

TRAFFIC IMPACT ASSESSMENT FOR THE PROPOSED INKWAZI ESTATE MIXED USE DEVELOPMENT

**LOCATED IN MR228 BETWEEN SEATON DELAVAL AND ROYAL PALM
ESTATES – KWADUKUZA MUNICIPALITY**

Project No: 104431_Inkwazi



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1. INTRODUCTION

Inkwazi Estate (Pty) Ltd propose to develop a new mixed use development known as Inkwazi Estate on a site that consists of several portions of the farm Lot 69 No. 917, located along Provincial Main Road 228 (MR228) between the Seaton Delaval residential development to the south and the Royal Palm Estates mixed use development to the north, situated within the KwaDukuza Municipality on the KwaZulu-Natal North Coast. The proposed development is planned to consist of a school, a worship site, residential development and limited commercial development.

An application is being submitted through the Development Facilitation Act (DFA) procedure to obtain the necessary planning approval for this proposed mixed use development. This report has been prepared in support of this DFA application and assesses the traffic and transportation impacts of the proposed development on the existing and planned road network. The report then makes recommendations for access and road network improvements required to accommodate the traffic and pedestrians generated by the proposed development for the existing road network and for the planned road network.

2. LOCATION OF THE SITE AND SURROUNDING ROAD NETWORK

The Inkwazi Estate mixed use development is planned on a site that consists of the consolidation of Portion 13, Portion 15, Remainder of Portion 19, Remainder of Portion 20, Portion 39 & Portion 150 of the Farm Lot 69 No. 917, located to the northwest of National Road 2 (N2) and west of MR228. MR228 crosses over the N2 just to the southeast of the site. The site extends westwards from MR228 up to the Ballito Crushers quarry which is located at the northwest corner of the site. Land under sugar cultivation and some rural houses are located immediately to the north of the site, the Seaton Delaval residential development presently under construction is located immediately to the south of the site and land under sugar cultivation is located to the east of the site across MR228 and immediately to the west of the site. The Flag Farm Animal Farm and the Royal Palm Estate residential development are located further to the north of the site.

Existing access to the site consists of a farm track off MR228 located at the northern end of the site's eastern boundary and two accesses off MR228 to a sugar cane loading area located at the southern end of the site's eastern boundary. Future access to the proposed development is thus also only possible off MR228.

The major road network surrounding the site and which the traffic generated by the proposed mixed use development is likely to use, includes the following roads:

1. **National Road 2 (N2)** is one of the main National routes in the country that extends from Cape Town in the south to Swaziland in the north.
2. **MR228** is a Provincial Main Road aligned in a southeast – northwest direction from MR330 in the southeast to MR467 in the northwest. The section of MR228 from MR330 to just beyond the MR474 intersection is a 7,0m wide, two-lane, 2-way, asphalt surfaced road in average to poor condition.

The section of MR228 from just beyond the MR474 intersection to MR467 is a 9,0m wide, two-lane, 2-way, gravel surfaced road in good condition. The horizontal alignment of MR228 past the site can be described as winding and the vertical alignment can be described as gently rolling.

3. **MR467** is a Provincial Main Road aligned in an approximate east – west direction that extends from Tinley Manor Beach in the east, across the N2 to MR2 (R102) in the west. As such this road functions as a local semi-rural access road. MR467 is a 2-lane single carriageway standard provincial main road with an 80km/h speed limit. The alignment of MR467 in the vicinity of the site has gentle to steep gradients with some gentle to sharp curves.
4. **MR2** is also a provincial main road but aligned in a north – south direction and extends from Nkonkoni in the north to Durban in the south. MR2 is effectively the alternative north – south route to the N2 and performs a local access function as well as a regional connector function. MR2 is a 2- and 3-lane single carriageway road with an 80km/h speed limit. The alignment of MR2 in the vicinity of the site has gentle to steep gradients and gentle curves.
5. **MR474** is a local connector road aligned in an east – west direction that extends from MR228 in the west to Sheffield Beach Road in the east. The width of MR474 varies between 6,0m and 7,0m. The alignment of MR474 in the vicinity of the site has gentle to steep gradients with some gentle to sharp curves.
6. **MR330** is the main access road from the N2 freeway to Sheffield Beach and Salt Rock. MR330 is a 9,0m wide asphalt surfaced road with 1,0m wide asphalt shoulders. The alignment of MR330 in the vicinity of the site is relatively flat and straight.

The site is 56,477ha in area and is currently zoned for agricultural use. The site is presently used for sugar cultivation.

The location of the site in relation to the surrounding road network is shown on the Locality Plan, Figure 1.

3. EXISTING TRAFFIC VOLUMES AND TRAFFIC CONDITIONS

3.1 Data Source

The peak traffic generation period of a mixed use development consisting of a school, residential development and limited commercial development will occur during the morning commuter peak hour when residents are leaving for work and school and workers are arriving at work, and during the afternoon commuter peak hour when residents are returning home from work or visiting the commercial components of the proposed development and workers are leaving for home.

The following classified traffic counts undertaken by Bala Survey & Research were used to assess the existing traffic conditions on the road network surrounding and serving the proposed Inkwazi Estate mixed use development:

1. MR228 and MR330 'T' junction on 17 July 2007

2. MR228 and MR474 'T' junction on 17 July 2007
3. MR228 and MR467 'T' junction on 6 November 2008
4. MR467 and MR2 intersection on 6 November 2008

The results and analysis of the above traffic counts are contained in Appendix A.

The AM peak hour at all of these intersections varied within the period 06h30 and 07h45 and the PM peak hour varied within the period 16h00 and 17h30. For the purpose of this assessment, the AM and PM peak hour at each individual intersection has been used as opposed to the AM and PM peak hour of the entire road network being assessed. It is therefore possible that peak hour traffic flows at adjacent intersections could differ. The two 2007 traffic counts were factored up by 5% to reflect existing 2008 traffic flows. These existing and factored 2008 AM and PM peak hour traffic volumes on the road network surrounding the site are shown on Figure 2.

3.2 Existing Traffic Conditions Along MR2, MR330, MR228, MR467 and MR474

A review of the AM and PM peak hour traffic counts on the surrounding road network showed that MR2, MR330, MR228, MR467 and MR474 all currently carry very low volumes of traffic with MR330 west of MR228, the busiest section of road in the vicinity of the site, carrying 808 veh/h two-way during the AM peak hour and 767 veh/h two-way during the PM peak hour. MR2 north of MR467 is the next busiest followed by MR228 and then MR474.

The existing AM and PM peak hour traffic volumes by direction along the busiest sections of MR2, MR330, MR228, MR467 and MR474 are given in Table 3.1 below:

The estimated practical carrying capacity of these road links based on their carriageway widths and access spacing are given below:

- MR2 - 2 200 veh/h two-way
- MR330 - 2 200 veh/h two-way
- MR228 asphalt surface - 2 000 veh/h two-way
- MR228 gravel surface - 600 veh/h two-way
- MR467 - 1 800 veh/h two-way
- MR474 - 1 000 veh/h two-way

TABLE 3.1 Existing AM and PM Peak Hour Traffic Volumes Along MR2, MR330, MR228, MR467 and MR474

SECTION OF ROAD	DIRECTION	AM PEAK HOUR	PM PEAK HOUR
		5-Year Forecast +	5-Year Forecast +
MR2 north of MR467 / MR104	Northbound	327 veh/h	368 veh/h
	Southbound	379 veh/h	322 veh/h
	Two-Way	706 veh/h	690 veh/h

MR2 south of MR467 / MR104	Northbound	365 veh/h	407 veh/h
	Southbound	436 veh/h	366 veh/h
	Two-Way	801 veh/h	773 veh/h
MR330 west of MR228	Eastbound	289 veh/h	392 veh/h
	Westbound	519 veh/h	375 veh/h
	Two-Way	808 veh/h	767 veh/h
MR330 east of MR228	Eastbound	186 veh/h	269 veh/h
	Westbound	370 veh/h	233 veh/h
	Two-Way	556 veh/h	502 veh/h
MR467 north of MR2	Eastbound	36 veh/h	33 veh/h
	Westbound	26 veh/h	57 veh/h
	Two-Way	62 veh/h	90 veh/h
MR228 east of MR467	Northbound	22 veh/h	47 veh/h
	Southbound	38 veh/h	29 veh/h
	Two-Way	60 veh/h	76 veh/h
MR228 west of MR474	Northbound	44 veh/h	36 veh/h
	Southbound	47 veh/h	65 veh/h
	Two-Way	91 veh/h	101 veh/h
MR474 north of MR228	Eastbound	82 veh/h	80 veh/h
	Westbound	106 veh/h	92 veh/h
	Two-Way	188 veh/h	172 veh/h

The existing traffic volumes along these sections of provincial road are all therefore well below their practical capacities with a maximum volume / capacity ratio of 0,37 for the section of MR330 west of MR228.

3.3 Existing Traffic Conditions at the Major Intersections

The four intersections identified in Section 3.1 are likely to be impacted on the most by the development generated traffic volumes.

