	0	0	0.00	0.00	50%	50%		0	0	0	0
	Total													**25**	**13**	**9**	**5**						**143**	**76**	**38**	**38**
	New Trips													**25**	**13**	**9**	**5**						**143**	**47**	**24**	**24**
	Pass By Trips													**0**	**0**	**0**	**0**							**29**	**15**	**15**

Given the location 2.7km from the nearest higher density area, it is highly unlikely that the retail component will generate noticeable trips other than pass-by trips and will mainly serve passing traffic. To ensure a conservative approach for capacity analyses purposes, additional trip generation was however assumed.

4 TRIP DISTRIBUTION & - ASSIGNMENT

The following figures show the trip distribution and - assignment.

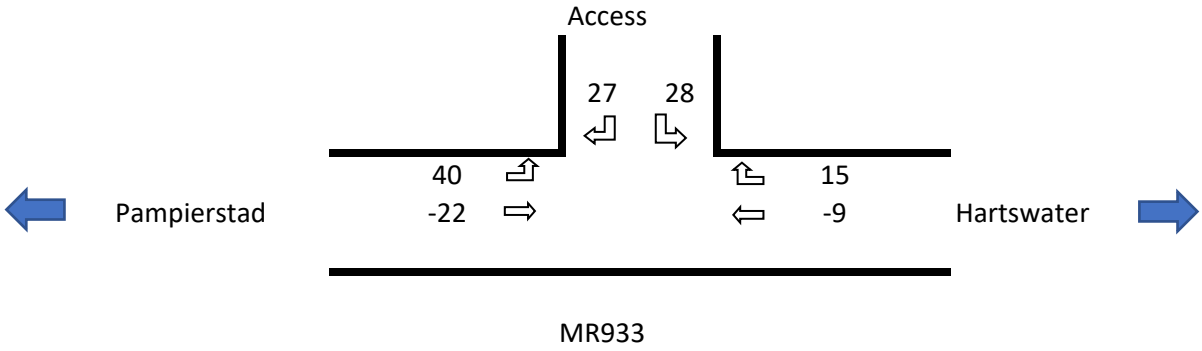


Figure 4.1a AM Trip Distribution

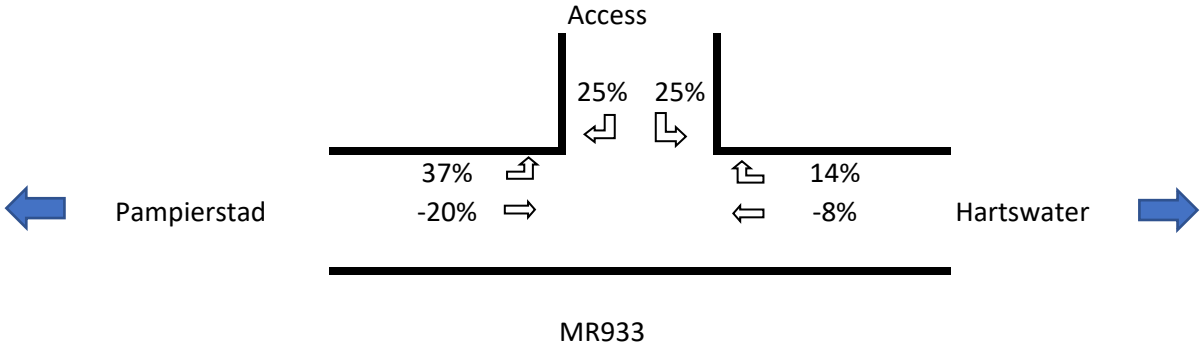


Figure 4.1b AM Trip Distribution

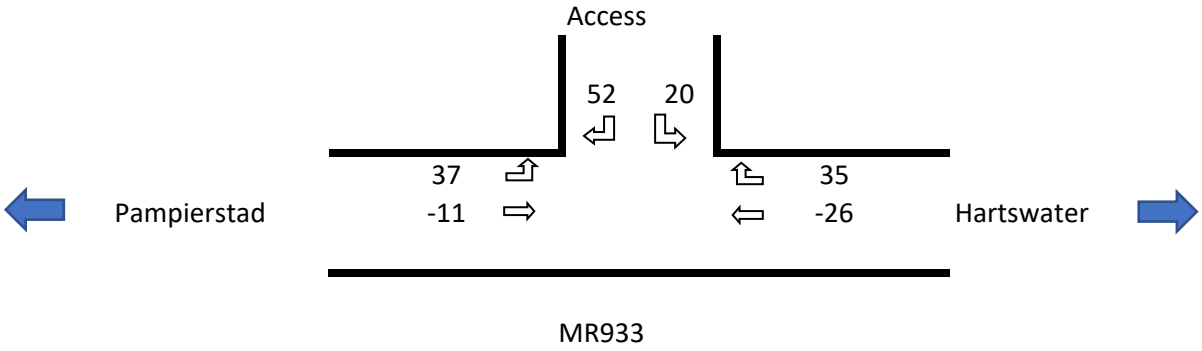


