Transport Impact Assessment

Macassar Housing Project

Western Cape

September 2012

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Summary Sheet

Report Type	Transport Impact Assessment
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This transport impact assessment has been prepared in accordance with the National Department of Transport's 'Guidelines for Traffic Impact Studies' PR93/635 (1995) by a suitably qualified and registered professional traffic engineer. Details of any of the calculations on which the results in this report are based will be made available on request.

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Report - Summary Table

This transport impact assessment is reported only in a summary table instead of a lengthy report to assist review and interpretation of the results. This summary table contains all the relevant information that is normally contained in a report. It should be sufficient for review and interpretation of the expected traffic impacts as well as the comprehension of the required measures to mitigate the traffic impact. If any more detail is required please contact the authors.

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Abbreviations

CM – Critical Movement

DR – Divisional Road

HCM – Highway Capacity Manual

LOS – Level of Service

MOE – Measures of Efficiency

MR – Provincial Main Road

N1 – National Route 001

OP – Minor Road (Ondergeskikte Pad)

RAP&G – Road Access Policy and Guidelines

SARTSM – South African Roads Traffic Signs Manual

SATGR – South African Trip Generation Rates

SDP – Site Development Plan

SQM – Square Meters (m^2)

SSD – Shoulder Sight Distance

TIA - Traffic Impact Assessment

TIS - Traffic Impact Statement

V/C – Volume to Capacity Ratio

Transport Impact Assessment Macassar Housing Project, Western Cape	
1. Purpose of Study	To determine the expected transport related impacts of the proposed Macassar housing project on the surrounding road network and recommend mitigations where necessary.
2. Locality of Development *Reference:* ***Figure 1***	Erf Number: 2633 and 3968, Macassar. Site Location: The proposed development is situated in the northern area of Macassar, approximately 7.5km to the west of Somerset West CBD. The site is bordered by the N2 national freeway to the north, Kramat Road to the west, Albatros Street to the east and Mandela Road to the south.
3. Proposed Development	It is proposed to develop subsidy housing, town housing, gap housing residential units and a small Industrial node on the site. The extent thereof is summarised in **Section 4** of this report.
4. Land Use *Reference:* ***Figure 2***	Existing Use: The site is currently mostly vacant land with some informal dwelling structures on a small portion of the site. Proposed Use: • Subsidy Housing 2 641 units • Town Housing 29 units • Gap Housing 41 units • Industrial Node 10 400m² GLA (40% coverage assumed)
5. Existing Access	Access to the site is currently possible via the existing road network, i.e. Mandela Road, Carnation Street, Kramat Road and Albatros Street.
6. Existing Roadways in Site Vicinity	N2 (National Freeway N2/1): Dual lanes per direction, with a median island, 120km/h speed limit and paved shoulders. See **Photo 1**. Old Main Road (Provincial Trunk Road TR2/1): Dual lanes per direction, with a median island, 100km/h speed limit, paved shoulders used as sidewalks and no on-street parking. See **Photo 2.** Baden Powell Drive (Provincial Main Road MR116): Dual lanes per direction, with a median island, 100km/h speed limit, paved shoulders used as sidewalks and no on-street parking. See **Photo 3.** Kramat Road (Provincial MR 163): Single lane per direction, no median island, paved shoulders used as sidewalks and no on-street parking. See **Photo 4**. Macassar Road (Provincial MR 165): Single lane per direction, no median island, 60km/h speed limit, paved shoulders used as sidewalks and no on-street parking. See **Photo 5**. Mandela Road (Provincial Minor Road OP403): Single lane per direction, no median island, unpaved sidewalks available on one side of the road and no on-street parking. See **Photo 6**. Link Avenue and Zandvliet Road (Municipal Streets): Single lane per direction, no median island, paved sidewalks on one side of the road with partial on-street parking. See **Photo 7** and **Photo 8**. Albatros Road (Municipal Street): Single lane per direction, no median island, paved shoulders used as sidewalks and no on-street parking. See **Photo 9**.

7. Analyses Hours	Peak hour manual traffic counts were conducted at the surrounding intersections along Macassar Road and Kramat Road in June 2011. The surrounding land use is residential. The following typical commuter peak periods were determined from the traffic counts: Weekday a.m. peak hour (07:00 to 08:00) Weekday p.m. peak hour (17:00 to 18:00).
8. Scenarios Analysed	2011 Existing traffic conditions (counted volumes) 2016 Background traffic conditions without Firgrove Industrial Development (existing 2011 traffic escalated with a growth rate as discussed in **Section 12** of this report) 2016 Total traffic conditions without Firgrove Industrial Development (background traffic volumes plus development trips) 2016 Background traffic conditions with Firgrove Industrial Development (existing 2011 traffic volumes plus approved development trips, escalated with a growth rate as discussed in **Section 13** of this report) 2016 Total traffic conditions with Firgrove Industrial Development (background traffic volumes with latent rights plus development trips) Intersection analyses were done using Traffix 8.0 software which is based on the Highway Capacity Manual (HCM).
9. Study Intersections (existing control) *Reference:* ***Figure 3***	Intersection 1: Baden Powell/ N2 Northern Terminal…..……..…..(Two-way stop) Intersection 2: Baden Powell/ N2 Southern Terminal.....……..(Two-way stop) Intersection 3: Baden Powell/ Macassar Road...…….....(Two-way stop) Intersection 4: Old Main Road/Kramat Road……..……..(Traffic signal) Intersection 5: Kramat Road/Mandela Road……...(Two-way Stop) Intersection 6: Kramat Road/Link Avenue.....……..(Two-way Stop) Intersection 7: Kramat Road/Macassar Road…….(Two-way Stop) Intersection 8: Macassar Road/Albatros Street……..(Two-way Stop) Intersection 9: Macassar Road/Zandvliet Road…….(Traffic signal) Intersection 10: Macassar Road/N2 Southern Terminal…….(Two-way Stop) Intersection 11: Macassar Road/N2 Northern Terminal…….(Two-way Stop) Intersection 12: Macassar Road/Old Main Road……..(Traffic signal)
10. Existing Traffic Conditions *Reference:* ***Figure 4,*** ***Figure 5,*** ***Table 1***	The existing operational analyses is based on existing geometry and counted volumes, dated June 2011. No conflict situations were observed at any of the minor intersections in the site vicinity during the typical weekday peak hours. From the analysis it is clear that all the study intersections are operating at acceptable levels-of-service. Based on current traffic volumes on the existing road network and the recommendations for turning lanes in the Road Access Guidelines and Policies (RAG&P, 2002), the following turning lanes are recommended for safety purposes :

10. Existing Traffic Conditions (Continued) *Reference:* ***Figure 4, Figure 5, Table 1***	• <u>Baden Powell Drive/Macassar Road</u>: o Add dedicated right-turn lanes northbound and southbound along Baden Powell Drive (RAG&P warranted during both peak hours). • <u>Kramat Road/Link Avenue</u>: o Northbound: Add a dedicated right-turn lane along Kramat Road (RAG&P warranted during the p.m. peak hour). • <u>Macassar Road/Kramat Road</u>: o Westbound: Add a dedicated right-turn lane along Macassar Road (RAG&P warranted during the p.m. peak hour). • <u>Macassar Road/Albatros Road</u>: o Westbound: Add a dedicated right-turn lane along Macassar Road (RG&P warranted during both the a.m. and p.m. peak hours). There are significant pedestrian movements along both Macassar Road and Kramat Road. There are paved shoulders along both roads and most of the local streets that pedestrian and cyclist use. No significant pedestrian issues have been identified. The relatively wide shoulders along the major roads and local streets provide sufficient space for pedestrians and cyclists to use without conflicting with the traffic.
11. Approved Development/ Latent Development Rights	**<u>Firgrove Industrial Estate</u>** This development is located to the east of Macassar Road in the proximity of Macassar Road/Zandvliet Road intersection. The following number of trips are expected from Firgrove Industrial Estate (Phases 1, 2 & 3) during peak hours: • AM peak hour total trips: 2 668 trips (inbound 1 867/outbound 801) • PM peak hour total trips: 2 668 trips (inbound 801/outbound 1 867). The services have been installed on the site but it seems that the development has not yet been implemented. All the City of Cape Town's conditions of approval in terms of the required upgrades to the Macassar Road/Zandvliet Road/Reeb Road, as a result of the proposed development have not yet been implemented. For the purposes of this study the road network was evaluated with two scenarios, i.e. 1) without the Firgrove Industrial Development and 2) with the Firgrove Industrial Development fully completed.
12. Planned Road Network Upgrades	The City of Cape Town's long-term road planning shows a half diamond interchange westbound towards the City at the current Kramat Road bridge over the N2 (See **Photo 10**). However, this future interchange will come at a significant cost and the road network analyses as discussed in this report shows that the future developments in the area can be accommodated without this interchange being implemented. It is recommended that the Baden Powell Drive and Macassar Road interchanges with the N2 rather be upgraded to accommodate the expected growth in traffic volumes associated with planned and future developments in the surrounding area. These upgrades are discussed in more detail in the following sections of this report.

13. Background Traffic Conditions (without Firgrove Development) *Reference:* ***Figure 6***,***Figure 7***, ***Figure 8***, ***Figure 9***, ***Figure 10*** & ***Table 1***.	Background Growth Rate: A three percent growth rate per annum was used to account for general background growth. The intersection upgrades that were proposed in the existing traffic conditions were only for safety and not operational. Therefore, they were not considered as part of the background traffic analyses. Two alternative scenarios were analysed for the background traffic conditions, i.e. one without the Firgrove Industrial Estate development and one with the Firgrove Industrial Estate development included. This section reports on the first scenario. Based on the analysis for the background conditions, the following study intersections are expected to experience operational constraints (The capacity analyses is based on the existing lane configuration as illustrated in **Figure 3**): <u>Baden Powell Drive/N2 Northern Terminal</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: Install a traffic signal. (Signal is warranted based on SARTS vol. 3) • Operations with Mitigation: Level-of-service “LOS B” with volume to capacity ratio of 58 percent. <u>Baden Powell Drive/Macassar Road</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: Construct a single lane circulation roundabout. • Operations with Mitigation: Level-of-service “LOS A” and volume to capacity ratio of 65 percent. <u>Macassar Road/N2 Southern Terminal</u> • Issue: The intersection is expected to operate at unacceptable Level-of-service “LOS F” with relatively long delay (>50.0 seconds per vehicle) during the a.m. peak hour. • Mitigation Proposed: Install a traffic signal (Signal warranted based on SARTSM Vol. 3) • Operations with Mitigation: Level-of-service “LOS B” and volume to capacity ratio of 87 percent. <u>Macassar Road/N2 Northern Terminal</u> • Issue: The intersection is expected to operate at unacceptable Level-of-service “LOS F” with relatively long delay (>50.0 seconds per vehicle) during the a.m. peak hour. • Mitigation Proposed: Install a traffic signal (Signal warranted based on SARTSM Vol. 3) • Operations with Mitigation: Level-of-service “LOS B” and volume to capacity ratio of 53 percent during the p.m. peak hour.
14. Trip Generation *References:* ***Table 2***	A trip generation rate was calculated for the existing Macassar area based on the traffic counts and the number of residential units counted from aerial photographs of the area. This calculated rate was used to estimate the trip generation for the subsidised housing component of the proposed

14. Trip Generation *References:* ***Table 2*** (Continued)	development. The South African Trip Generation Rates, DOT 1995, was used for the Town Houses and Gap Housing units. The trip generation rate for service related Industrial land use suggested in the COTO110 was used to determine the trip generation for the industrial node. The COTO rate was adjusted to allow for internal trips and the expected low vehicle ownership in the area. <u>AM and PM Peak Hour Trip Rates</u> • Subsidised housing 0.36 AM/ 0.28 PM trips/unit • Town Houses 1.1 trips/unit • Gap Housing 1.1 trips/unit • Industrial 0.5 trips/100m²
15. Development Trips *References:* ***Figure 12***, ***Figure 13***, ***Table 3***	The trip rates as discussed in **Section 14** of this report, results in the following number of trips: • AM peak hour total trips: 1 026 trips (inbound 369/outbound 657) • PM peak hour total trips: 829 trips (inbound 529/outbound 300).
16. Trip Distribution *References:* ***Figure 11***	The following trip distribution will be assumed based on the existing travel pattern from Macassar: 15% of trips to/from the north-west along Old Main Road 20% of trips to/from the west along the N2 5% of trips to/from the west along Macassar Road 5% of trips to/from the south-west along Baden Powell 30% of trips to/from the east along Reeb Road 10% of trips to/from the east along the N2 5% of trips to/from the east along Old Main Road 10% of trips to/from the north-east along Macassar Road/min Road.
17. Site Access	Access to the site will be via the local street network that in-turn gain access via the primary network through the following intersections, full intersections at Kramat Road/Mandel Road, Kramat Road/Link Avenue, Macassar Road/Albatros Road and the signalised intersection at Macassar Road/Zandvliet Road.
18. Total Traffic Conditions (without Firgrove Industrial Development) *Reference:* **Figure 14, Figure 15, Figure 16, Figure 17, Figure 18 & Table 4.**	The development trips were added to the 2016 background traffic volumes without latent rights to determine the 2016 total traffic conditions. The following study intersections will experience capacity constraints (The capacity analyses is based on the recommended lane configuration for the 2016 Background Conditions –without the Firgrove Industrial Estate, as illustrated in **Figure 8**): <u>Macassar Road/N2 Southern Terminal</u> • Issue: The intersection is expected to operate over capacity during the a.m. peak hour. • Mitigation Proposed: Add a dedicated northbound left-turn lane • Operations with Mitigation: Level-of-service “LOS B” and volume to capacity ratio of 70 percent during the a.m. peak hour.

19. Background Traffic Conditions (with Firgrove Development) *Reference:* ***Figure 19, Figure 20, Figure 21, Figure 22, Figure 23*** *&* ***Table 5****.*	A three percent growth rate per annum was also used to account for general background traffic growth. This section reports on the second analysis scenario where the Firgrove Industrial Development trips were added to the background traffic volumes. Based on the analysis for the background conditions with the Firgrove Industrial Development, the following study intersections are expected to experience operational constraints (The capacity analyses is based on existing lane configuration as illustrated in **Figure 3**): <u>Baden Powell Drive/N2 Northern Terminal</u> • Issue: The intersection is expected to operate over capacity during both peak hours. • Mitigation Proposed: Install a traffic signal. (Signal is warranted based on SARTS vol. 3) • Operations with Mitigation: Level-of-service "LOS B" with volume to capacity ratio of 69 percent during the p.m. peak hour. <u>Baden Powell Drive/Macassar Road</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: Construct a single lane circulation roundabout. • Operations with Mitigation: Level-of-service "LOS A" and volume to capacity ratio of 67 percent. <u>Macassar Road/Zandvliet Road</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: o Eastbound and Westbound: Add dedicated right-turn lanes along Macassar Road o Northbound: Add an additional right-turn lane along Reeb Road • Operations with Mitigation: Level-of-service "LOS D" and volume to capacity ratio of 96 percent during the p.m. peak hour. <u>Macassar Road/N2 Southern Terminal</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: o Install a traffic signal (Signal is warranted based on SARTS vol. 3) o Northbound: Add a dedicated left-turn lane • Operations with Mitigation: Level-of-service "LOS D" and volume to capacity ratio of 98 percent during the p.m. peak hour. <u>Macassar Road/N2 Northern Terminal</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour.

19. Background Traffic Conditions (with Firgrove Development) *Reference:* ***Figure 19, Figure 20, Figure 21, Figure 22, Figure 23 & Table 5***. (Continued)	• Mitigation Proposed: o Install a traffic signal (Signal is warranted based on SARTS vol. 3) o Southbound: Add a dedicated through lane along Macassar Road • Operations with Mitigation: Level-of-service "LOS C" and volume to capacity ratio of 93 percent during the a.m. peak hour. <u>Macassar Road/Old Main Road</u> • Issue: The intersection is expected to operate over capacity during the p.m. peak hour. • Mitigation Proposed: Add a dedicated northbound left-turn lane along Macassar Road • Operations with Mitigation: Level-of-service "LOS D" and volume to capacity ratio of 91 percent during the a.m. peak hour. The conflicts between pedestrians and motor vehicles along roads/streets with no pedestrian facilities will gradually worsen as both the pedestrian and vehicle volumes increase. Although it was assumed in the Firgrove Industrial Development TIA that only 5 percent of Firgrove Industrial Estate traffic will be to/from Macassar, it is a norm that companies give precedence to local people. Therefore, for the purposes of this report it is expected that at least 15% of trips to/from this development will be from the Macassar area. However, this will add to the existing pedestrian activities along Macassar Road and Zandvliet Road. In many instances where low income areas are located near main roads, pedestrian safety issues are common and often require major interventions such as formal pedestrian crossings and/or traffic control changes, such as four-way stops, traffic signals or pedestrian bridges. With the recommended upgrade of the Macassar Road/Zandvliet Road/Reeb Road intersection in the future with the Firgrove Industrial Development completed, the pedestrian facilities at this intersection should also be re-evaluated. It is evident from this background conditions analysis that significant improvements are required across the network even without any development on this proposed site, specifically also at the N2/Macassar Road interchange. These improvements are required anyway and should not burden the development of the proposed site.
20. Total Traffic Conditions (with Firgrove Industrial Development) *Reference:* ***Figure 24, Figure 25, Figure 26, Figure 27, Figure 28 & Table 6.***	In this scenario, the development trips were added to the 2016 background traffic volumes with latent rights to determine the 2016 total traffic conditions. The following study intersections will experience capacity constraints (The capacity analyses is based on the recommended lane configuration for the 2016 Background Conditions –with the Firgrove Industrial Estate, as illustrated in **Figure 21**): <u>Baden Powell Drive/N2 Southern Terminal</u> • Issue: The intersection is expected to operate at unacceptable Level-of-service "LOS F" and relatively long delays (>50.0 seconds per vehicle) • Mitigation Proposed: Install a traffic signal. (Signal is warranted based on SARTS vol. 3)

20 Total Traffic Conditions (with Firgrove Industrial Development) *Reference:* ***Figure 24, Figure 25, Figure 26, Figure 27, Figure 28*** *&* ***Table 6***. (Continued)	• Operations with Mitigation: Level-of-service "LOS B" with volume to capacity ratio of 62 percent during the p.m. peak hour. <u>Macassar Road/Zandvliet Road</u> • Issue: The intersection is expected to operate over capacity during both peak hours. • Mitigation Proposed: Change the southbound left-turn lane to a slip lane with an acceleration lane along Macassar Road. • Operations with Mitigation: Level-of-service "LOS D" and volume to capacity ratio of 99 percent during the p.m. peak hour. <u>Macassar Road/N2 Southern Terminal</u> • Issue: The intersection is expected to operate over capacity during both peak hours. • Mitigation Proposed: o Southbound: Add an additional through lane o Northbound: Change a left-turn lane to a shared through and left-turn lane • Operations with Mitigation: Level-of-service "LOS A" and volume to capacity ratio of 75 percent during the a.m. peak hour. <u>Macassar Road/Old Main Road</u> • Issue: The intersection is expected to operate over capacity during the a.m. peak hour. • Mitigation Proposed: Add a dedicated westbound left-turn lane along Old Main Road • Operations with Mitigation: Level-of-service "LOS D" and volume to capacity ratio of 97 percent during the a.m. peak hour.
21. Active Mobility (NMT)	<u>Existing Facilities</u>: A paved walkway is available on the southern side Zandvliet Road. All the other local streets and major roads have no sidewalks available. An Active Mobility (NMT)) survey was done during the weekday peak hour along Macassar Road and Kramat Road. During the survey, approximately 145 pedestrians and 20 cyclists were observed during the a.m. peak period and approximately 233 pedestrians and 21 cyclists during the p.m. peak period. <u>Proposed Facilities</u>: It is recommended that hard surfaced sidewalks/paths be provided within the development site. <u>Traffic Calming:</u> Marked/raised pedestrian crosswalks within the development site and the surrounding road network should be provided to improve pedestrian safety. High visibility road signs should be erected along Macassar Road and Kramat Road to inform motorists of pedestrian activities. These facilities should also be implemented along Zandvliet Road, particularly close to Zandvliet Secondary School. The need and location for these traffic calming measures should be investigated in more detail during the design stage of the project.

22. Public Transport	Existing Facilities: There is public transport (buses and mini-bus taxis) available along the major roads and local streets in Macassar. Proposed Facilities: Provision should be made for public transport facilities/lay-byes in the site vicinity. Preferably the lay-byes should be sheltered and linked with sidewalks/paths.
23. Conclusions & Recommendations	It is proposed to develop Macassar Housing Project with a total of approximately 2 711 residential units on Erf 2633 and Erf 3968, in Macassar. No significant conflict situations were observed at any of the minor street intersections in the site vicinity during the typical weekday peak periods. However based on the Road Access Guidelines and Policy, the following turning lanes are proposed for safety reasons: • Baden Powell Drive/Macassar Road: Add dedicated right-turn lanes northbound and southbound along Baden Powel Drive. • Macassar Road/Link Avenue: Add a dedicated northbound right-turn lane along Macassar Road • Macassar Road/Kramat Road: Add a dedicated Westbound right-turn lane along Macassar Road • Macassar Road/Albatros Road: Add a dedicated Westbound right-turn lane along Macassar Road Access to the site will be via local street networks that gain access to the major network via several intersections along Kramat Road and Macassar Road The development is expected to generate approximately 1 028 vehicular trips during the weekday a.m. peak hour and approximately 816 vehicular trips during the weekday p.m. peak hour based on a surveyed trip rate for the existing Macassar area and trip rates from the Department of Transport SATGR, 1995, for low to middle income residential areas. Two alternative scenarios were analysed for the Background and Total Traffic conditions, i.e. one without the Firgrove Industrial Estate development and one with the Firgrove Industrial Estate development. The Firgrove Industrial Development has not been implemented, but has approved development rights, which will have a significant impact on the surrounding road network. The wider impact of the Firgrove Industrial Development was not assessed, i.e. the specific impact on the interchange. It is obvious from the analyses in this report that traffic from/to the Firgrove Industrial Development will have significant impacts on the interchange and surrounding road network that should require mitigation. The mitigation required for the Firgrove Industrial Development should not burden the proposed Macassar Housing Project. **2016 Background Traffic Conditions without Firgrove Industrial Development** • Baden Powell Drive/N2 Northern Terminal: Install a traffic signal. (Signal is warranted based on SARTS vol. 3) • Baden Powell Drive/Macassar Road: Construct a single lane circulation roundabout. • Macassar Road/N2 Southern Terminal: Install a traffic signal (Signal warranted based on SARTSM Vol. 3)

23. Conclusions & Recommendations (Continued)	• Macassar Road/N2 Northern Terminal: Install a traffic signal (Signal warranted based on SARTSM Vol. 3) **2016 Total Traffic Conditions without Firgrove Industrial Development** • Macassar Road/N2 Southern Terminal: Mitigation Proposed: Add a dedicated northbound left-turn lane **2016 Background Traffic Conditions with Firgrove Industrial Development** • Baden Powell Drive/N2 Northern Terminal: Install a traffic signal. (Signal is warranted based on SARTS vol. 3) • Baden Powell Drive/Macassar Road: Construct a single lane circulation roundabout. • Macassar Road/Zandvliet Road/Reeb Road: o Westbound and Eastbound: Add dedicated right-turn lanes along Macassar Road o Northbound: Add an additional right-turn lane along Reeb Road • Macassar Road/N2 Southern Terminal: o Install a traffic signal (Signal is warranted based on SARTS vol. 3) o Northbound: Add a dedicated left-turn lane • Macassar Road/N2 Northern Terminal: o Install a traffic signal (Signal is warranted based on SARTS vol. 3) o Southbound: Add a dedicated through lane • Macassar Road/Old Main Road: Add a dedicated westbound left-turn lane **2016 Total Traffic Conditions with Firgrove Industrial Development** • Baden Powell Drive/N2 Southern Terminal: Install a traffic signal. (Signal is warranted based on SARTS vol. 3) • Macassar Road/Zandvliet Road/Reeb Road: Change the southbound left-turn lane to a slip lane with a yield to the eastbound though traffic. • Macassar Road/N2 Southern Terminal: o Southbound: Add an additional through lane o Northbound: Change the southbound left-turn lane to a slip lane with an eastbound acceleration lane along Macassar Road. • Macassar Road/Old Main Road: Add a dedicated westbound left-turn lane along Old Main Road **Active Mobility (NMT)**: Marked/raised pedestrian crosswalks along the local streets within the development site should be provided to improve pedestrian safety. High visibility road signs should be erected along Macassar Road and Kramat Road to inform motorists of pedestrian activity. **Public transport** facilities should be provided in the site vicinity. Preferably these lay-byes should be sheltered and linked with sidewalks/paths.

REFERENCES

- Provincial Administration: Western Cape, Department of Economic Affairs, Agriculture and Tourism: Transport Branch, Road Access Guidelines and Policies, 2002.
- Department of Transport, Guidelines for Traffic Impact Studies, Report No. PR 93/645, Pretoria, 1995.
- Department of Transport, South African Trip Generation Rates, Report No. RR 92/228, Pretoria, 1995.
- Department of Transport, Urban Transport Guidelines, UTG7, Pretoria, 1989
- Department of Transport, Off-Street Parking Indices, N DoT PG 3/85, November 1985
- Hawkins Hawkins and Osborn South Consulting Engineers, Public Transport TIA Component Guidelines, December 2001.
- South African Traffic Signs Manual Traffic Signal Design, Volume 3, April 2001 (SARTSM, Vol.3).