All of these intersections were analysed using the SIDRA computerised analysis package for the 2008 AM and PM peak hour traffic volumes and for the existing intersection layouts at each intersection. A summary of the results of the analysis at each intersection is given below:

MR2 and MR467 / MR104 intersection

The analysis showed that with the exception of the MR467 and MR104 right-turn movements into MR2, which are operating at a Level of Service 'E' during both peak periods (but experience acceptable delays and queue lengths), all other movements at this intersection are currently operating at a Level of Service 'A' or 'B'. There is very little congestion at this intersection even during peak periods. This intersection is a drop-off / pick-up point for minibus taxi services along MR2.

MR467 and MR228 'T' junction

The analysis showed that this intersection is currently operating at very good Levels of Service during both the AM and PM peak hours with the Levels of Service of all movements between 'A' and 'B', experiencing very little delay (less than 15 seconds per vehicle) and a maximum queue length of 1 vehicle in MR228. There is no congestion at this intersection even during peak periods.

MR330 and MR228 'T' junction

The analysis showed that this intersection is currently operating at very good Levels of Service during both the AM and PM peak hours with the Levels of Service of all movements between 'A' and 'C', experiencing very little delay (less than 20 seconds per vehicle) and a maximum queue length of 4 vehicles in MR228.

MR228 and MR474 'T' junction

The analysis showed that this intersection is also currently operating at very good Levels of Service between 'A' and 'B' during both the AM and PM peak hours, experiencing very little delay (less than 10 seconds per vehicle) and a maximum queue length of 1 vehicle in MR228 from the north.

3.4 Existing Pedestrian Activity

There is very little pedestrian activity in MR228 past the site even during the AM and PM peak periods as at present the site is isolated from any major developments.

There is, however, a concentration of pedestrian activity at the MR330 and MR228 intersection associated with minibus taxi passengers being picked up or dropped off in MR330 and there is some pedestrian activity at the MR228 and MR474 intersection associated with the surrounding residential development and employment opportunities. There is also a local general dealer / tavern along MR228 to the north of the site which attracts pedestrians throughout the day.

Neither MR474, MR228 or MR467 are minibus taxi or bus routes. MR330 and MR2 are, however, main minibus taxi routes.

There are no public transport facilities in the vicinity of the site.

3.5 Road Safety

Due to the horizontal and vertical alignment of MR474, the visibility and sight distance conditions along MR474 are restricted by the tight horizontal alignment and in some cases the vertical alignment. Visibility and sight distance conditions along MR2, MR330 and MR228 are, however, generally good. Some sections of MR467 in the vicinity of the MR228 intersection have restricted sight distance conditions.

Vehicle speeds along MR2 and MR330 are generally higher than MR228, MR467 and MR474 but are not considered to be excessive. Vehicle speeds along MR228, particularly the gravel section, are not high and vehicle speeds along MR474 are much lower due to the narrower road and restricted visibility.

Isolated cases of vehicles travelling at high speed during off-peak periods were observed along MR2 and MR330. MR228 carries a high proportion of heavy vehicles generated by Ballito Crushers compared to the other roads in the vicinity of the site.

With the exception of the western edge of MR2 north of the MR467 / MR104 intersection, there are no sidewalks along any of the roads in the vicinity of the site and therefore all pedestrians walk within the respective roadways.

4. THE INKWAZI ESTATE MIXED USE DEVELOPMENT AND ACCESS PROPOSALS

Inkwazi Estate (Pty) Ltd propose to develop a mixed use development on a site which is a consolidation of Portion 13, Portion 15, Remainder of Portion 19, Remainder of Portion 20, Portion 39 & Portion 150 of the Farm Lot 69 No. 917, located along Provincial Main Road 228 (MR228) between the Seaton Delaval residential development to the south and the Royal Palm Estates mixed use development to the north.

The site is situated within the KwaDukuza Municipality on the KwaZulu-Natal North Coast.

The proposed development is planned to consist of the following:

- A School
- A Worship Site
- 250 High Income Residential Units
- 1 150 Middle Income Residential Units
- 5 Commercial Sites that will contain 100 Middle Income Residential Units and $\pm 7\ 500\text{m}^2$ of Commercial Floor Area
- A Clubhouse and Activity Node for Inkwazi Estate residents only.

The school and worship site are planned to be located at the southeast corner of the site fronting onto MR228, the limited commercial development is planned to be located along the eastern boundary of the site also fronting onto MR228 and the residential development is planned to be located within the remainder of the site to the west, although very large sections of the site are environmentally sensitive and will be designated wetlands.

Two access points located 350m apart are planned to serve the proposed mixed use development as follows:

1. A main access road off MR228 located just north of midway along the eastern boundary of the site. This main access is planned to serve most of the limited commercial component of the development and most of the residential component of the development. The position of this access is effectively fixed as it is located directly opposite the existing access to the Reynolds Farm (Portion 244) situated on the eastern side of MR228. This access is aligned 90° to MR228.
2. A secondary access also off MR228 located at the southeastern corner of the site. This access is planned to serve the school, worship site, a small residential component of the development and the clubhouse / activity node. This access is aligned parallel to MR228 within the site from the southeast corner northwards before turning 90° to MR228 and continuing westwards. This alignment is required in order to obtain the required minimum 350m spacing between the two accesses along a provincial main road and is influenced by the wetland located at the southeast corner of the site.

Both access roads will be culs-de-sac that extend from MR228 westwards into the site. The two access roads will, however, be connected via a minor right-of-way servitude aligned through the limited commercial component of the proposed development. The right-of-way servitude intersections with the two access roads will be a minimum of 60m from MR228.

The access to Palermo at Seaton Delaval is located just to the south of the southeastern corner of the site and therefore the secondary access and the Palermo access need to be combined. Alternatively the access could be taken directly off MR228 where it bends from parallel to 90° to MR228, however, the spacing from the main access would be 230m which will require a relaxation from the KwaZulu-Natal Department of Transport.

The town planning layout and master plan for the proposed Inkwazi Estate mixed use development including the position of the two accesses and the internal road network are contained in Appendix B to this report.

5. TRAFFIC GENERATION AND DISTRIBUTION OF THE PROPOSED INKWAZI ESTATE MIXED USE DEVELOPMENT

5.1 Traffic Generation

As indicated previously, the peak traffic generation period of a mixed use development consisting of the above landuses will occur during the morning commuter peak hour and during the afternoon commuter peak hour. The worship site and the clubhouse / activity node are not expected to generate any traffic during these peak commuter periods. For the purpose of calculating traffic generation, it has been assumed that the school will be a primary school containing 600 learners.

The Department of Transport's document 'South African Trip Generation Rates (June 1995)' gives the following AM and PM peak hour traffic generation rates and directional splits for the proposed landuses in the Inkwazi Estate mixed use development.

TABLE 5.1 AM and PM Peak Hour Traffic Generation Rates and Directional Splits of the Landuses Expected to be Developed in the Proposed Inkwazi Estate Mixed Use Development

LANDUSE	AM PEAK HOUR GENERATION RATE	PM PEAK HOUR GENERATION RATE	DIRECTIONAL SPLIT
Commercial	1,08 veh/h / 100m ^{2*}	10,81 veh/h / 100m ^{2**}	50 : 50
High Income Residential	1,50 veh/h / 100m ²	1,50 veh/h / 100m ²	75 : 25
Middle Income Residential	1,10 veh/h / 100m ²	1,10 veh/h / 100m ²	75 : 25
Primary School	0,90 veh/h / 100m ²	-	50 : 50

* Commercial use generates minimal traffic during the AM peak hour

** Based on a commercial floor area of 7 490m²

Using the above trip generation rates and directional splits, and the number of units, number of learners and commercial floor area, the total volume of AM and PM peak hour traffic that the proposed Inkwazi Estate mixed use development could potentially generate can be calculated as shown in Table 5.2 below:

TABLE 5.2 Calculation of the Potential AM Peak Hour and PM Peak Hour Traffic Generation of the Proposed Inkwazi Estate Mixed Use Development by Landuse

LANDUSE	FLOOR AREA UNITS LEARNERS	TOTAL (veh/h two-way)	AM PEAK HOUR		PM PEAK HOUR	
			IN	OUT	IN	OUT
Commercial	7 490m ²	80 / 810	40	40	405	405
High Income Residential	250	375	94	281	281	94
Middle Income Residential	1 250	1 375	344	1 031	1 031	344
Primary School	600	540 / 0	270	270	-	-
TOTAL	-	2 370 / 2 560	748	1 622	1 717	843

For the retail component, the Department of Transport's document indicates, however, that only 42% of this traffic is new or additional on the surrounding road network with 35% passing the site on MR228 and 23% diverted to the site from the surrounding road network. As this commercial component will be fairly isolated from other residential or commercial developments, it is highly likely that the majority of the traffic attracted to this commercial component will be from the residents that will live in the 1 500 residential units in the Inkwazi Estate development. It has therefore been assumed that 42% of all the traffic generated by the commercial component during the PM peak hour will be new or additional on the surrounding road network with the remaining 58% either external traffic already generated by the residential component of the development or internal trips between the residential and commercial components.