Figure 4.2a PM Trip Distribution

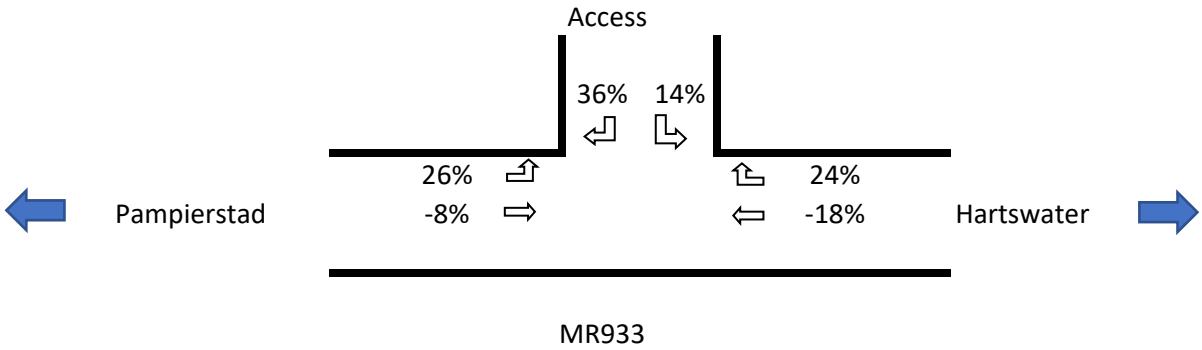


Figure 4.2b PM Trip Distribution

5 TRAFFIC SCENARIOS

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

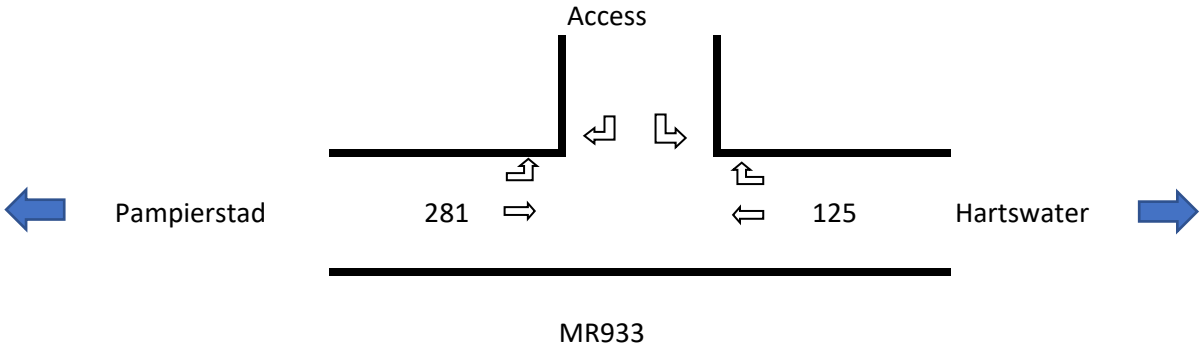


Figure 5.1: 2022 AM Peak Volumes

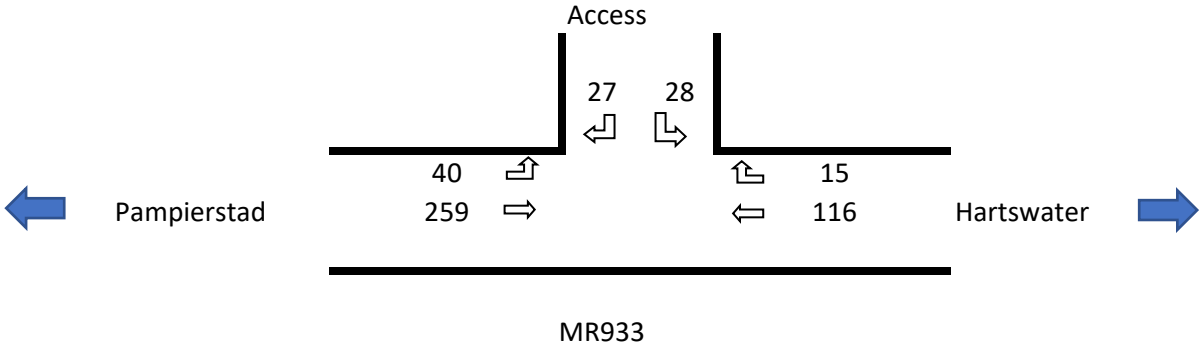


Figure 5.2: 2022 AM Peak with Development

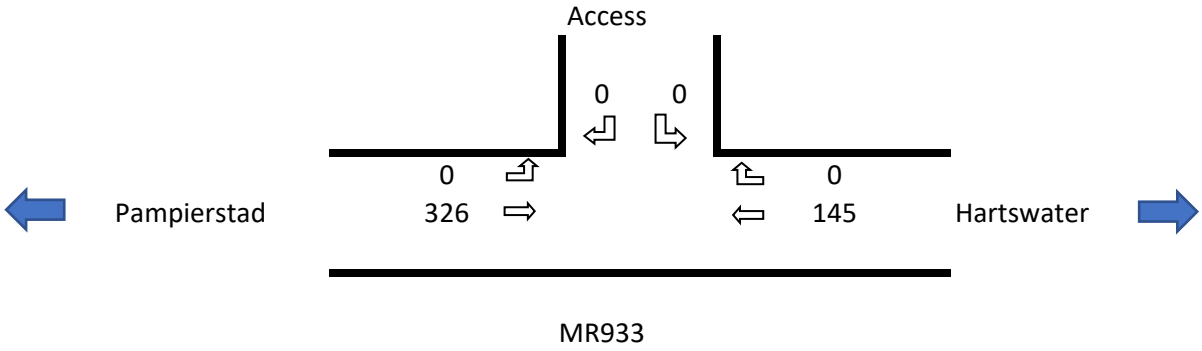


Figure 5.3: 2027 AM Background Peak

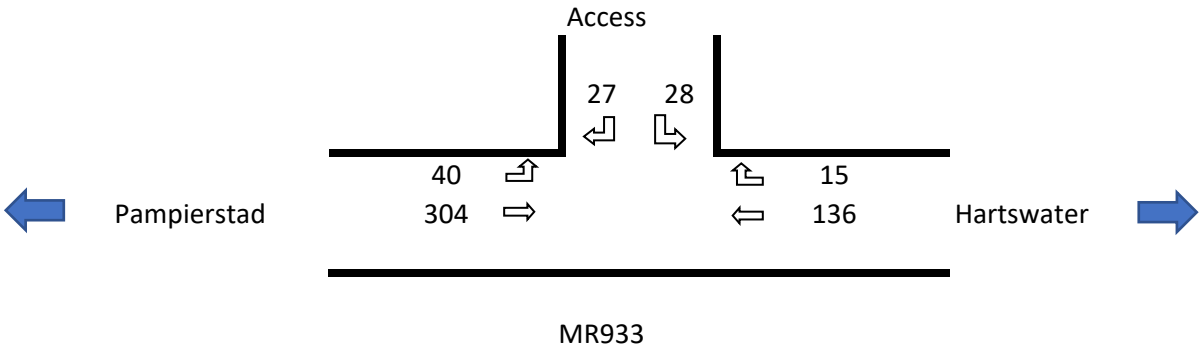