Appendix A

Figures



PROJECT:	FIGURE:	NUMBER:
Macassar Housing Project	Locality Plan	01

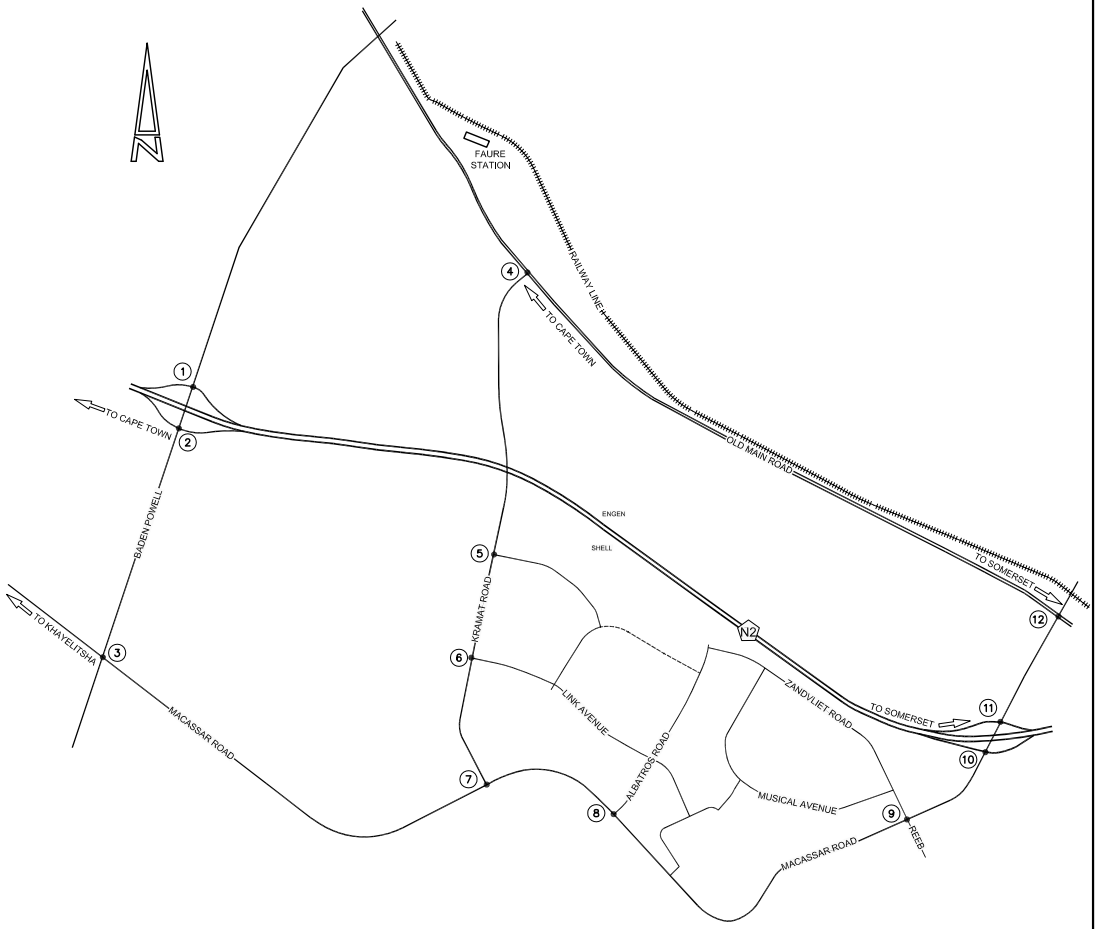


Technical Information

Zoning	Number	Legend	Area (ha)	% of total
Informal Residential (Erven 1 - 2385)	2385		29,5178	30,41
Res I (GAP) (Erven 2386 - 2423)	38		0,8137	0,84
Res III (Townhouses: Erf 2424)	1		0,9796	1,01
Institutional I (Creche: Erven 2425 - 2429)	5	C	0,9834	1,01
Institutional I (Primary School: Erf 2430)	1	PS	2,3456	2,42
Institutional II (House of Worship: Erven 2431 - 2433)	3		0,4333	0,45
Business I (Erf 2434)	1		1,4986	1,54
Industrial I (Erf 2435-2437)	3		2,6004	2,68
POS (canal & landscaping area, i.e. tree planting & berm) (Erf 2438)	1		3,8666	3,98
POS (Erven 2439-2452)	13		7,2012	7,42
Road	3		18,7212	19,29
Remainder Erf 2633	1		28,0877	28,94
Total	2456		97,0491	100

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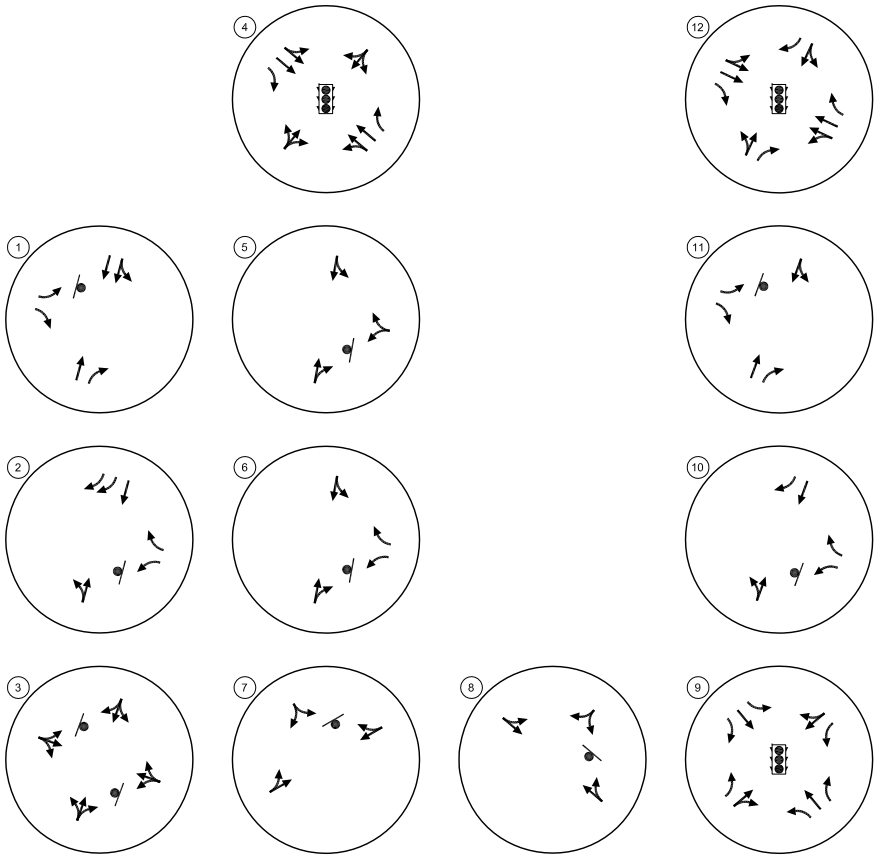
PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	PROPOSED SITE DEVELOPMENT PLAN	2



LEGEND

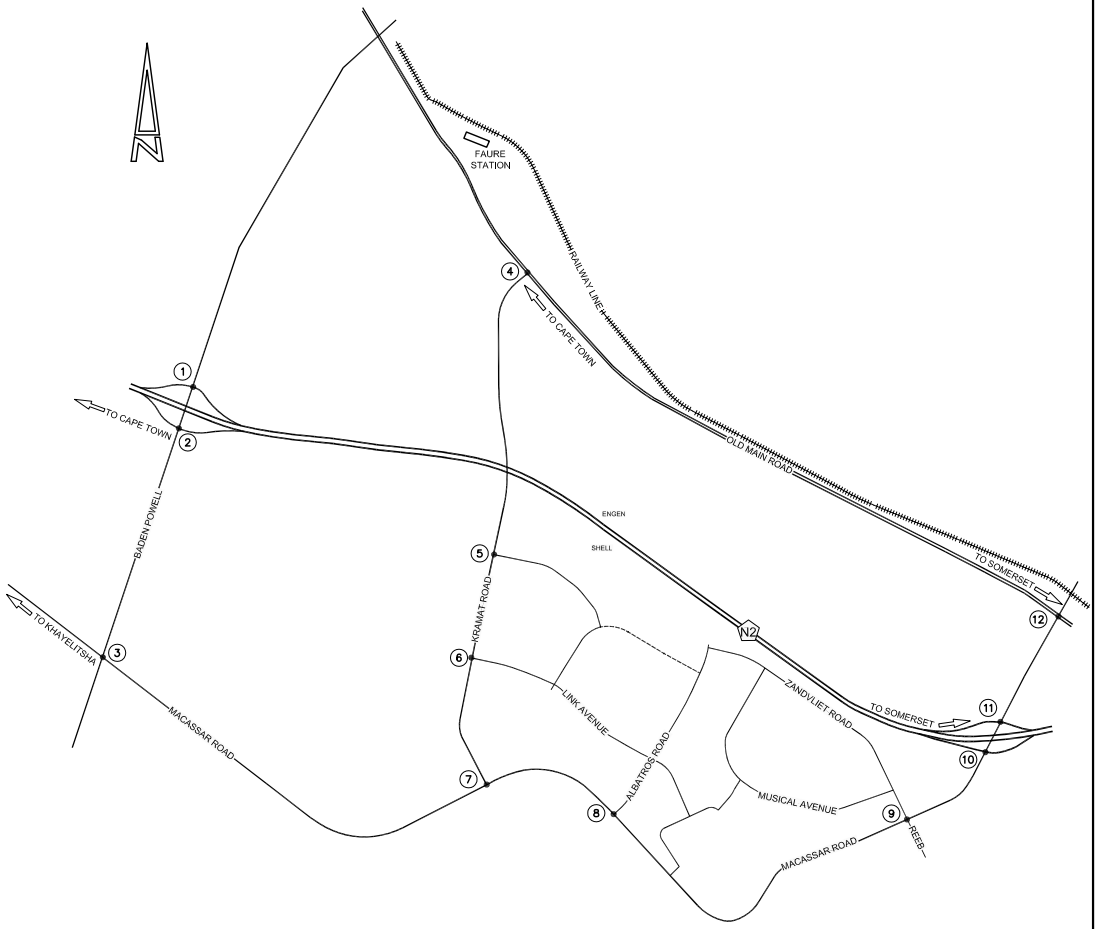
STOP/ YIELD CONTROL

TRAFFIC SIGNAL



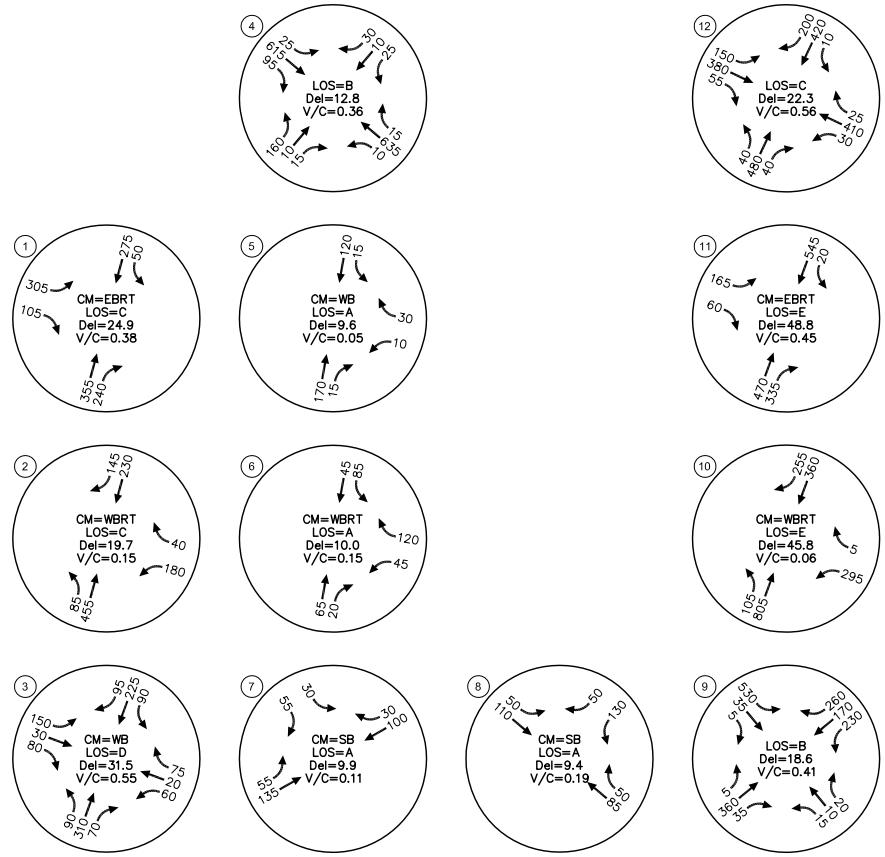
SCHEMATIC

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXISTING LANE CONFIGURATION AND TRAFFIC CONTROL DEVICES	3



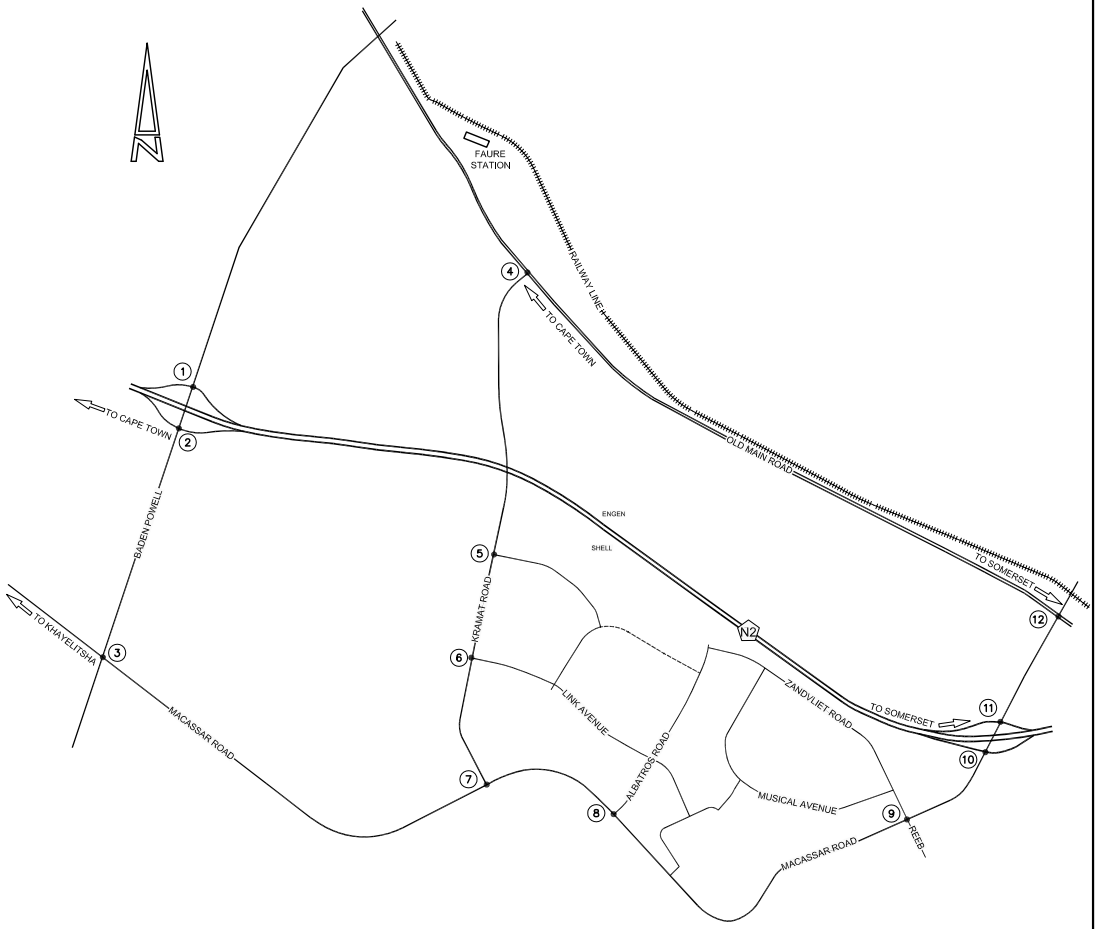
LEGEND	
CM =	CRITICAL MOVEMENT (UNSIGNALISED)
LOS =	INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del =	INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C =	CRITICAL VOLUME–TO–CAPACITY RATIO

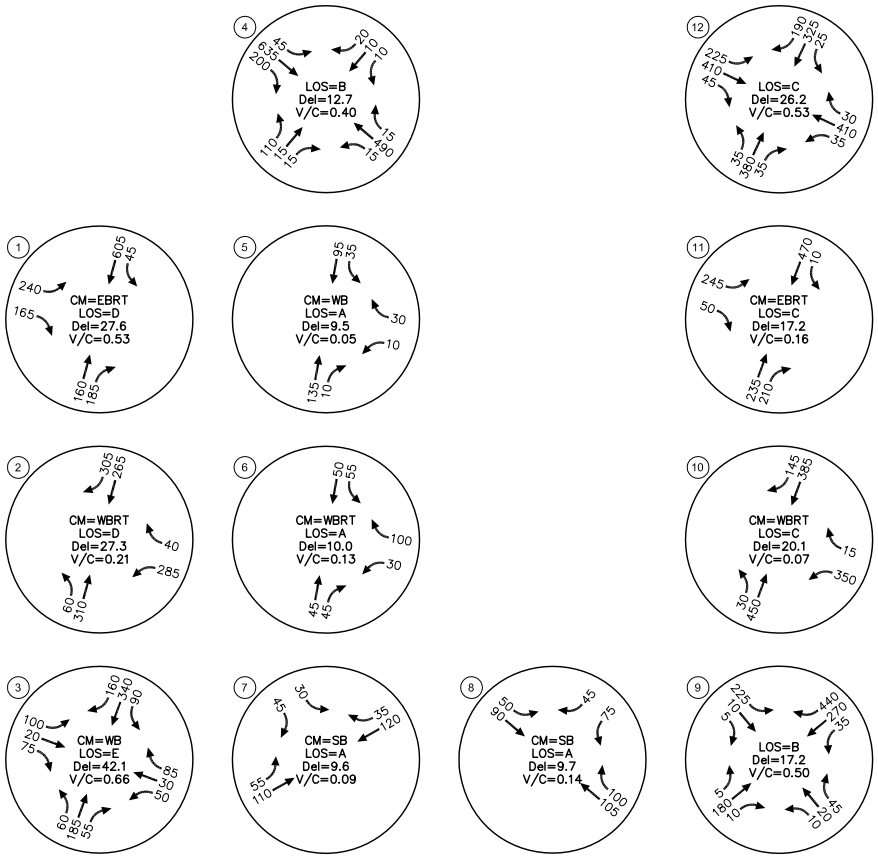
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.
DATE OF COUNT: JUNE 2011



SCHEMATIC

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXISTING TRAFFIC CONDITIONS - AM PEAK HOUR	4





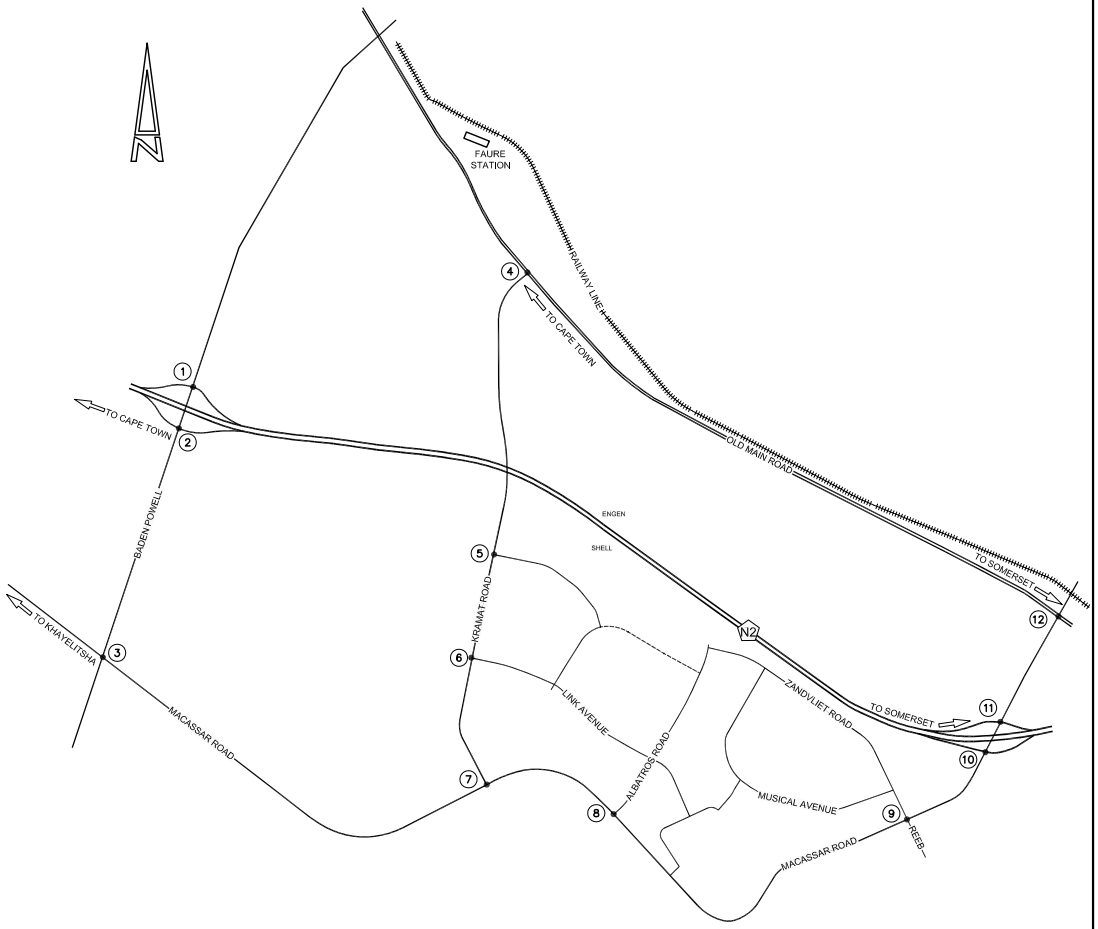
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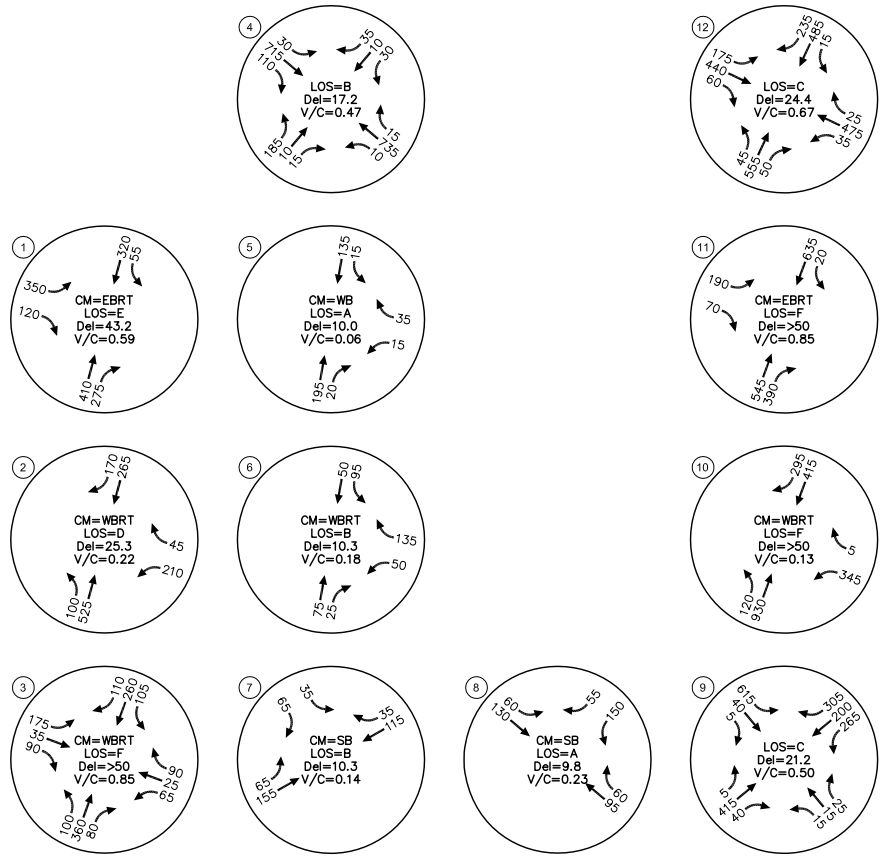
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.
DATE OF COUNT: JUNE 2011

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXISTING TRAFFIC CONDITIONS - PM PEAK HOUR	5





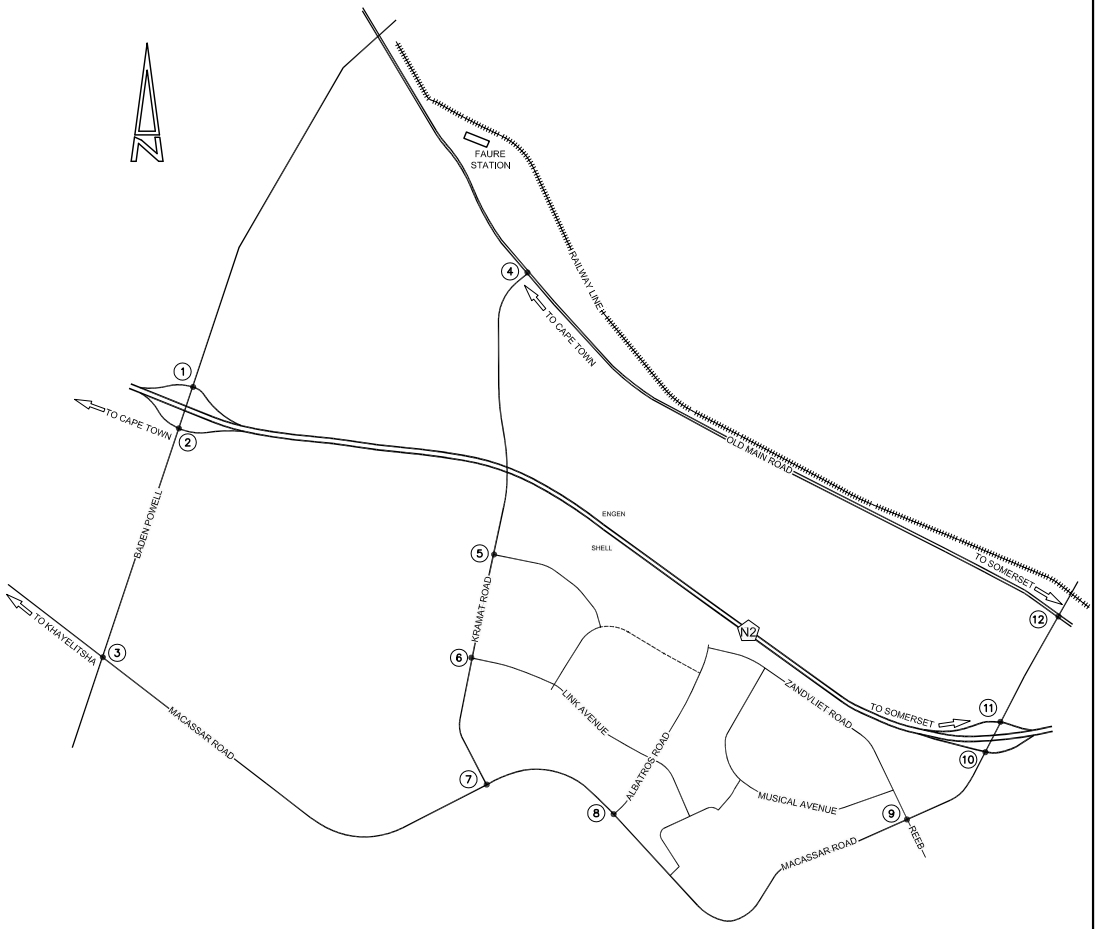
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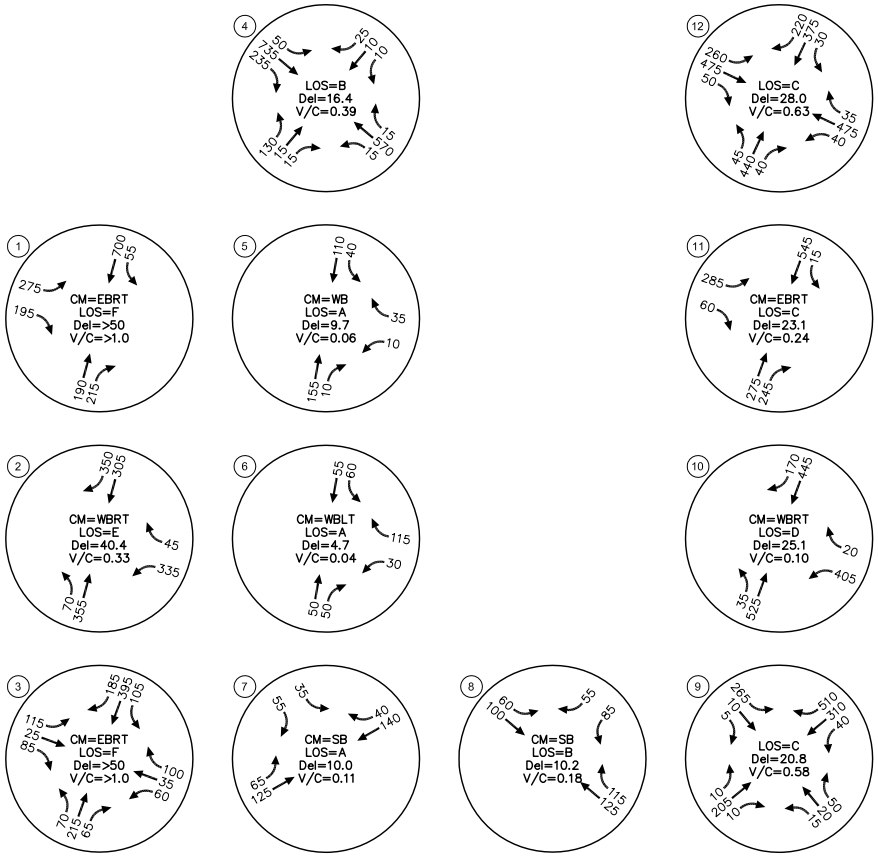
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
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Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 BACKGROUND TRAFFIC CONDITIONS AM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	6





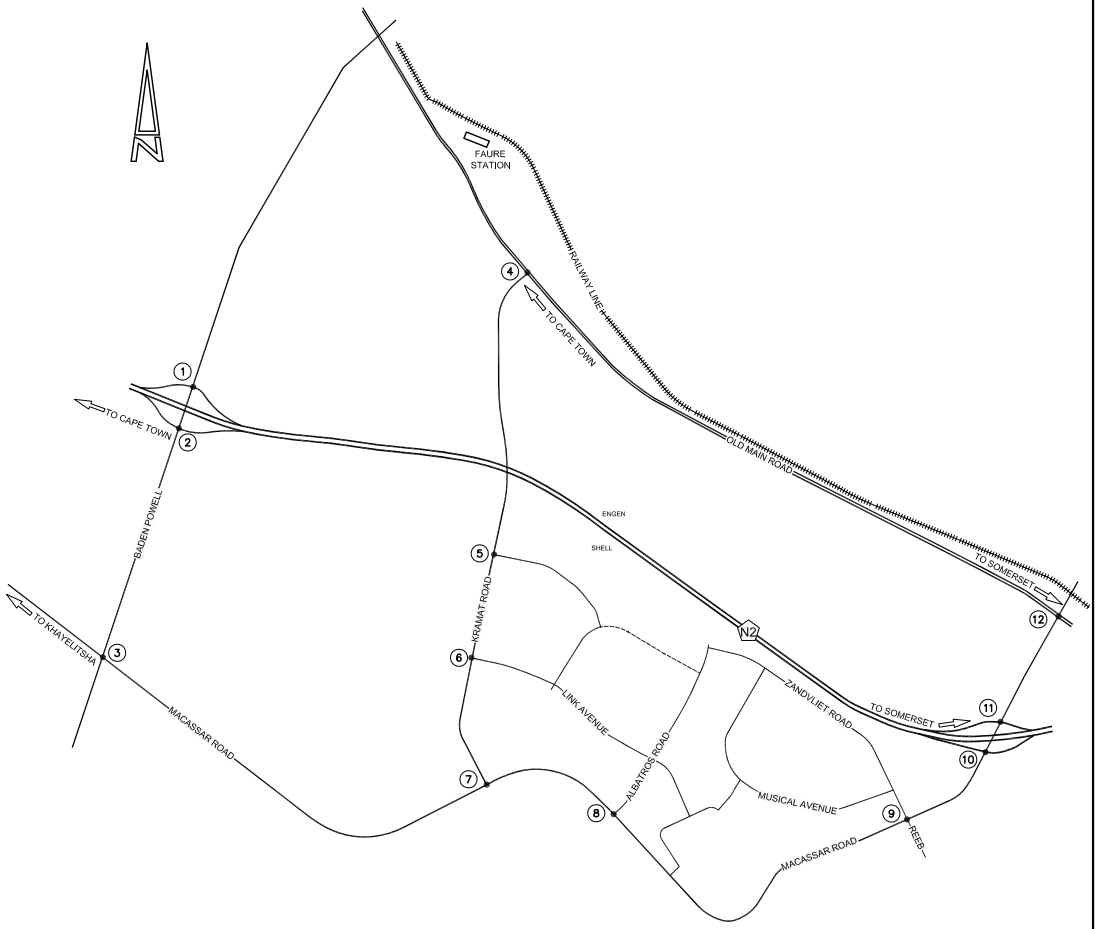
SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
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V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 BACKGROUND TRAFFIC CONDITIONS PM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	7