Similarly for the primary school, it is highly likely that at least 50% if not more of the learners at the primary school will come from the residential component of the proposed Inkwazi Estate development which in effect will generate an internal trip within the site.

The trip generation rate for the school has therefore been discounted by 50% as the estate's learners will be dropped off at the school during the home to work trip or by an internal trip.

The residential trip generation rates have therefore also been discounted slightly to take into account the internal trips between residential and school during the AM peak hour and between residential and commercial during the PM peak hour. The reduced trip generation of the proposed Inkwazi Estate mixed use zone based on the above discounts for internal and multi-purpose trips is presented in Table 5.3 below:

TABLE 5.3 Calculation of the Most Likely AM Peak Hour and PM Peak Hour Traffic Generation of the Proposed Inkwazi Estate Mixed Use Development by Landuse, Reduced for Internal and Multi-Purpose Trips

LANDUSE	REVISED GENERATION RATE	TOTAL (veh/h two-way)	AM PEAK HOUR		PM PEAK HOUR	
			IN	OUT	IN	OUT
Commercial	4,54	34 / 340	17	17	170	170
High Income Residential	1,28	319	80	239	239	80

Middle Income Residential	0,93	1 163	291	872	872	291
Primary School	0,45	270 / 0	135	135	-	-
TOTAL	-	1 786 / 1 821	523	1 263	1 81	540

The proposed Inkwazi Estate mixed use development is therefore expected to generate 1 786 veh/h two-way during the AM peak hour and 1 821veh/h two-way during the PM peak hour that will use MR228 and the connecting roads for access.

5.2 Traffic Distribution on Existing Road Layout

The distribution of the traffic generated by the proposed Inkwazi Estate mixed use development is expected to be in similar ratios to the distribution of the existing peak hour traffic travelling along MR2, MR330, MR228, MR467 and MR474 as well as the ratio of employment opportunities to the north, south, east and west of the site, influenced by the accessibility of the site to these various employment opportunities.

It should be noted that the distribution of the traffic generated by the middle income Inkwazi Estate mixed use development will be significantly from the distribution of the Seaton Delaval generated traffic. There are many employment opportunities for middle income earners along the R102 and therefore this traffic will make use of the MR228 – MR467 – MR2 route as opposed to the MR228 – MR330 – N2 route.

Based on these factors, the assumed distribution of the AM and PM peak hour traffic generated by the proposed Inkwazi Estate mixed use development on the existing surrounding road network is given in Table 5.4 below:

TABLE 5.4 Assumed Distribution of Traffic Generated by the Proposed Inkwazi Estate Mixed Use Development for the Existing Road Layout

DIRECTION	ROUTE	AM PEAK HOUR		PM PEAK HOUR	
		% In	% Out	% In	% Out
NORTH	MR228 – MR467	5	5	5	5
	MR228 – MR467 – MR2	20	20	20	20
	MR228 – MR330 – N2	15	15	15	15
SOUTH	MR228 – MR330 – N2	30	30	30	30
	MR228 – MR467 – MR2	15	15	15	15
EAST	MR228 – MR330	10	10	10	10
WEST	MR228 – MR330	5	5	5	5

Based on the distribution pattern given in Table 5.4, the traffic generated by the proposed Inkwazi Estate mixed use development has been distributed onto the existing road network as shown on the attached Figure 3.

5.3 Traffic Distribution for Future Road Layout

The biggest planned changes to the existing road network in the vicinity of the site from approved developments are as follows:

- The upgrade of MR330 to a 4-lane road from the Salt Rock interchange on the N2 to MR228 which is a condition of approval for the Richmond development, the Brettenwood Estate commercial development and for a new shopping centre located at the northeast quadrant of the Salt Rock interchange on the N2.
- The upgrade of MR228 from MR330 to MR474 which is a condition of approval for the Brettenwood Estate commercial development.
- The upgrade of MR228 from MR474 to the Palermo access in the Seaton Delaval which is a condition of approval for the first 600 residential units of the Seaton Delaval development.
- The proposed new Sheffield Beach interchange on the N2 located at the existing MR228 bridge over the N2 which is a condition of approval of the remaining 700 residential units of the Seaton Delaval development.

The upgrade of MR330 and MR228 will not really impact on the distribution of the traffic generated by the proposed Inkwazi Estate, however, the proposed Inkwazi Estate mixed use development will be located very close to the proposed new Sheffield interchange on the N2 and therefore the new interchange is expected to significantly alter the distribution of the traffic generated by this development.

The assumed distribution of the AM and PM peak hour traffic generated by the proposed Inkwazi Estate mixed use development based on the same factors as above but taking into account the close proximity of the new Sheffield interchange on the N2 is given in Table 5.5 below:

TABLE 5.5 Assumed Distribution of Traffic Generated by the Proposed Inkwazi Estate Mixed Use Development for the Future Road Layout

DIRECTION	ROUTE	AM PEAK HOUR		PM PEAK HOUR	
		% In	% Out	% In	% Out
NORTH	MR228 – MR467	5	5	5	5
	MR228 – MR467 – MR2	20	20	20	20
	MR228 – N2	15	15	15	15
SOUTH	MR228 – N2	30	30	30	30
	MR228 – MR467 – MR2	15	15	15	15
EAST	MR228 – MR330	10	10	10	10
WEST	MR228 – MR330	5	5	5	5

Based on the distribution pattern given in Table 5.5 for the future road layout, the traffic generated by the proposed Inkwazi Estate mixed use development has been distributed onto this future road network as shown in Figure 4.

6. TRAFFIC IMPACT ASSESSMENT

It is highly likely, however, that the proposed Inkwazi Estate mixed use development will only be fully occupied and generating maximum traffic in five years time and therefore to identify the access and road network requirements to accommodate the

proposed Inkwazi Estate generated traffic, the 2008 traffic flows have been factored up to represent five year forecast 2013 traffic flows.

Even though the existing economy has slowed down considerably in the last year which is likely to continue for at least the next 2 years there are numerous residential and commercial developments in the vicinity of the site that are under construction and that will be fully or partially occupied within the next five years. All these developments have been approved, however, several of them are changing in nature and landuse as markets change or other opportunities arise. Brettenwood Estate for example has introduced a retiree village which will now generate much less traffic than originally anticipated. Due to the slow take-up of these higher income residential opportunities and the delay in developing the commercial opportunities, it is highly unlikely that all of the approved developments will be fully developed and generating maximum traffic even in 10 years time. It was therefore considered prudent to assess the access and road network improvement requirements for a five year horizon plus the traffic generated by the proposed Inkwazi Estate mixed use development.

The 2008 AM and PM peak hour traffic flows have therefore been factored up by 7% per annum for the next 5 years to reflect the increase in traffic due to the take up from the approved residential and commercial developments in the vicinity of the site. These five year forecast 2013 traffic flows used for this traffic assessment are shown in Figure 5.

The traffic impact assessment for the proposed Inkwazi Estate mixed use development has therefore been undertaken for the following two scenarios:

1. The five year forecast traffic volumes shown in Figure 5 plus the AM and PM peak hour traffic expected to be generated by the proposed Inkwazi Estate mixed use development for the existing plus known improvements road network shown in Figure 3. These combined five year forecast plus development generated traffic volumes on the existing road network are shown in Figure 6. This scenario has assumed that MR228 and MR330 will already be upgraded as part of the Seaton Delaval development, Brettenwood commercial development, Richmond development and the new shopping centre development.
2. The five year forecast traffic volumes shown in Figure 5 plus the AM and PM peak hour traffic expected to be generated by the proposed Inkwazi Estate mixed use development on the future road network shown in Figure 4. These combined five year forecast plus development generated traffic volumes on the future road network are shown in Figure 7. This scenario is the above scenario plus the new Sheffield interchange on the N2.

6.1 Traffic Impact Assessment of the Existing Road Network

A review of the five year forecast plus the development generated traffic volumes on the existing road network, showed that most of the road links in the vicinity of the site are expected to experience an increase in existing traffic flows due to the proposed Inkwazi Estate mixed use development.

The five year forecast plus the development generated AM and PM peak hour traffic volumes by direction on MR2, MR330, MR467, MR228 and MR474 for the existing road network layout are given in Table 7.1 below:

An assessment of the five year forecast plus the development generated AM and PM peak hour traffic showed that MR330 west of MR228 will be operating at very close to capacity, however, this section of road is planned to be upgraded to a 4-lane carriageway road from the Salt Rock interchange on the N2 up to the MR228 intersection as part of the Brettenwood commercial development located at the northeast quadrant of the MR330 and MR228 intersection and a proposed new shopping centre located at the northeast quadrant of the Salt Rock interchange on the N2. This increased capacity will be able to accommodate the forecast traffic volumes along this section of MR330.

