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DESIGN & IMPLEMENTATION OF THE EXTENSION OF NGONYAMA ROAD IN DIEPSLOOT, JOHANNESBURG, GAUTENG

TRAFFIC IMPACT STUDY

January 2013

Quality Management

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DESIGN & IMPLEMENTATION OF THE EXTENSION OF NGONYAMA ROAD IN DIEPSLOOT, JOHANNESBURG, GAUTENG

Traffic Impact Study

December 2012

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APPENDICES

1. Introduction

1.1 Background

The Diepsloot Township was established in 1994 as a relocation area for informally settled households from Zevenfontein. It was subsequently used to accommodate informal settlers removed from the Alexandra Far East Bank in 1995. Diepsloot's regional and local location is shown in **Figure 1.1 and 1.2**

Diepsloot has a population of approximately 161,325 people living on a 5.18km^2 area comprising of formal and informal housing. Region A's Spatial Development Framework (SDF) 2007-2008 estimated that 74% of the housing units in Diepsloot are informal structures with families lacking access to basic services such as running water, sewage and rubbish removal.

Diepsloot has a history of violent protests which were triggered, amongst other incidents, by service delivery backlogs, rumoured relocations and xenophobic attacks.

The Development Vision for Diepsloot (2007) is "*to establish the area as a socially, economically and environmentally sustainable human settlement that is spatially integrated into the city of Johannesburg with access to basic services and opportunities for social mobility and economic development*". One of the aims of this vision was to develop nodes and activity streets within Diepsloot.

In addition, the Diepsloot 2020 Framework and the Diepsloot Urban Development Framework (UDF) and Business Plan identified a hierarchy of mixed nodes in line with the City's Spatial Development Framework (SDF).

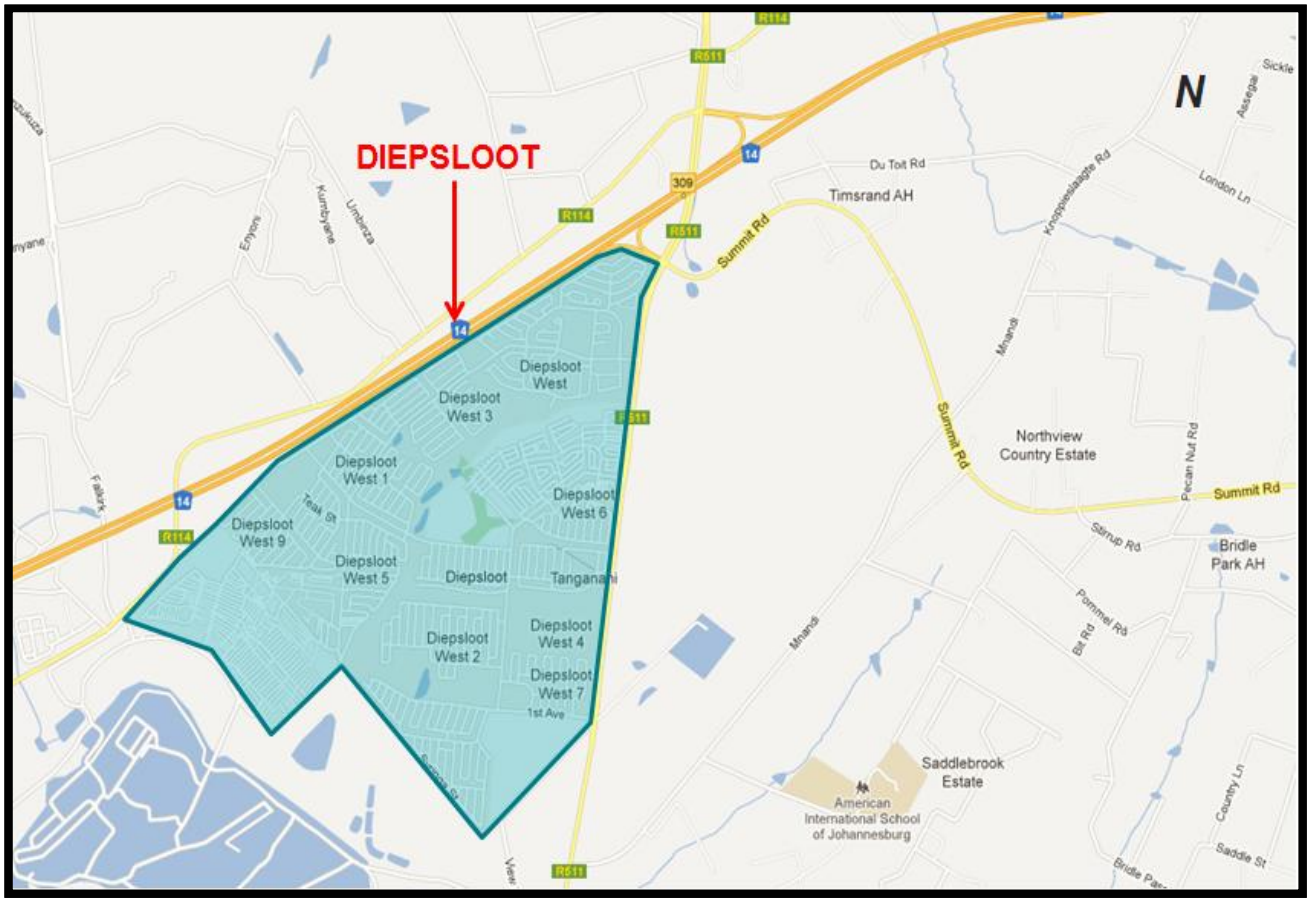
Ngonyama Road is a major access and connector road traversing through Diepsloot stretching from the north and south of the Diepsloot Township as shown in **Figure 1.3**. It fosters a large proportion of the economic activity (both formal and informal) and public and non-motorised transport in the area. Despite the importance of this road it forms an incomplete system resulting in inefficient movement throughout the area.