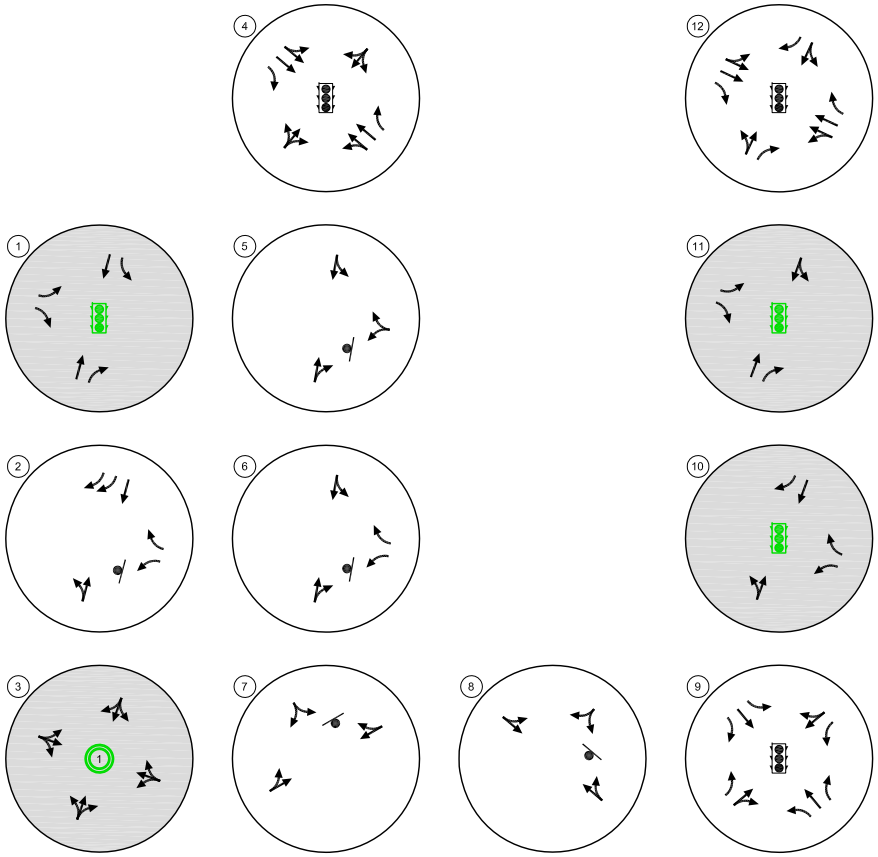


LEGEND

- STOP / YIELD CONTROL
- TRAFFIC SIGNAL
- ROUNDABOUT

LEGEND

- EXISTING INTERSECTION LAYOUT AND CONTROL
- UPGRADES PROPOSED FOR 2016 BACKGROUND TRAFFIC CONDITIONS (WITHOUT THE FIRGROVE INDUSTRIAL DEVELOPMENT)



SCHEMATIC

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PROJECT:

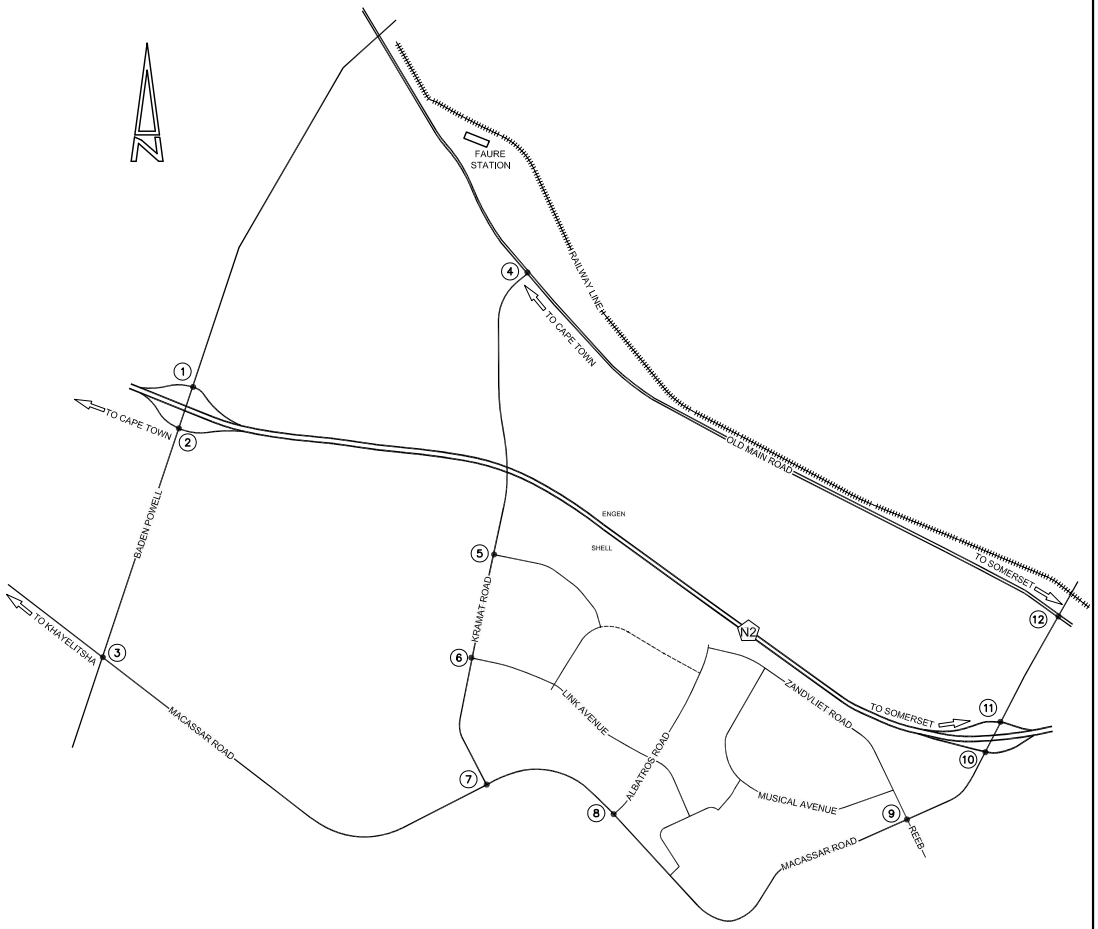
MACASSAR HOUSING PROJECT

FIGURE:

RECOMMENDED LANE CONFIGURATION AND TRAFFIC CONTROL DEVICES FOR 2016 BACKGROUND CONDITIONS WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT

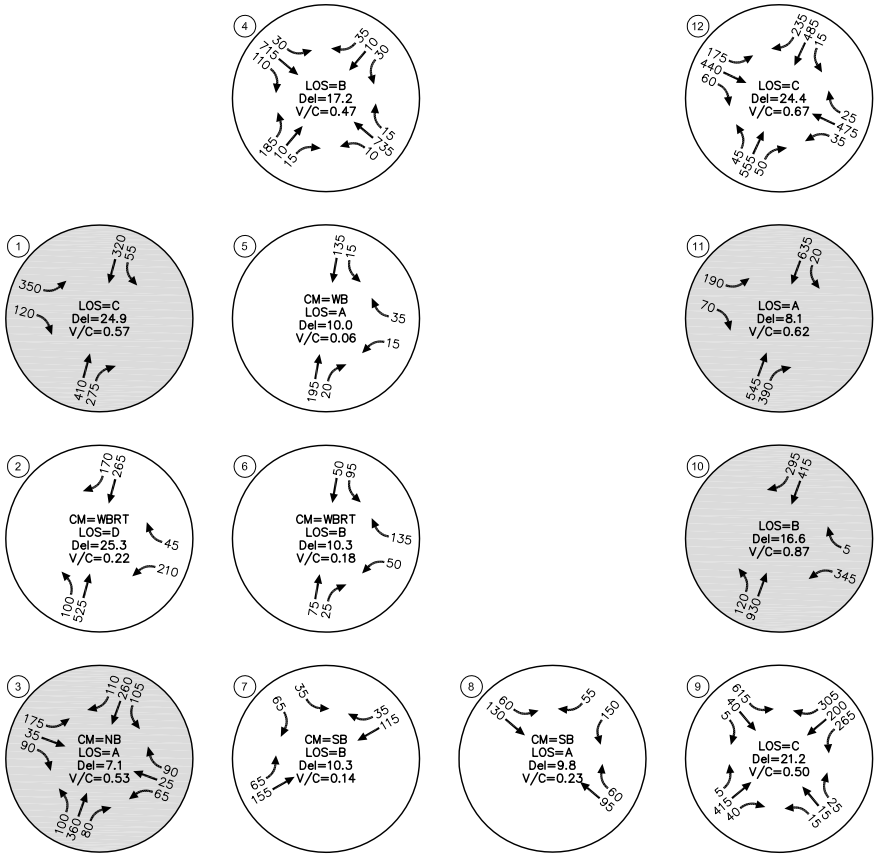
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8



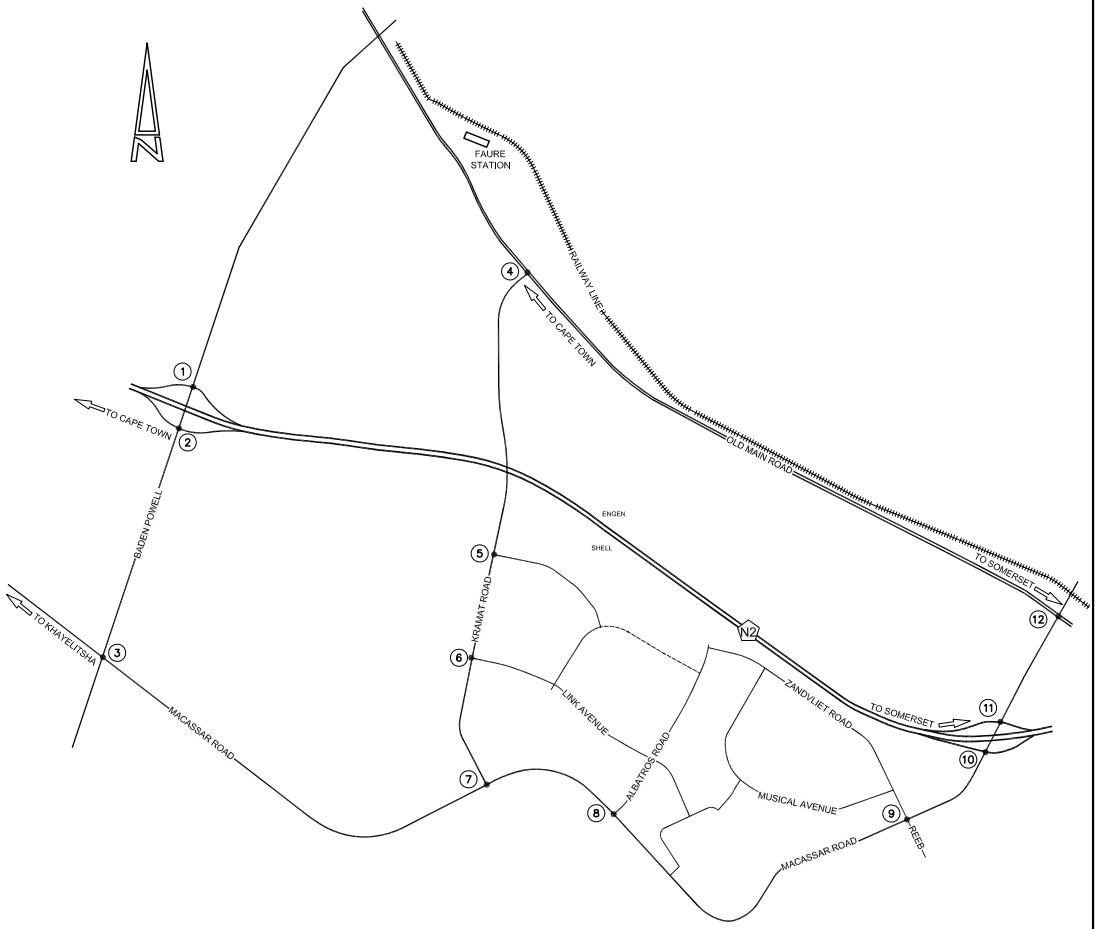
LEGEND	
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Del =	INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C =	CRITICAL VOLUME–TO–CAPACITY RATIO

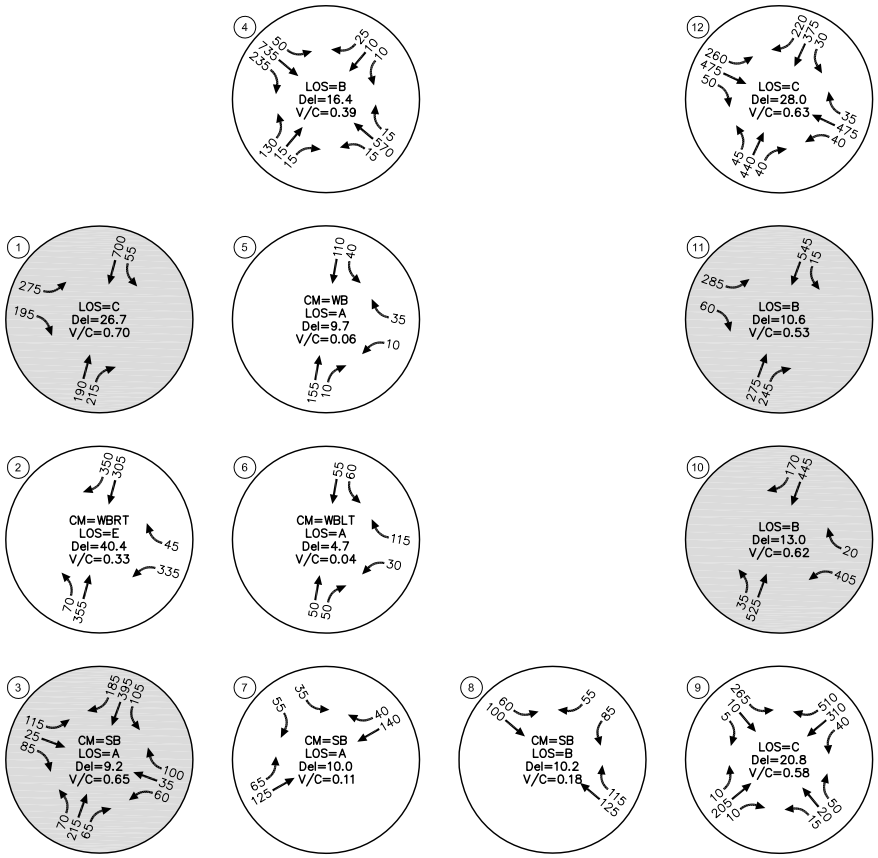
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 8.



SCHEMATIC

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 BACKGROUND TRAFFIC CONDITIONS AM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	9





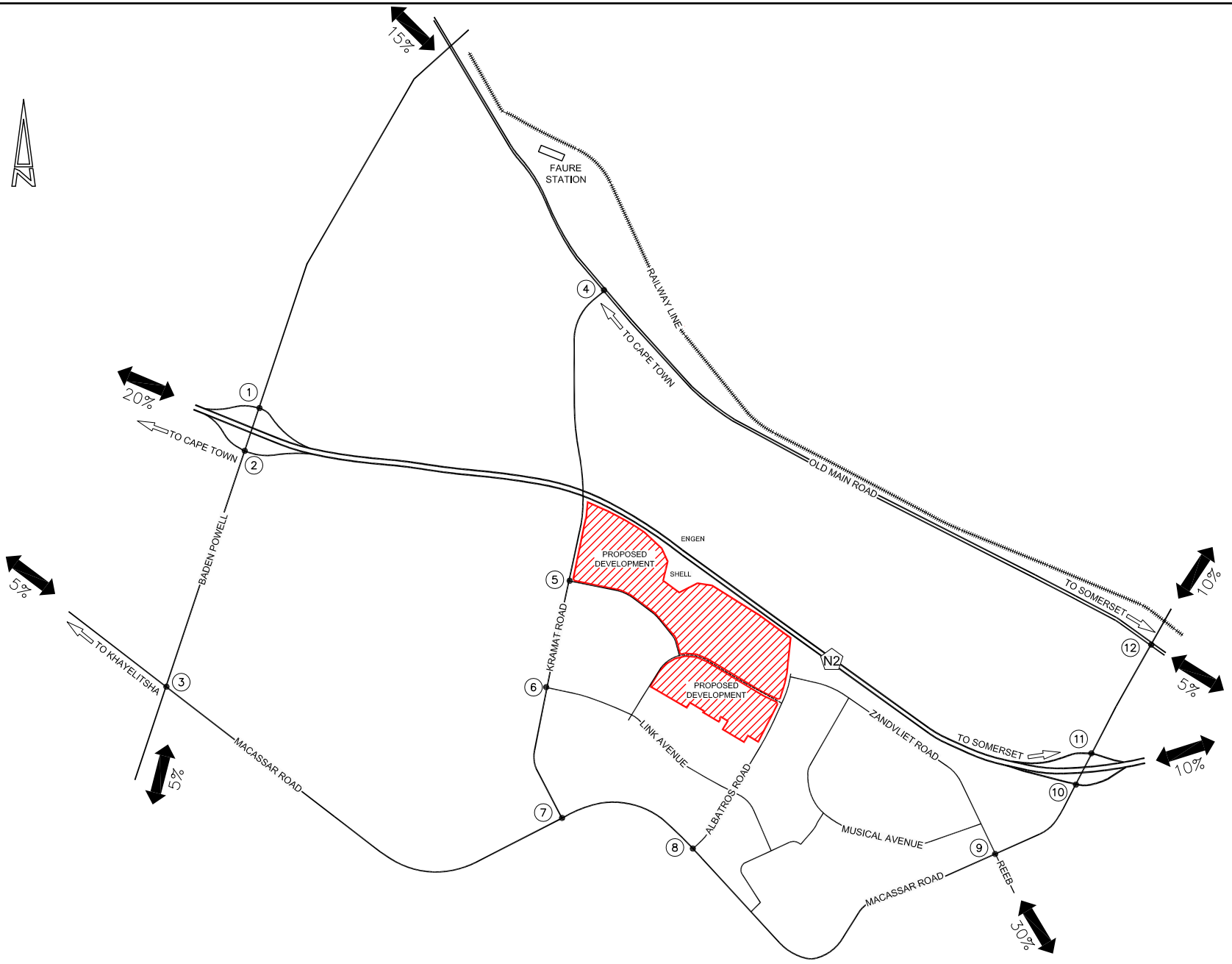
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
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V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 8.

SCHEMATIC

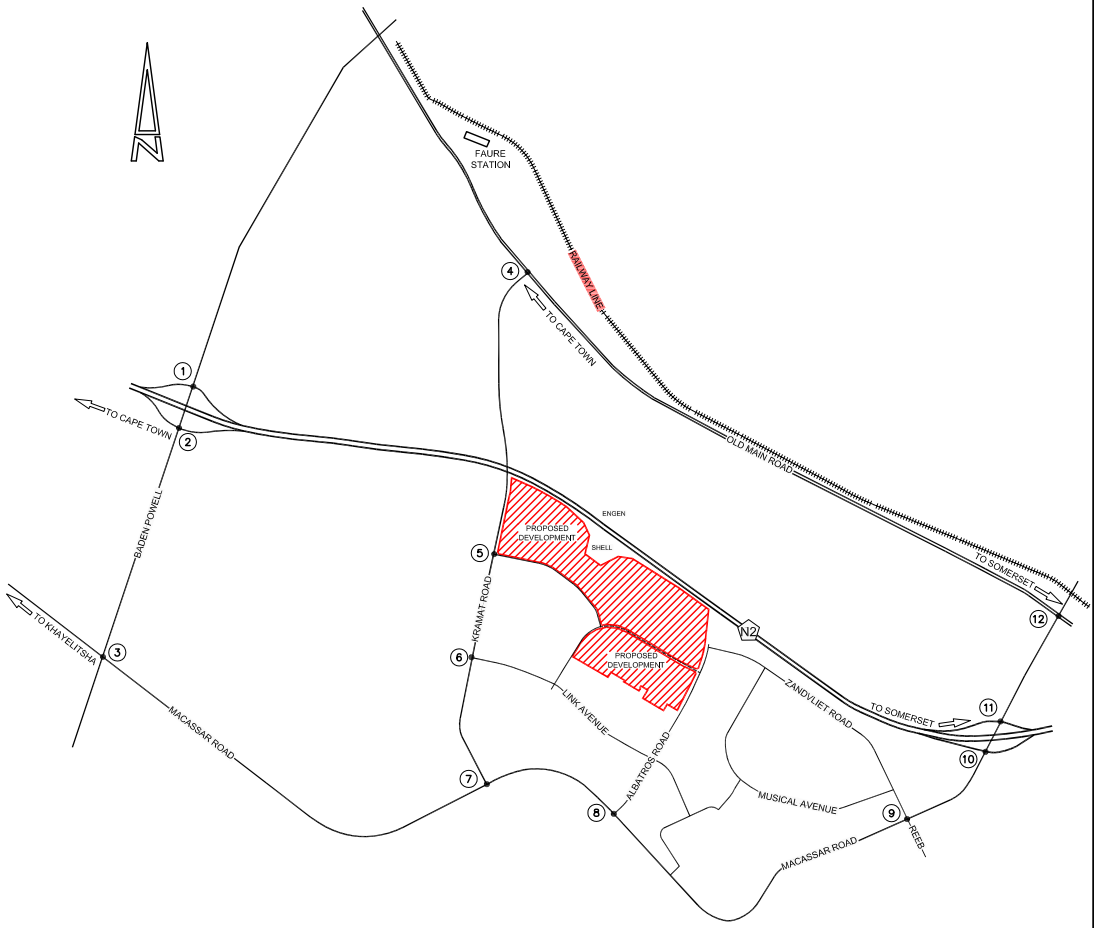
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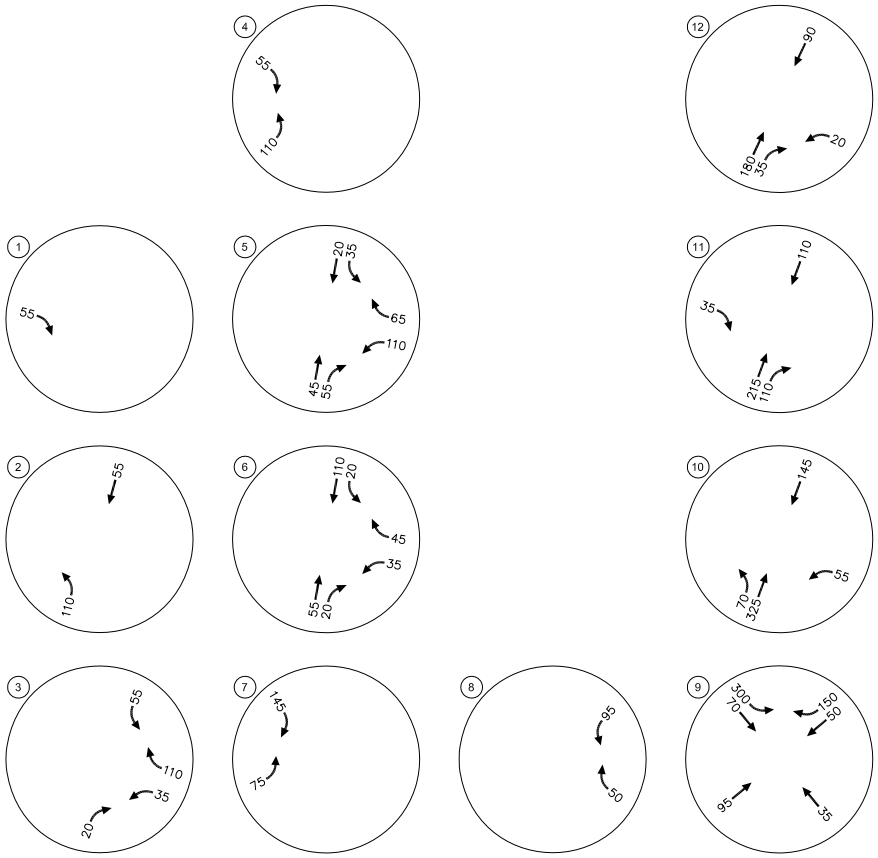
PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 BACKGROUND TRAFFIC CONDITIONS PM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	10



