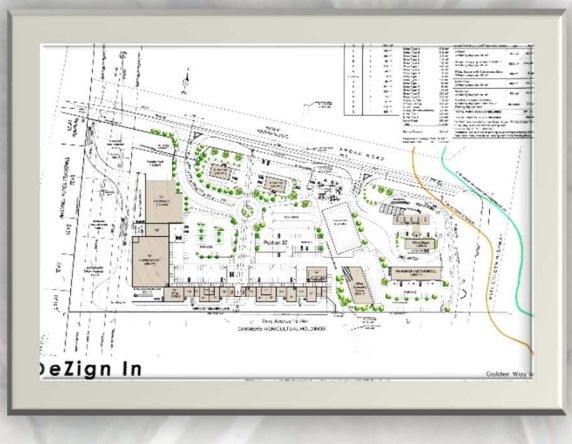
addendum 9

SYNCHRONICITY DEVELOPMENT PLANNERS



TRAFFIC IMPACT STUDY

(AUGUST 2022)

PROPOSED TOWNSHIP: ENNERDALE SOUTH EXTENSION 6

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Hamatino Consulting Engineers	**TITLE OF REPORT:** **TRAFFIC IMPACT STUDY: ENNERDALE SOUTH EXTENSION 6**

Report File Name:	P 30_22/TIA/Ennerdale South Extension 6
Client:	Synchronocity Development Planners.

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DESCRIPTION OF REVISIONS	REVISION	DATE

EXECUTIVE SUMMARY

ABSTRACT

Client is desirous to establish a shopping center on Portion 37 of the farm Fonteine 313-IQ to be known as Ennerdale South Extension 6.

A formal township application is currently been prepared by Synchronicity Development Planning in order to obtain the necessary statutory approvals required for the commencement of this development.

It is currently anticipated that the development will consist of the following:

- Business 1: 0.3476 ha;
- Business 3: 3.1175 ha;
- Commercial 1: 0.8826 ha
- Special: 0.6481 ha (Restaurants, Informal Trading)
- Filling Station

The applicable site is being bordered along the eastern boundary by Road R553 (Golden Highway) and Broad Road along the northern boundary.

Access to the development will be provided from Broad Road which abuts the development along the northern boundary. Both these roads sorts under the jurisdiction of Gautrans.

The compilation of a traffic impact study is a requirement in accordance with TMH 16 (South African Traffic Impact and Site Traffic Assessment Manual), hence this study.

RECOMMENDATIONS

Based on the conclusions that have been derived from this study (refer section 11), the following are recommended:

- That the development be supported from a traffic engineering point of view;

- That the following intersections be upgraded in accordance with section 7 of this report:
    - Broad Rd / R553 (Golden Highway) Intersection;

- Access to the shopping centre be provided in accordance with the relevant township layout plan and as approved by the Gautrans;

- It be noted that Access to the filling station is currently under discussion with Gautrans

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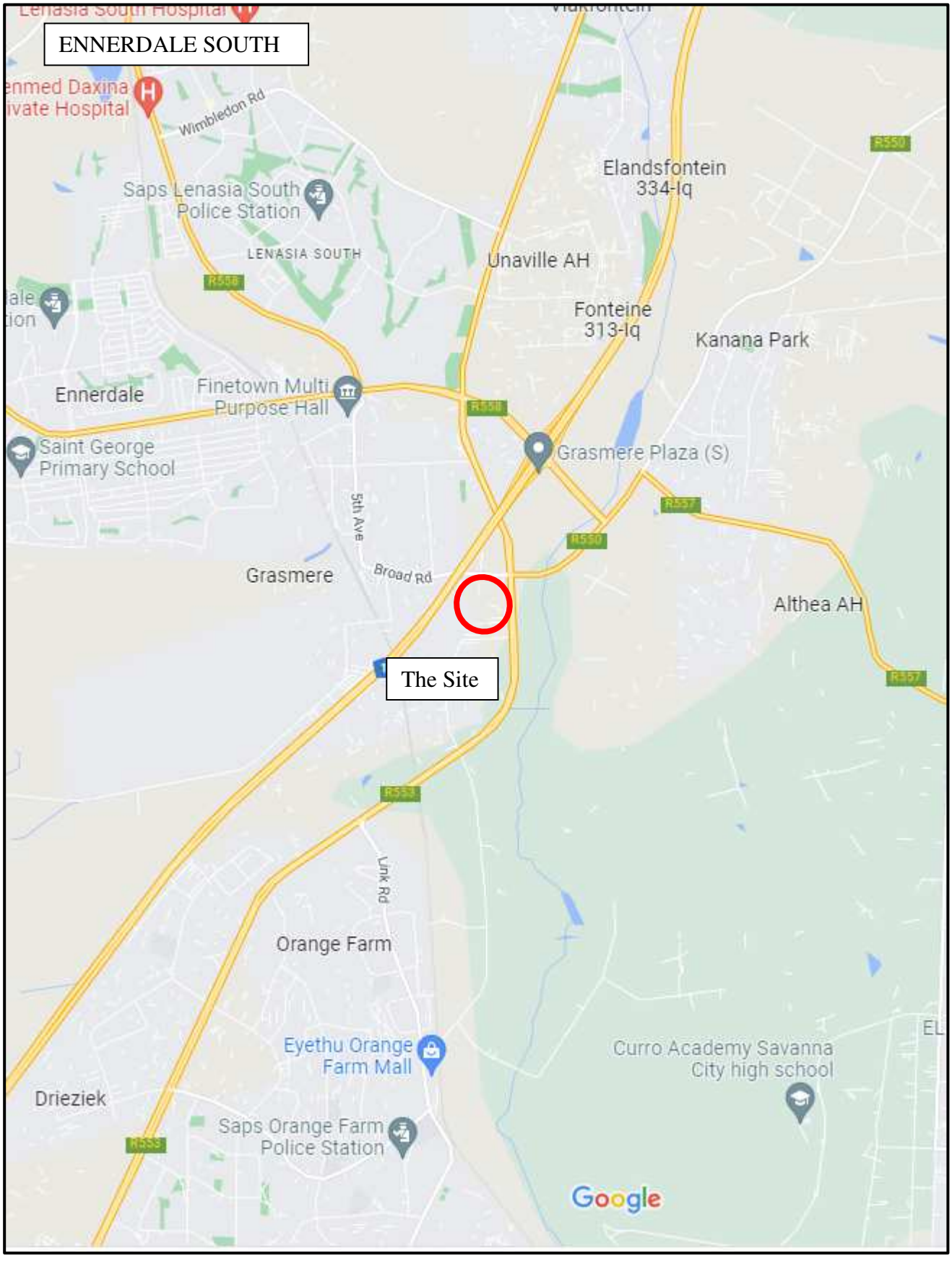


1. INTRODUCTION

1.1 BACKGROUND

Client is desirous to establish a shopping center on Portion 37 of the farm Fonteine 313-IQ to be known as Ennerdale South Extension 6.