The Johannesburg Development Agency (JDA) has identified that the value and benefits from the proposed nodes can be fully exploited by completing and upgrading Ngonyama Road. The proposed construction will include providing a complete road and a river crossing which will complete the missing link. This will improve efficiency of movement and enhance opportunities for economic development. The missing section of Ngonyama Road measures approximately 4km in length.

Image: Google

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 1.1**
TITLE:	**Locality of Diepsloot within the City of Johannesburg**	**Date:**	**October 2012**



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Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 1.2**
TITLE:	**Diepsloot Township Locality**	**Date:**	**October 2012**

1.2 Purpose of Study

WSP SA Civil and Structural Engineers (Pty) Lts. ('WSP') has been appointed by the JDA in October 2012 as Traffic Engineers. As part of the appointment a Transport Impact Assessment (TIA) needs to be prepared for the Design and Implementation of Ngonyama Road.

WSP's role in the project will encompass the following:

- Review existing documentation and consult with the relevant parties;
- Conduct relevant studies to test the viability of proposed interventions identified in the UDF;
- Produce a TIA for planned interventions in the UDF and obtain approval from all relevant authorities;
- Produce a detailed traffic plan for the Ngonyama Road project;
- Oversee the implementation of the approved traffic plan for Ngonyama Road;
- Ensure handover to JRA and produce close-out documentation;and
- Prepare presentations and meetings.

1.3 Study Area

The study area for the TIA is the section of Ngonyama Road which is located in Extensions 7, 2, and 5 on the southern side of the Diepsloot Township . The study focuses on Ngonyama Road and its surroundings from the Ngonyama/William Nicol Drive intersection in the east, over the river to Mkhwanazi Street in the west. The study area is shown in **Figures 1.3 and 1.4.**