SCHEMATIC

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED TRIP DISTRIBUTION	11



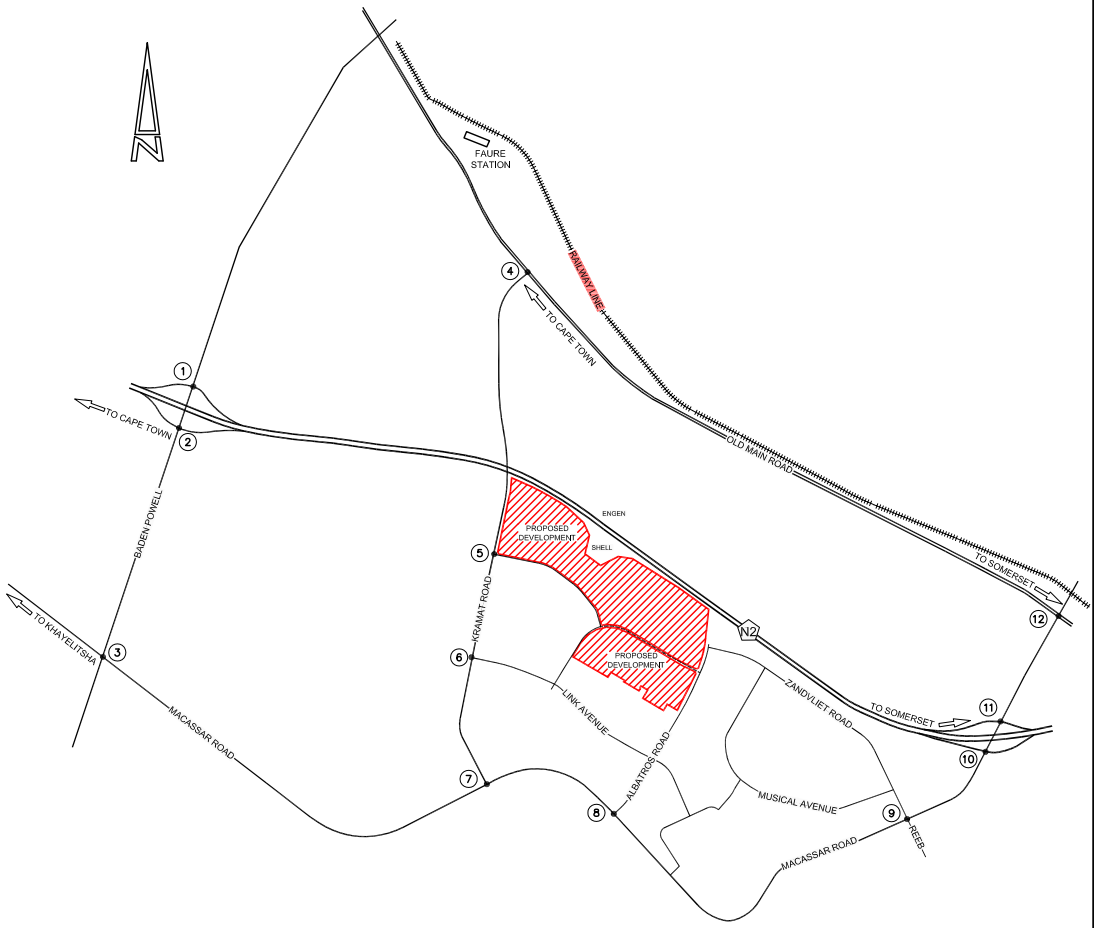


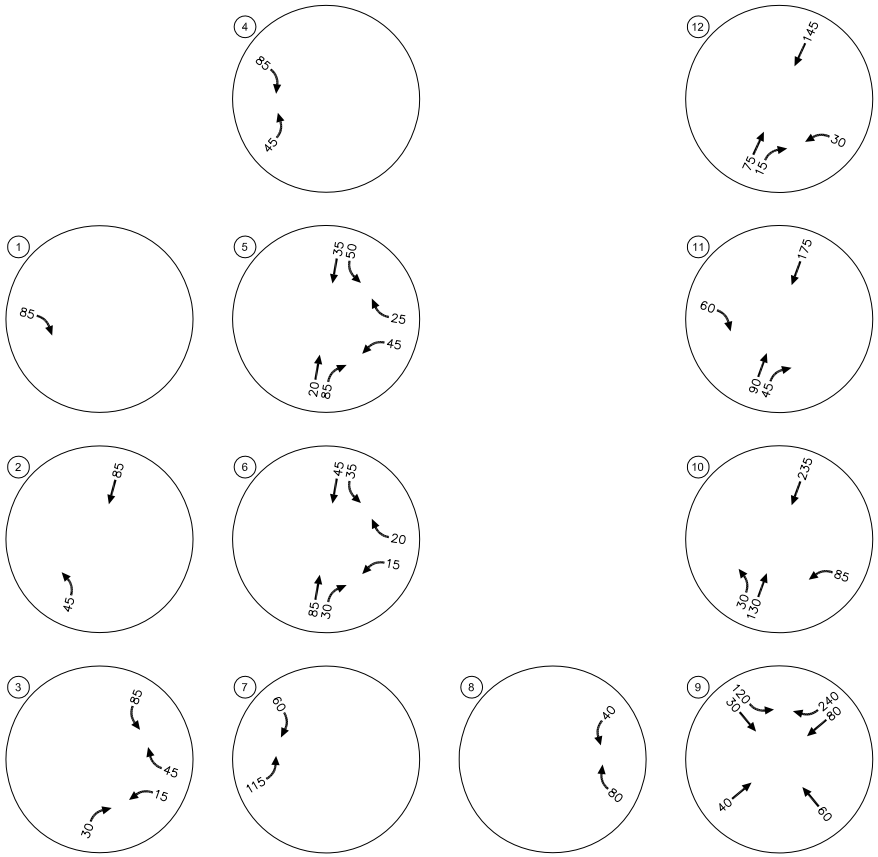
SCHEMATIC

PEAK HOUR	IN	OUT	TOTAL
AM	369	657	1 026

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED SITE GENERATED TRIPS - AM PEAK HOUR	12

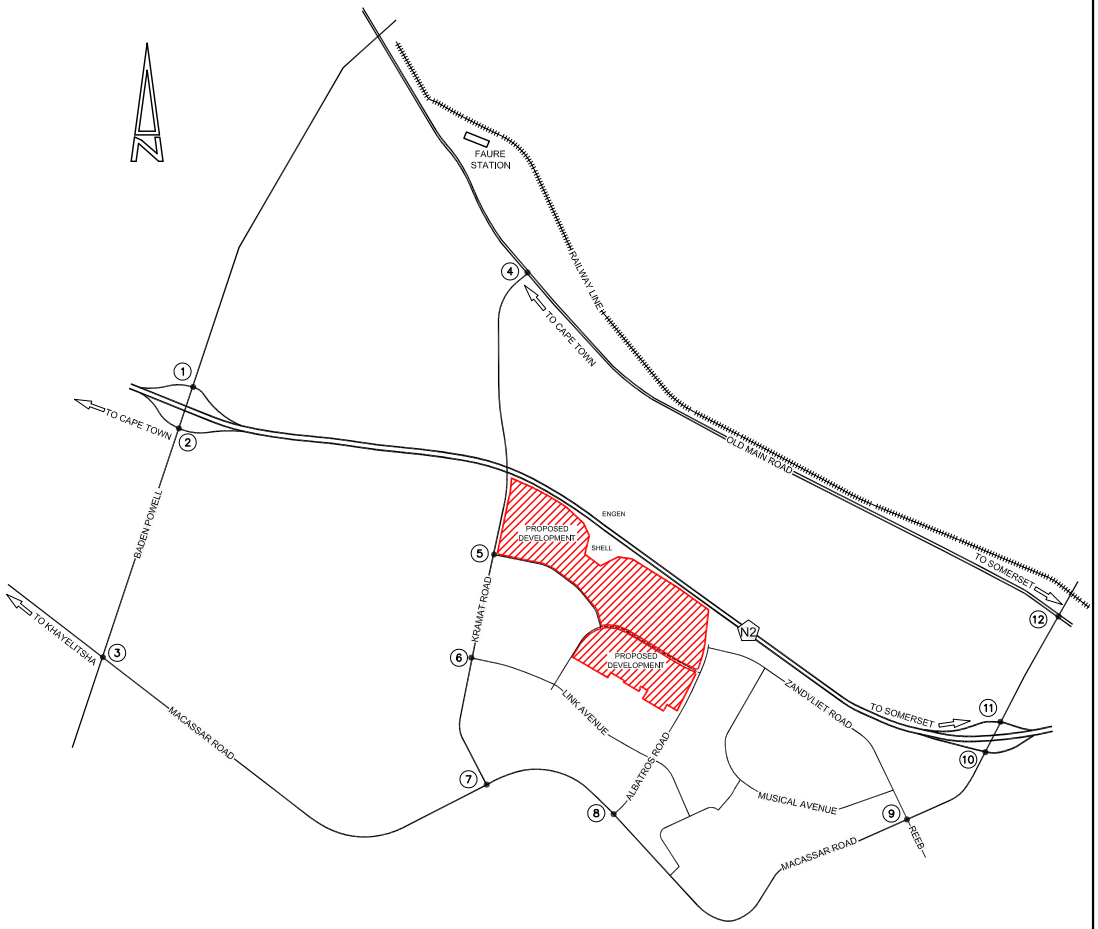


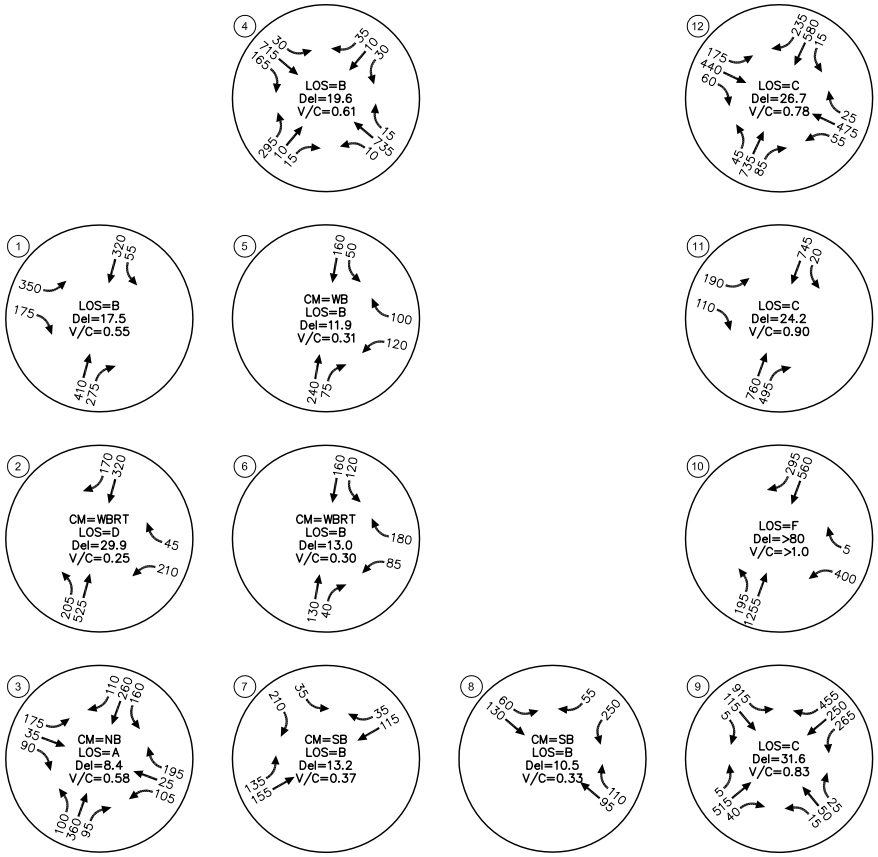


PEAK HOUR	IN	OUT	TOTAL
PM	529	300	829

SCHEMATIC

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED SITE GENERATED TRIPS - PM PEAK HOUR	13





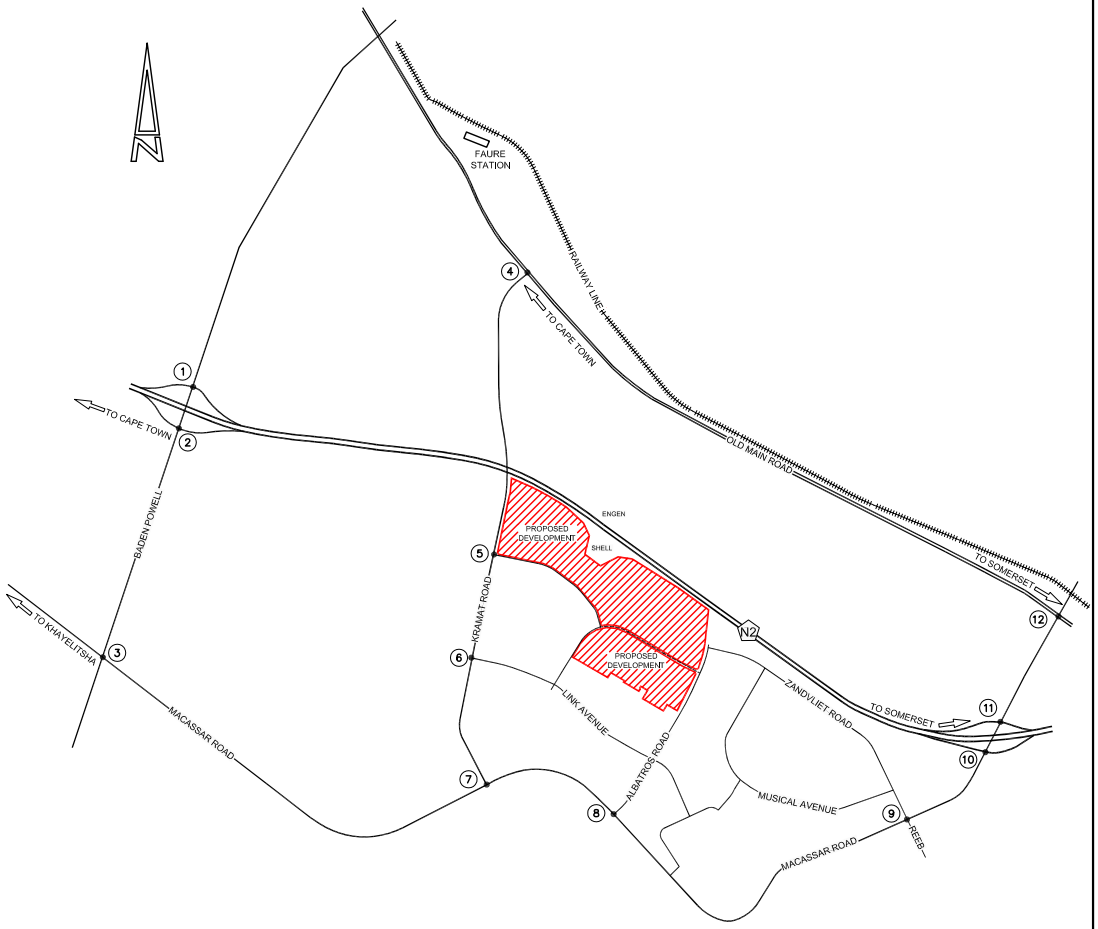
SCHEMATIC

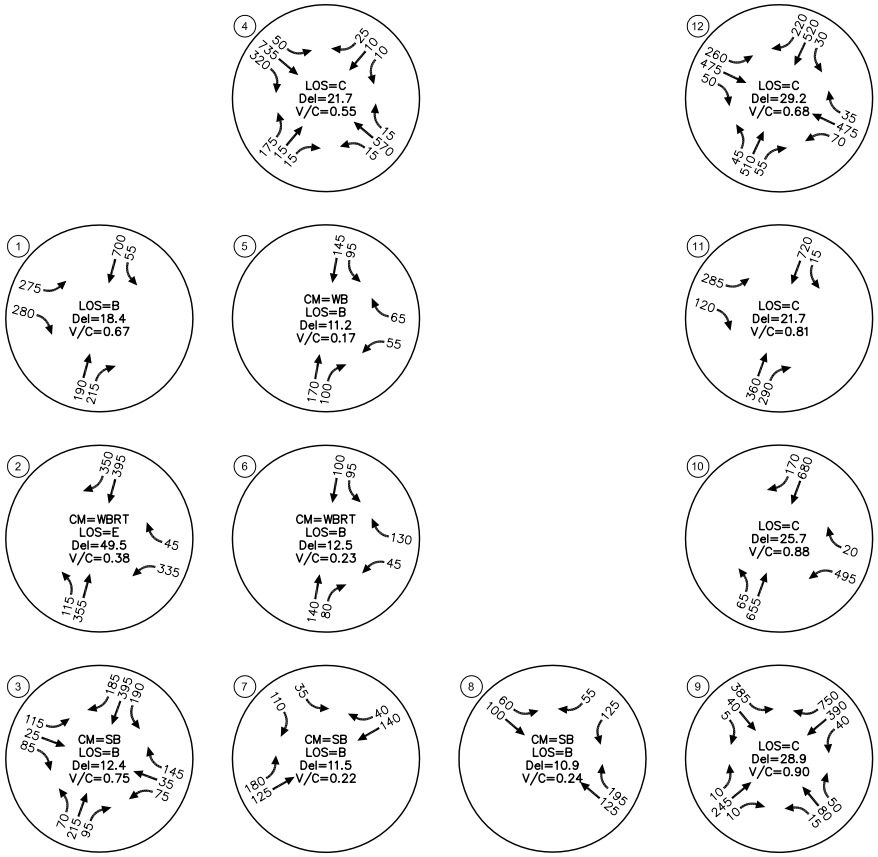
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
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Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 8.

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 TOTAL TRAFFIC CONDITIONS AM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	14





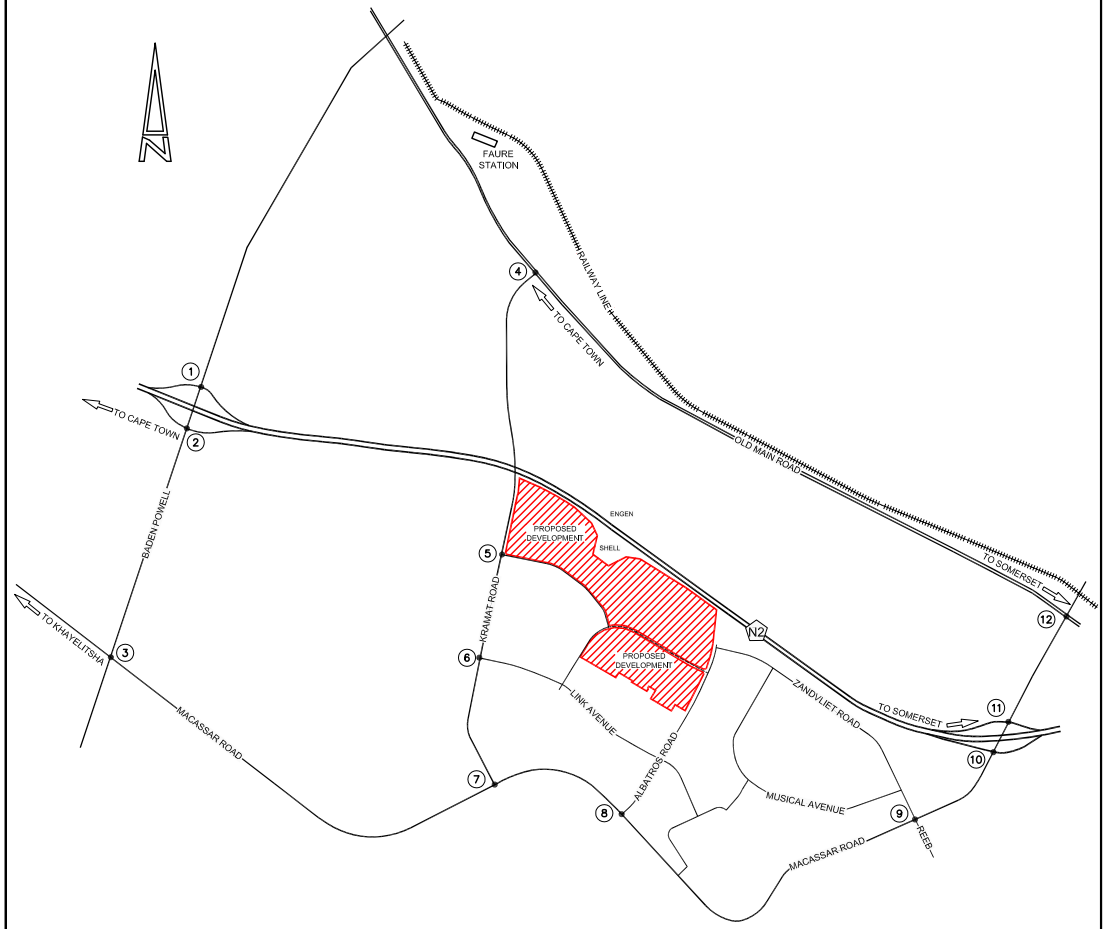
SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 8.

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 TOTAL TRAFFIC CONDITIONS PM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	15

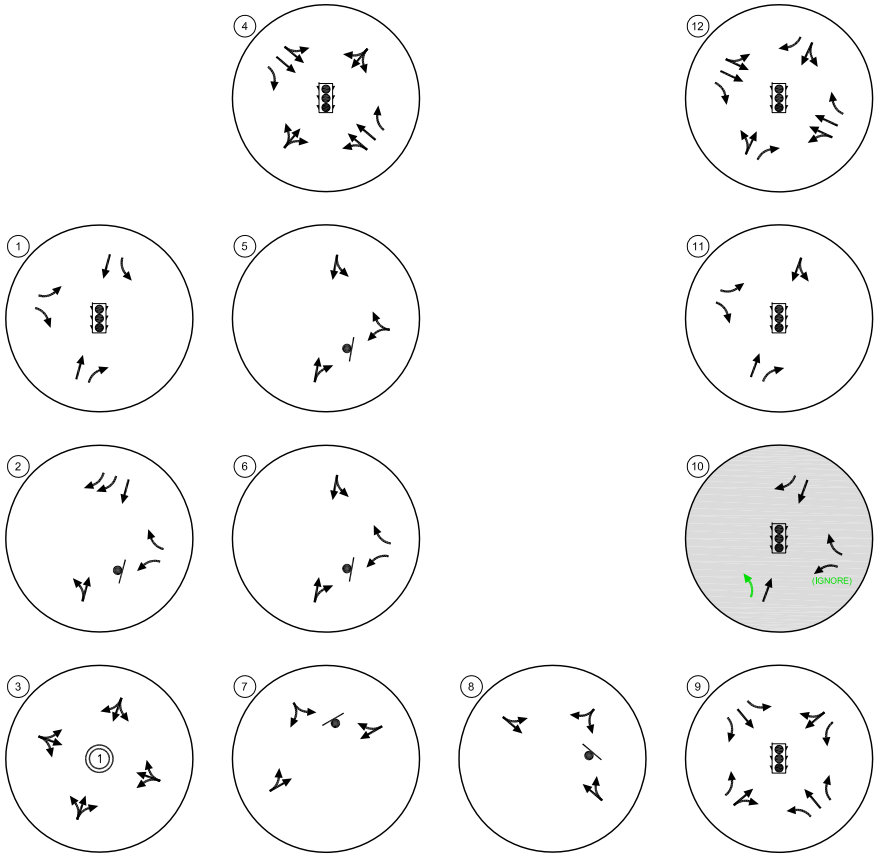


LEGEND

- STOP / YIELD CONTROL
- TRAFFIC SIGNAL
- ROUNDABOUT

LEGEND

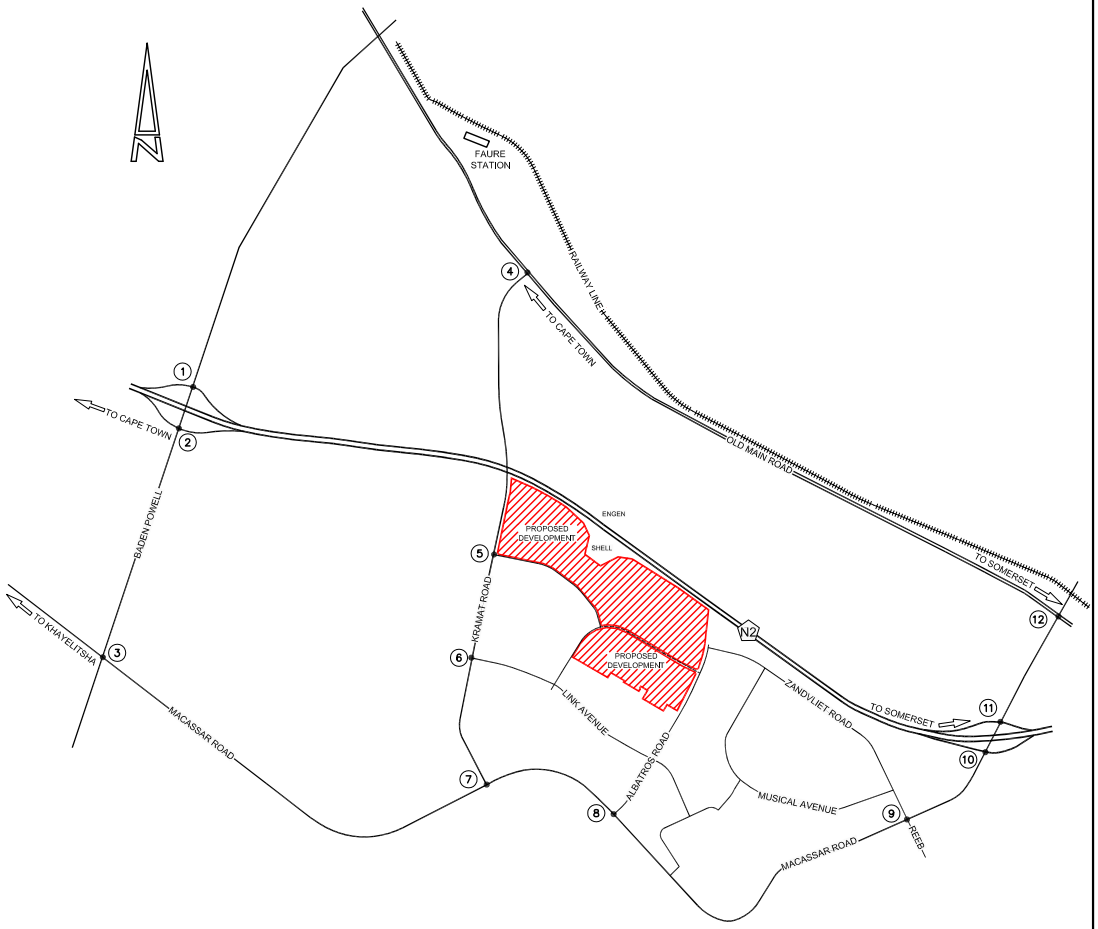
- 2016 BACKGROUND INTERSECTION LAYOUT AND CONTROL
- UPGRADES PROPOSED FOR 2016 BACKGROUND TRAFFIC CONDITIONS (WITHOUT THE FIRGROVE INDUSTRIAL DEVELOPMENT)

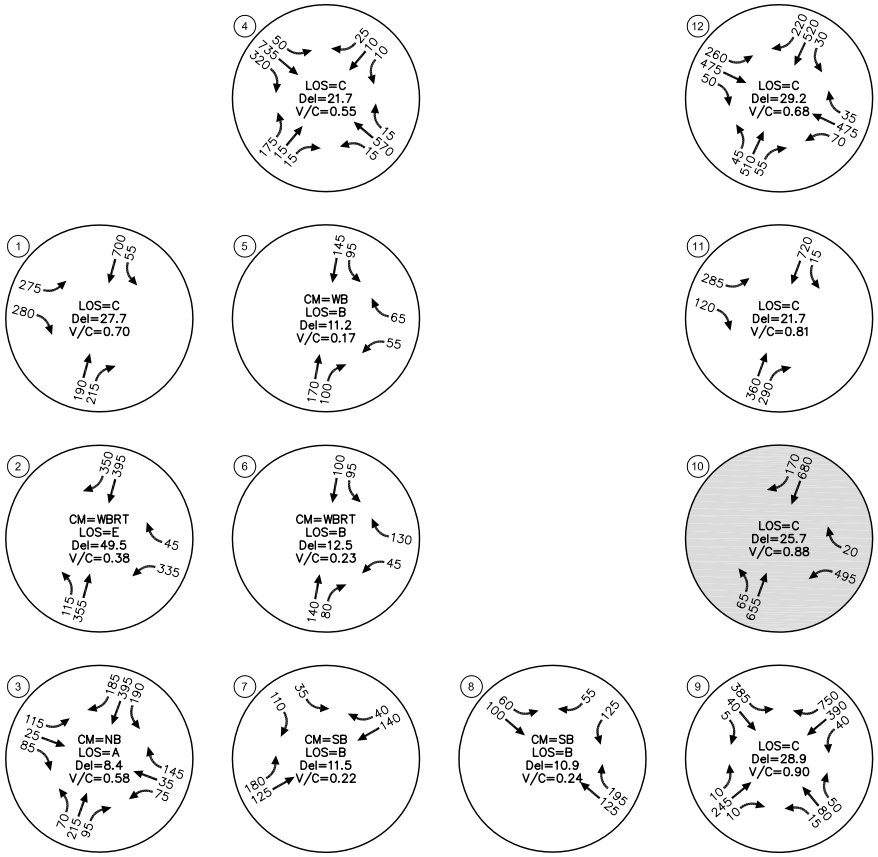


SCHEMATIC

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	RECOMMENDED LANE CONFIGURATION AND TRAFFIC CONTROL DEVICES FOR 2016 TOTAL CONDITIONS WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	16





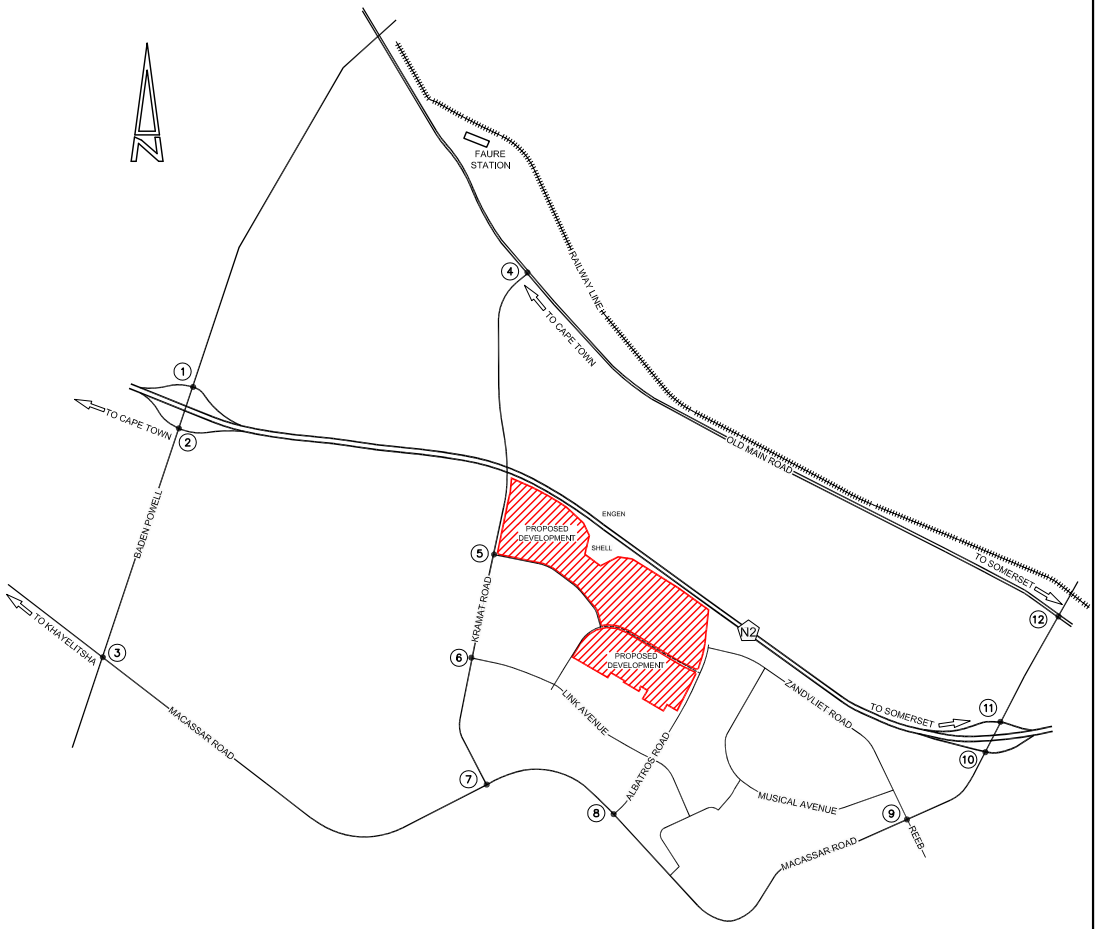
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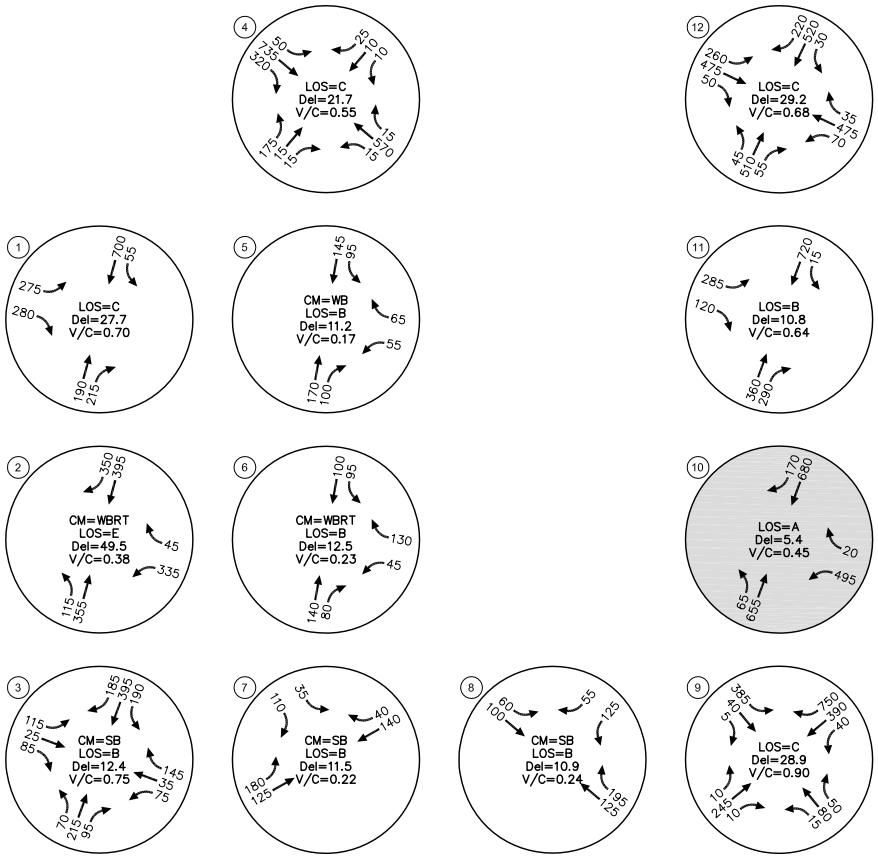
LEGEND
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V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 16.