TABLE 7.1 Five Year Forecast Plus Development Generated AM and PM Peak Hour Traffic Volumes Along MR2, MR330, MR467, MR228 and MR474 On the Existing Road Network Layout

SECTION OF ROAD	DIRECTION	AM PEAK HOUR	PM PEAK HOUR
		5-Year Forecast +	5-Year Forecast +
MR2 north of MR467 / MR104	Northbound	649 veh/h	554 veh/h
	Southbound	562 veh/h	645 veh/h
	Two-Way	1211 veh/h	1199 veh/h
MR2 south of MR467 / MR104	Northbound	526 veh/h	693 veh/h
	Southbound	728 veh/h	531 veh/h
	Two-Way	1254 veh/h	1224 veh/h
MR330 west of MR228	Eastbound	639 veh/h	1125 veh/h
	Westbound	1294 veh/h	768 veh/h
	Two-Way	1933 veh/h	1893 veh/h

TABLE 7.1 (cont'd) Five Year Forecast Plus Development Generated AM and PM Peak Hour Traffic Volumes Along MR2, MR330, MR467, MR228 and MR474 On the Existing Road Network Layout

SECTION OF ROAD	DIRECTION	AM PEAK HOUR	PM PEAK HOUR
		5-Year Forecast +	5-Year Forecast +
MR330 east of MR228	Eastbound	386 veh/h	431 veh/h
	Westbound	570 veh/h	454 veh/h
	Two-Way	956 veh/h	885 veh/h
MR467 north of MR2	Eastbound	232 veh/h	495 veh/h
	Westbound	479 veh/h	268 veh/h
	Two-Way	711 veh/h	763 veh/h
MR228 east of MR467	Northbound	535 veh/h	281 veh/h
	Southbound	261 veh/h	552 veh/h
	Two-Way	796 veh/h	833 veh/h
MR228 west of MR474	Northbound	375 veh/h	819 veh/h
	Southbound	823 veh/h	415 veh/h
	Two-Way	1198 veh/h	1234 veh/h
MR474 north of MR228	Eastbound	178 veh/h	139 veh/h
	Westbound	175 veh/h	193 veh/h
	Two-Way	353 veh/h	332 veh/h

The section of MR228 from the N2 crossing to MR467 will be operating over capacity for a gravel surfaced road and this section of MR228 will need to be upgraded to an asphalt surfaced road in order to accommodate the increase in traffic volumes.

All the other sections of road in the vicinity of the site will be able to accommodate the increase in two-way traffic flows generated by the proposed Inkwazi Estate mixed use development. It should be noted that the Sheffield interchange on the N2 was not a traffic capacity requirement as an upgraded MR228 and MR330 can accommodate the traffic generated by the proposed Seaton Delaval development. The Sheffield interchange on the N2 was a request from the developers to improve the accessibility of Seaton Delaval and hence increase the land values. An upgraded MR228 and MR330 as planned will be able to accommodate all of the AM and PM peak hour traffic generated by the Seaton Delaval development and the proposed Inkwazi Estate mixed use development.

6.2 Traffic Impact Assessment of Major Junctions on the Existing Road Layout

All of the major junctions in the vicinity of the site are expected to experience an increase in some movements due to the traffic generated by the proposed Inkwazi Estate mixed use development. These junctions were analysed to assess the type of control and junction layout requirements to accommodate the five year forecast plus Inkwazi Estate generated AM and PM peak hour traffic volumes at acceptable Levels of Service. For this analysis, a maximum Level of Service 'D' was considered to be acceptable for AM and PM peak hour traffic conditions.

The results of the SIDRA analysis at each main intersection are discussed below:

MR2 and MR467 / MR104 Intersection

This intersection is expected to experience an increase in the MR467 westbound left- and right-turn movements, in the MR2 northbound right-turn movement and the MR2 southbound left-turn movement during both the AM and PM peak periods.

The analysis of the five year forecast plus development generated AM and PM peak hour traffic volumes at this intersection showed that the increased traffic volumes are likely to satisfy the Southern African Road Traffic Signs Manual's warrants for the installation of traffic signals. The following geometric layout will be required to accommodate the increased traffic flows for signal control:

MR2 Northbound Approach	-	Left-Turn Slip Lane
	-	Straight Lane
	-	Right-Turn Lane
MR2 Southbound Approach	-	Left-Turn Lane (30m)
	-	Straight Lane
	-	Right-Turn Lane
MR104 Eastbound Approach	-	Shared All Movement Lane
MR467 Westbound Approach	-	Shared Straight and Right-Turn Lane
	-	Left-Turn Lane (Yield Control)

MR467 and MR228 / Nutriflo Access Road Intersection

This intersection is expected to experience an increase mainly in the MR228 eastbound left-turn movement and the MR467 northbound right-turn movement during both the AM and PM peak hours due to the traffic generated by the proposed Inkwazi Estate mixed use development.

The analysis of the five year forecast plus development generated AM and PM peak hour traffic volumes at this intersection showed that the intersection will require minor improvements to accommodate the increased traffic volumes. The following geometric layout will be required at this intersection which can remain as a priority controlled intersection with MR228 and Nutriflo under stop control:

MR467 Eastbound Approach	-	Shared Left-Turn and Straight Lane
	-	Right-Turn Lane (75m long)
MR467 Westbound Approach	-	Shared All Movement Lane
MR228 Northbound Approach	-	Left-Turn Lane
	-	Shared Straight and Right-Turn Lane (25m)
Nutriflo Southbound Approach	-	Shared All Movement Lane

The MR228 crossing of the Umhlali River can be retained as low level crossing as there is alternative access to the proposed development via MR330.

MR228 and MR474 Intersection

The MR228 southbound right-turn movement and MR228 northbound straight movement are expected to experience the biggest increases at this intersection during the AM and PM peak periods due to the proposed Inkwazi Estate mixed use development.

The analysis showed that this intersection will need to be re-configured such that MR228 northbound and southbound are the two free flow approaches and that MR474 intersects with MR228 from the east under stop control. This intersection will not require signalization but the following geometric layout will be required:

MR228 Northbound Approach	-	Straight Lane
	-	Right-Turn Lane (30m long)
MR228 Southbound Approach	-	Left-Turn Slip Lane
	-	Straight Lane
MR474 Westbound Approach	-	Shared Left- and Right-Turn Lane

It has been assumed that this reconfiguration will be undertaken as part of Seaton Delaval's improvements to MR228.

MR228 and MR330 Intersection

This intersection is planned to be upgraded substantially as part of the Brettenwood Estate's commercial development located at the northeast quadrant of the MR330 and MR228 intersection. The analysis showed that the upgraded MR330 and MR228 intersection will easily be able to accommodate the additional traffic expected to be generated by the proposed Inkwazi Estate mixed use development. The increased traffic flows due to this development will in any event reduce significantly when the new Sheffield interchange is constructed on the N2 at the MR228 crossing.

MR228 and Main Access Road into Inkwazi Estate

The analysis showed that the following geometric layout will be required for this main access intersection serving the proposed Inkwazi Estate mixed use development:

- MR228 Northbound Approach - Left-Turn Lane (50m)
- Straight Lane
- MR228 Southbound Approach - Straight Lane
- Right-Turn Lane (75m)
- MR228 Eastbound Approach - Left-Turn Lane
- Right-Turn Lane (60m)

MR228 and Secondary Access Road into Inkwazi Estate

The analysis showed that single lane approaches will provide sufficient capacity at this secondary access intersection to accommodate the forecast volume of traffic. The 180° bend at this access will be designed to accommodate the turning sweep path of a single unit heavy vehicle (bus or similar).

All internal intersections off these two access roads will be a minimum of 60m from the MR228 intersection.

6.3 Traffic Impact Assessment of the Future Road Network

A review of the five year forecast plus the development generated traffic volumes on the future road network that includes the Sheffield interchange on the N2, showed that most of the road links in the vicinity of the site are still expected to experience some increase in existing traffic flows due to the proposed Inkwazi Estate mixed use development.

The five year forecast plus the development generated AM and PM peak hour traffic volumes by direction on MR2, MR330, MR467, MR228 and MR474 for the future road network are given in Table 7.2 below:

TABLE 7.2 Five Year Forecast Plus Development Generated AM and PM Peak Hour Traffic Volumes Along MR2, MR330, MR467, MR228 and MR474 for the Future Road Network Layout

SECTION OF ROAD	DIRECTION	AM PEAK HOUR	PM PEAK HOUR
		5-Year Forecast +	5-Year Forecast +
MR2 north of MR467 / MR104	Northbound	585 veh/h	527 veh/h
	Southbound	536 veh/h	581 veh/h
	Two-Way	1121 veh/h	1108 veh/h
MR2 south of MR467 / MR104	Northbound	526 veh/h	672 veh/h
	Southbound	728 veh/h	531 veh/h
	Two-Way	1254 veh/h	1203 veh/h
MR330 west of MR228	Eastbound	430 veh/h	613 veh/h
	Westbound	789 veh/h	552 veh/h
	Two-Way	1219 veh/h	1165 veh/h
MR330 east of MR228	Eastbound	386 veh/h	431 veh/h
	Westbound	570 veh/h	454 veh/h
	Two-Way	956 veh/h	885 veh/h
MR467 north of MR2	Eastbound	206 veh/h	431 veh/h
	Westbound	415 veh/h	241 veh/h
	Two-Way	621 veh/h	672 veh/h
MR228 east of MR467	Northbound	471 veh/h	254 veh/h
	Southbound	135 veh/h	488 veh/h
	Two-Way	606 veh/h	742 veh/h
MR228 west of MR474	Northbound	104 veh/h	256 veh/h
	Southbound	252 veh/h	108 veh/h
	Two-Way	356 veh/h	364 veh/h

MR474 north of MR228	Eastbound	178 veh/h	139 veh/h
	Westbound	175 veh/h	193 veh/h
	Two-Way	353 veh/h	332 veh/h

An assessment of the above five year forecast plus the development generated AM and PM peak hour traffic showed that only the section of MR228 from the new interchange to MR467 will be operating close to capacity for a gravel surfaced road and this section of MR228 will still need to be upgraded to an asphalt surfaced road. All the other sections of road in the vicinity of the site will be able to accommodate the increase in two-way traffic flows generated by the proposed Inkwazi Estate mixed use development.