A formal township application is currently been prepared by Synchronicity Development Planning in order to obtain the necessary statutory approvals required for the commencement of this development.

It is currently anticipated that the development will consist of the following:

- Business 1: 0.3476 ha;
- Business 3: 3.1175 ha;
- Commercial 1: 0.8826 ha
- Special: 0.6481 ha (Restaurants, Informal Trading)
- Filling Station

The applicable site is being bordered along the eastern boundary by Road R553 (Golden Highway) and Broad Road along the northern boundary.

Access to the development will be provided from Broad Road which abuts the development along the northern boundary. Both these roads sorts under the jurisdiction of Gautrans.

The compilation of a traffic impact study is a requirement in accordance with TMH 16 (South African Traffic Impact and Site Traffic Assessment Manual), hence this study.

1.2 PURPOSE OF THIS STUDY

The primarily purpose of this study is to ensure that the access and external road infrastructure to the development is appropriate, safe and will be able to accommodate the anticipated traffic demand in a safe and efficient manner.

The study is done in order to ensure that an acceptable level of service is maintained at all times. In the event that un-acceptable intersection levels of service are expected, mitigation measures are proposed accordingly.

1.3 STUDY AREA

The study area is limited to an analysis of the following intersections (refer figure 1 below):

- Broad Road / Development Access Intersection;
- Broad Rd / R553 (Golden Highway).

1.4 TRAFFIC NOMENCLATURE

Traffic nomenclature used in this report includes the following:

Vph : Vehicles per hour

Pcu : Passenger car unit

Kph : Kilometres per hour

V/C : Volume to capacity ratio

LOS : Level of service

According to the Highway Capacity Manual, the LOS is defined according to the following table:

TABLE 1: LEVEL OF SERVICE

LEVEL-OF-SERVICE CRITERIA FOR PRIORITY INTERSECTIONS & ROUNDABOUTS

Level of Service	Average Control Delay (S/veh)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

LOS	Control Delay per Vehicle (s/veh)
A	0-10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Table 1 indicates the levels of services as A to F, of which A is the best and F is the worst level of service.

An explanation of the respective levels of services is as follows:

Level of Service A: Free flowing traffic with a volume to capacity ratio between 0 to 0.1

Level of Service B: Low stable flow with a volume to capacity ratio between 0.1 to 0.3

Level of Service C: High stable flow with a volume to capacity ratio between 0.3 to 0.7

Level of Service D: Approaching unstable flow with a volume to capacity ratio between 0.7 to 1.0

Level of Service E: Unstable flow with a volume to capacity ratio of 1.0

Level of Service F: Forced flow

Intersections or lanes with a Level of Service E or F should be upgraded as soon as possible.

2. METHODOLOGY

The methodology undertaken in conducting this study was as follow:

- Discussion of the project with the Client;

- Study of background information & other reports compiled to date;

- Conduct weekday morning (06h00 to 09h00am) and afternoon (15h00 to 18h00) peak hour traffic counts in order to determine the existing background traffic volumes. Traffic counts has been conducted as follow:

    - Traffic surveys have been undertaking by means of a CCTV camera recording of each intersection;
    - The recorded videos have been manual counted in office on the sample sheets provided from this office at 15 min intervals (06:00am – 09:00am and 15:00pm – 18:00pm one weekday only);
    - 3 leg intersections consist of 6 movements through the intersection;
    - 4 leg intersections consist of 12 movements through the intersection;
    - Volumes are classified into light vehicles (LV) and heavy vehicles (HV)
    - Light vehicles are passenger cars, light delivery vehicles, bakkies, kombis and motorcycles;
    - Heavy vehicles all others.

- Analyse the existing intersection levels of service. The Traffix for Windows as well as Sidra Intersection 5.0 software package was used to determine the existing levels of service, V/C ratios and the total delay experienced at the analysed intersections. Analysis performed is based on the method dictated in the Highway Capacity Manual;

- Determine the number of trips that will be generated by the development. Trip generation was calculated by using trip generation rates for typical land uses, with specific reference to the South African Trip Data Manual (TMH 17);

- The land uses and areas has been adopted from the site development plan which has been compiled by others;

- Determine the trip distribution, using the existing trip distribution pattern of the area.

- Determine the impact of the proposed development on the adjacent road network during peak traffic hour periods for both the 2022 as well as future year 2027 development scenarios;
- Propose mitigation measures if applicable;
- All of the above to be included in a single volume report, for approval by the local authority & Roads Authority.

3. TRAFFIC STATUS QUO

3.1 EXISTING PEAK HOUR TRAFFIC VOLUMES

Traffic surveys were conducted during the week starting on Tuesday 27 July 2021 and ending Monday 02 August 2021.

The peak hour traffic counts were conducted during the following times:

- Morning: 06h00 to 09h00 am (Tuesday 27 July 2021);
- Afternoon: 15:00 – 18:00 pm (Tuesday 27 July 2021).

The weather was mostly sunny and pleasant with no adverse weather conditions experienced during the counting days. Normal Traffic flow phenomena were observed during all of the counting days.

The following information was deduced from the traffic counts:

TABLE 2: PEAK HOUR TRAFFIC COUNTS

Intersection	2021 Count	Peak hour	Peak hour Factor
AM TRAFFIC			
Broad Rd / R553 (Golden Highway	2447	07:00 – 08:00	0.91
Broad Rd / Access	231	07:00 – 08:00	0.93
FRIDAY PM TRAFFIC			
Broad Rd / R553 (Golden Highway)	2879	17:00 – 18:00	0.91
Broad Rd / Access	240	17:00 – 18:00	0.9
SATURDAY TRAFFIC			
Broad Rd / R553 (Golden Highway)	2736	17:00 – 18:00	0.9
Broad Rd / Access	303	17:00 – 18:00	0.9

3.2 7 - DAY TRAFFIC COUNT

A 07-day, 24-hour traffic count was performed by this company during the week starting Tuesday 27 July 2021 and ending Monday 02 August 2021.