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 TOTAL TRAFFIC CONDITIONS AM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT	17





SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
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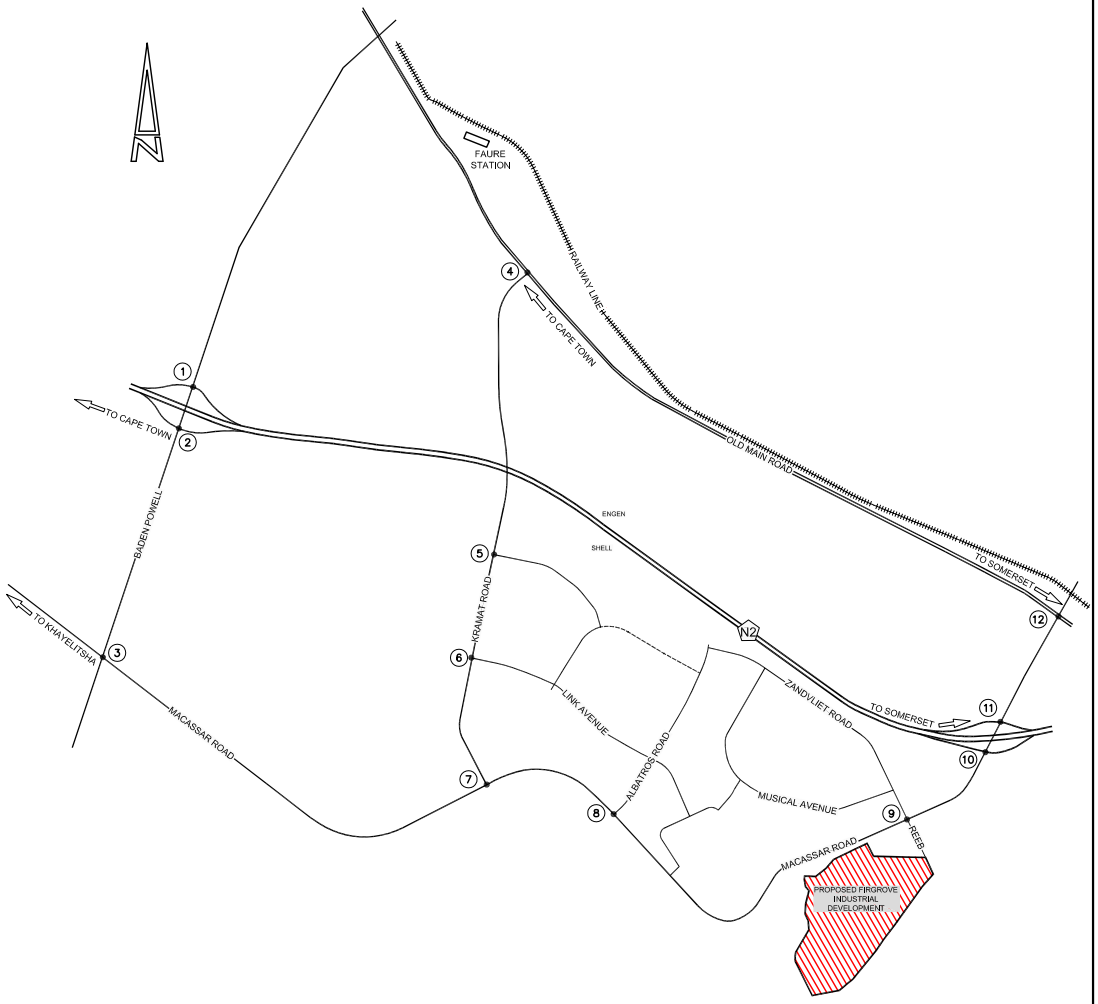
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 16.

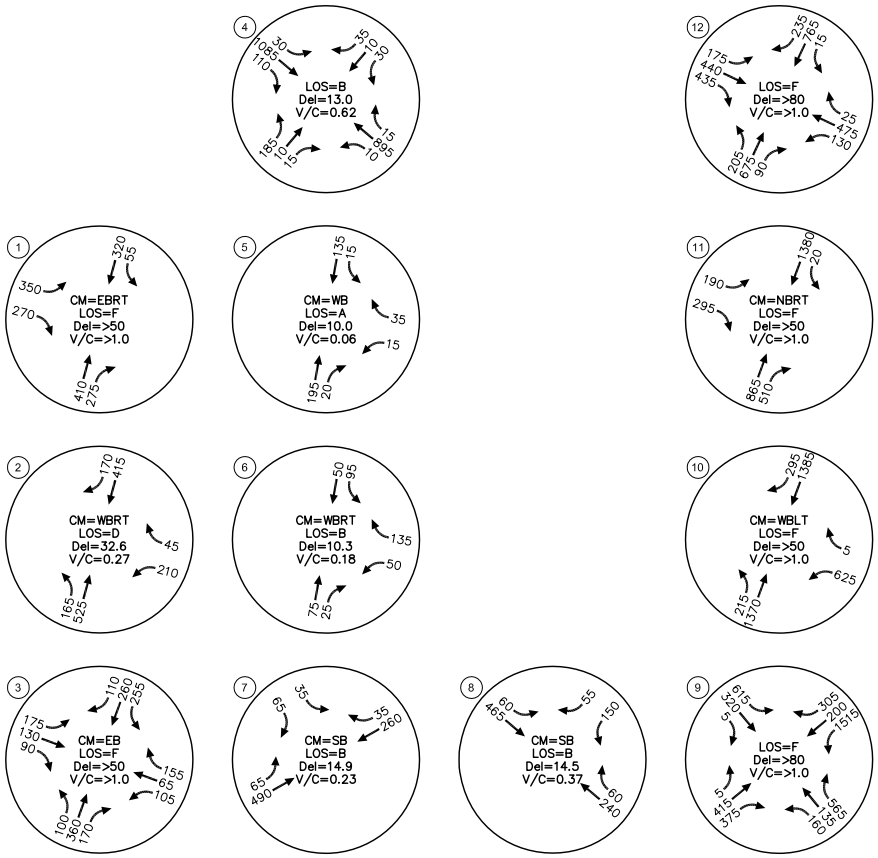
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PROJECT:
MACASSAR HOUSING PROJECT

FIGURE:
MITIGATED 2016 TOTAL TRAFFIC CONDITIONS PM PEAK HOUR - WITHOUT FIRGROVE INDUSTRIAL DEVELOPMENT

NUMBER:
18





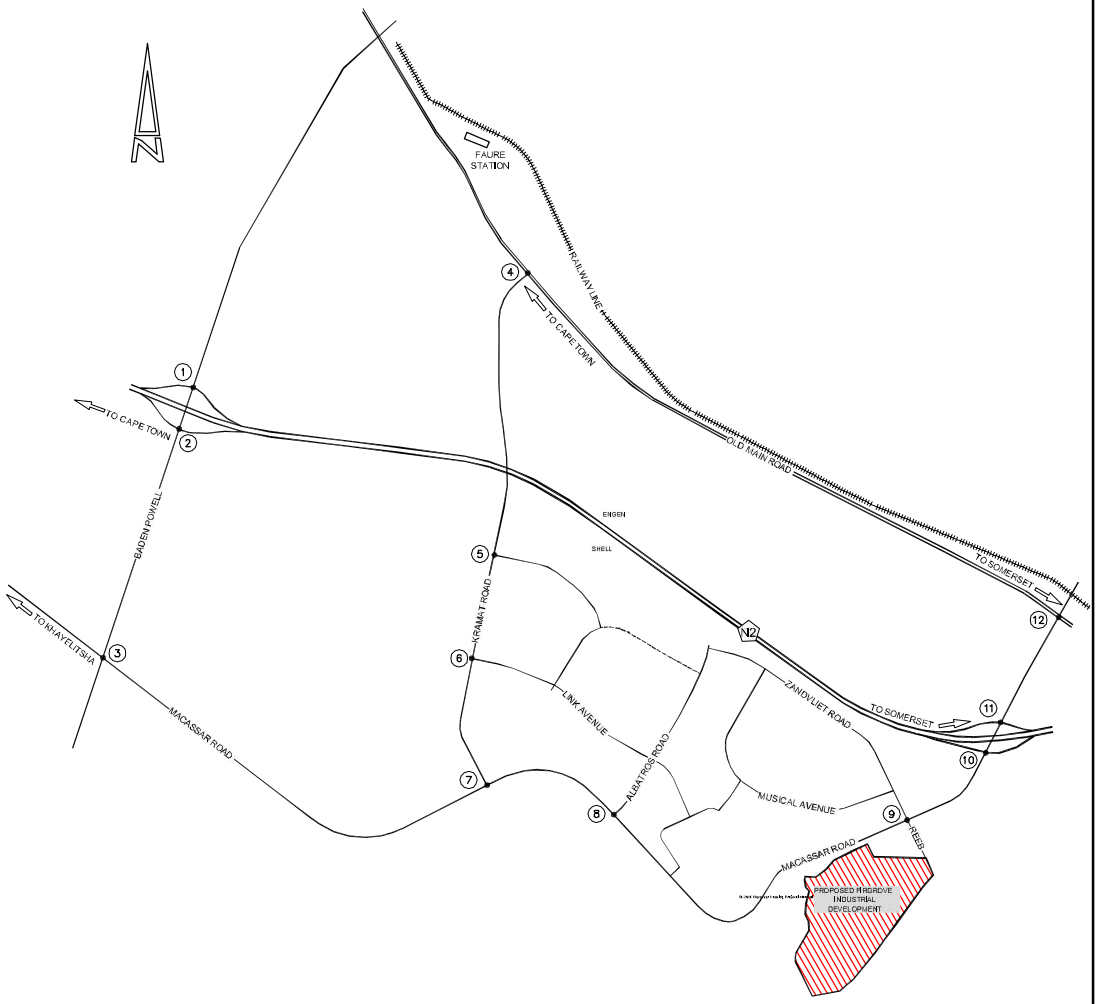
LEGEND	
CM =	CRITICAL MOVEMENT (UNSIGNALISED)
LOS =	INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
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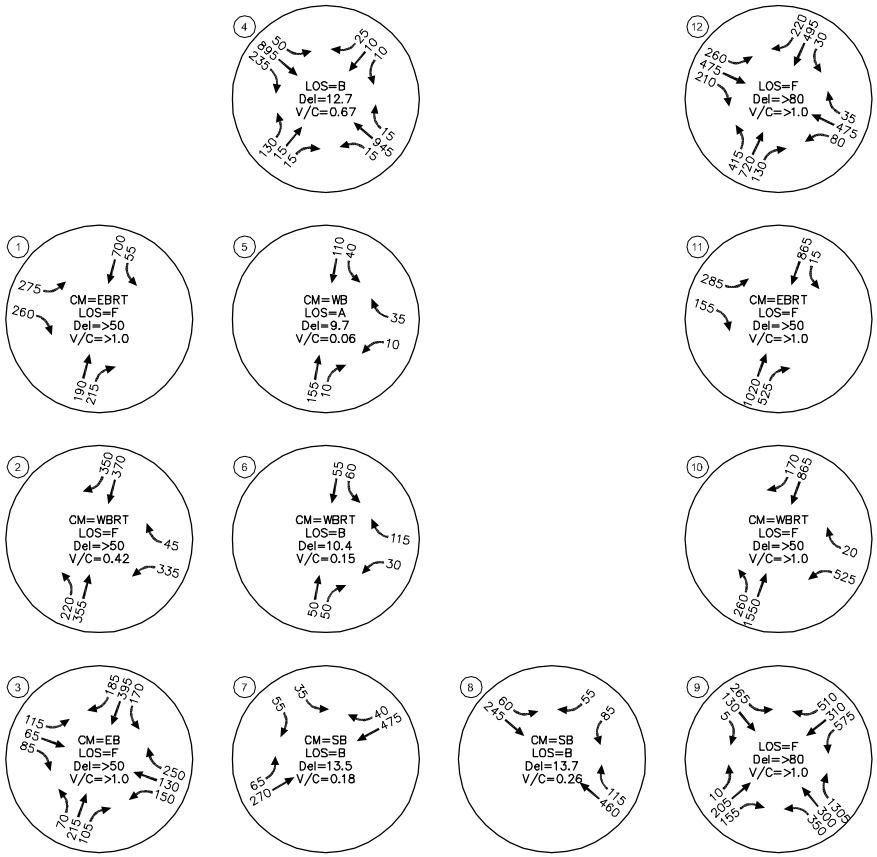
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.

SCHEMATIC

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PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 BACKGROUND TRAFFIC CONDITIONS AM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	19





SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 3.

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PROJECT:

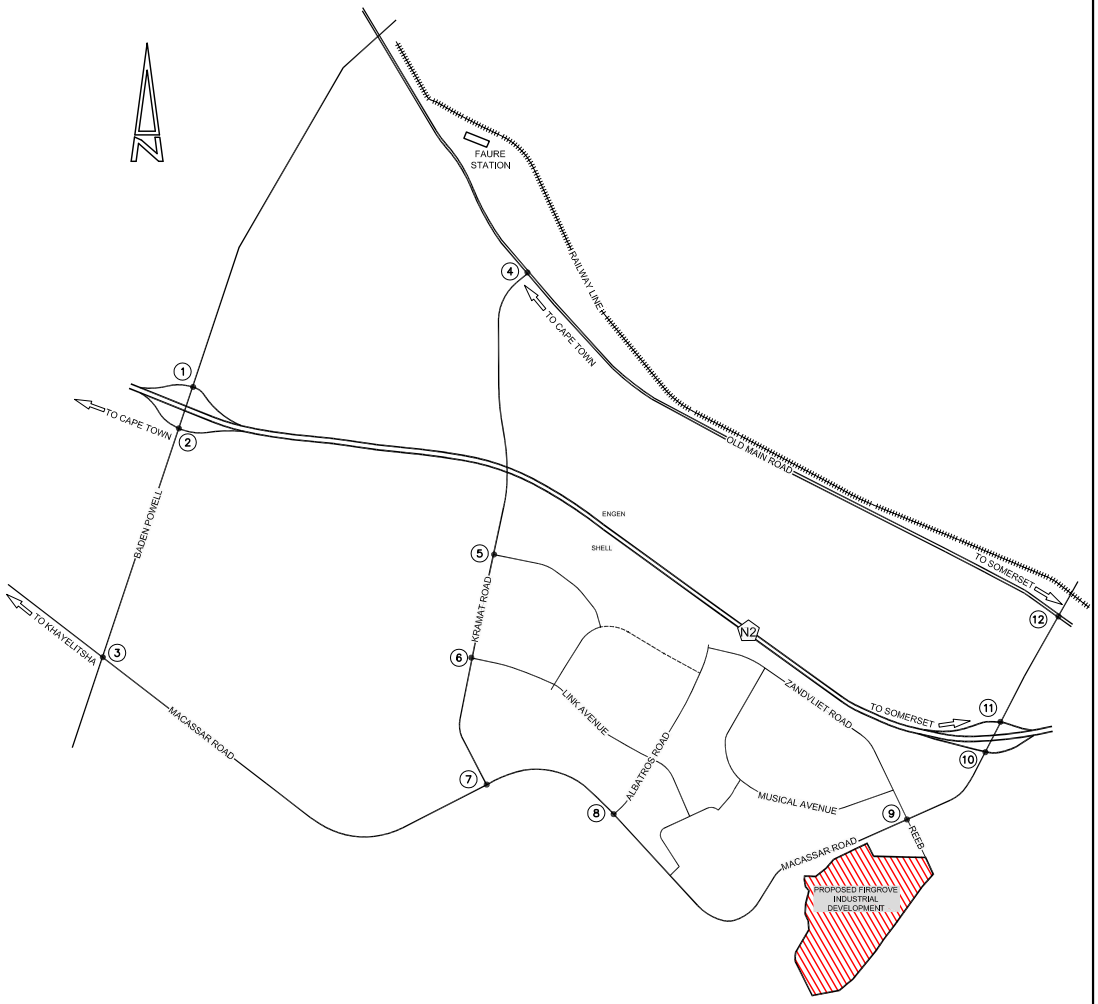
MACASSAR HOUSING PROJECT

FIGURE:

EXPECTED 2016 BACKGROUND TRAFFIC CONDITIONS PM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT

NUMBER:

20

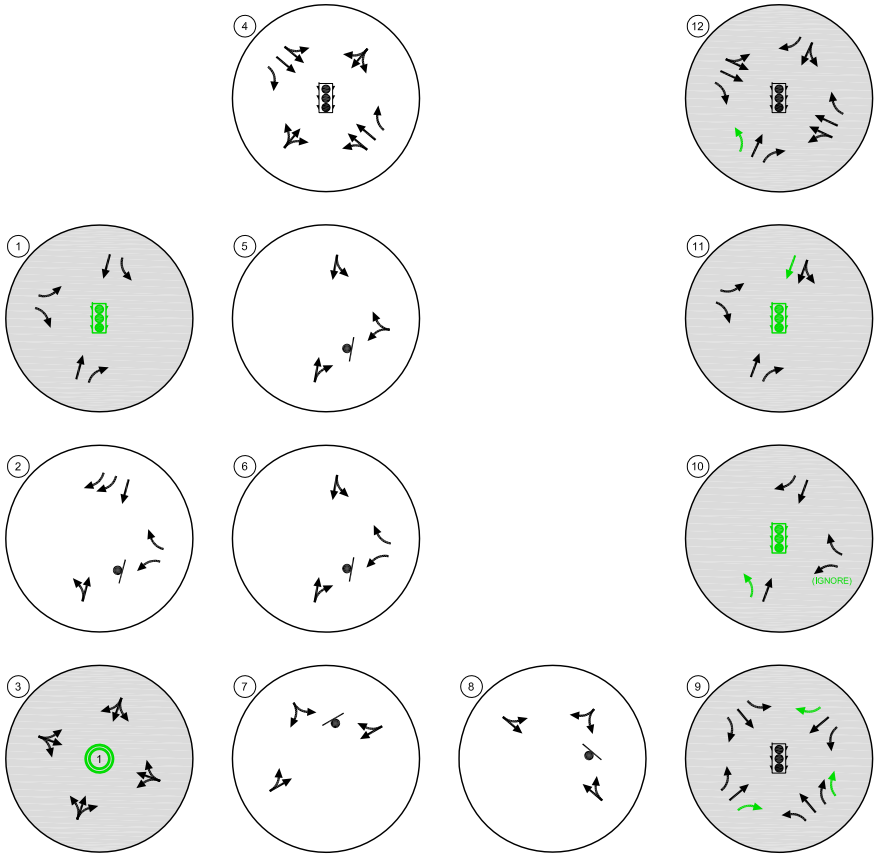


LEGEND

- STOP / YIELD CONTROL
- TRAFFIC SIGNAL
- ROUNDABOUT

LEGEND

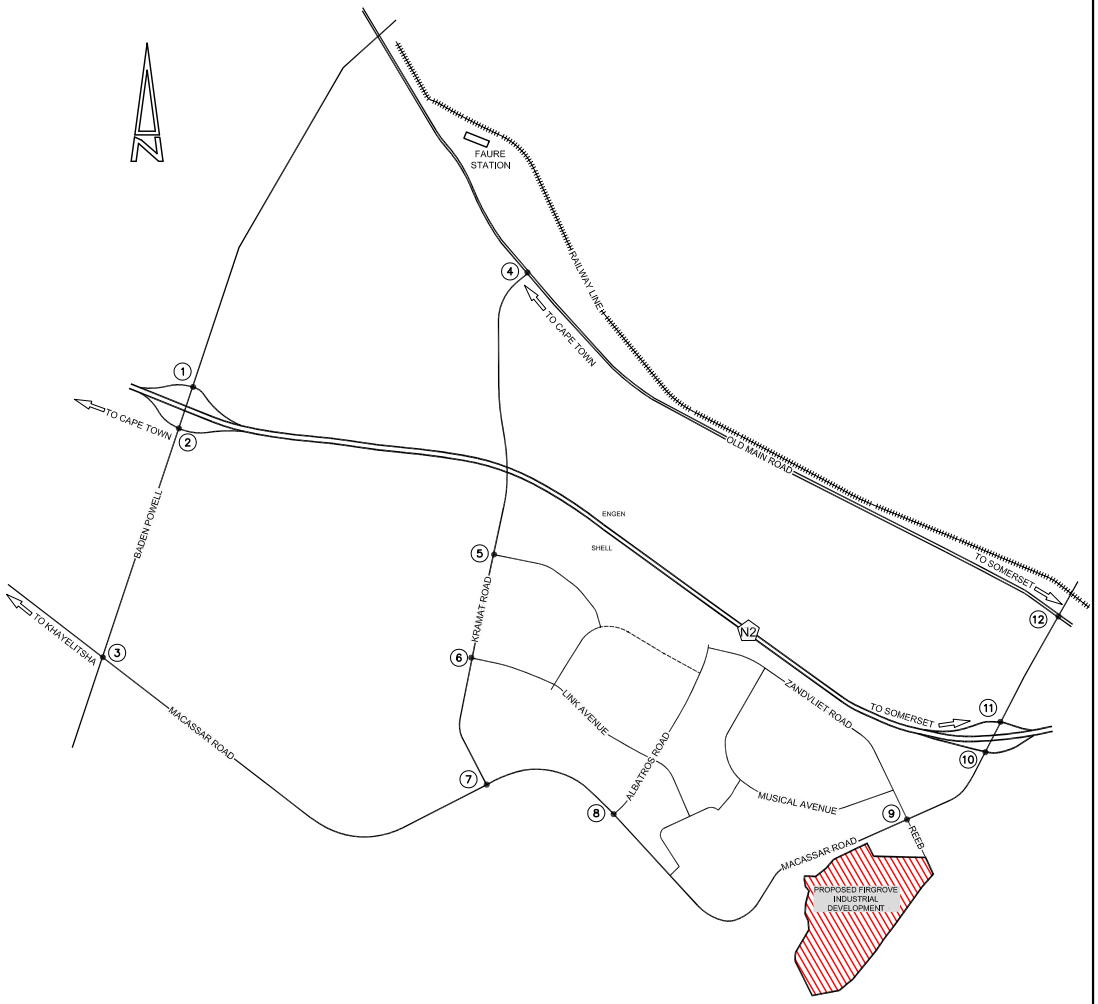
- EXISTING INTERSECTION LAYOUT AND CONTROL
- UPGRADES PROPOSED FOR 2016 BACKGROUND TRAFFIC CONDITIONS (WITH THE FIRGROVE INDUSTRIAL DEVELOPMENT)

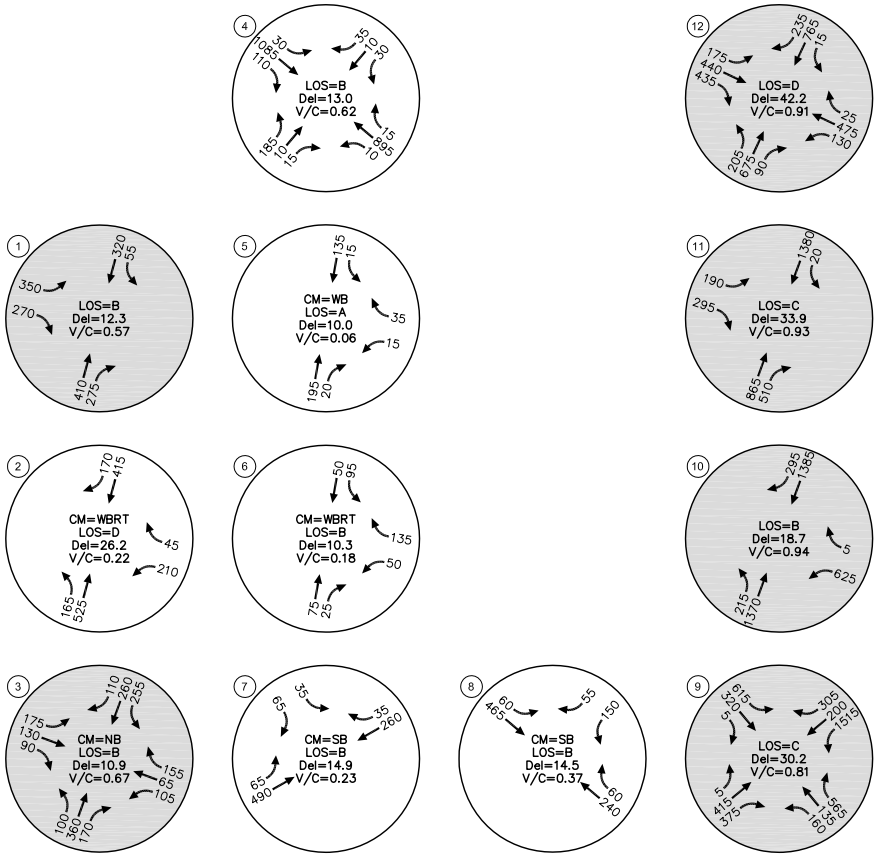


SCHEMATIC

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	RECOMMENDED LANE CONFIGURATION AND TRAFFIC CONTROL DEVICES FOR 2016 BACKGROUND CONDITIONS WITH FIRGROVE INDUSTRIAL DEVELOPMENT	21





SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

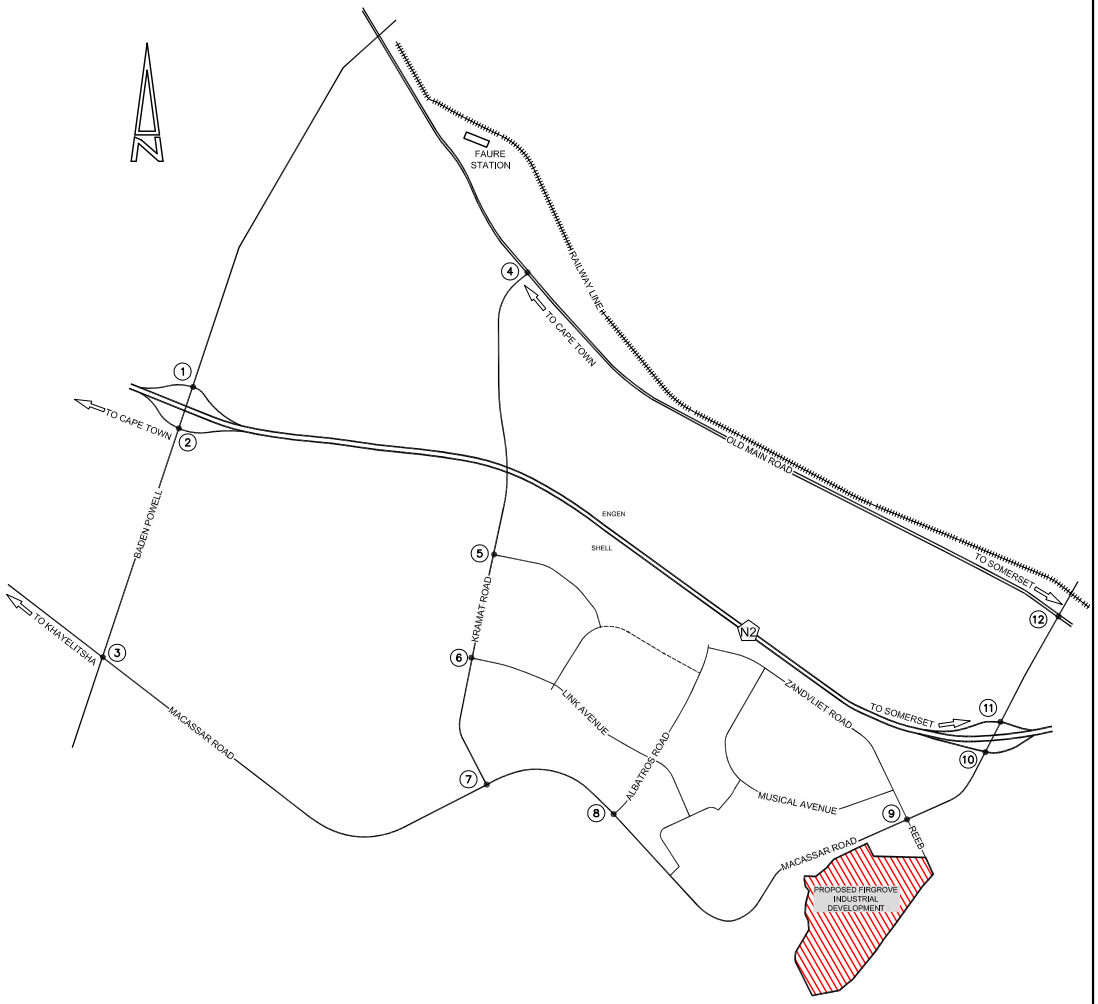
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 21.