Figure 5.4: 2027 AM Peak with Development

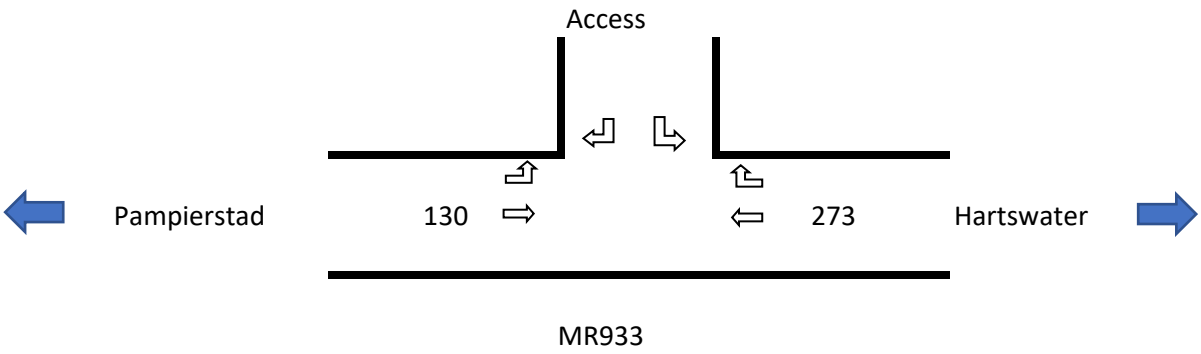


Figure 5.5: 2022 PM Peak Volumes

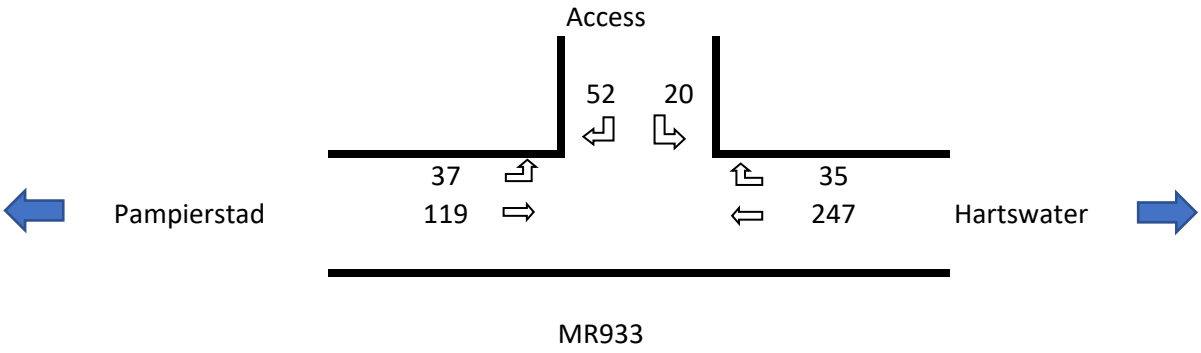


Figure 5.6: 2022 PM Peak with Development

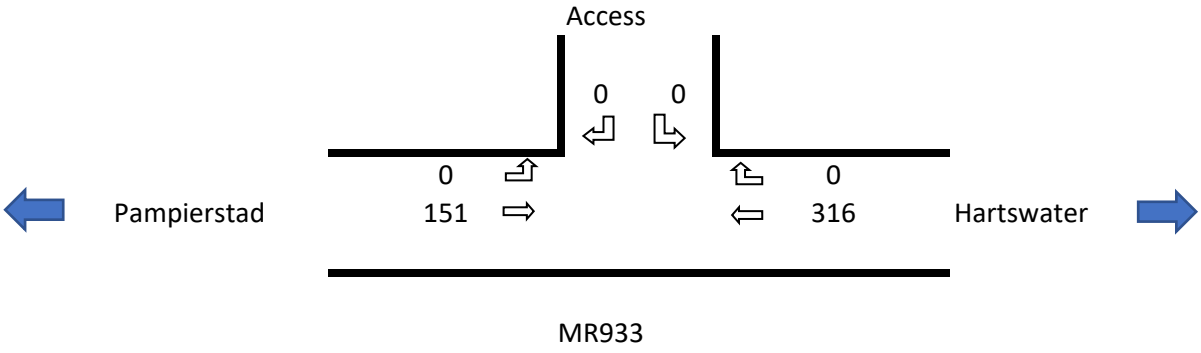


Figure 5.7: 2027 PM Background Peak

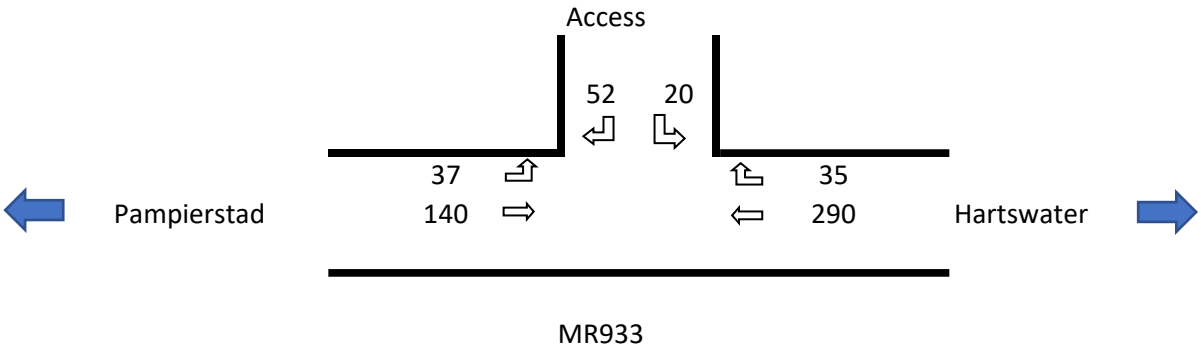


Figure 5.8: 2027 PM Peak with Development

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.