6.4 Traffic Impact Assessment of Major Junctions on the Future Road Layout

All of the major junctions in the vicinity of the site are still expected to experience an increase in some movements due to the traffic generated by the proposed Inkwazi Estate mixed use development. These junctions were analysed to assess the control and junction layout requirements to accommodate the five year forecast plus Inkwazi Estate generated AM and PM peak hour traffic volumes at acceptable Levels of Service on the future road network. For this analysis, a maximum Level of Service 'D' was considered to be acceptable for AM and PM peak hour traffic conditions.

The results of the SIDRA analysis at each main intersection are discussed below:

MR2 and MR467 / MR104 Intersection

This intersection is still expected to experience an increase in the MR467 westbound left- and right-turn movements, in the MR2 northbound right-turn movement and the MR2 southbound left-turn movement during both the AM and PM peak periods.

The analysis of the five year forecast plus development generated AM and PM peak hour traffic volumes at this intersection showed that the increased traffic volumes may satisfy the Southern African Road Traffic Signs Manual's warrants for the installation of traffic signals. The geometric layout recommended for the existing road network will also be required to accommodate the increased traffic flows for the future road network, for both existing priority and for signal control.

MR467 and MR228 / Nutriflo Access Road Intersection

This intersection is still expected to experience an increase mainly in the MR228 eastbound left-turn movement and the MR467 northbound movement during both the AM and PM peak hours due to the traffic generated by the proposed Inkwazi Estate mixed use development.

The analysis of the five year forecast plus development generated AM and PM peak hour traffic volumes at this intersection for the future road network showed that the minor improvements recommended for the existing road network layout will also be required for the future road network layout.

The MR228 crossing of the Umhlali River can still be retained as a low level crossing as there is alternative access to the proposed development via the new interchange on the N2.

MR228 and MR474 Intersection

The MR228 southbound right-turn movement and MR228 northbound straight movement are still expected to experience some increase in existing traffic flows. The analysis showed that this intersection will still need to be re-configured such that MR228 northbound and southbound are the two free flow approaches and that MR474 intersects with MR228 from the east under stop control. This intersection will not require signalization but the geometric layout recommended for the existing road network layout will also be required for the future road network layout.

MR228 and MR330 Intersection

This intersection is planned to be upgraded substantially as part of the Brettenwood Estate's commercial development located at the northeast quadrant of the MR330 and MR228 intersection. The analysis showed that the upgraded MR330 and MR228 intersection will easily be able to accommodate the low volume of additional traffic expected to be generated by the proposed Inkwazi Estate mixed use development.

MR228 and Main Access Road into Inkwazi Estate

The same geometric layout for this access intersection that is required for the existing road network layout will be required for the future road network layout.

MR228 and Secondary Access Road into Inkwazi Estate

The same geometric layout for this access intersection that is required for the existing road network layout will be required for the future road network layout.

6.5 Pedestrian Assessment

As the proposed Inkwazi Estate development is fairly isolated, it is not expected to generate high volumes of pedestrians and therefore no pedestrian infrastructure will be required along the external road network in the vicinity of the site.

There is, however, likely to be fairly high pedestrian activity within the Inkwazi Estate and it is therefore recommended that a sidewalk be constructed along one side of all the two internal roads serving the Inkwazi Estate mixed use development as well as the road that connects the limited commercial sites. It is also recommended that a sidewalk be provided along the southern edge of MR228 for the length of the site past the limited commercial development.

6.6 Public Transport

MR228 is currently not a public transport route. Once the Seaton Delaval residential development and the Inkwazi Estate mixed use development are fully developed, it is highly likely that they could become a minibus taxi destination and origin during the AM and PM peak periods respectively. MR228 and MR467 will therefore become public transport routes and hence it is recommended that as part of the MR228 upgrade, a minibus taxi layby is provided in both directions of MR228 downstream of the Inkwazi Estate main access intersection.

Up until MR228 becomes a public transport route, Inkwazi Estate mixed use development will need to provide a vehicular shuttle service to and from MR2 and to and from MR330 during the commuter peak periods to transport their domestic and commercial workers to and from the existing public transport routes serving the area.

6.7 Road Safety

No major adverse road safety implications are expected to arise due to the additional traffic generated by the proposed Inkwazi Estate mixed use development. MR228 will be asphalt surfaced to provincial road standard.

Sight distance conditions at the position of the main access road serving the proposed Inkwazi Estate are good.

The sight distances at this access intersection along MR228 to and from the east are in excess of 250m and the sight distances to and from the west are restricted to approximately 175m by a horizontal and vertical curve in MR228.

Sight distance conditions at the position of the secondary access road serving the proposed Inkwazi Estate are very good. The sight distances at this access intersection along MR228 to and from the east are in excess of 350m and the sight distances to and from the west are also in excess of 350m.

Sight distance conditions at the alternative position for the secondary access road serving the proposed Inkwazi Estate are also good. The sight distances at this access intersection along MR228 to and from the east and to and from the west are approximately 200m.

Sidewalks are recommended along the southern edge of MR228 for the length of the site and along one side of both main access roads serving the proposed Inkwazi Estate mixed use development. These sidewalks will reduce vehicular / pedestrian conflict.

Minibus taxi laybys are also recommended in MR228 in both directions at the main access intersection to accommodate minibus taxis stopping to pick-up or drop-off passengers.

Street lighting is recommended in MR228 at the two access intersections serving the proposed Inkwazi Estate mixed use development to improve visibility and hence road safety at night.

7. CONCLUSIONS AND RECOMMENDATIONS

The above traffic assessment of the proposed Inkwazi Estate mixed use development gave the following conclusions and recommendations:

1. Existing traffic volumes on the road network surrounding and serving the site are generally very low and very little congestion occurs on this road network even during peak periods.
2. The proposed Inkwazi Estate mixed use development is expected to generate a maximum of 1 786 veh/h two-way during the AM peak hour and 1 821veh/h two-way during the PM peak hour, distributed to the north, south, east and west via MR228, MR467, MR2, MR474 and MR330, and then onto the N2.
3. Two road network layout scenarios were analysed; the existing road network including future upgrades to MR228 and MR330 required for the Seaton Delaval, Brettenwood Estate commercial component and Richmond development at the MR330 and MR228 intersection and a new shopping centre development at the Salt Rock / Umhlali interchange on the N2; and a future road

network that includes the new Sheffield interchange on the N2 at the existing MR228 crossing over the N2 required by the second phase of the Seaton Delaval development.

4. The analysis of the impact of the Inkwazi Estate mixed use development generated traffic on the existing road network including the known upgrades to MR228 and MR330, showed that the following additional improvements to the surrounding road network will be required to accommodate the Inkwazi Estate mixed use development:
 - Improvements to and signalization of the MR2 and MR104 / MR467 intersection including pedestrian crossings, signals and phasing, once warranted
 - Minor improvements to the MR467 and MR228 / Nutriflo intersection
 - Upgrading of MR228 to an asphalt surface road from the MR228 crossing over the N2 to MR467.
 - Sidewalks along one side of the two access roads serving the proposed development.
 - A sidewalk along MR228 for the length of the site.
 - Street lighting in MR228 at the two access intersections.
 - Minibus taxi laybys in MR228 in both directions, downstream of the new main access road serving the Inkwazi Estate mixed use development.

The costs of the above improvements will be to the developers account.

5. The analysis showed that the Inkwazi Estate mixed use development does not require the new Sheffield interchange on the N2 in order to accommodate the development generated traffic.
6. The analysis of the impact of the Inkwazi Estate mixed use development generated traffic on the future road network showed that the additional improvements to the existing surrounding road network described above will still be required.
7. In addition to the above recommendations, it is recommended that until a formal public transport service is provided along MR228, the Inkwazi Estate mixed use development provides a shuttle service between the development and the existing public transport services in MR2 and MR330.
8. All intersections off the two access roads will be located a minimum of 60m from MR228.