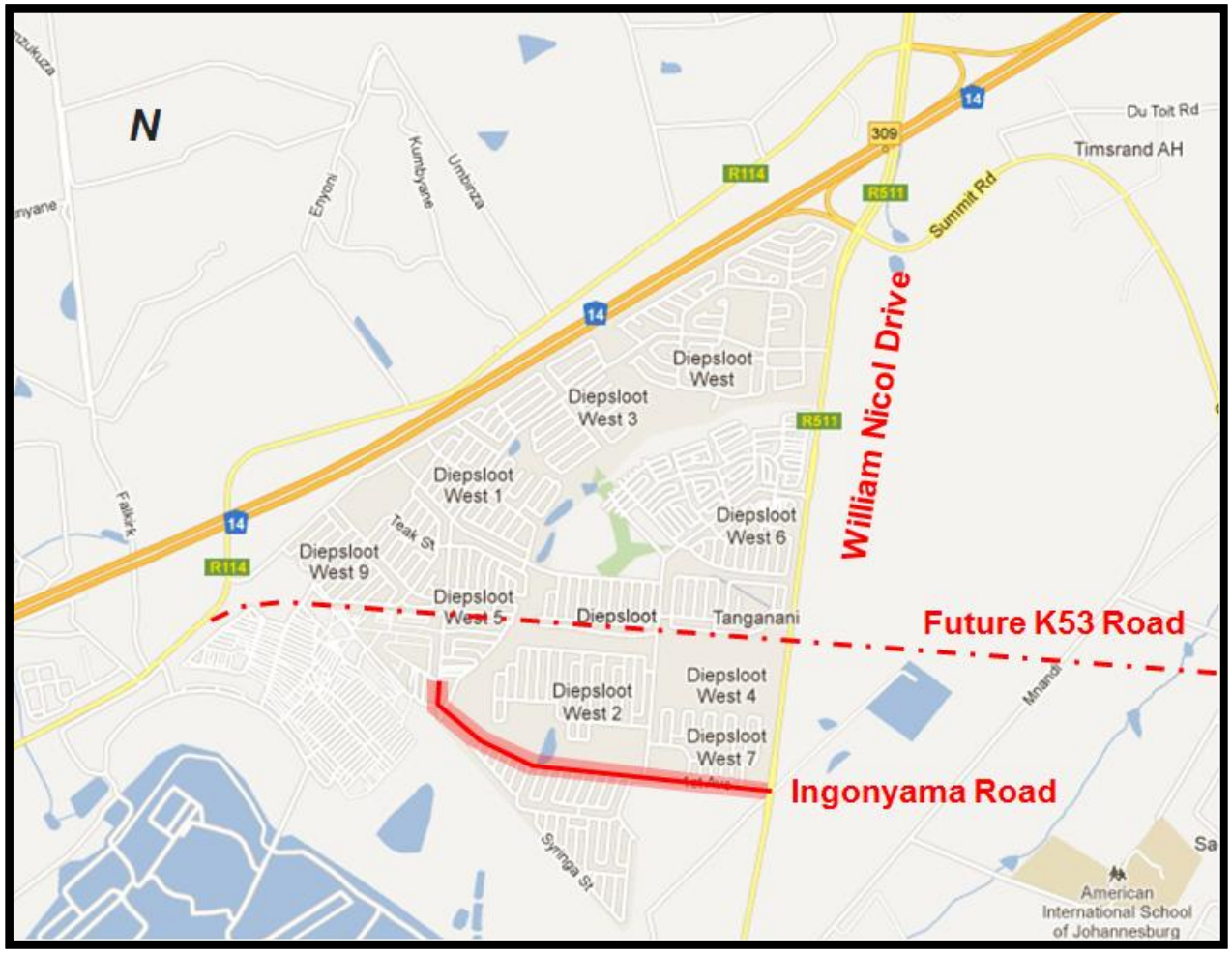


Image: Google

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 1.3**
TITLE:	**Study Area**	**Date:**	**October 2012**

Image: Google

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**
Ref:	**Figure 1.4**
TITLE:	**Aerial View of Study Area**
Date:	**October 2012**

2. Policy & Planning

2.1 Diepsloot Urban Development Framework & Business Plan (2010)

The JDA developed an Urban Development Framework (UDF) for the Diepsloot area in 2010. The UDF is aligned to the Upgrading of Marginalised Areas Programme and Township Regeneration. It forms the basis for the Design and Implementation of Ngonyama Road project.

The aim of the UDF is “to promote a consistent urban development policy approach for effective urban reconstruction and development, to guide development policies, strategies and actions of all stakeholders in the urban development process and to steer them towards the achievement of a collective vision.’

2.1.1 Development Nodes

A number of nodes have been identified for development along Ngonyama Road. The nodes are defined as ‘growth points for the township’s development programme, from which adjacent areas can be progressively improved’. The key to the success of the development nodes is an efficient multimodal movement system, noting that taxis account for approximately60% of transport in Diepsloot, which links the nodes and housing, with good internal connections and external linkages to higher order roads.

The UDF proposes the following development nodes on Ngonyama Road within the study area:

- The Shopping Centre Node (C), adjacent to the intersection of Ngonyama Road and William Nicol Drive R511/K46;
- The Quarry site (N9) node at the intersection of Ngonyama Road & Ubuntu Road; and
- Link Node (N5), west of the watercourse.