Sunny and pleasant weather was experienced most of the week. Normal traffic flow was therefore not affected by extreme weather conditions.

A cctv camera recorder has been set up at the intersection of R553 / R550 with GPS coordinates 26°25'35.33"S 27°52'39.69"E (D,M,S format).

A summary of the traffic volume counts are tabled in tables 1 below
The following ADT has been found to be applicable:

- North bound (along R553): 12 944 Vehicles per day;
- South bound (along R553): 14 449 Vehicles per day;
- West bound (along R550 passing site): 1715 Vehicles per day;
- East bound (along R550 passing site): 1522 Vehicles per day.

TOTAL **30 629 Vehicles per day**

TABLE 3: SUMMARY OF 7 DAY TRAFFIC COUNT

DAY	DATE	TOTAL VEHICLES					LIGHT VEHICLES				HEAVY VEHICLES			
		NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	NB	WB	SB	EB
Tue	27-Jul-21	12613	1637	14010	1392	29652	12074	1572	13359	1339	539	65	651	53
Wed	28-Jul-21	12747	1616	14034	1408	29805	12195	1532	13359	1345	552	84	675	63
Thu	29-Jul-21	12866	1601	14205	1491	30163	12315	1509	13492	1414	551	92	713	77
Fri	30-Jul-21	12999	1664	14220	1385	30268	12419	1585	13545	1322	580	79	675	63
Sat	31-Jul-21	14430	1913	15726	1887	33956	14067	1859	15321	1848	363	54	405	39
Sun	01-Aug-21	12191	1933	14903	1723	30750	11966	1881	14466	1696	225	52	437	27
Mon	02-Aug-21	12759	1639	14046	1368	29812	12200	1572	13382	1313	559	67	664	55
TOTAL WEEK (7 days)		**12944**	**1715**	**14449**	**1522**	**30629**	**12462**	**1644**	**13846**	**1468**	**481**	**70**	**603**	**54**
ADT (sum of both directions)												30629		

The observed traffic volumes are shown in Appendix A to this report.

4. ANALYSIS: EXISTING SCENARIO 2022

4.1 AM AND PM: PEAK ANALYSIS

It was found from the development trip generation that the Friday pm and Saturday trip generations are significantly higher than the weekday am trip generation.

Analysis in the remainder of the report was consequently conducted for the above-mentioned peak traffic hour scenarios.

The Traffix for Windows as well as Sidra Intersection 5.0 software package was used to determine the existing levels of service, V/C ratios and the total delay experienced at the analysed intersections. Analysis performed is based on the method dictated in the Highway Capacity Manual.

It is evident from table 4 below that the following intersections are currently (2022) operating at an un-acceptable level of service:

- Broad Rd / R553 (Golden Highway) Intersection;

The above-mentioned intersections need to be upgraded in order to be able to accommodate the existing 2022 background traffic demand prior to development.

Intersection upgrading is discussed in section 7 of this report.

TABLE 4: PEAK HOUR EXISTING LEVELS OF SERVICE (2022)

INTER-SECTION	LEVELS OF SERVICE AND DELAY (s)												
	Northbound			Southbound			Eastbound			Westbound			Int
	L	S	R	L	S	R	L	S	R	L	S	R	LOS
FRIDAY PM													
Broad Rd / R553 (Golden Highway)	B	C	F	B	F	B	C	C	C	F	F	F	F
	11	24.5	57.7	10.9	88.4	13.9	16.1	16.1	16.1	799	799	799	357.5
Broad Rd / Access	Yet to be provided												
SATURDAY													
Broad Rd / R553 (Golden Highway)	B	F	F	B	F	B	C	C	C	F	F	F	F
	11.61	66.6	111.2	11.8	114	14.8	20.1	20.1	20.1	343	343	343	150
Broad Rd / Access	Yet to be provided												

5. TRIP GENERATION & TRIP DISTRIBUTION

The Developer is currently in process to obtain the necessary statutory approvals in order to develop a shopping centre township consisting of the following (refer township layout plan attached hereto as annexure C):

It is currently anticipated that the development will consist of the following:

- Business 1: 0.3476 ha;
- Business 3: 3.1175 ha;
- Commercial 1: 0.8826 ha
- Special: 0.6481 ha (Restaurants, Informal Trading)
- Filling Station

5.1 DEVELOPMENT TRIP GENERATION, DISTRIBUTION AND ASSIGNMENT TO THE ROAD NETWORK

5.1 TRIP GENERATION – ENNERDALE SOUTH EXTENSION 6

The typical trip generation for the applicable land uses were taken from the South African Trip Data Manual Version 1.0 (TMH 17) and adjusted in accordance with table 3.2 of the TMH 17 where applicable. The anticipated trip generation of the proposed development is depicted in table 5 below.