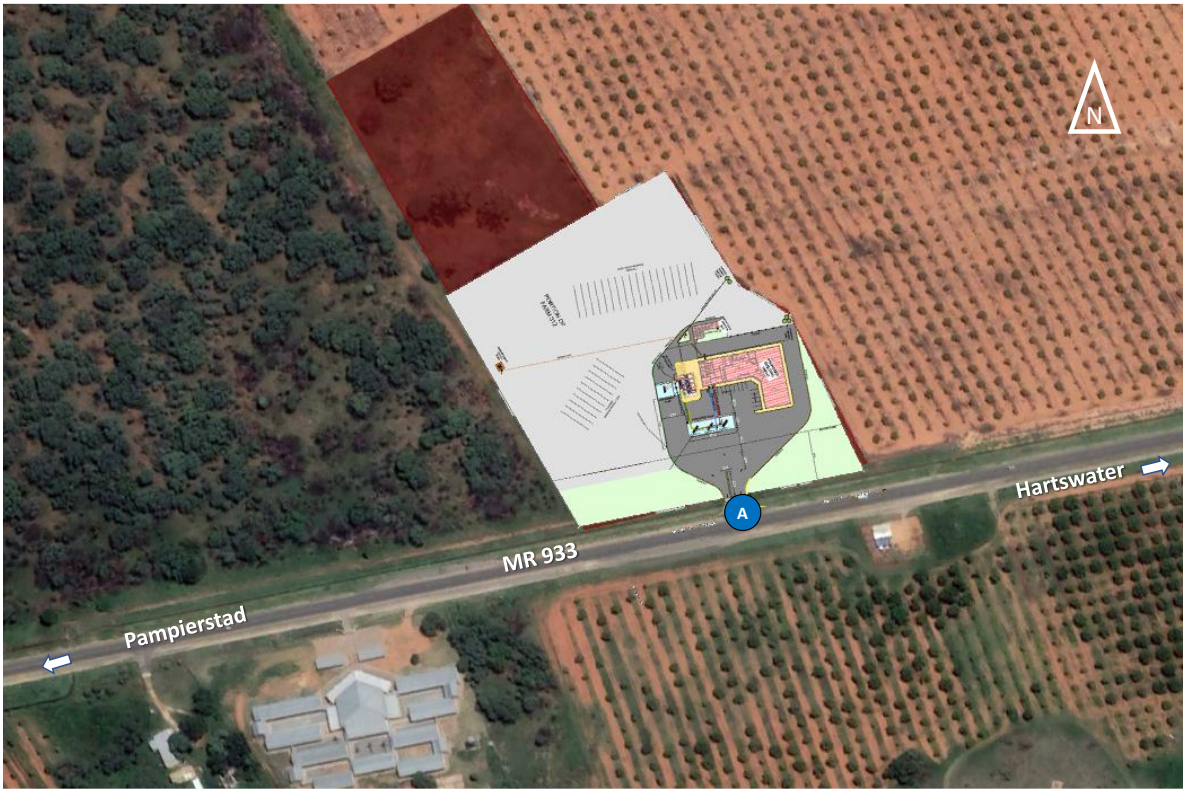
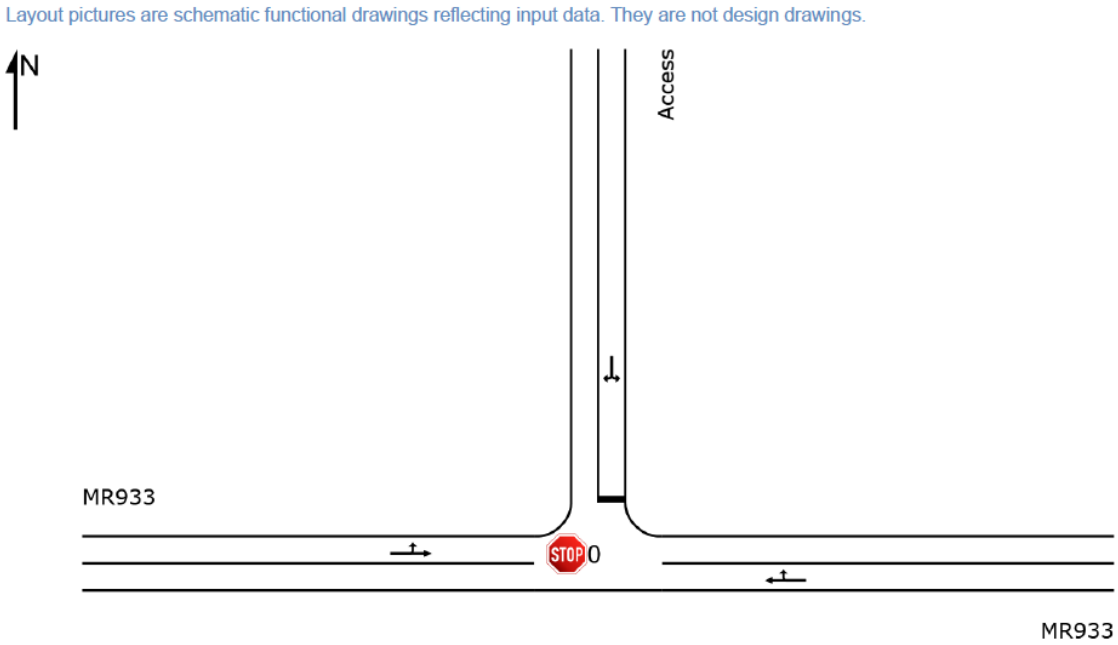