The location of the existing and proposed nodes along the section of Ngonyama Road is shown in **Figure 2.1**

a) Shopping Centre Node

This node is located at the entrance to the existing Diepsloot Shopping Mall at the intersection of Ngonyama Road and William Nicol Drive. The proposed changes to the node include the following:

- Adding an intermodal transport interchange;
- BRT station along William Nicol Drive; and
- High Density Housing

b) Quarry Node

This node is located at the intersection of Ngonyama Road and Ubuntu Street. The developed quarry node is proposed to include the following:

- High density mixed use housing;
- Community facilities
- Open spaces; and
- A buy-back (recycling) centre.

c) Link Node

The Link Node is proposed at the river crossing on Ngonyama Road. The area around link node is currently squatted with an informal taxi rank located towards the end of Ngonyama Road.

The developed link node is proposed to include the following:

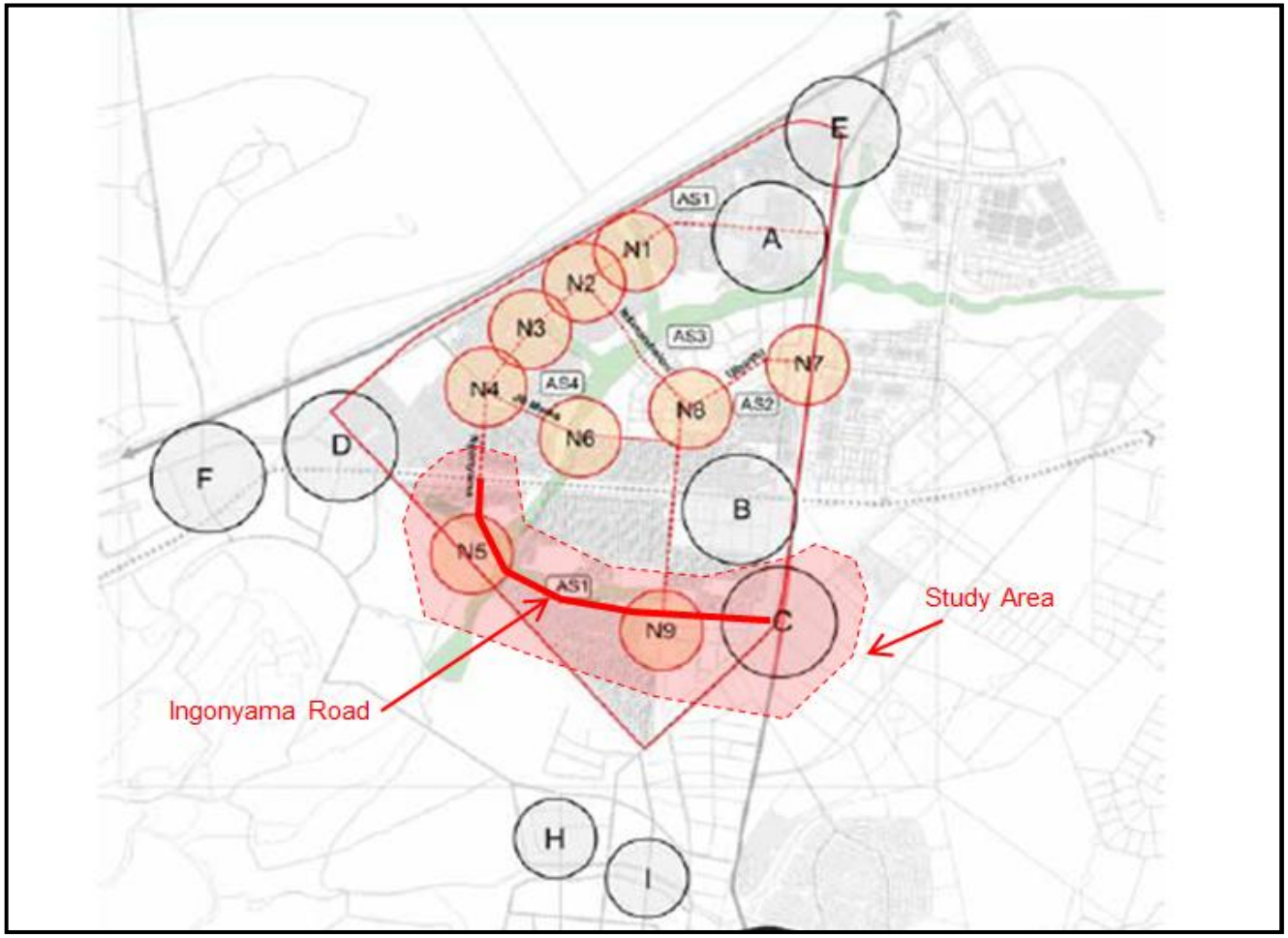
- High density residential;
- Community Facility ; and
- Intermodal Public Transport Interchange; and
- Open Spaces

The existing and proposed layouts of the three nodes along Ngonyama Road are included in **Chapter 8** of this report.