TABLE 5 : DEVELOPMENT TRIP GENERATION

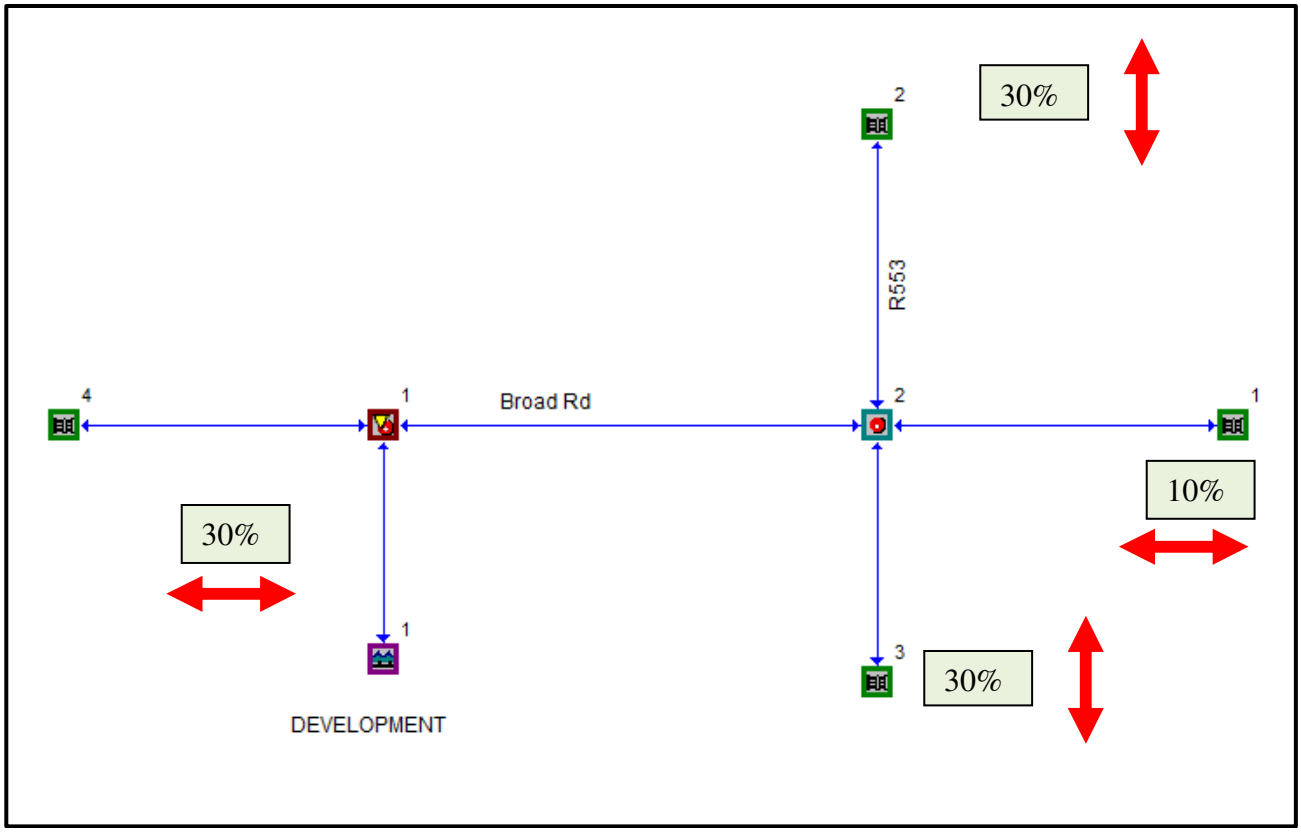
Land Use	Unit	Quant	Rate /100m^2	Trips	Mixed Use	Red Trips	DIRECTIONAL SPLIT	
							IN	OUT
WEEKDAY AM TRIP GENERATION								
Shopping Centre	GLA	4333	0	0	0%	0	0.00	0.00
Hardware	GLA	1500	1.15	17	15%	15	9.53	5.13
Offices	GLA	630	2.1	13	10%	12	10.12	1.79
Workshop / motor retail	GLA	650	2.2	14	15%	12	7.90	4.25
Fast food restaurants	GLA	480	45	216	15%	184	100.98	82.62
Sport & recreational	seats	100		0	0%	0	0.00	0.00
Filling Station	Trip Interception only							
TOTAL						**222**	**129**	**94**
WEEKDAY PM TRIP GENERATION								
Shopping Centre	GLA	4333	12.24	530	0%	530	265.18	265.18
Hardware	GLA	1500	5.20	78	15%	66	29.84	36.47
Offices	GLA	630	2.10	13	10%	12	2.38	9.53
Workshop / motor retail	GLA	650	2.30	15	15%	13	6.35	6.35
Fast food restaurants	GLA	480	50.00	240	15%	204	112.20	91.80

Land Use	Unit	Quant	Rate /100m²	Trips	Mixed Use	Red Trips	DIRECTIONAL SPLIT	
							IN	OUT
Sport & recreational	seats	100	15.00	50	0%	50	45.00	5.00
Filling Station	Trip Interception only							
TOTAL						**875**	**461**	**414**
WEEKDAY PM TRIP GENERATION								
Shopping Centre	GLA	4333	16.20	702	0%	702	350.97	350.97
Hardware	GLA	1500	12.00	180	15%	153	76.50	76.50
Offices	GLA	630	0.00		10%	0	0.00	0.00
Workshop / motor retail	GLA	650	2.20	14	15%	12	5.47	6.69
Fast food restaurants	GLA	480	30.00	144	15%	122	67.32	55.08
Sport & recreational	seats	100	17.00	30	0%	30	27.00	3.00
Filling Station	Trip Interception Only							
TOTAL						**1020**	**527**	**492**

5.2 TRIP DISTRIBUTION

The trip distribution was deduced from the existing traffic counts. The development trips are expected to distribute in accordance with figure 1 below.

FIGURE 1: TRAFFIX ROAD NETWORK & TRIP DISTRIBUTION



The anticipated trip generation and distribution as per this section was added to the existing background traffic (as per section 3) and analysed as such. The aforesaid analysis is included in sections 6 & 7 of this report.

6. BASE YEAR ANALYSIS WITH DEVELOPMENT (2022)

The trips that are expected to be generated by this mixed-use development (refer paragraph 5.1.1) was assigned to the existing background traffic and distributed in accordance with paragraph 5.1.2 and analysed as such. A peak hour factor of 0.85 has been used in the analysis.

Note that the Access intersection has been analysed as a signalised intersection and in accordance with section 8 (Access) of this report.

It is evident from table 6 below that the following intersections will not be able to accommodate the traffic demand after development completion:

- Broad Rd / R553 (Golden Highway) Intersection;

Intersection upgrading is discussed in section 8 of this report.

TABLE 6 : PEAK HOUR LEVELS OF SERVICE WITH DEVELOPMENT (2022)

INTER-SECTION	LEVELS OF SERVICE AND DELAY (s)												
	Northbound			Southbound			Eastbound			Westbound			Int
	L	S	R	L	S	R	L	S	R	L	S	R	LOS
FRIDAY PM													
Broad Rd / R553 (Golden Highway)	C	D	F	B	F	D	F	F	F	F	F	F	F
	19.4	33.4	92.5	12.4	152	33.4	130	130	130	+500	+500	+500	457
Broad Rd / Access (signalised)	B	B	C	n/a	n/a	n/a	n/a	B	B	B	B	n/a	B
	15.9	15.9	20.1	n/a	n/a	n/a	n/a	15.1	17	19.8	15.9	n/a	18.1
SATURDAY													
Broad Rd / R553 (Golden Highway)	C	F	F	B	F	E	F	F	F	F	F	F	F
	23.2	101	158	13.1	173	44	263	263	263	536	536	536	231
Broad Rd / Access (signalised)	B	A	C	n/a	n/a	n/a	n/a	B	B	C	B	n/a	B
	15.7	15.7	21.9	n/a	n/a	n/a	n/a	16.3	17.9	22.5	16.1	n/a	19.6

7. HORIZON YEAR ANALYSIS (2027)

A five-year horizon analysis has been conducted in order to determine the longer-term sustainability of the road's infrastructure. A 5.0 traffic background growth has been assumed for analysis purposes as well as the addition of latent rights developments.