APPENDIX A

RESULTS AND ANALYSIS OF TRAFFIC COUNTS

APPENDIX B

TOWN PLANNING LAYOUT AND MASTER PLAN

TRAFFIC SURVEY ANALYSIS

CLIENT: AFRICON CONSULTING

SITE: INTERSECTION OF MAIN ROAD 2 AND MAIN ROAD 104 AND MAIN ROAD 467

DATE: 12 HOUR COUNT ON THURSDAY 06 NOVEMBER 2008

UNITS: CLASSIFIED

APPROACH FROM NAME MOVEMENT TIME	NORTH MAIN ROAD 2															TOTAL
	LEFT TURN					STRAIGHT					RIGHT TURN					ALL MOVEMENTS
	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	
06:00 - 06:15	1	0	1	0	2	21	13	2	2	38	3	0	1	0	4	44
06:15 - 06:30	2	0	1	0	3	76	28	6	0	110	1	0	2	0	3	116
06:30 - 06:45	4	0	0	0	4	65	27	9	0	101	1	0	1	0	2	107
06:45 - 07:00	3	0	0	0	3	54	20	3	3	80	3	0	1	0	4	87
07:00 - 07:15	1	0	0	0	1	58	17	4	1	80	0	0	0	0	0	81
07:15 - 07:30	3	0	0	0	3	62	20	11	3	96	2	1	2	0	5	104
07:30 - 07:45	2	0	0	0	2	50	23	9	3	85	0	0	0	0	0	87
07:45 - 08:00	1	0	0	0	1	49	17	7	0	73	0	0	0	0	0	74
08:00 - 08:15	4	0	1	0	5	43	10	10	1	64	1	0	0	0	1	70
08:15 - 08:30	2	0	0	0	2	32	10	8	1	51	1	0	1	0	2	55
08:30 - 08:45	4	0	1	0	5	21	10	8	1	40	5	0	1	0	6	51
08:45 - 09:00	2	0	0	0	2	35	6	3	1	45	0	0	2	1	3	50
09:00 - 09:15	0	0	0	0	0	23	5	9	0	37	0	0	2	0	2	39
09:15 - 09:30	2	0	0	0	2	48	7	7	0	62	2	0	1	0	3	67
09:30 - 09:45	2	0	0	0	2	24	8	6	0	38	0	0	1	0	1	41
09:45 - 10:00	0	0	3	0	3	28	8	12	2	50	1	0	0	0	1	54
10:00 - 10:15	3	0	3	0	6	30	6	23	0	59	3	0	0	0	3	68
10:15 - 10:30	2	0	0	0	2	27	10	14	0	51	0	0	0	0	0	53
10:30 - 10:45	0	0	0	0	0	28	11	8	0	47	1	0	0	0	1	48
10:45 - 11:00	1	0	1	0	2	44	7	18	0	69	1	0	1	0	2	73
11:00 - 11:15	3	0	1	0	4	36	4	14	0	54	2	0	0	0	2	60
11:15 - 11:30	1	0	1	0	2	21	7	10	0	38	0	0	0	0	0	40
11:30 - 11:45	3	0	0	0	3	35	12	17	2	66	1	0	0	0	1	70
11:45 - 12:00	1	0	1	0	2	32	0	14	0	46	0	0	1	0	1	49
12:00 - 12:15	2	0	2	0	4	48	4	7	0	59	4	0	0	0	4	67
12:15 - 12:30	0	0	0	0	0	16	1	2	0	19	0	0	0	0	0	19
12:30 - 12:45	6	0	1	0	7	40	5	20	0	65	1	0	0	0	1	73
12:45 - 13:00	2	0	1	0	3	43	11	14	1	69	1	0	0	0	1	73
13:00 - 13:15	2	0	0	0	2	38	7	9	0	54	0	0	1	0	1	57
13:15 - 13:30	1	0	0	0	1	37	7	17	2	63	1	0	0	0	1	65
13:30 - 13:45	1	0	0	0	1	37	10	17	0	64	1	0	1	0	2	67
13:45 - 14:00	1	0	0	0	1	41	5	13	0	59	2	0	0	0	2	62
14:00 - 14:15	2	0	0	0	2	27	16	11	1	55	1	0	0	0	1	58
14:15 - 14:30	3	0	0	0	3	47	10	18	1	76	0	0	0	0	0	79
14:30 - 14:45	1	0	0	0	1	57	15	17	1	90	2	0	0	0	2	93
14:45 - 15:00	0	0	0	0	0	53	15	10	1	79	1	0	0	0	1	80
15:00 - 15:15	2	0	0	0	2	57	10	19	1	87	1	0	0	0	1	90
15:15 - 15:30	3	0	0	0	3	44	19	13	2	78	0	0	1	0	1	82
15:30 - 15:45	3	0	0	0	3	31	18	13	1	63	0	0	1	0	1	67
15:45 - 16:00	2	0	0	0	2	43	14	15	1	73	2	0	1	0	3	78
16:00 - 16:15	0	0	3	0	3	35	19	9	1	64	2	0	1	0	3	70
16:15 - 16:30	3	0	0	0	3	56	18	15	1	90	1	0	1	0	2	95
16:30 - 16:45	0	0	0	0	0	42	12	12	0	66	2	0	1	0	3	69
16:45 - 17:00	1	0	1	0	2	59	20	10	0	89	1	0	1	0	2	93
17:00 - 17:15	2	0	0	0	2	53	19	13	1	86	0	0	2	0	2	90
17:15 - 17:30	0	0	0	0	0	50	13	4	2	69	1	0	0	0	1	70
17:30 - 17:45	1	0	0	0	1	48	13	10	1	72	1	0	0	0	1	74
17:45 - 18:00	0	0	0	0	0	38	11	9	1	59	2	0	2	0	4	63
TOTAL	85	0	22	0	107	1982	578	529	39	3128	55	1	30	1	87	3322