The nodes present a network of points at which a mix of urban functions exist, with the connections between nodes presenting opportunities for economic development supported by high volumes of movement. The connections between nodes are intended as activity streets where access to the activity along the street is of paramount importance.

2.1.2 The Role of Ngonyama Road

Ngonyama Road is identified as an activity street as it forms the connections between development nodes. It is the connecting thread between all three nodes and it currently fosters numerous small businesses along its length resulting in a vibrant urban street character.



Source: Diepsloot UDF, 2010

Key/Legend:

C – The Shopping Centre Node

N9 – The Quarry Site Node

N5 – The Link Node

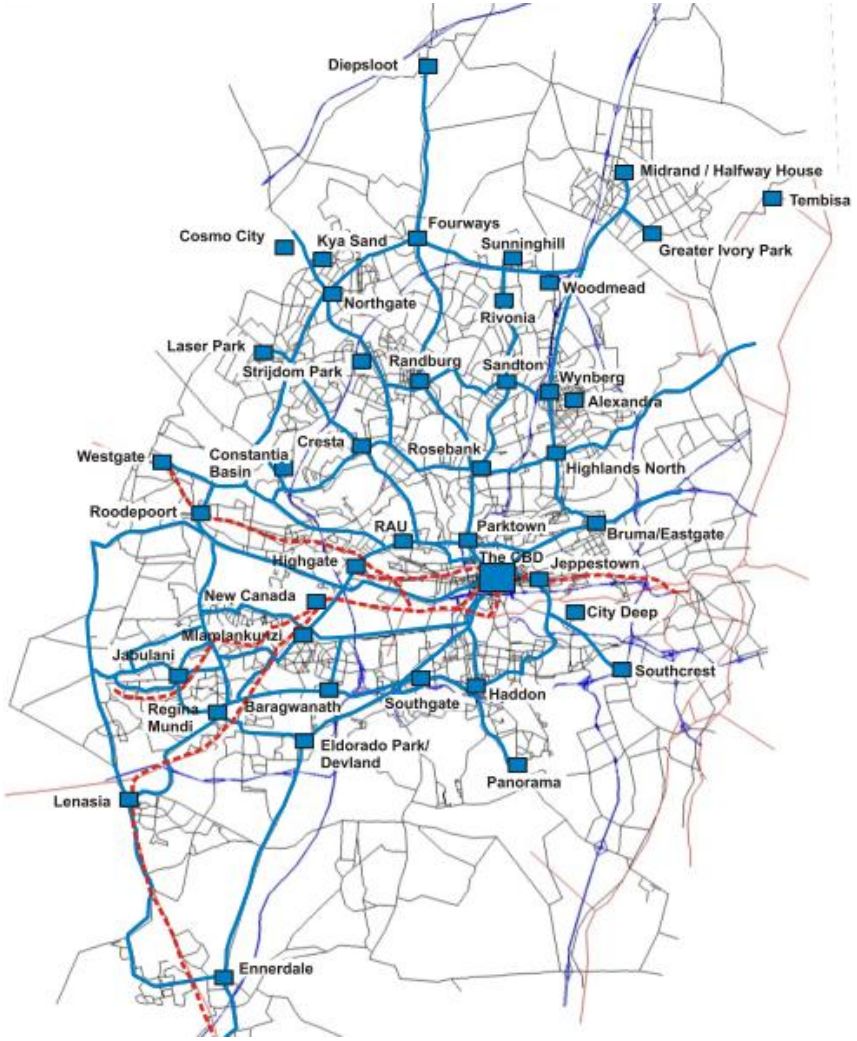
PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 2.1**
TITLE:	**Nodes Along Ingonyama Road**	**Date:**	**October 2012**

2.2 Comprehensive Integrated Public Transport Plan 2003/2008 Updated 2004

Strategic Public Transport Network (SPTN)

One of the mechanisms identified for improving public transport provision within the City of Johannesburg is the implementation of the proposed Strategic Public Transport Network (SPTN) as shown in **Figure 2.2**.