7.1 HORIZON YEAR (2027) INTERSECTION ANALYSIS

No latent rights developments which impact the study area is applicable.
A conservative 5.0% background traffic growth rate has nevertheless been assumed in order to allow for possible latent rights developments that may impact the study area.

It is evident from table 7 below that the following intersections will not be able to accommodate the horizon year traffic demand and needs to be upgraded prior to the horizon year 2027.

- Broad Rd / R553 (Golden Highway) Intersection;

TABLE 7 : HORIZON YEAR LEVELS OF SERVICE (2027)

INTER-SECTION	LEVELS OF SERVICE AND DELAY (s)												
	Northbound			Southbound			Eastbound			Westbound			Int
	L	S	R	L	S	R	L	S	R	L	S	R	LOS
FRIDAY PM													
Broad Rd / R553 (Golden Highway)	C	F	F	B	F	E	F	F	F	F	F	F	F
	19.4	50.7	168	12.7	266	36.6	136	136	136	+500	+500	+500	+500
Broad Rd / Access (signalised)	B	B	C	n/a	n/a	n/a	n/a	B	B	B	B	n/a	B
	15.9	15.9	20.1	n/a	n/a	n/a	n/a	15.4	17.1	19.8	16.4	n/a	18.1
SATURDAY													
Broad Rd / R553 (Golden Highway)	C	F	F	B	F	E	F	F	F	F	F	F	F
	23.2	182	262	13.2	279	45.2	281	281	281	712	712	712	327
Broad Rd / Access (signalised)	B	A	C	n/a	n/a	n/a	n/a	B	B	C	B	n/a	B
	15.7	15.7	21.9	n/a	n/a	n/a	n/a	16.8	18	22.5	16.5	n/a	19.6

7. INTERSECTION UPGRADING

It was found in the preceding sections 6 and 7 that the following intersection is currently 2022 already operating at an un-acceptable level of service and is expected to deteriorate further with the addition of traffic growth and development trip generation.

- Broad Rd / R553 (Golden Highway) Intersection;

The above-mentioned intersections need therefore to be upgraded as soon as possible by Gautrans / Developer (in lieu of services contributions towards roads) in order to be able to accommodate the existing traffic demand as well as further traffic background growth (note that the upgrading proposal included below will also be able to accommodate the 2027 horizon year with an assumed 5.0% annual compounded background traffic growth).

7.1 BROAD ROAD / R553 (GOLDEN HIGHWAY)

7.1.1 Immediate upgrading (as soon as possible- not as a result of the development)

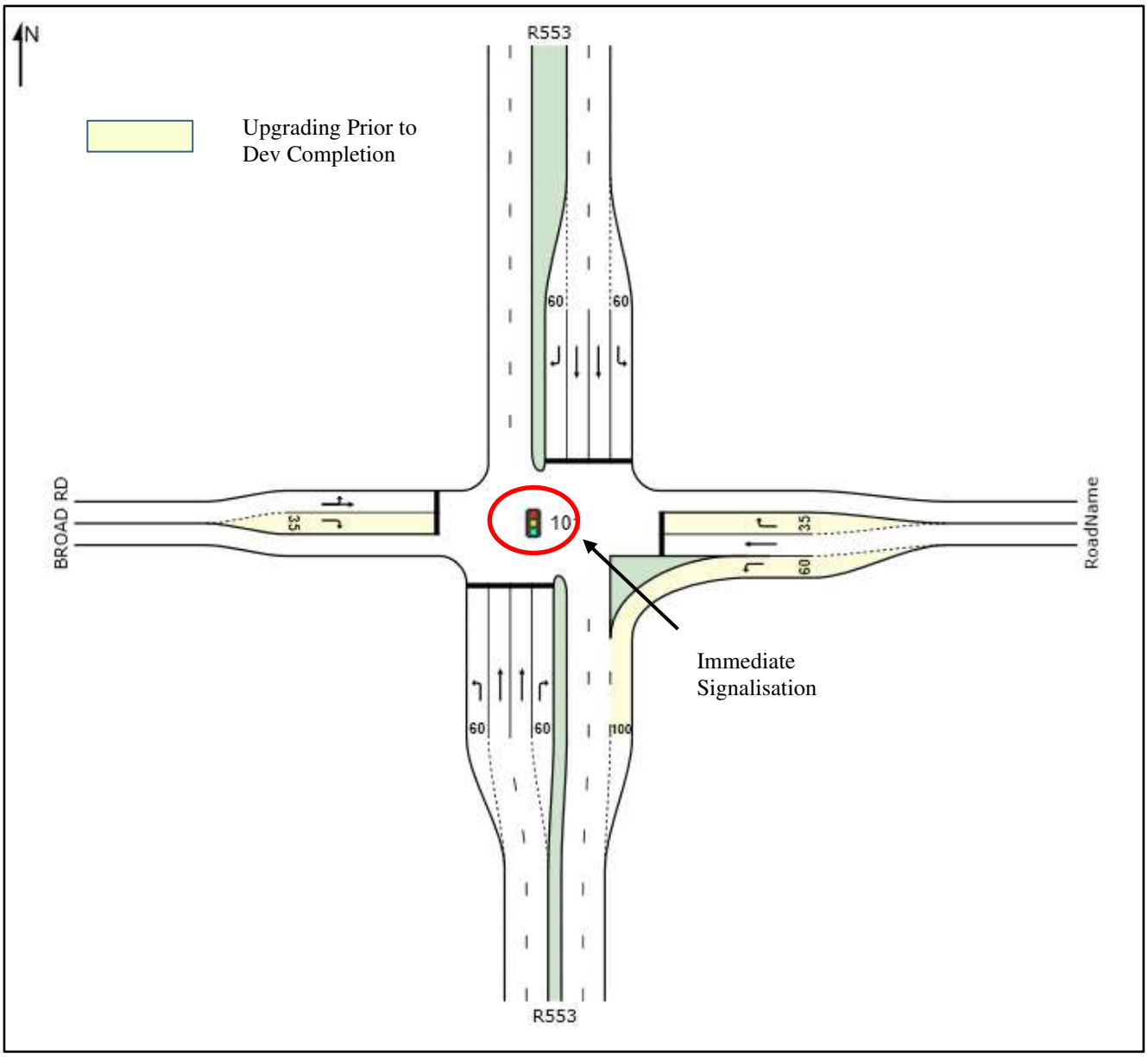
This intersection is currently (2022) operating at an un-acceptable level of service during all of the analysed pm peak periods. It is consequently proposed that the intersection be upgraded as follow:

- That this intersection be signalised by the Gauteng Provincial Government: Roads and Transport subject to the following:
  - A formal signal plan containing at least four different stages be compiled by a traffic engineer in accordance with the South African Road Traffic Signs Manual Volume 3;
- Add right turn auxiliary lanes at both the north and southbound approaches (Broad Road) of 35m long excluding tapers;
- Add a westbound left turn sliplane with a continuous downstream weave lane onto R553 southbound (not yield control).