Figure 6.1: Intersections Investigated

6.1 Intersection A: Access

The current access is as follows:



Current Layout

Worst case levels of service should be as follows:

Intersection: Access		North			East			South			West		
		L	T	R	L	T	R	L	T	R	L	T	R
4	2027 AM Peak with development	B		B		A	A				A	A	
8	2027 PM Peak with development	B		B		A	A				A	A	

The access is therefore expected to operate at acceptable levels of service. Note must be taken of the findings of the next chapter.

7 SITE DEVELOPMENT PLAN

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

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DATE DATUM	June 2022

PROJECT/PROJEK
PAMPIERSTAD PROPOSED FILLING STATION

CLIENT/KLIENT
G.P OLIVIER

DRAWING DESCRIPTION/TEKENING BESKRYWING
SITE DEVELOPMENT PLAN OPTION 4

PAPER SIZE/PAPIER GROOTTE	SCALE/SKAAL	DRAWING No./TEKENING Nr.	REV Nr.
A1	1:500	10963/C/M/L/001	—

DRAFT

7.1 Access Consideration

Considering the nature of the development, access is the most important aspect of the development.

7.1.1 Road Classification

To determine the appropriate access spacing, functional road classification needs to be determined.

Of importance, according to TRH 26 the functional classification is not necessarily in line with the official classification of roads, as the latter classification can include other criteria such as administration or geometry, and not function. To investigate appropriate access management, it is thus necessary to functionally classify a road, irrespective of its formal classification

TRH 26 South African Road Classification and Access Management Manual [10] uses a six-class rural and urban road classification system. The first three classes in the system consist of mobility roads while the second three classes are used for access/activity roads or streets

A distinction is made between rural and urban areas. Roads in rural and urban areas have the same six functional classes but at different scales and standards. Rural roads have longer reaches of connectivity and therefore require higher levels of mobility than urban roads. It is therefore necessary that the classification system should differentiate between rural and urban areas.

Rural Classes		**Urban Classes**	
R1	Rural principal arterial*	U1	Urban principal arterial
R2	Rural major arterial*	U2	Urban major arterial
R3	Rural minor arterial*	U3	Urban minor arterial
R4	Rural collector road	U4	Urban collector street
R5	Rural local road	U5	Urban local street
R6	Rural walkway	U6	Urban Walkway

The area under consideration is relatively peri-urban. TRH 26 describes an urban area as follows:

For the purposes of this document, an urban area is defined as an area that has been subdivided into erven, whether formal or informal. It includes areas on which townships have been formally declared as well as informal settlements. Rural settlements of one hectare or less are also included in the urban definition.

The area mainly consists of small holdings, but mostly bigger than the one-hectare standard. The MR933 however primarily links Pampierstad with Hartswater as the main centre of employment, indicating a more urban character.

If regarded as an urban area, the road can be classified as U3 Urban Minor Arterial.

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Class U3 Urban Minor Arterials

Urban minor arterials would typically be required to serve traffic in most urban areas, including small towns.