TRAFFIC SURVEY ANALYSIS

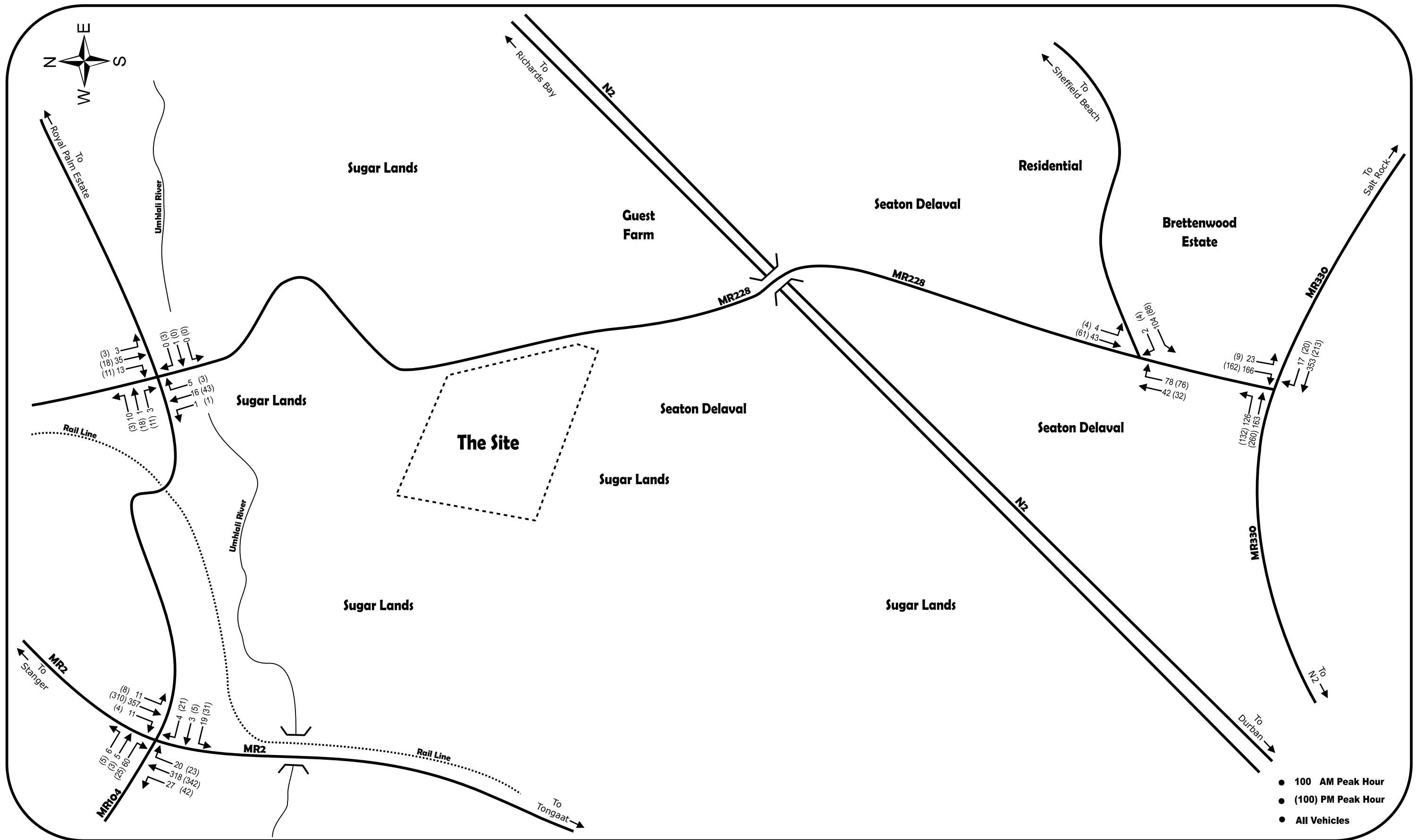
CLIENT: AFRICON CONSULTING

SITE: INTERSECTION OF MAIN ROAD 467 AND MAIN ROAD 228 AND NUTRIFLO

DATE: 12 HOUR COUNT ON THURSDAY 06 NOVEMBER 2008

UNITS: CLASSIFIED

APPROACH FROM NAME MOVEMENT TIME	NORTH MAIN ROAD 467															TOTAL
	LEFT TURN					STRAIGHT					RIGHT TURN					ALL MOVEMENTS
	C	T	H	B	TOTAL	C	T	H	B	TOTAL	C	T	H	B	TOTAL	
06:00 - 06:15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
06:15 - 06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 - 06:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 - 07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 - 07:15	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
07:15 - 07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
08:00 - 08:15	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
08:15 - 08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 - 08:45	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
08:45 - 09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 - 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 - 09:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 - 09:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 - 10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 - 10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 - 10:30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
10:30 - 10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 - 11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 - 11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 - 11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 - 11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 - 12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 - 12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
13:15 - 13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45 - 14:00	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
14:00 - 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15 - 14:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30 - 14:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45 - 15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
15:15 - 15:30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
15:30 - 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
16:00 - 16:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
16:30 - 16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
17:00 - 17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
17:30 - 17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	0	0	0	1	1	0	0	0	1	11	0	4	0	15	17



January 2009

Existing AM Peak Hour and PM Peak Hour Traffic Volumes

PROPOSED INKWAZI ESTATE MIXED USE DEVELOPMENT IN MR228 - KWADUKUZA MUNICIPALITY

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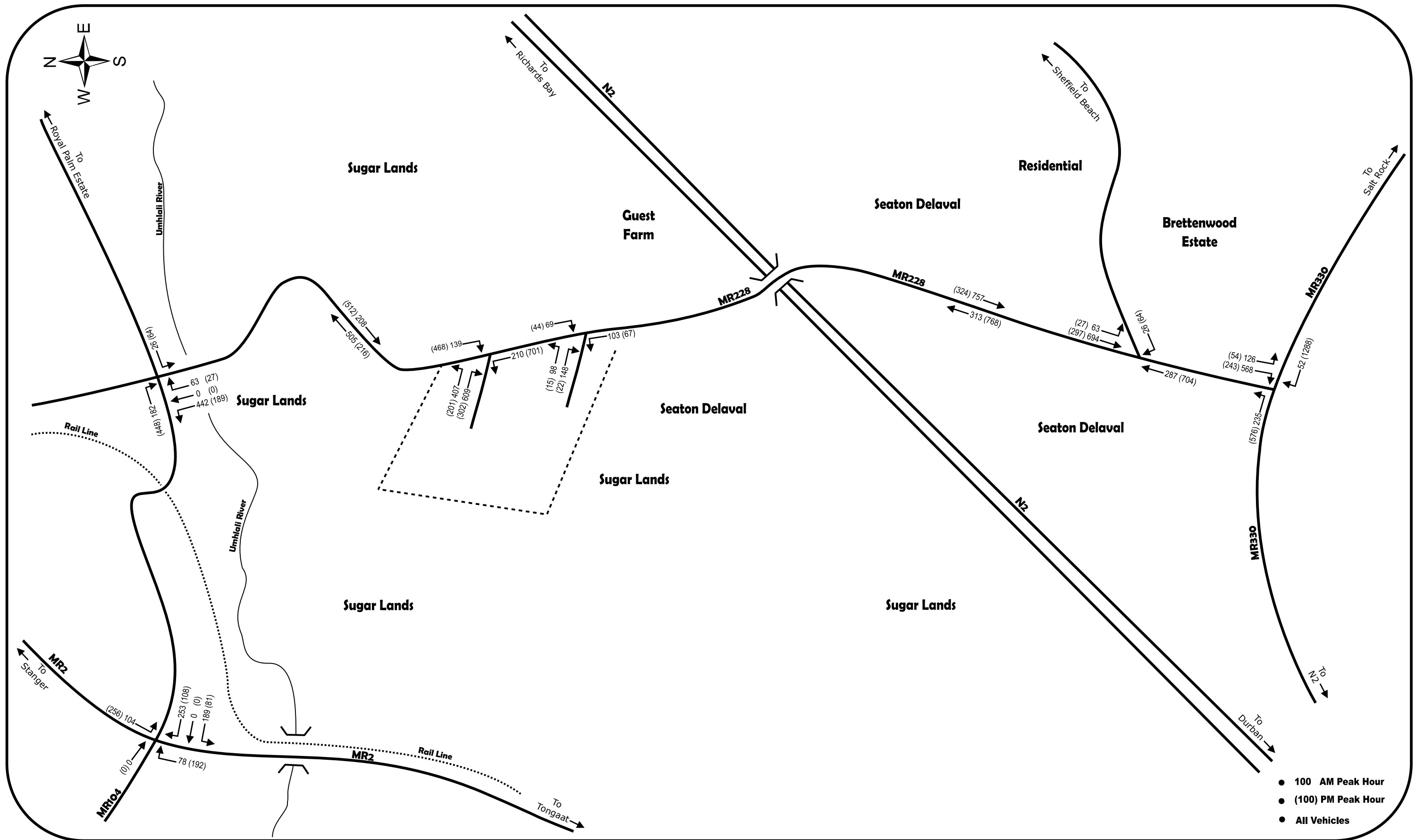
PROJ.