7.1.2 Intersection upgrading prior to the horizon year 2027

No further intersection upgrading other than the above is required.

FIGURE 2: BROAD ROAD / R553 INTERSECTION UPGRADING



7.2 UPGRADED INTERSECTION ANALYSIS

The upgraded intersection proposals as contained in section 7.1 above has been analysed of which the results are tabled in table 8 below.

TABLE 8: UPGRADED INTERSECTION ANALYSIS: 2027 HORIZON YEAR

INTER-SECTION	LEVELS OF SERVICE AND DELAY (s)												
	Northbound			Southbound			Eastbound			Westbound			Int
	L	S	R	L	S	R	L	S	R	L	S	R	LOS
FRIDAY PM													
Broad Rd / R553 (Golden Highway)	C	B	B	B	C	B	C	C	D	A	C	C	B
	21.5	17	17.3	19.9	22.4	34.5	32.2	26.6	36.1	5.8	22.6	34.5	16.4
SATURDAY													
Broad Rd / R553 (Golden Highway)	C	C	C	C	C	B	D	C	C	A	B	C	C
	23.7	24.9	27.5	21.5	29.6	15.1	36	30.5	33.3	5.7	19.9	34.1	23

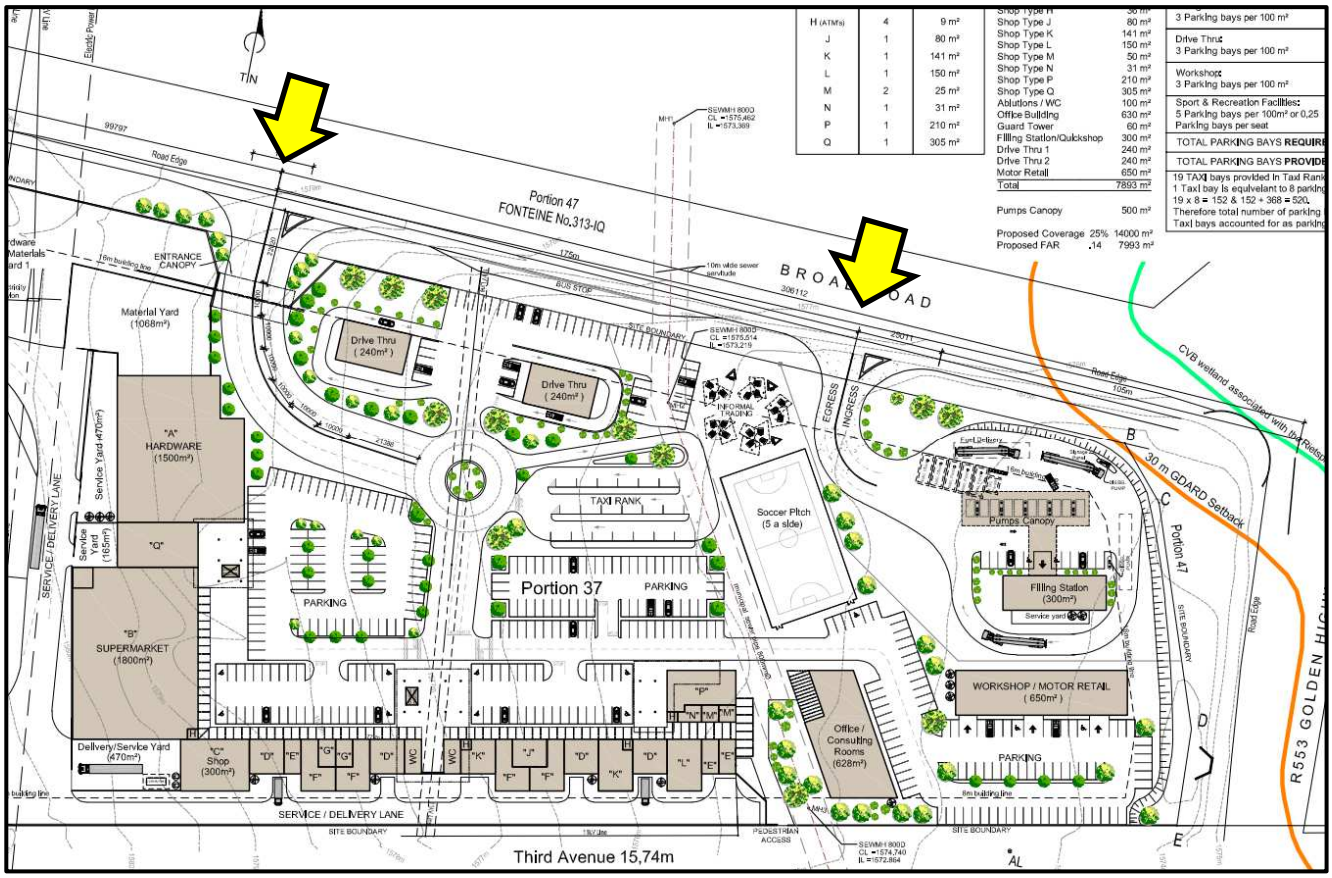
9. ACCESS INTERSECTIONS

9.1 ACCESS TO DEVELOPMENT - REFER ANNEXURE C

Access to the development will be provided via a new 20m road reserve in accordance with the Gautrans approval of the proposed development and access.

An exclusive access for the filling station has been planned from Broad which abuts the filling station erf along the northern boundary. This access has not yet been approved by the Gautrans and is currently (at the time of this report) in discussion with Gautrans. In the event that approval will be granted, no throughfare between the filling station and the remainder of the township will be provided. In the event that the above-mentioned access is not approved, access to the filling station will be granted from the township internal road network. The above-mentioned access locality is depicted in figure 3 further below.