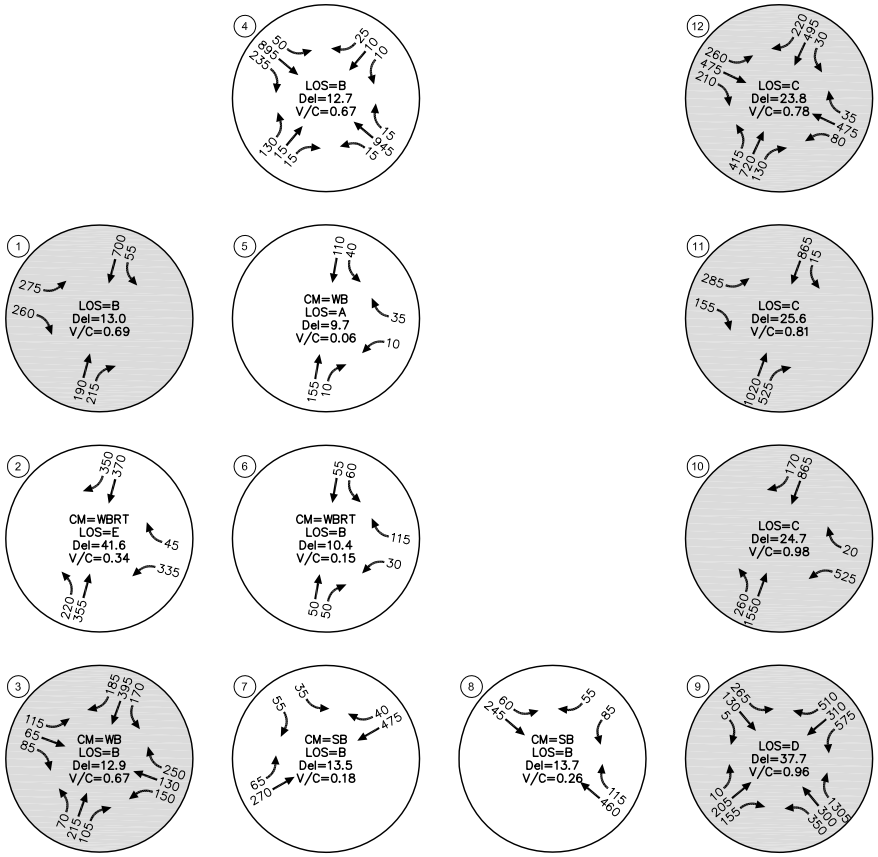
its (PTY) LTD Engineers

PROJECT:
MACASSAR HOUSING PROJECT

FIGURE:
MITIGATED 2016 BACKGROUND TRAFFIC CONDITIONS AM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT

NUMBER:
22





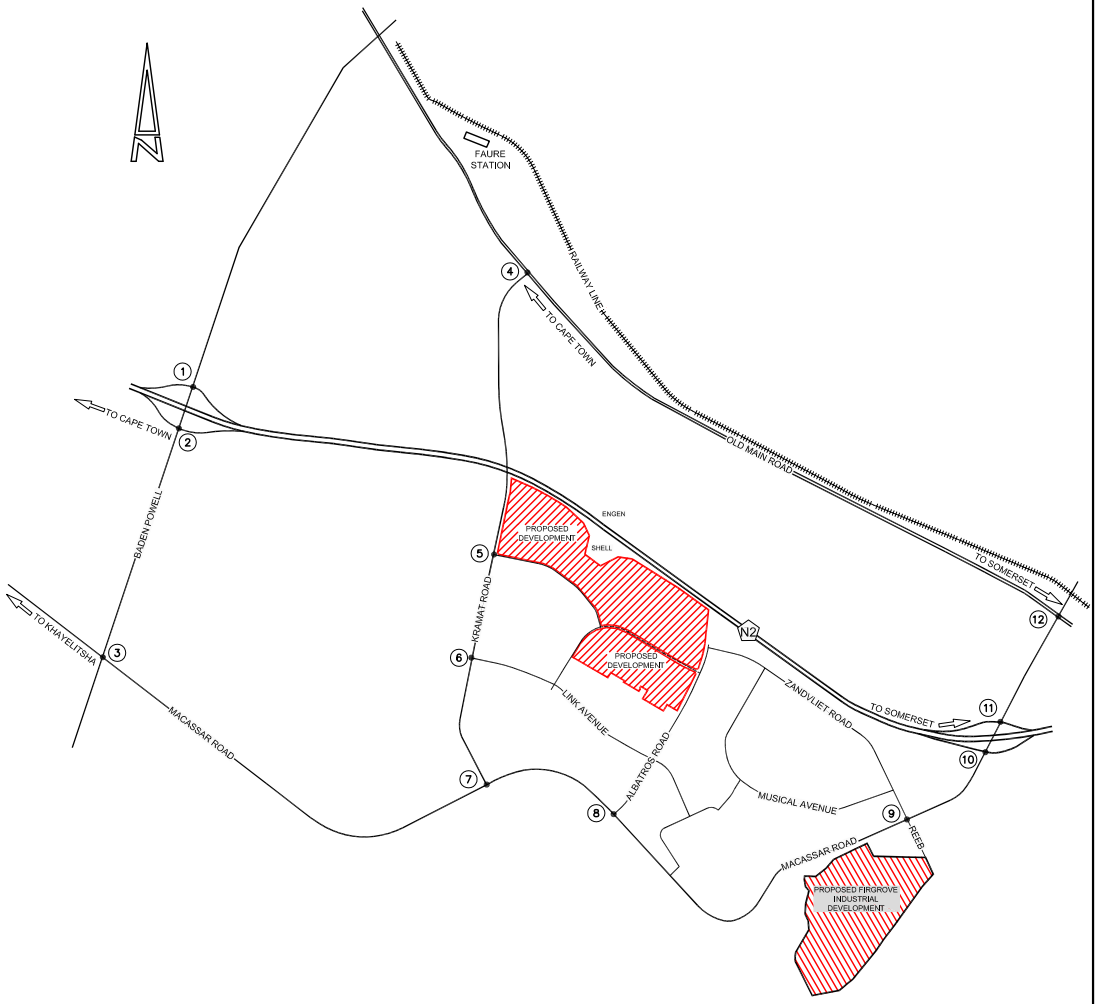
SCHEMATIC

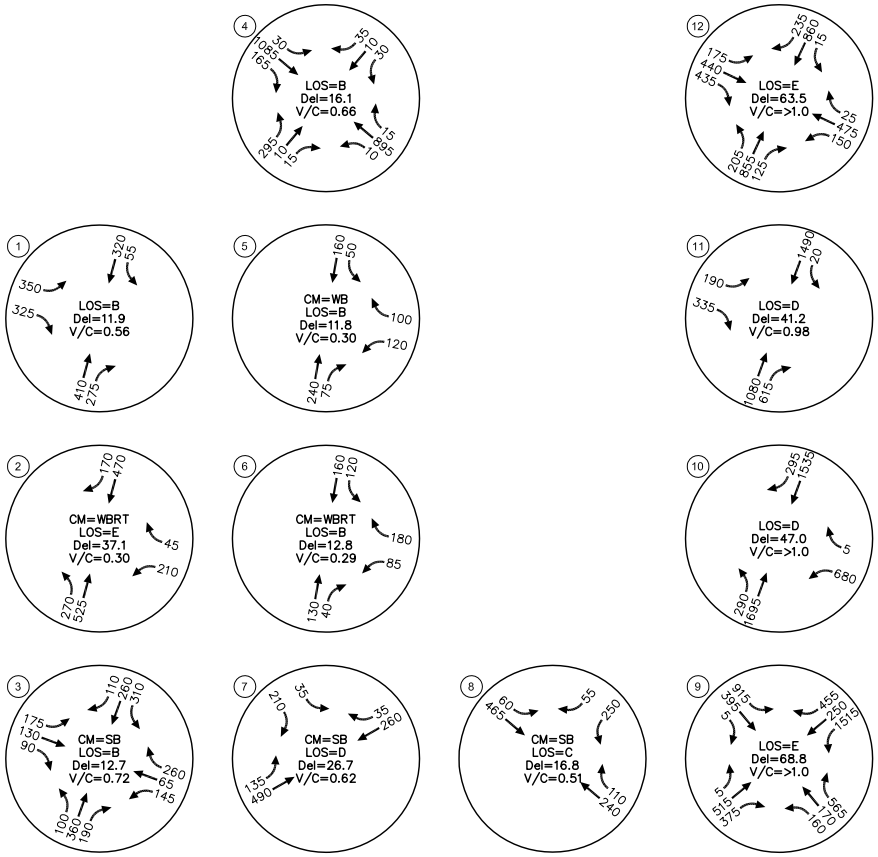
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
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V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 21.

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 BACKGROUND TRAFFIC CONDITIONS PM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	23





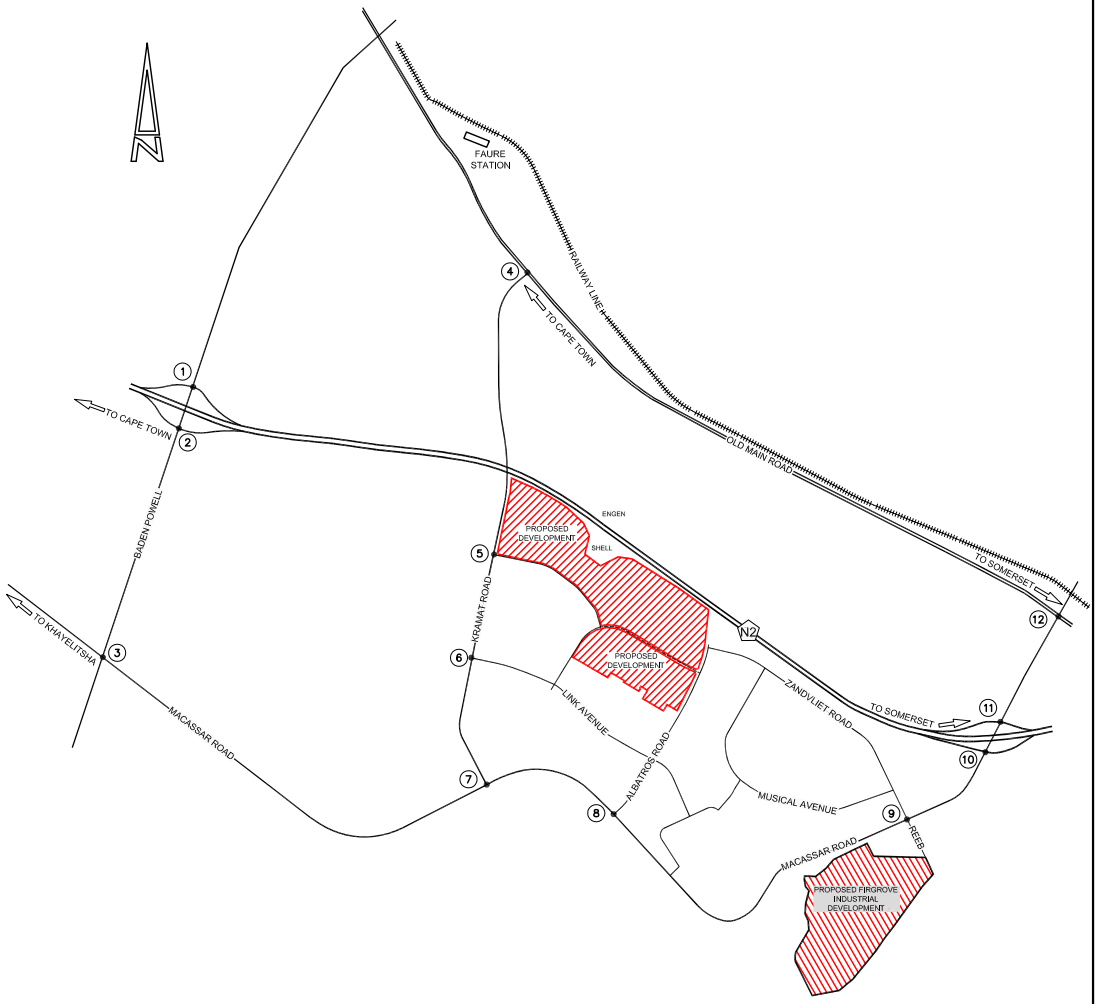
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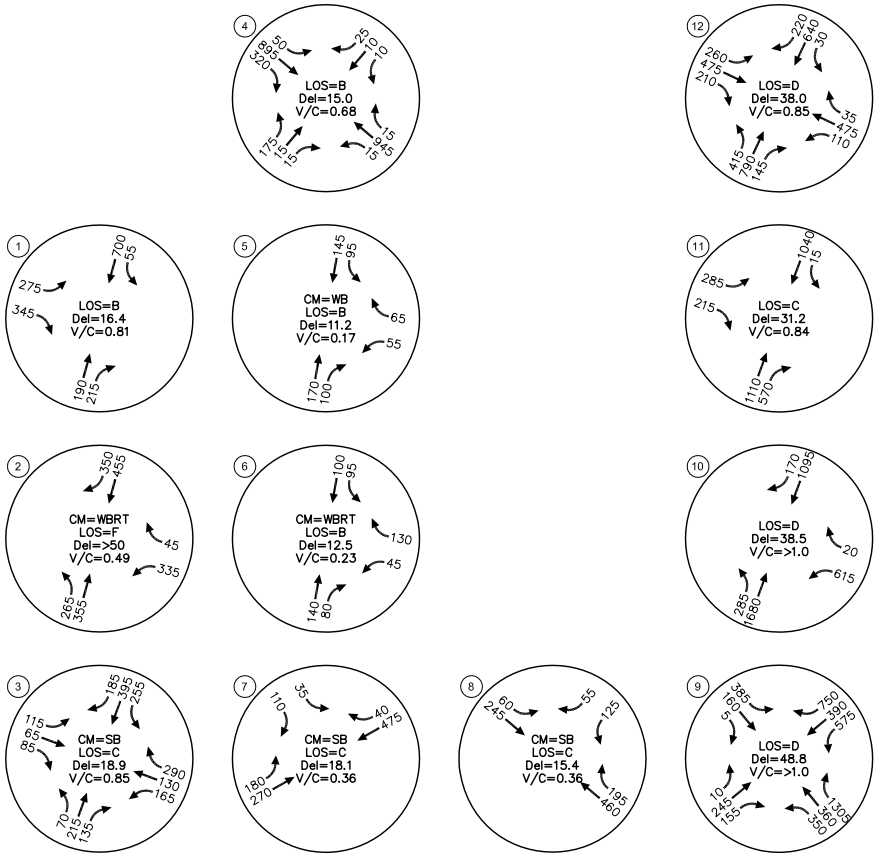
LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 21.

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 TOTAL TRAFFIC CONDITIONS AM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	24





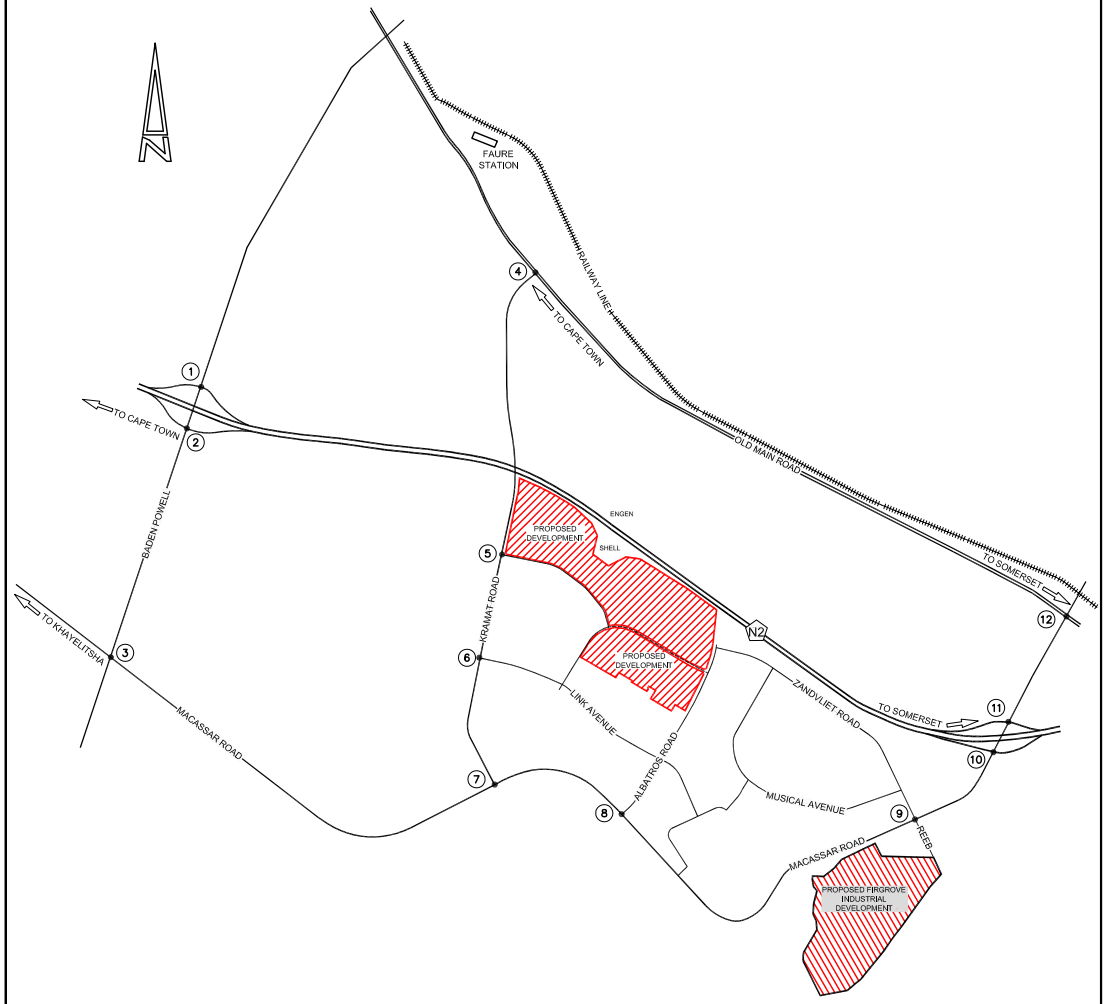
SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 21.

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	EXPECTED 2016 TOTAL TRAFFIC CONDITIONS PM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	25

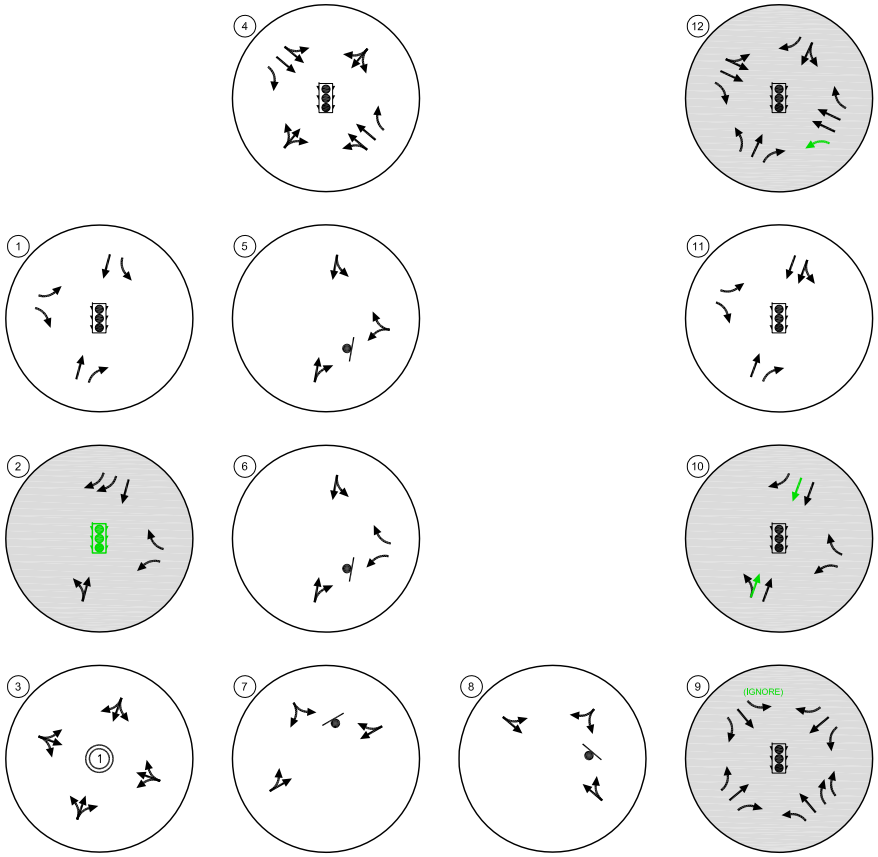


LEGEND

- STOP / YIELD CONTROL
- TRAFFIC SIGNAL
- (1) ROUNDABOUT

LEGEND

- 2016 BACKGROUND INTERSECTION LAYOUT AND CONTROL
- UPGRADES PROPOSED FOR 2016 TOTAL TRAFFIC CONDITIONS (WITH THE FIRGROVE INDUSTRIAL DEVELOPMENT)



SCHEMATIC

its (PTY) LTD Engineers

PROJECT:

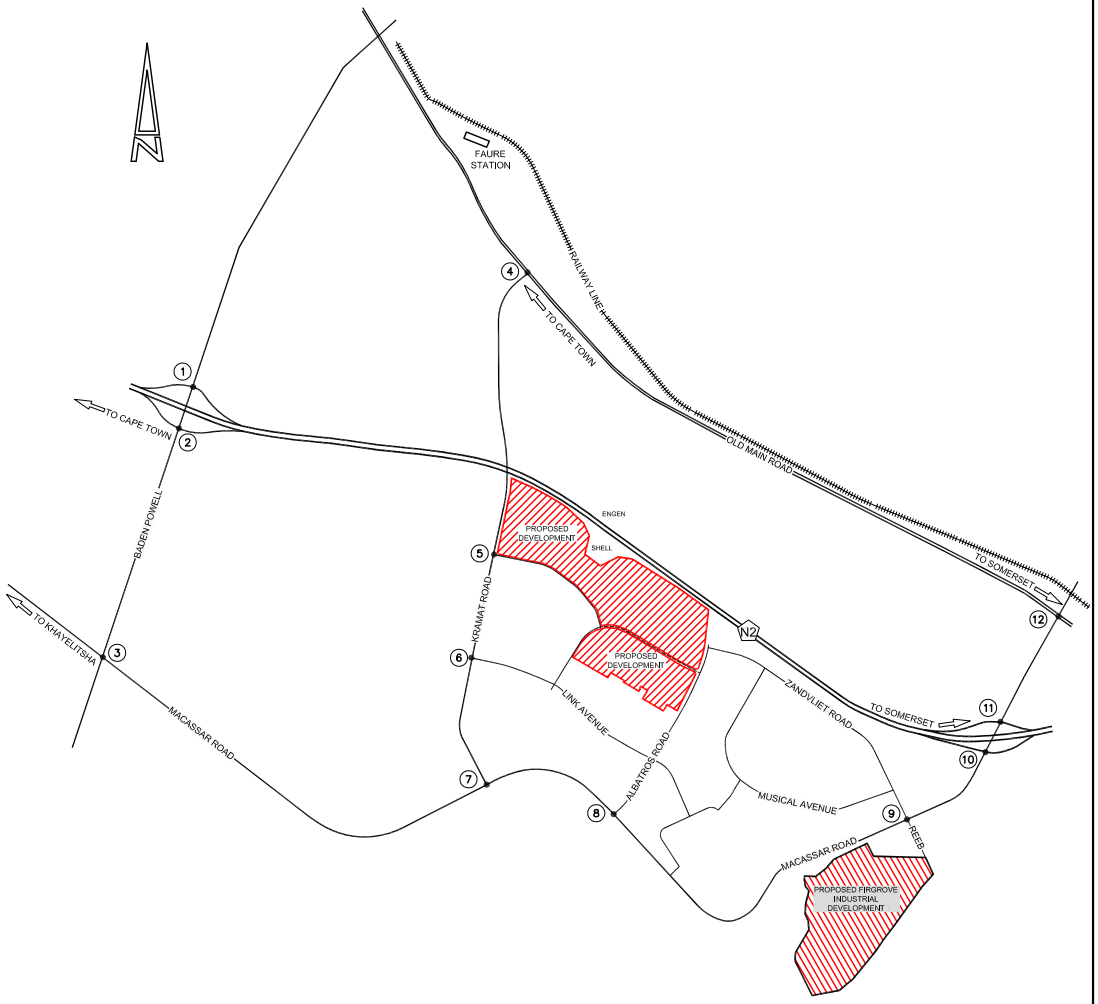
MACASSAR HOUSING PROJECT

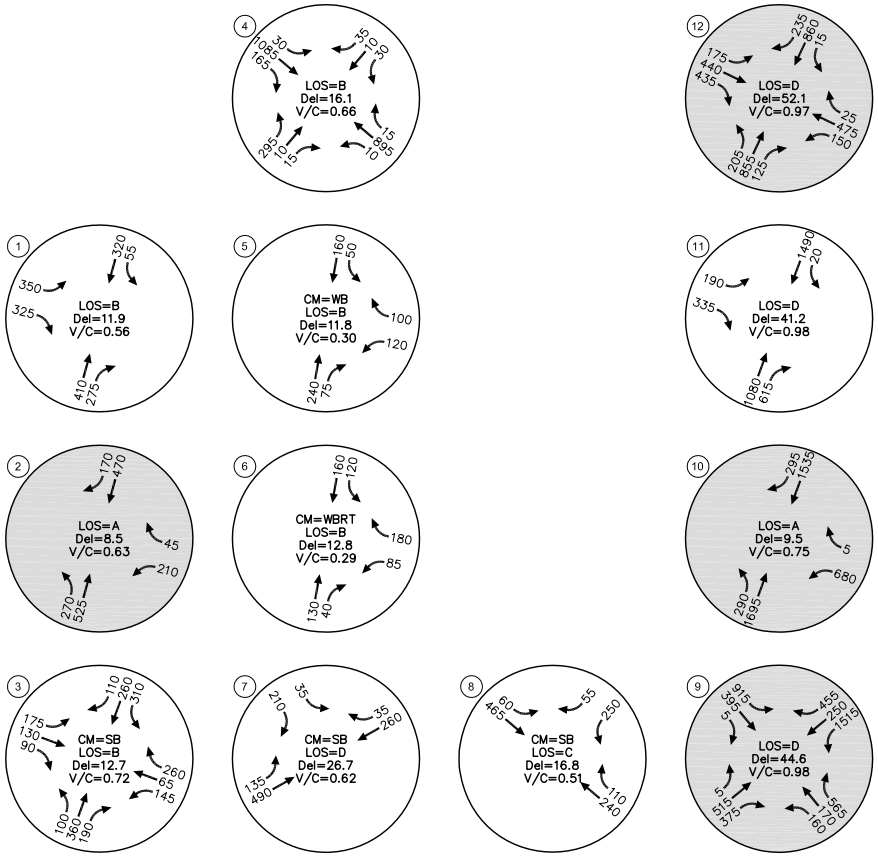
FIGURE:

RECOMMENDED LANE CONFIGURATION AND TRAFFIC CONTROL DEVICES FOR 2016 TOTAL CONDITIONS WITH FIRGROVE INDUSTRIAL DEVELOPMENT

NUMBER:

26





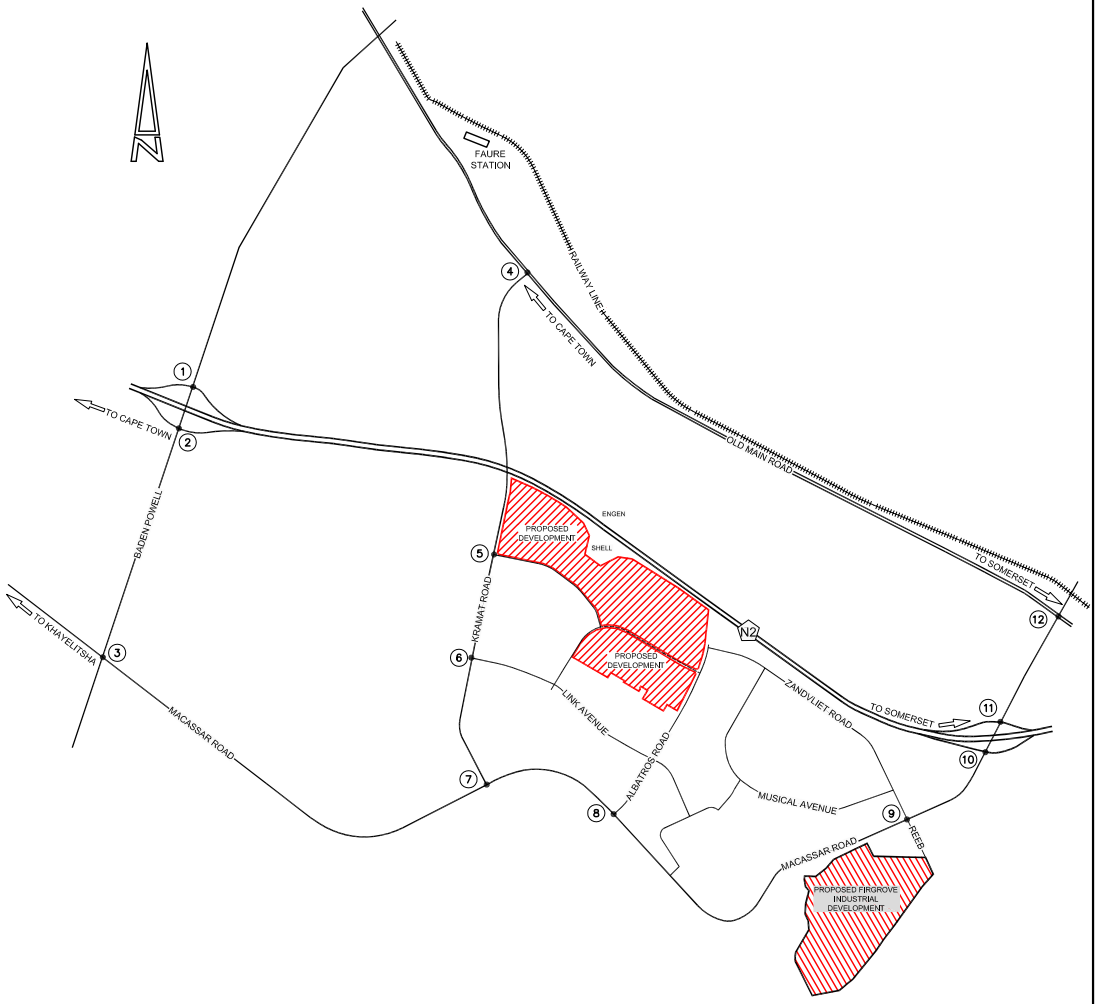
LEGEND	
CM =	CRITICAL MOVEMENT (UNSIGNALISED)
LOS =	INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del =	INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
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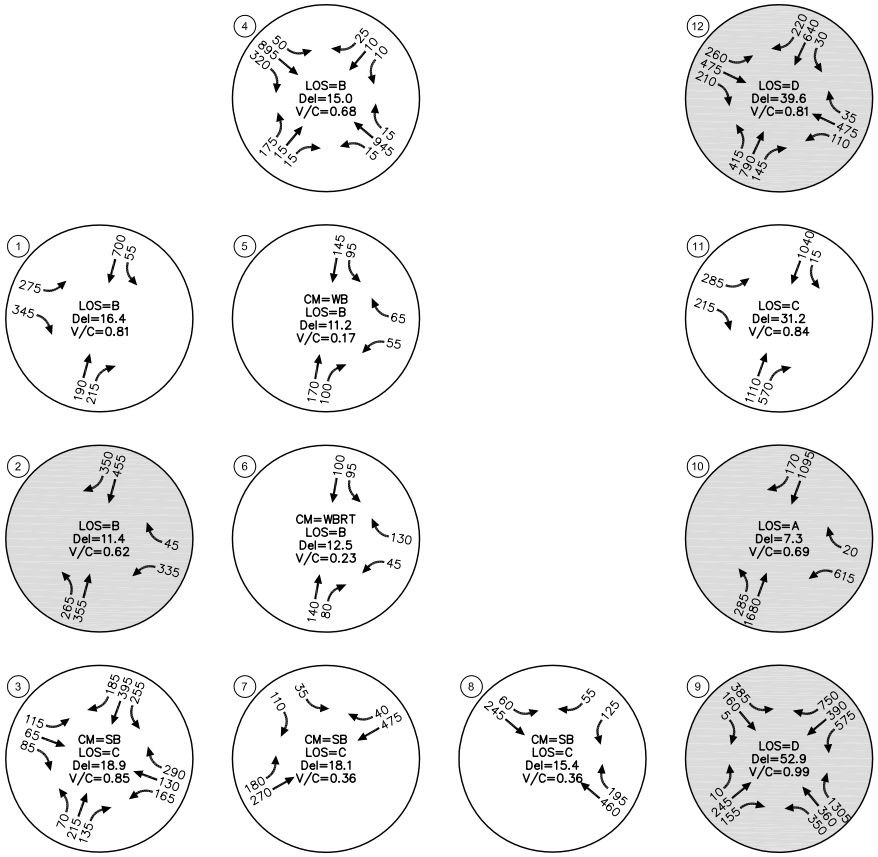
NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 26.

SCHEMATIC

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 TOTAL TRAFFIC CONDITIONS AM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	27





SCHEMATIC

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME–TO–CAPACITY RATIO

NOTE:
CAPACITY ANALYSES BASED ON LANE CONFIGURATIONS AS ILLUSTRATED IN FIGURE 26.

its (PTY) LTD Engineers

PROJECT:	FIGURE:	NUMBER:
MACASSAR HOUSING PROJECT	MITIGATED 2016 TOTAL TRAFFIC CONDITIONS AM PEAK HOUR - WITH FIRGROVE INDUSTRIAL DEVELOPMENT	28

Appendix B

Tables

Table 1: Comparison between 2011 Existing and 2016 Background Traffic Conditions (Without Firgrove Industrial Development)

Number	Intersection	2011 Existing Weekday Peak Hour						2016 Background Weekday Peak Hour					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
1	Baden Powell Road/ N2 Northern Terminal	C	24.9	0.38	D	27.6	0.53	E	43.2	0.59	F	>50.0	>1.0
2	Baden Powell Road/ N2 Southern Terminal	C	19.7	0.15	D	27.3	0.21	D	25.3	0.22	E	40.4	0.33
3	Baden Powell Road/ Macassar Road	D	31.5	0.55	E	42.1	0.66	F	>50.0	0.85	F	>50.0	>1.0
4	Old Main Road/ Kramat Road	B	12.8	0.36	B	12.7	0.40	B	17.2	0.47	B	16.4	0.39
5	Kramat Road/ Carnation Street	A	9.6	0.05	A	9.5	0.05	A	10.0	0.06	A	9.7	0.06
6	Kramat Road/ Link Avenue	A	10.0	0.15	A	10.0	0.13	B	10.3	0.18	A	4.7	0.04
7	Macassar Road/ Kramat Road	A	9.9	0.11	A	9.6	0.09	B	10.3	0.14	A	10.0	0.11
8	Macassar Road/ Albatros Road	A	9.4	0.19	A	9.7	0.14	A	9.8	0.23	B	10.2	0.18
9	Macassar Road/ Zandvliet Road	B	18.6	0.41	B	17.2	0.50	C	21.2	0.50	C	20.8	0.58
10	Macassar Road/ N2 Southern Terminal	E	45.8	0.06	C	20.1	0.07	F	>50.0	0.13	D	25.1	0.10
11	Macassar Road/ N2 Northern Terminal	E	48.8	0.45	C	17.2	0.16	F	>50.0	0.85	C	23.1	0.24
12	Old Main Road/ Macassar Road	C	22.3	0.56	C	26.2	0.53	C	24.4	0.67	C	28.0	0.63

LOS – Level-of-Service, Delay in seconds per vehicle, V/C – Volume-to-capacity Ratio.
Data for Two-way Stop is for Critical Movement
Data for Signals & All-Way Stop is average of all approaches

Table 2: Proposed Trip Generation Rates

Land Use	Units	Source	Size/ Volume	Weekday AM Peak		
				Rate	In	Out
Residential	Unit	Surveyed	2 468	0.36	35%	65%
Town Houses	Unit	DoT210	40	1.10	25%	75%
Gap Housing	Unit	DOT210	38	1.10	25%	75%
Industrial	100m²	COTO110	10 400	0.50	70%	30%
				Weekday PM Peak		
Residential	Unit	Surveyed	2 468	0.28	65%	35%
Town Houses	Unit	DoT210	40	1.10	75%	25%
Gap Housing	Unit	DOT210	38	1.10	75%	25%
Industrial	100m²	COTO110	10 400	0.50	30%	70%

Table 3: Estimated Peak Hour Trips

Land Use	Trip Type	Weekday AM Peak			Weekday PM Peak		
		In	Out	Total	In	Out	Total
Residential	Drive-way Trips	311	577	**888**	449	242	**691**
Town Houses		11	33	**44**	33	11	**44**
Gap Housing		11	31	**42**	31	11	**42**
Industrial		36	16	**52**	16	36	**52**
Total		**369**	**657**	**1 026**	**529**	**300**	**829**

Table 4: Comparison between 2016 Background with Upgrades and 2016 Total Traffic Conditions (Without Firgrove Industrial Development)

Number	Intersection	2016 Background Weekday Peak Hour						2016 Total Weekday Peak Hour					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
1	Baden Powell Road/ N2 Northern Terminal	C	24.9	0.57	C	26.7	0.70	B	17.5	0.55	B	18.4	0.67
2	Baden Powell Road/ N2 Southern Terminal	D	25.3	0.22	E	40.4	0.33	D	29.9	0.25	E	49.5	0.38
3	Baden Powell Road/ Macassar Road	A	7.1	0.53	A	9.2	0.65	A	8.4	0.58	B	12.4	0.75
4	Old Main Road/ Kramat Road	B	17.2	0.47	B	16.4	0.39	B	19.6	0.61	C	21.7	0.55
5	Kramat Road/ Carnation Street	A	10.0	0.06	A	9.7	0.06	B	11.9	0.31	B	11.2	0.17
6	Kramat Road/ Link Avenue	B	10.3	0.18	A	4.7	0.04	B	13.0	0.30	B	12.5	0.23
7	Macassar Road/ Kramat Road	B	10.3	0.14	A	10.0	0.11	B	13.2	0.37	B	11.5	0.22
8	Macassar Road/ Albatros Road	A	9.8	0.23	B	10.2	0.18	B	10.5	0.33	B	10.9	0.24
9	Macassar Road/ Zandvliet Road	C	21.2	0.50	C	20.8	0.58	C	31.6	0.83	C	28.9	0.90
10	Macassar Road/ N2 Southern Terminal	B	16.6	0.87	B	13.0	0.62	F	>80.0	>1.0	C	25.7	0.88
11	Macassar Road/ N2 Northern Terminal	A	8.1	0.62	B	10.6	0.53	C	24.2	0.90	C	21.7	0.81
12	Old Main Road/ Macassar Road	C	24.4	0.67	C	28.0	0.63	C	26.7	0.78	C	29.2	0.68

LOS – Level-of-Service, Delay in seconds per vehicle, V/C – Volume-to-capacity Ratio.
Data for Two-way Stop is for Critical Movement
Data for Signals & All-Way Stop is average of all approaches

Table 5: Comparison between 2011 Existing and 2016 Background Traffic Conditions (With Firgrove Industrial Development)

Number	Intersection	2011 Existing Weekday Peak Hour						2016 Background Weekday Peak Hour					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
1	Baden Powell Road/ N2 Northern Terminal	C	24.9	0.57	C	26.7	0.70	F	>50.0	>1.0	F	>50.0	>1.0
2	Baden Powell Road/ N2 Southern Terminal	D	25.3	0.22	E	40.4	0.33	D	32.6	0.27	F	>50.0	0.42
3	Baden Powell Road/ Macassar Road	A	7.1	0.53	A	9.2	0.65	F	>50.0	>1.0			
4	Old Main Road/ Kramat Road	B	17.2	0.47	B	16.4	0.39	B	13.0	0.62	B	12.7	0.67
5	Kramat Road/ Carnation Street	A	10.0	0.06	A	9.7	0.06	A	10.0	0.06	A	9.7	0.06
6	Kramat Road/ Link Avenue	B	10.3	0.18	A	4.7	0.04	B	10.3	0.18	B	13.5	0.18
7	Macassar Road/ Kramat Road	B	10.3	0.14	A	10.0	0.11	B	14.9	0.23	B	13.5	0.18
8	Macassar Road/ Albatros Road	A	9.8	0.23	B	10.2	0.18	B	14.5	0.37	B	13.7	0.26
9	Macassar Road/ Zandvliet Road	C	21.2	0.50	C	20.8	0.58	F	>80.0	>1.0	F	>80.0	>1.0
10	Macassar Road/ N2 Southern Terminal	B	16.6	0.87	B	13.0	0.62	F	>50.0	>1.0	F	>50.0	>1.0
11	Macassar Road/ N2 Northern Terminal	A	8.1	0.67	B	10.6	0.53	F	>50.0	>1.0	F	>50.0	>1.0
12	Old Main Road/ Macassar Road	C	24.4	0.67	C	28.0	0.63	F	>50.0	>1.0	F	>80.0	>1.0

LOS – Level-of-Service, Delay in seconds per vehicle, V/C – Volume-to-capacity Ratio.
Data for Two-way Stop is for Critical Movement
Data for Signals & All-Way Stop is average of all approaches

Table 6: Comparison between 2016 Background with Upgrades and 2016 Total Traffic Conditions (With Firgrove Industrial Development)

Number	Intersection	2016 Background Weekday Peak Hour						2016 Total Weekday Peak Hour					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
1	Baden Powell Road/ N2 Northern Terminal	B	12.3	0.57	B	13.0	0.69	B	11.9	0.56	B	16.4	0.81
2	Baden Powell Road/ N2 Southern Terminal	D	26.2	0.22	E	41.6	0.34	E	37.1	0.30	F	>50.0	0.49
3	Baden Powell Road/ Macassar Road	B	10.9	0.67	B	12.9	0.67	B	12.7	0.72	C	18.9	0.85
4	Old Main Road/ Kramat Road	B	13.0	0.62	B	12.7	0.67	B	16.1	0.66	B	15.0	0.68
5	Kramat Road/ Carnation Street	A	10.0	0.06	A	9.7	0.06	B	11.8	0.30	B	11.2	0.17
6	Kramat Road/ Link Avenue	B	10.3	0.18	B	10.4	0.15	B	12.8	0.29	B	12.5	0.23
7	Macassar Road/ Kramat Road	B	14.9	0.23	B	13.5	0.18	D	26.7	0.62	C	18.1	0.36
8	Macassar Road/ Albatros Road	B	14.5	0.37	B	13.7	0.26	C	16.8	0.51	C	15.4	0.36
9	Macassar Road/ Zandvliet Road	C	30.2	0.81	D	37.7	0.96	E	68.8	>1.0	D	48.8	>1.0
10	Macassar Road/ N2 Southern Terminal	B	18.7	0.94	C	24.7	0.98	D	47.0	>1.0	D	38.5	>1.0
11	Macassar Road/ N2 Northern Terminal	C	33.9	0.93	C	25.6	0.81	D	41.2	0.98	C	31.2	0.84
12	Old Main Road/ Macassar Road	D	42.2	0.91	C	23.8	0.78	E	63.5	>1.0	D	38.0	0.85

LOS – Level-of-Service, Delay in seconds per vehicle, V/C – Volume-to-capacity Ratio.
Data for Two-way Stop is for Critical Movement
Data for Signals & All-Way Stop is average of all approaches

Appendix C

Photographs



Photo 1: Eastbound view along N2 towards the Engen One Stop



Photo 2: Eastbound view along Old Main Road from Kramat Road



Photo 3: Northbound view along Baden Powell Drive



Photo 4: Northbound view along Kramat Road towards the N2



Photo 5: Eastbound view along Macassar Road towards Reeb Road



Photo 6: Westbound view along Mandela Road towards Kramat Road



Photo 7: Westbound view along Link Avenue towards Kramat Road



Photo 8: Westbound view along Zandvliet Road towards the Site



Photo 9: Northbound view along Albatros Road towards the Site



Photo 10: Southbound view along Kramat Road Bridge over the N2

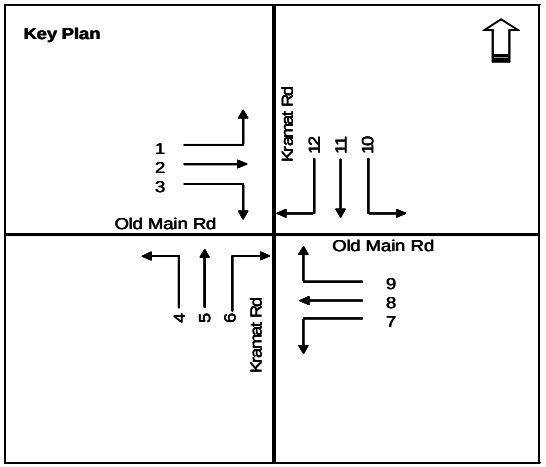
Appendix D

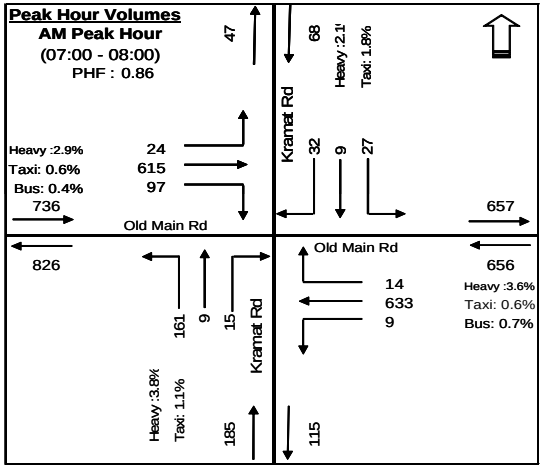
Traffic Count Information

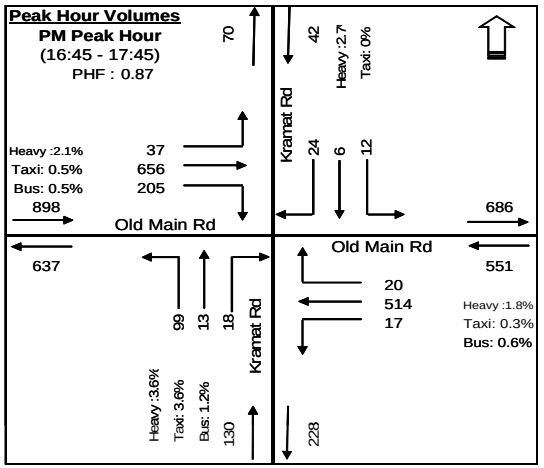
TRAFFIC COUNT

INTERSECTION: **Old Main Rd/Kramat Rd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

TIME		Total Traffic — Traffic Movements													Hourly Totals
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	
06:00	06:15														
06:15	06:30														
06:30	06:45	3	61	24	31	2	3	2	64	1	1	1	9	**202**	**202**
06:45	07:00	7	65	19	37	3	2		92		5	2	4	**236**	**438**
07:00	07:15	4	126	21	51	2	1	4	156	1	9	4	8	**387**	**825**
07:15	07:30	4	145	33	42	3	8	1	115	2	5		7	**365**	**1190**
07:30	07:45	6	181	21	39	1	2	2	203	4	6	2	9	**476**	**1464**
07:45	08:00	10	163	22	29	3	4	2	159	7	7	3	8	**417**	**1645**
08:00	08:15	8	125	10	28	3	5	5	143	3	3	2	3	**338**	**1596**
08:15	08:30	3	123	22	31		3	3	111	3	4	4	7	**314**	**1545**
08:30	08:45														**1069**
08:45	09:00														**652**
09:00	09:15														**314**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
12:00	12:15														
12:15	12:30														
12:30	12:45														
12:45	13:00														
13:00	13:15														
13:15	13:30														
13:30	13:45														
13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45	5	132	43	20		3	3	115	4	2	5	2	**334**	**334**
16:45	17:00	6	140	43	24	2	3	7	131	7	3	1	6	**373**	**707**
17:00	17:15	7	166	50	21	2	7	5	146	6	3	1	8	**422**	**1129**
17:15	17:30	12	204	58	24	2	3	3	146	3	4	2	5	**466**	**1595**
17:30	17:45	12	146	54	30	7	5	2	91	4	2	2	5	**360**	**1621**
17:45	18:00	12	118	40	37	4		5	109	2	1	4	2	**334**	**1582**
18:00	18:15	37	108	42	33	3	4	2	81	6	5	8	4	**333**	**1493**
18:15	18:30	3	123	55	35	3	3	2	82	4	1		4	**315**	**1342**
18:30	18:45														**982**
18:45	19:00														**648**
TOTAL		139	2126	557	512	40	56	48	1944	57	61	41	91	5672	
EST. 24 HR		**167**	**2551**	**668**	**614**	**48**	**67**	**58**	**2333**	**68**	**73**	**49**	**109**	**6806**	





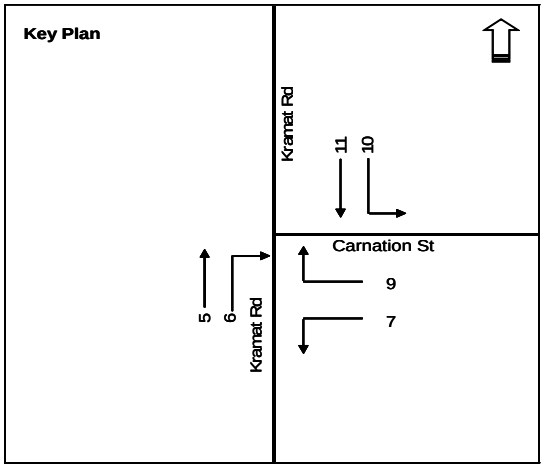


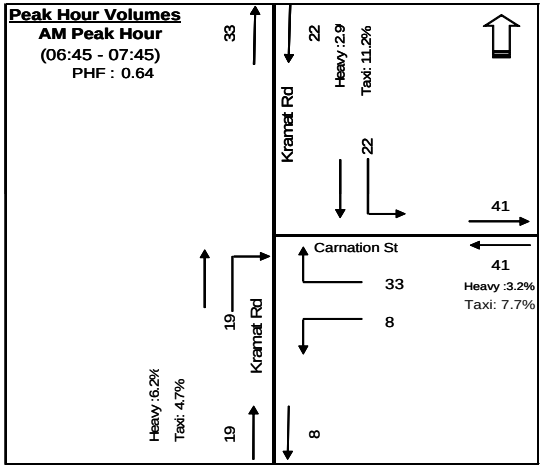
G:\2918 Macassar Housing Project\Traffic Counts\[2918_TrafficCounts_KramatRd&OldMainRd_2011_06_06.xlsm]Input All Vehs

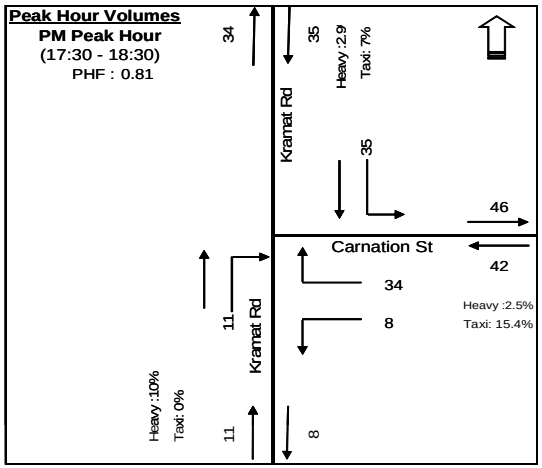
TRAFFIC COUNT

INTERSECTION: **/Carnation St/Kramat Rd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

Total Traffic														Hourly
TIME		Traffic Movements												Totals
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	
06:00	06:15														
06:15	06:30														
06:30	06:45						2	5		3	7			**17**	**17**
06:45	07:00						7	3		11	11			**32**	**49**
07:00	07:15						2	2		7	3			**14**	**63**
07:15	07:30						3	1		6	4			**14**	**77**
07:30	07:45						7	2		9	4			**22**	**82**
07:45	08:00						4	6		8	2			**20**	**70**
08:00	08:15						2	3		1	3			**9**	**65**
08:15	08:30						2	1		4	4			**11**	**62**
08:30	08:45														**40**
08:45	09:00														**20**
09:00	09:15														**11**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
12:00	12:15														
12:15	12:30														
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14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45						4	1		3	8			**16**	**16**
16:45	17:00						3	1		7	15			**26**	**42**
17:00	17:15						1	2		7	11			**21**	**63**
17:15	17:30						1	3		4	8			**16**	**79**
17:30	17:45						2			12	7			**21**	**84**
17:45	18:00						6	3		9	9			**27**	**85**
18:00	18:15						1	2		7	6			**16**	**80**
18:15	18:30						2	3		6	13			**24**	**88**
18:30	18:45														**67**
18:45	19:00														**40**
TOTAL							49	38		104	115			306	
EST. 24 HR							**59**	**46**		**125**	**138**			**367**	