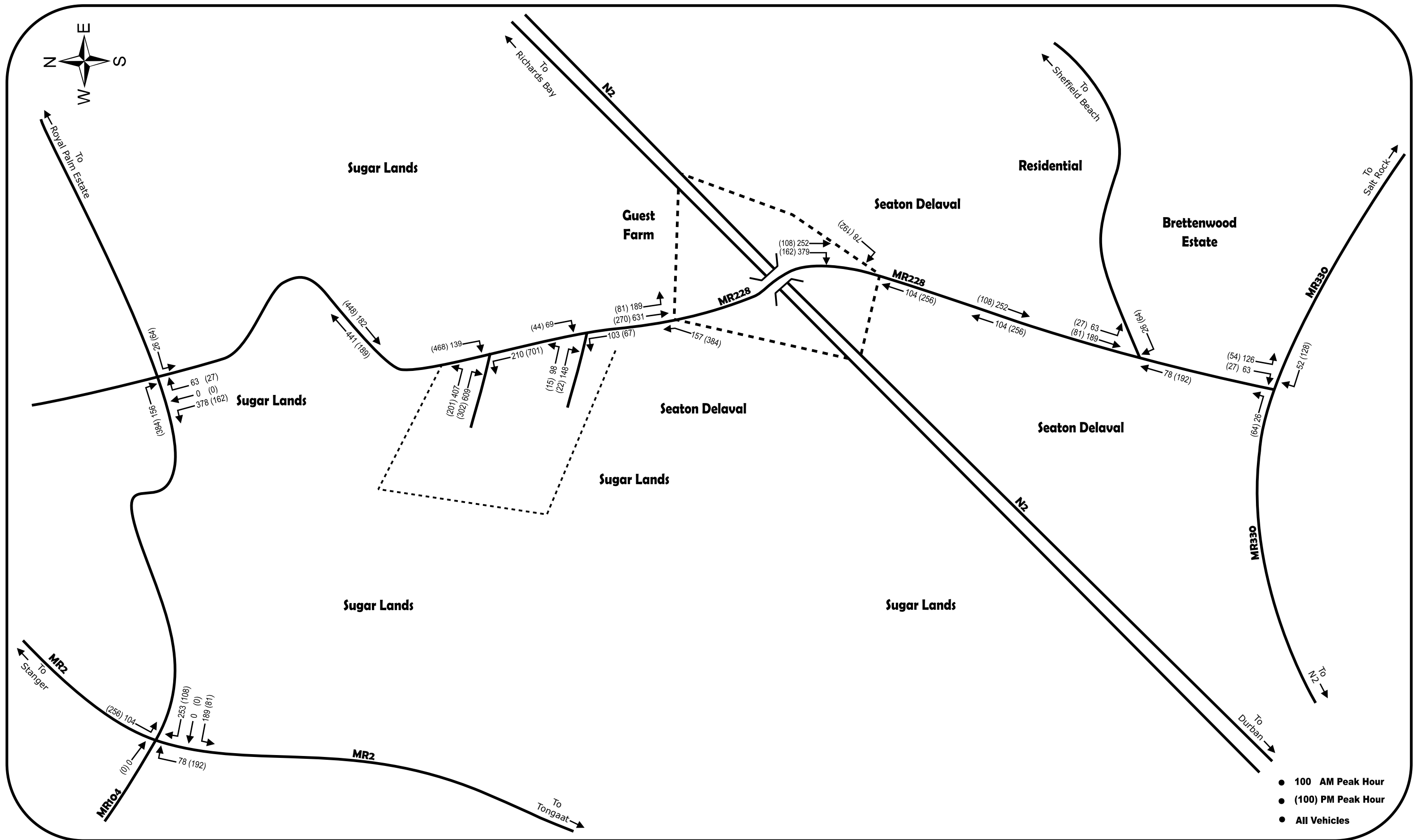
104431_INKWAZI

Figure

2

Not To Scale





January 2009

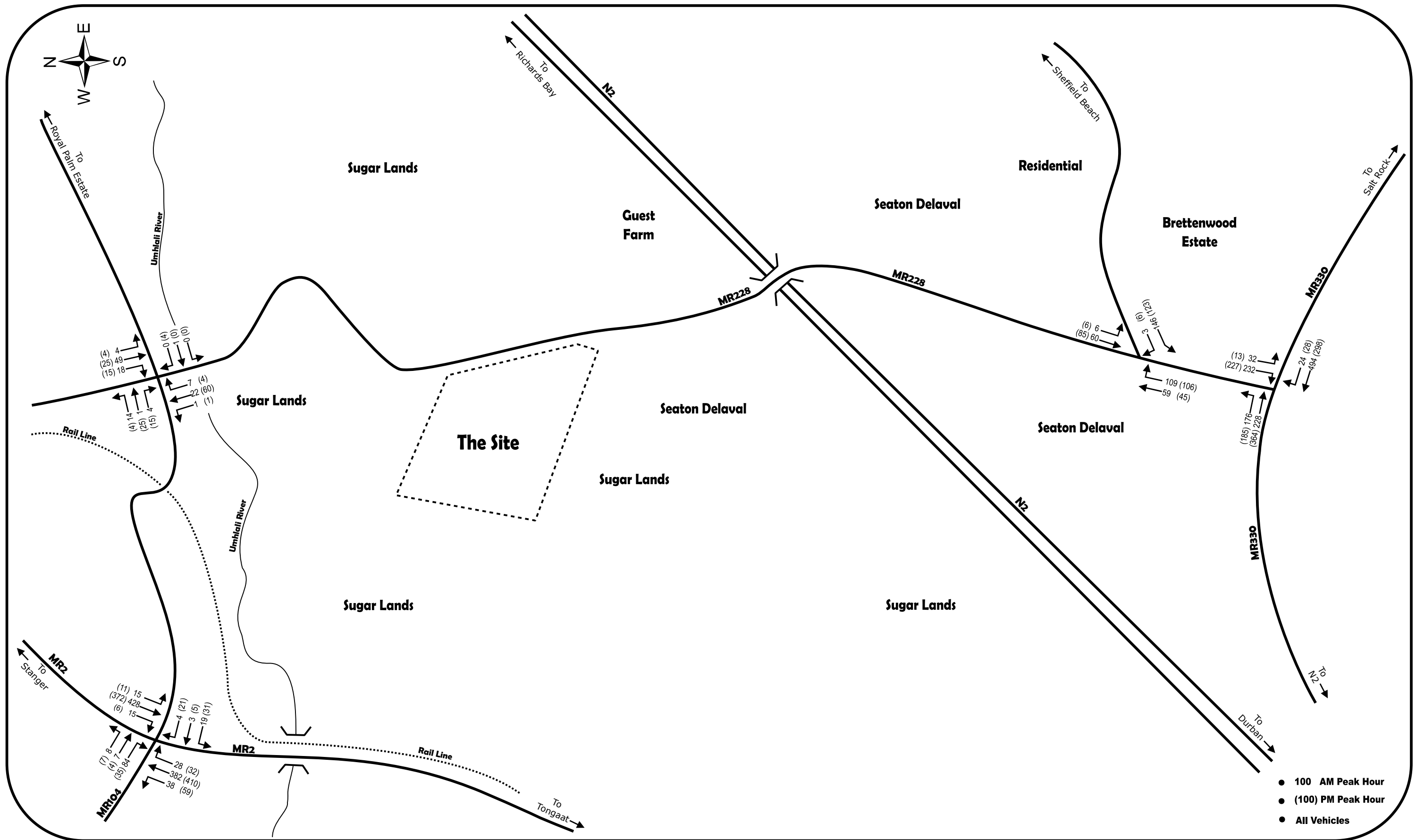
Development Generated AM Peak Hour and PM Peak Hour Traffic Volumes on Future Road Network
 PROPOSED INKWAZI ESTATE MIXED USE DEVELOPMENT IN MR228 - KWADUKUZA MUNICIPALITY

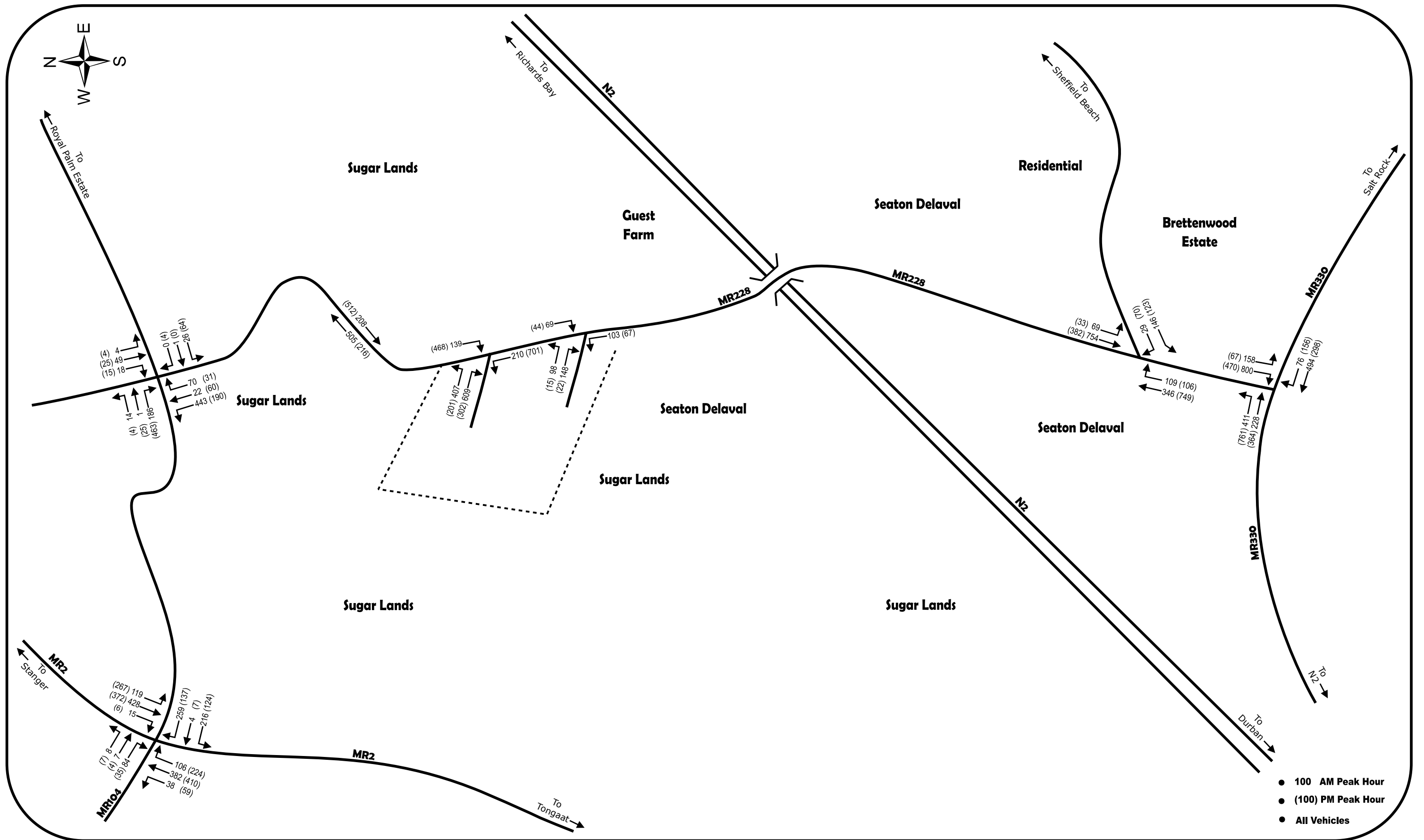
AFRICON (PTY) LTD

PROJ.
104431_INKWAZI

Figure
4

Not To Scale





January 2009

Five Year Forecast Plus Development Generated AM Peak Hour and PM Peak Hour Traffic Volumes and Existing Road Network
 PROPOSED INKWAZI ESTATE MIXED USE DEVELOPMENT IN MR228 - KWADUKUZA MUNICIPALITY

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Figure
6

Not To Scale