FIGURE 3: DEVELOPMENT ACCESS LOCALITIES

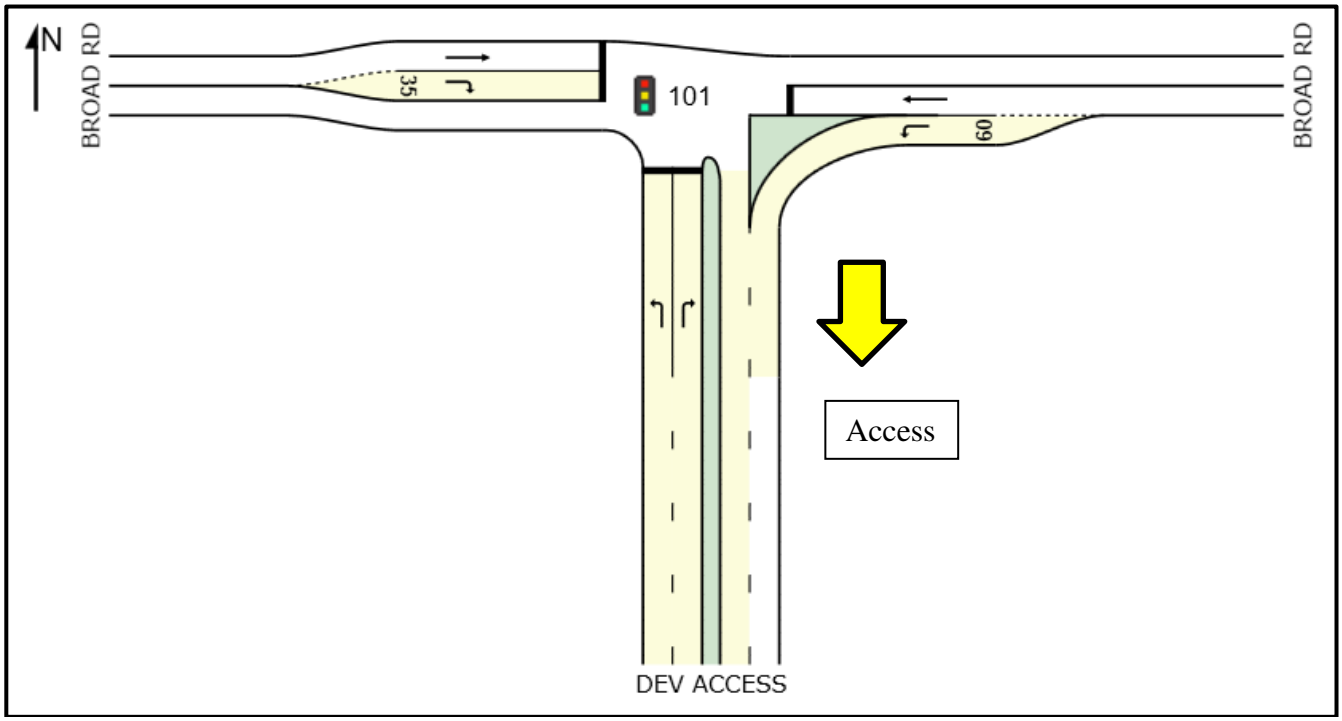


9.2 ACCESS INTERSECTION CAPACITY ANALYSIS & INTERSECTION LAYOUT

9.2.1: ACCESS INTERSECTION GEOMETRY

The access intersection capacity has been analysed in accordance with the access intersection geometry as depicted in figure 4 below.

FIGURE 4: ACCESS INTERSECTION LAYOUT



9.2.2: ACCESS INTERSECTION CAPACITY

The access intersection capacity has been analysed in accordance with the access intersection geometry as depicted in figure 4 above for the horizon year 2027 development scenario which is the worst-case scenario.

The access intersection levels of service for the horizon year 2027 has been analysed and tabled in table 7, section 7 of this report and duplicated in table 9 below for ease of reference.

TABLE 9 : ACCESS INTERSECTION LEVELS OF SERVICE (2027)

INTER-SECTION	LEVELS OF SERVICE AND DELAY (s)												
	Northbound			Southbound			Eastbound			Westbound			Int
	L	S	R	L	S	R	L	S	R	L	S	R	LOS
FRIDAY PM													
Broad Rd / Access (signalised)	B	B	C	n/a	n/a	n/a	n/a	B	B	B	B	n/a	B
	15.9	15.9	20.1	n/a	n/a	n/a	n/a	15.4	17.1	19.8	16.4	n/a	18.1
SATURDAY													
Broad Rd / Access (signalised)	B	A	C	n/a	n/a	n/a	n/a	B	B	C	B	n/a	B
	15.7	15.7	21.9	n/a	n/a	n/a	n/a	16.8	18	22.5	16.5	n/a	19.6

10. PUBLIC TRANSPORTATION

Public transport is this area is mainly provided by means of mini-bus taxis and private transportation companies.

A taxi rank facility will be provided on the site with direct access from the internal roundabout with an one-way traffic flow through the traffic rank.

A Demarcated safe pedestrian walkway facility will be provided between the above-mentioned taxi rank facility and the shopping complex.

11. CONCLUSIONS & RECOMMENDATIONS

11.1 CONCLUSIONS

It has been found that:

- The following intersections are currently (2022) operating at an un-acceptable level of service and need to be upgraded in order to be able to accommodate the existing 2022 background traffic demand prior to development.
    - Broad Rd / R553 (Golden Highway) Intersection;

- The trip generation of the development is expected to be as follow:
    - 222 AM trips (129 in; 94 out);
    - 875 Friday PM (461; 414)
    - 1020 Saturday trips (527 in; 492 out);

- The following intersections are expected to be operating at an un-acceptable level of service with the addition of the development traffic demand after development completion:
    - Broad Rd / R553 (Golden Highway) Intersection;

- The upgrading of the above intersection (signalisation and addition of lanes) in accordance with section 7, figure 2 of this report will sufficiently mitigate the existing and expected future delays at this intersection;

- The above-mentioned proposed upgrading will still yield sufficient capacity by the horizon year 2027;

- The development access intersection is expected to be operating at an acceptable level of service by the horizon year 2027;

- Sufficient on-site public transportation infrastructure is provided in the form a taxi rank facility.

11.2 RECOMMENDATIONS

Based on the conclusions that have been derived from this study, the following are recommended:

- That the development be supported from a traffic engineering point of view;
- That the following intersections be upgraded in accordance with section 7 of this report:
    - Broad Rd / R553 (Golden Highway) Intersection;
- Access to the shopping centre be provided in accordance with the relevant township layout plan and as approved by the Gautrans;
- It be noted that Access to the filling station is currently under discussion with Gautrans;

REFERENCES

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2. Committee of State Road Authorities, 1988, **TRH 17 Geometric design of Rural Roads,** National Department of Transport, Pretoria.