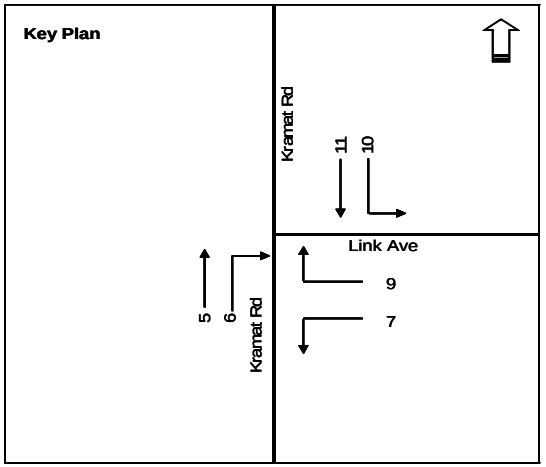


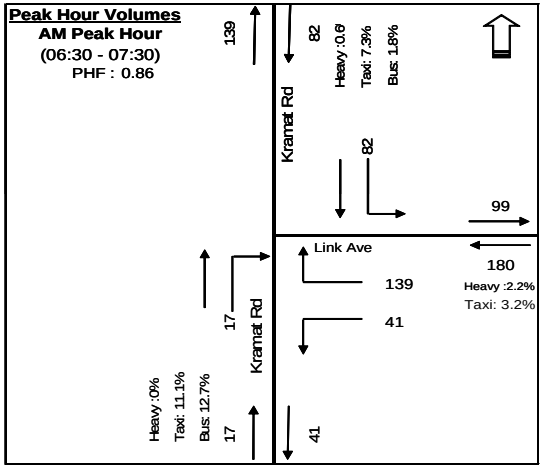


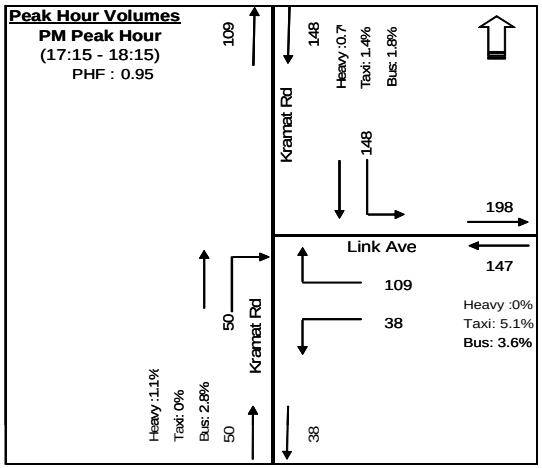
TRAFFIC COUNT

INTERSECTION: **/Link Ave/Kramat Rd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

TIME		Total Traffic — Traffic Movements													Hourly Totals
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	
06:00	06:15														
06:15	06:30														
06:30	06:45						4	9		30	20			**63**	**63**
06:45	07:00						7	12		31	15			**65**	**128**
07:00	07:15						3	8		46	24			**81**	**209**
07:15	07:30						3	12		32	23			**70**	**279**
07:30	07:45						8	12		19	17			**56**	**272**
07:45	08:00						6	11		21	20			**58**	**265**
08:00	08:15						1	6		22	8			**37**	**221**
08:15	08:30						1	5		18	8			**32**	**183**
08:30	08:45														**127**
08:45	09:00														**69**
09:00	09:15														**32**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
12:00	12:15														
12:15	12:30														
12:30	12:45														
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13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45						4	4		15	32			**55**	**55**
16:45	17:00						7	9		22	28			**66**	**121**
17:00	17:15						10	1		9	39			**59**	**180**
17:15	17:30						10	12		26	43			**91**	**271**
17:30	17:45						13	6		30	38			**87**	**303**
17:45	18:00						11	9		23	33			**76**	**313**
18:00	18:15						16	11		30	34			**91**	**345**
18:15	18:30						14	10		22	33			**79**	**333**
18:30	18:45														**246**
18:45	19:00														**170**
TOTAL							118	137		396	415			1066	
EST. 24 HR							**142**	**164**		**475**	**498**			**1279**	



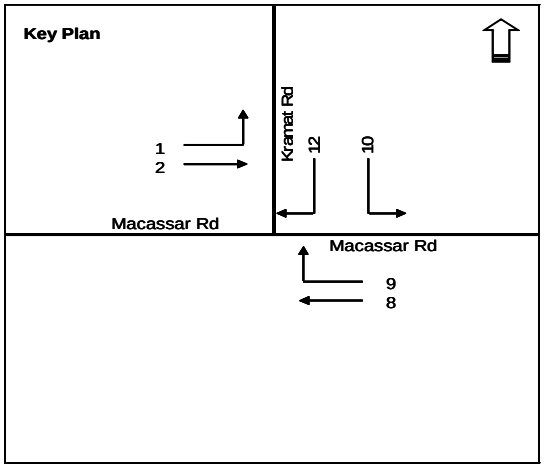


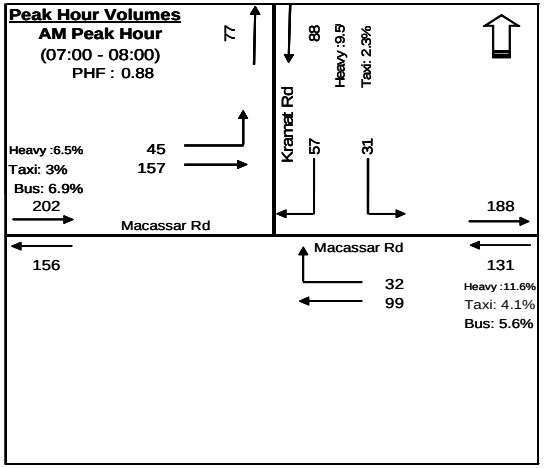


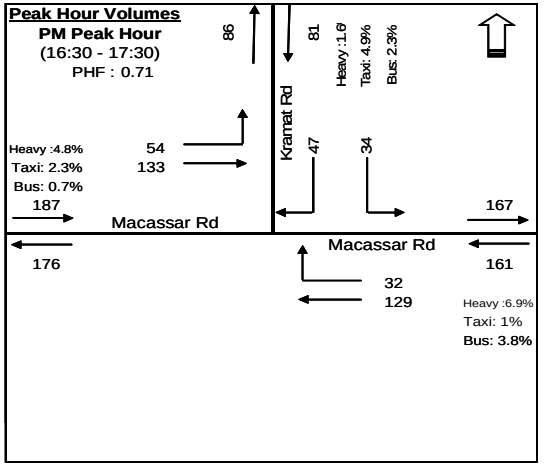
TRAFFIC COUNT

INTERSECTION: **Macassar Rd//Kramat Rd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

Total Traffic															Hourly
TIME		Traffic Movements													
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	Totals
06:00	06:15														
06:15	06:30														
06:30	06:45	6	17						16	4	4		12	**59**	**59**
06:45	07:00	11	25						18	9	5		12	**80**	**139**
07:00	07:15	12	37						27	4	10		14	**104**	**243**
07:15	07:30	8	34						33	9	6		14	**104**	**347**
07:30	07:45	14	42						15	7	6		10	**94**	**382**
07:45	08:00	11	44						24	12	9		19	**119**	**421**
08:00	08:15	2	25						20	6	3		10	**66**	**383**
08:15	08:30	7	17						17	4	4		10	**59**	**338**
08:30	08:45														**244**
08:45	09:00														**125**
09:00	09:15														**59**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
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15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45	11	37						34	9	6		9	**106**	**106**
16:45	17:00	12	35						29	2	7		13	**98**	**204**
17:00	17:15	9	22						26	7	4		5	**73**	**277**
17:15	17:30	22	39						40	14	17		20	**152**	**429**
17:30	17:45	9	22						19	6	4		8	**68**	**391**
17:45	18:00	16	26						35	6	5		13	**101**	**394**
18:00	18:15	19	18						25	6	5		9	**82**	**403**
18:15	18:30	19	27						10	4	7		13	**80**	**331**
18:30	18:45														**263**
18:45	19:00														**162**
TOTAL		188	467						388	109	102		191	1445	
EST. 24 HR		**226**	**560**						**466**	**131**	**122**		**229**	**1734**	





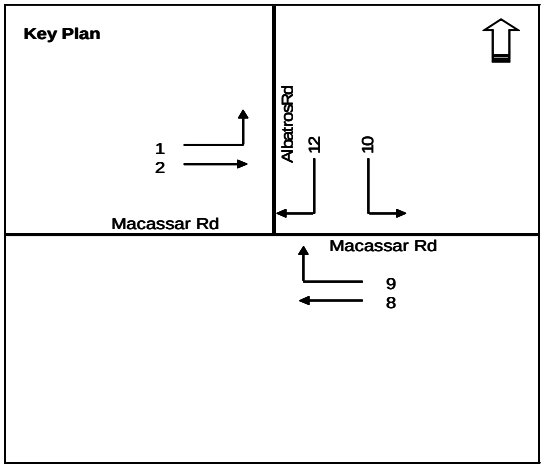


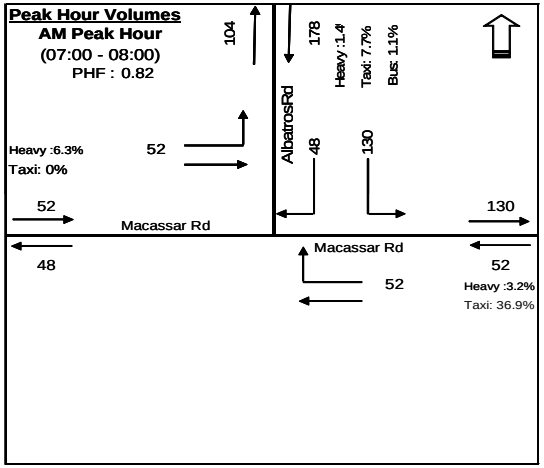
G:\2918 Macassar Housing Project\Traffic Counts\[2918_TrafficCounts_KramatRd&MacassarRd_2011_06_06.xlsm]Figure_Daily Volumes

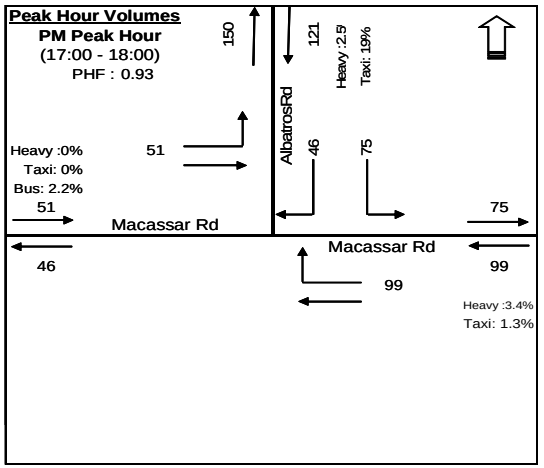
TRAFFIC COUNT

INTERSECTION: **Macassar Rd//AlbatrosRd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

TIME		Total Traffic / Traffic Movements													Hourly Totals
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	
06:00	06:15														
06:15	06:30														
06:30	06:45	9								19	14		9	**51**	**51**
06:45	07:00	8								13	22		8	**51**	**102**
07:00	07:15	19								16	33		18	**86**	**188**
07:15	07:30	5								14	34		8	**61**	**249**
07:30	07:45	17								13	38		9	**77**	**275**
07:45	08:00	11								9	25		13	**58**	**282**
08:00	08:15	9								8	15		7	**39**	**235**
08:15	08:30	7								5	14		4	**30**	**204**
08:30	08:45														**127**
08:45	09:00														**69**
09:00	09:15														**30**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
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11:30	11:45														
11:45	12:00														
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13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45	13								18	9		13	**53**	**53**
16:45	17:00	12								26	10		12	**60**	**113**
17:00	17:15	10								26	18		10	**64**	**177**
17:15	17:30	11								23	22		7	**63**	**240**
17:30	17:45	13								26	17		15	**71**	**258**
17:45	18:00	17								24	18		14	**73**	**271**
18:00	18:15	6								13	13		7	**39**	**246**
18:15	18:30	12								18	16		4	**50**	**233**
18:30	18:45														**162**
18:45	19:00														**89**
TOTAL		179								271	318		158	926	
EST. 24 HR		**215**								**325**	**382**		**190**	**1111**	



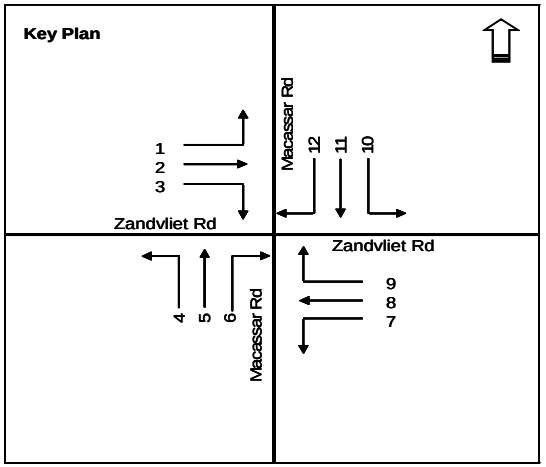


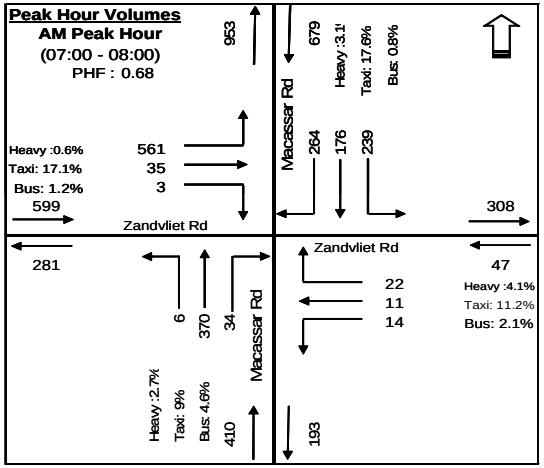


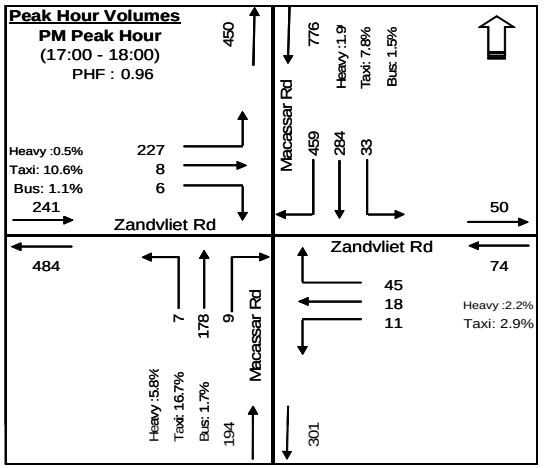
TRAFFIC COUNT

INTERSECTION: **Zandvliet Rd/Macassar Rd**
PERIOD: **2hrsAM & 2hrsPM**
DATE: **01-Jun-11** **Note: Macassar**

Total Traffic														Hourly
TIME		Traffic Movements												
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	Totals
06:00	06:15														
06:15	06:30														
06:30	06:45	43	3		1	17	1	2	2	1	5	25	11	**111**	**111**
06:45	07:00	83	6	1	2	47	3	3	4	3	24	33	33	**242**	**353**
07:00	07:15	104	10			68	15	2	4	5	51	38	55	**352**	**705**
07:15	07:30	144	14	1		90	8	4	5	6	86	45	52	**455**	**1160**
07:30	07:45	222	10		4	139	10	7	2	6	74	64	102	**640**	**1689**
07:45	08:00	91	1	2	2	73	1	1		5	28	29	55	**288**	**1735**
08:00	08:15	69	1	3		33		1	3	2	14	24	65	**215**	**1598**
08:15	08:30	66	4	1	5	58	4	2	3	7	23	50	57	**280**	**1423**
08:30	08:45														**783**
08:45	09:00														**495**
09:00	09:15														**280**
09:15	09:30														
09:30	09:45														
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
12:00	12:15														
12:15	12:30														
12:30	12:45														
12:45	13:00														
13:00	13:15														
13:15	13:30														
13:30	13:45														
13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15														
16:15	16:30														
16:30	16:45	60	3	2		38	2	7	4	48	11	55	54	**284**	**284**
16:45	17:00	44	4	1	1	34	2	3	5	17	3	48	66	**228**	**512**
17:00	17:15	51	2	4	1	40	4	2	5	22	4	62	123	**320**	**832**
17:15	17:30	52			3	43	2	3	5	10	12	77	121	**328**	**1160**
17:30	17:45	61	3	1	3	45	2	4	5	6	8	82	113	**333**	**1209**
17:45	18:00	63	3	1		50	1	2	3	7	9	63	102	**304**	**1285**
18:00	18:15	54	7		1	38		3	4	15	4	34	73	**233**	**1198**
18:15	18:30	55	7			44		2	6	4	3	53	90	**264**	**1134**
18:30	18:45														**801**
18:45	19:00														**497**
TOTAL		1262	78	17	23	857	55	48	60	164	359	782	1172	4877	
EST. 24 HR		**1514**	**94**	**20**	**28**	**1028**	**66**	**58**	**72**	**197**	**431**	**938**	**1406**	**5852**	



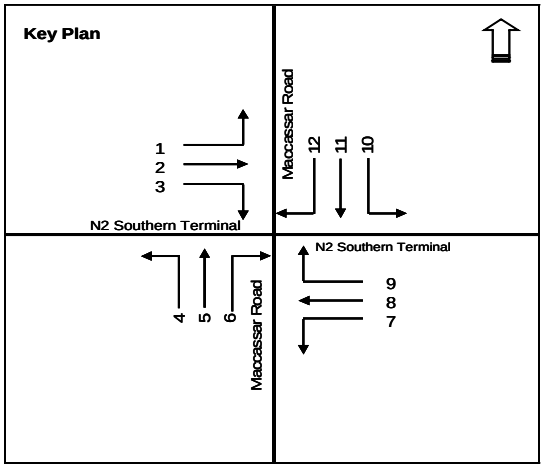


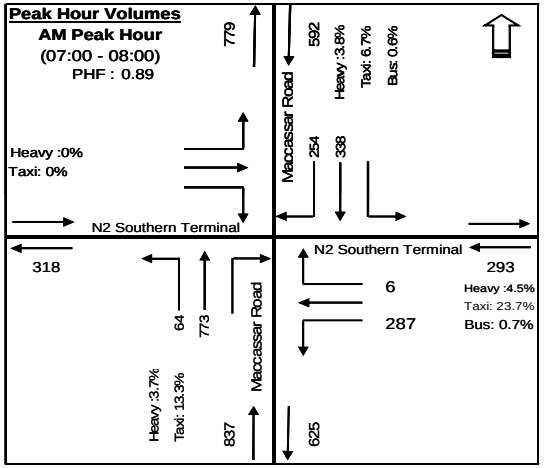


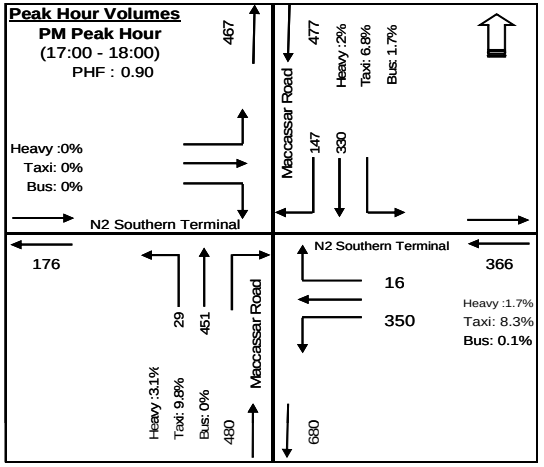
TRAFFIC COUNT

INTERSECTION: **N2 Southern Terminal/Maccassar Road**
PERIOD: **3hrsAM & 3hrs PM**
DATE: **27-Aug-10** **Area: Maccassar**

Total Traffic														Hourly
TIME		Traffic Movements												
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	Totals
06:00	06:15				11	34		15				23	33	**116**	**116**
06:15	06:30				19	45		25				22	38	**149**	**265**
06:30	06:45				13	93		35		1		33	37	**212**	**477**
06:45	07:00				14	147		50		3		47	61	**322**	**799**
07:00	07:15				22	175		64		1		82	65	**409**	**1092**
07:15	07:30				21	197		87		1		108	68	**482**	**1425**
07:30	07:45				16	238		65		2		72	63	**456**	**1669**
07:45	08:00				5	163		71		2		76	58	**375**	**1722**
08:00	08:15				9	99		54		4		52	71	**289**	**1602**
08:15	08:30				6	85		30		4		48	61	**234**	**1354**
08:30	08:45				7	85		48		6		30	64	**240**	**1138**
08:45	09:00				4	65		32		2		34	41	**178**	**941**
09:00	09:15														**652**
09:15	09:30														**418**
09:30	09:45														**178**
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
11:15	11:30														
11:30	11:45														
11:45	12:00														
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13:30	13:45														
13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15				6	75		33		7		32	22	**175**	**175**
15:15	15:30				11	125		51		7		49	34	**277**	**452**
15:30	15:45				5	100		32		6		51	26	**220**	**672**
15:45	16:00				7	100		64		13		58	27	**269**	**941**
16:00	16:15				19	100		69		9		71	31	**299**	**1065**
16:15	16:30				6	100		93		10		83	47	**339**	**1127**
16:30	16:45				10	127		68		9		75	36	**325**	**1232**
16:45	17:00				8	102		66		9		71	30	**286**	**1249**
17:00	17:15				11	113		78		4		81	45	**332**	**1282**
17:15	17:30				4	103		84		2		81	41	**315**	**1258**
17:30	17:45				9	129		91		6		95	36	**366**	**1299**
17:45	18:00				5	106		97		4		73	25	**310**	**1323**
18:00	18:15														**991**
18:15	18:30														**676**
18:30	18:45														**310**
18:45	19:00														
TOTAL					248	2706		1402		112		1447	1060	6975	
EST. 24 HR															



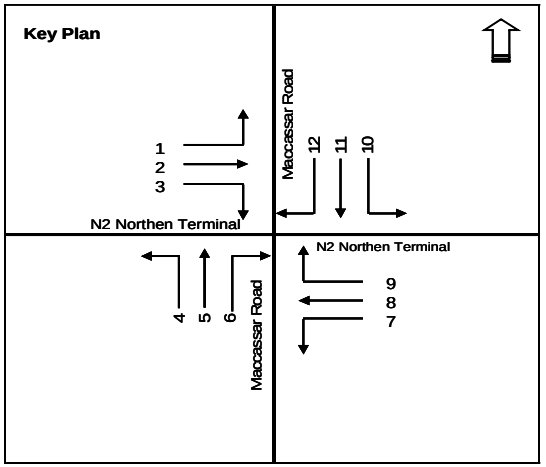


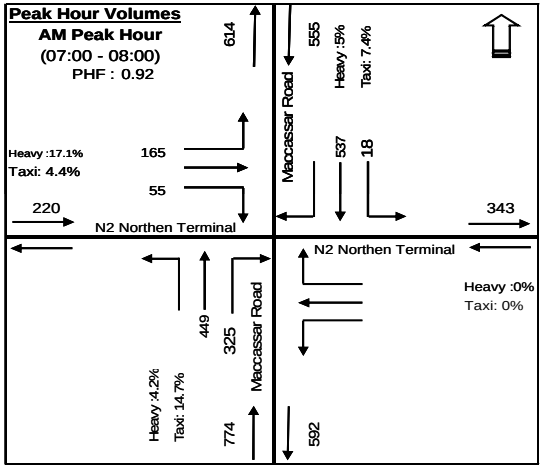


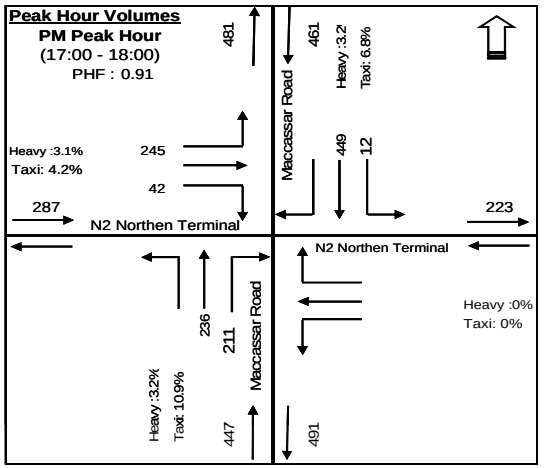
TRAFFIC COUNT

INTERSECTION: **N2 Northen Terminal/Maccassar Road**
PERIOD: **3hrsAM & 3hrs PM**
DATE: **27-Aug-10** **Area: Maccassar**

Total Traffic														Hourly
TIME		Traffic Movements												
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	Totals
06:00	06:15	8				16	18				6	56		**104**	**104**
06:15	06:30	4		7		7	38				3	53		**112**	**216**
06:30	06:45	17		6		31	63				2	64		**183**	**399**
06:45	07:00	27		14		59	88				5	94		**287**	**686**
07:00	07:15	36		23		99	79				4	124		**365**	**947**
07:15	07:30	48		11		122	72				5	165		**423**	**1258**
07:30	07:45	40		11		119	120				4	124		**418**	**1493**
07:45	08:00	41		10		109	54				5	124		**343**	**1549**
08:00	08:15	35		12		44	57				5	111		**264**	**1448**
08:15	08:30	26		15		50	33				5	94		**223**	**1248**
08:30	08:45	29		15		45	43				3	79		**214**	**1044**
08:45	09:00	45		12		24	37				3	63		**184**	**885**
09:00	09:15														**621**
09:15	09:30														**398**
09:30	09:45														**184**
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
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13:45	14:00														
14:00	14:15														
14:15	14:30														
14:30	14:45														
14:45	15:00														
15:00	15:15	37		8		45	36				3	36		**165**	**165**
15:15	15:30	80		11		73	53				5	75		**297**	**462**
15:30	15:45	70		7		51	48				3	75		**254**	**716**
15:45	16:00	89		8		63	43				8	66		**277**	**993**
16:00	16:15	56		19		68	29				4	102		**278**	**1106**
16:15	16:30	62		5		64	36				3	98		**268**	**1077**
16:30	16:45	86		13		88	39				3	109		**338**	**1161**
16:45	17:00	61		11		64	37				2	84		**259**	**1143**
17:00	17:15	69		11		64	45				5	116		**310**	**1175**
17:15	17:30	57		8		61	40				1	117		**284**	**1191**
17:30	17:45	70		13		62	71				2	112		**330**	**1183**
17:45	18:00	49		10		49	55				4	104		**271**	**1195**
18:00	18:15														**885**
18:15	18:30														**601**
18:30	18:45														**271**
18:45	19:00														
TOTAL		1142		260		1477	1234				93	2245		6451	
EST. 24 HR															







TRAFFIC COUNT

INTERSECTION: **Old Main Rd/Macassar Rd**
PERIOD: **5 Hours**
DATE: **20/07/2006** **Note: Firgrove**

Total Traffic															Hourly
TIME		Traffic Movements													
Start	End	1	2	3	4	5	6	7	8	9	10	11	12	Total	Totals
06:00	06:15														
06:15	06:30														
06:30	06:45	8	33	5	9	37	7	8	64	4	3	54	32	**264**	**264**
06:45	07:00	13	47	11	7	70	10	8	87	4	2	64	28	**351**	**615**
07:00	07:15	33	89	18	10	59	3	11	92	7	4	107	42	**475**	**1090**
07:15	07:30	38	90	12	17	87	16	7	138	6		90	33	**534**	**1624**
07:30	07:45	48	133	12	8	77	10	9	102	6	6	114	82	**607**	**1967**
07:45	08:00	30	66	11	5	55	12	5	78	4	1	69	44	**380**	**1996**
08:00	08:15	29	74	12	8	62	13	8	83	3	1	105	61	**459**	**1980**
08:15	08:30	19	67	9	6	48	9	8	71	7	2	59	22	**327**	**1773**
08:30	08:45	39	42	22	1	19	5	14	25	4		54	24	**249**	**1415**
08:45	09:00	32	51	16	7	40	14	15	58	1		53	24	**311**	**1346**
09:00	09:15														**887**
09:15	09:30														**560**
09:30	09:45														**311**
09:45	10:00														
10:00	10:15														
10:15	10:30														
10:30	10:45														
10:45	11:00														
11:00	11:15														
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14:00	14:15														
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14:30	14:45														
14:45	15:00														
15:00	15:15														
15:15	15:30														
15:30	15:45														
15:45	16:00														
16:00	16:15	29	86	10	13	83	6	6	71	3	5	50	29	**391**	**391**
16:15	16:30	49	101	10	24	72	18	5	63	3	8	50	34	**437**	**828**
16:30	16:45	46	72	6	9	119	8	10	71	6	4	45	34	**430**	**1258**
16:45	17:00	43	92	10	11	76	12	12	72	5	9	57	28	**427**	**1685**
17:00	17:15	62	114	7	5	101	8	7	102	9	6	77	62	**560**	**1854**
17:15	17:30	57	106	11	11	93	7	6	113	8	8	99	57	**576**	**1993**
17:30	17:45	63	96	11	11	92	10	13	105	5	8	86	36	**536**	**2099**
17:45	18:00	44	92	14	10	93	8	8	89	10	2	62	36	**468**	**2140**
18:00	18:15	57	80	15	13	87	12	14	63	3	5	61	34	**444**	**2024**
18:15	18:30	23	65	9	5	66	5	2	60	4	2	43	16	**300**	**1748**
18:30	18:45														**1212**
18:45	19:00														**744**
TOTAL		762	1596	231	190	1436	193	176	1607	102	76	1399	758	8526	
EST. 24 HR															