In cities and larger towns, the Class U3 arterials would be used to provide connections between districts of the city or town and form the last leg of the journey on the mobility road network, bringing traffic to within one kilometre of its final destination. In small towns, they would be used to provide general overall mobility to the whole town. The arterials can also be used to serve economic activity centres that are not served by Class 1 or 2 arterials.

The Class U3 arterials should also be used to serve as connectors to rural Class 3 routes. They should preferably start and stop at arterials of equal or one higher Class (2 to 3), but can connect to Class 1 principal arterials.

Minor arterials function as through routes on a district scale. While still carrying predominantly through traffic, they serve shorter distance trips with a length of around 2 km, but can be as short as a single block if connecting higher order routes.

The minor arterials would typically carry volumes of traffic of between 10 000 and 40 000 vehicles per day.

If regarded as a rural area, a Class R3 Rural Minor Arterial can be considered. The typical length of these routes however varies between about 10 km and 100 km, which is not typical of the MR933.

Practically, if regarded as a rural road the road can be regarded as a Class R4 Rural Collector, which TRH26 describes as follows:

Class R4 rural collector roads

These roads form the link to local destinations. They do not carry through traffic but only traffic with an origin or destination along or near the road. A collector road must never be quicker to use to pass through an area than the alternative mobility road.

These roads would typically give access to smaller rural settlements, tourist areas, mines, game and nature parks and heritage sites. The roads can also provide direct access to large farms. Collector roads can also be provided within larger rural settlements to provide a collector function in such settlements.

The length of these roads would mostly be shorter than 10 km. Traffic volumes should not be more than about 1 000 vehicles per day

From a practical point of view Class U3 and Class R4 roads have similar spacing requirements and it is not critical to finalise the type of area for spacing purposes.

`

7.1.2 Intersection / Access Spacing

Current high-volume access spacing in the area is as follows. (There are a number of low volume accesses in the area, which are probably mostly not formally approved)

TMH 16 prescribes as follows with regards to access to filling stations (service stations):

Service stations

4.5.1. Access to service (filling) stations is subject to the same conditions and requirements applicable to other types of development, but with the following exemptions:

a) Access may be provided by means of marginal access on all classes of roads in both urban and rural areas.

b) Access separation requirements may be reduced as specified in this manual.

4.5.2. The above exemptions may only be allowed when the access is restricted to the service station only and not to a shared access with any other adjacent erven or other parts of the road network. This restriction is not applicable where the access meets all the requirements provided in this chapter (i.e. if no exemptions are required to accommodate the access).

4.5.3. The service station may include ancillary facilities associated with the service function of the service station and which are intended to serve the driving public making use of the primary service function. The ancillary facilities may not be primary trip generators.

The Manual prescribes the following access separation for Class 2 and 3 roads

`

Intersection/Access configuration	Class 2	Class 3
a) Right-turn lanes not required	150-175 m	125-150 m
b) Right-turn lane required in one direction only	150-175 m	125-150 m
c) Right-turn lanes required in two directions	250-300 m	200-250 m
d) Service station without bus stop	125-150 m	100-125 m
e) Service station with bus stop (includes bus stop)	150-175 m	125-150 m

Although the development might contain a retail component bigger than a normal convenience shop, with a location 2.7km from the nearest higher density area, it is highly unlikely that the retail component will be a primary trip generation and the requirements of the table above should be applicable.

In principle the minimum access spacing is 150m to 175m, which is available.

7.1.3 Sight Distances

Stopping sight distance should at least at all times be maintained. This is the distance required to enable a driver to observe an obstruction, and stop in time.

Basic stopping sight distances are as follows:

Table 34 Stopping sight distances (AASHTO, 2004)

Design speed				Stopping sight distance (m) for gradients of:			
(km/h)	-9%	-6%	-3%	0%	3%	6%	9%
20	25	20	20	20	20	20	20
30	35	35	35	35	35	30	30
40	55	50	50	50	45	45	45
50	75	70	70	65	65	60	60
60	100	95	90	85	80	80	75
70	125	120	110	105	100	100	95
80	155	145	140	130	125	120	115
90	190	175	165	155	150	145	140
100	225	210	195	185	175	170	160
110	265	245	230	215	205	195	190
120	305	285	265	250	235	225	215
130	350	325	305	285	270	255	245

Ideally adequate gap acceptance sight distance must be provided at access to allow drivers to find a sufficiently large gap in the traffic stream to enter the road safely and with limited disruption to the traffic on the main road.

Sight distance to the east is unrestricted, as shown below.