3. Committee of Transportation Officials, 2012, **South African Trip Data Manual,** TMH17, National Roads Agency Limited, Pretoria.

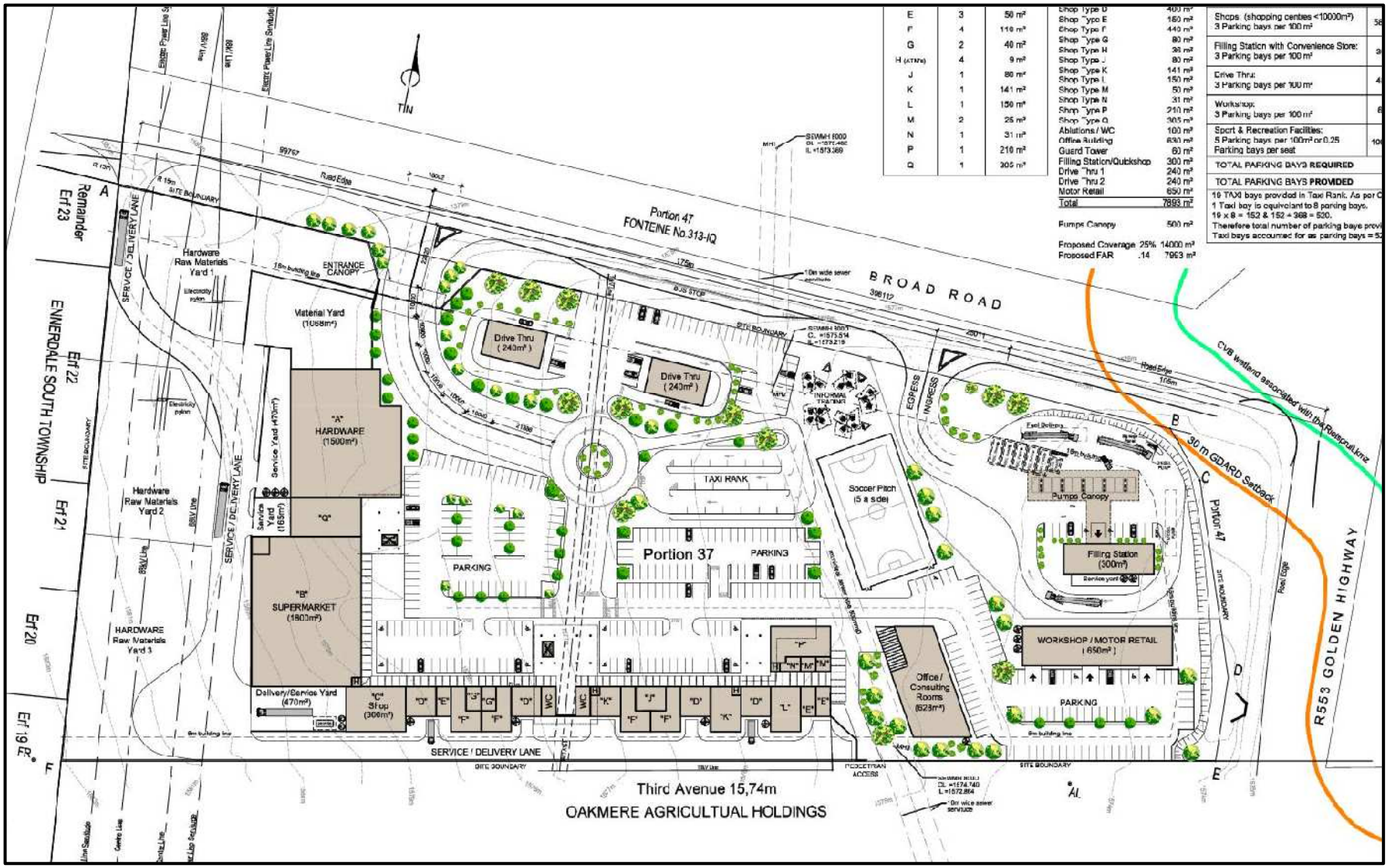
4. Dowling Associates Inc, 1997, **Traffic for Windows Version 8.0**

5. National Department of Transport, 1995, **Manual for Traffic Impact Studies,** Research Report PR 93/635, BKS (Pty) Ltd, Pretoria.

6. South African National Roads Agency Limited, 2002, **Geometric Design Guidelines,** Version 1.0, CSIR, Pretoria.

7. Transportation Research Board, **Highway Capacity Manual,** Washington D.C.

ANNEXURE C: TOWNSHIP LAYOUT



E	3	50 m²
F	4	110 m²
G	2	40 m²
H (ATMs)	4	9 m²
J	1	86 m²
K	1	141 m²
L	1	150 m²
M	2	25 m²
N	1	31 m²
P	1	210 m²
Q	1	305 m²

Shop Type D	400 m²
Shop Type E	150 m²
Shop Type F	440 m²
Shop Type G	80 m²
Shop Type H	38 m²
Shop Type J	80 m²
Shop Type K	141 m²
Shop Type L	150 m²
Shop Type M	50 m²
Shop Type N	31 m²
Shop Type P	210 m²
Shop Type Q	305 m²
Ablutions / WC	100 m²
Office Building	630 m²
Guard Tower	60 m²
Filling Station/Quickshop	300 m²
Drive Thru 1	240 m²
Drive Thru 2	240 m²
Motor Retail	650 m²
Total	7893 m²
Pumps Canopy	500 m²
Proposed Coverage 25%	14000 m²
Proposed FAR .14	7993 m²

Shops (shopping centres <10000m²) 3 Parking bays per 100 m²	56
Filling Station with Convenience Store: 3 Parking bays per 100 m²	9
Drive Thru: 3 Parking bays per 100 m²	4
Workshop: 3 Parking bays per 100 m²	6
Sport & Recreation Facilities: 5 Parking bays per 100m² or 0.25 Parking bays per seat	104
TOTAL PARKING BAYS **REQUIRED**	
TOTAL PARKING BAYS **PROVIDED**	
19 TAXI bays provided in Taxi Rank. As per C 1 Taxi bay is equivalent to 8 parking bays. 19 x 8 = 152 & 152 + 368 = 520. Therefore total number of parking bays prov Taxi bays accounted for as parking bays = 52	