Photo 3: Unrestricted sight distance to the east

The available sight distance to the west is more than 700m

Photo 4: Sight distance to the west

The area has a 60km/h speed restriction and based on TMH 16 the minimum gap acceptance sight distance should be 158m.

In this instance sight distances far exceed the requirements.

`

7.1.4 Provision of Auxiliary Lanes

Although auxiliary lanes are not specifically required from a capacity point of view, note should be taken of the need for auxiliary lanes based on safety considerations.

The requirements differ if the road is regarded as a U3 Urban Minor Arterial or as a Class R4 Rural Collector

a) Urban Standards for Arterials

If the road is regarded as a Class 3 Urban Minor Arterial the following should be considered:

- According to TMH16 Section 7.4.2 and Table 13 a right turn lane and left turn deceleration lane should be provided on the uncontrolled approaches.
- Based on Table 13 the right turn lane should be at least 80m in length, whilst the left turn lane should be 65m long
- TMH16 does not make provision for an acceleration lane in urban areas other than at a signal-controlled intersection. An acceleration lane is thus not recommended in this instance.

b) Rural Standards for Collectors

The TMH 16 prescribes the following:

- According to TMH16 Section 7.4.2 and Table 13 a right turn lane should be provided, but a left turn deceleration lane is not compulsory on uncontrolled approaches.
- Requirements are provided for the lengths of auxiliary lanes at traffic signal and priority-controlled intersections in urban areas, but not for intersections in rural areas. Auxiliary turning lanes must however be of sufficient length to accommodate queues at the intersection and, for turning vehicles to decelerate without resulting in an unacceptable speed differential.
- In this position a right turn lanes should be provided of at least 50m to allow at least two heavy vehicles to queue in the right turn lane whilst waiting for oncoming traffic.
- If regarded as a rural road, according to TMH16 the following is prescribed:

  7.6.1 Acceleration lanes must be provided on rural Class 1 to 3 priority-controlled intersections to allow trucks turning onto a road to accelerate before entering the traffic stream.

  7.6.3. The required length of the acceleration lane is 500 m irrespective of the class of roads

  An acceleration lane should thus be provided.

c) Summary

.Given the peri-urban nature of the site, from a practical traffic point of based on ensuring safe operations, the requirements for an urban road are recommended, namely:

- Provision of a right-turning lane of at least 80m from the east
- Provision of a 65m left turn lane from the west.
- An acceleration lane is not recommended in this instance

`

7.1.5 Access Gradient

An aspect to consider in this instance is the water canal with a bridge structure which will have to be crossed to obtain access, as shown below.

Photo 5: Bridge structure

TMH16 prescribes as follows:

7.3.1. The gradient of intersecting roads should be as flat as practical on those sections of the roads that are used for the storage of stopped vehicles (referred to as "storage platforms" by AASHTO (2004)).

7.3.2. Grades steeper than 3% significantly affect capacity, traffic operations and driver judgement at intersections. Stopping distances increase significantly on steeper downgrades, particular for heavy vehicles. Longer gap acceptance sight distances are also required

Grades steeper than 3% should therefore be avoided. Where this is not possible, alternative locations for the intersection or access must first be considered and evaluated.

Apart from widening of the structure, care should thus also be taken to ensure acceptable gradients.

`

7.2 Other Aspects

7.2.1 Throat Length

To ensure turning vehicles on the site do not affect vehicles entering the site, a throat length (clear portion of road between site boundary and first turn off) of approximately 20m should be provided. Provision is made for this in the concept layout plan.

7.2.2 Traffic Flow on Site

Although it is accepted that the layout is still conceptual, the basic layout seems acceptable with sufficient manoeuvring movement.

7.2.3 Provision for Fuel Tanker

It is important that a fuel tanker parked on the site should not affect traffic flow on the site. The site is of sufficient size to ensure this.

`

8 CONCLUSIONS AND RECOMMENDATIONS

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

a) The development will not have a notable effect on levels of service and capacity considerations are not of a concern.

b) The site can be developed as a filling station with the current access as it is believed that the facility will mainly serve passing traffic and will generate insignificant primary trips.

c) Although upgrading of the access is not required from a capacity point of view, for road safety purposes and to comply with the requirements of TMH16, the access should be upgraded as follows:

.

- Provision of a right-turning lane of at least 80m from the east
- Provision of a 65m left turn lane from the west.
- An acceleration lane is not recommended in this instance

d) An acceptable site development plan is possible

In summary, the development can be recommended for approval from a traffic point of view.

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