Of relevance to the Diepsloot area is the proposed Diepsloot-Fourways-Randburg link and other proposed linkages/routes. The implementation of this link will enable Diepsloot residents improved access to major employment centres within the City of Johannesburg with an improved public transport network.



Source: CITP (2003/2008),City of Johannesburg

Key/Legend:

Road based Network
Rail Network

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 2.2**
TITLE:	**Proposed Strategic Public Transport Network**	**Date:**	**October 2012**

2.3 Diepsloot Economic Activity Analysis

An Economic Area Analysis has been undertaken by Demacon Market Studies in 2012 for the Diepsloot Township. This included an analysis of the existing economic conditions and trends and it also modelled the potential economic impact of the priority interventions which are proposed in the UDF.

2.3.1 Diepsloot Demographics

Data from the Economic Activity Analysis report pertaining to the existing demographics of Diepsloot are the following:

- 55.9% of the population is made up by 26-64 year olds;
- Housing in Diepsloot consists predominantly of Reconstruction and Development Programme (RDP) type housing, informal dwellings/shacks, high numbers of backyard accommodation and a small proportion of bonded units;
- High population density with an average of 3.1 households per stands and an average of 3.7 members per household;
- An average of 1.6 income earners per household;
- Average annual population growth of 13.2% between 1995 to 2010; and
- Weighted average household income of R6 562.80/month

2.3.1 Nodal Hierarchy

Demacon Market Studies developed a Nodal Hierachy Model to reflect the 'ripeness' for economic development/intervention for the development nodes proposed in the UDF.

The Nodal Hierachy Model was based on the following:

- Exposure to major arterials;
- Land Availability;
- Nature of the area;
- Levels of private sector investment;
- Levels of public sector investment; and
- Current economic function of the node.

Of the 11 proposed development nodes, the three nodes of relevance to this study were rated as follows:

- Shopping Centre Node rated number 1 with a rating of 77.5%;
- Quarry Node rated number 8 with a rating of 45.0%; and
- Link Node rated number 11 with a rating of 32.5%.

The economic analysis proposes that economic development should focus towards nodes 1 to 4, before focusing on the smaller more community focused nodes. Node1 is therefore a top priority. The implementation of Ngonyama Road will in all likelihood include the priority of the Quarry and Link Nodes as well, due to improved access of connectivity.

3. Existing Roadway Elements

3.1 Existing Road Network

3.1.1 Regional Road Network

Diepsloot is bordered by the N14 to the west and William Nicol Drive (R511/K46) to the east. The N14 is a national highway which connects Pretoria to Krugersdorp whilst William Nicol Drive is a major provincial arterial that connects Hartebeestpoort in the North West Province with Sandton.

Summit Road is an east-west arterial which connects with William Nicol Drive to the north of Diepsloot. It connects Midrand in the east to William Nicol and the N14. Therefore Diepsloot is positioned in proximity of main roads that link to major town centres in the northern parts of Johannesburg.

The regional road network is indicated in **Figure 3.1**.

3.1.2 Local Road Network

Diepsloot has a radial main road network comprising of two semi-circular roads, Ngonyama Road and Ubuntu Road, which run in a north-to-south direction. It also consists of radial roads JB Marks and Ndimatsheloni Roads which run in an east-to-west direction.

Ngonyama and Ubuntu Roads are local urban collectors which provide access to Diepsloot at their intersections with William Nicol Drive to the east. A number of local streets, which provide access to properties, are located along the length of Ngonyama and Ubuntu Roads

The disconnection of Ngonyama Road at the river and in Diepsloot Ext. 1 prevents the full benefits of the local road network from being realised.

The local road network is indicated in **Figure 3.2**.

3.2 Roadway Conditions

The southern section of Ngonyama Road is made up of an approximately 180m section of surfaced road from the William Nicol Drive/Ngonyama Road intersection to Achilles Road which provides access to the Diepsloot Mall. The surfaced section of Ngonyama Road is shown in **Figure 3.3**. The road markings are faint with signage limited to street name signs only.

The remainder of the study area is characterised by gravel road sections which have been severely eroded. Stormwater drainage has not been provided and in most sections the road is reduced to one lane due to illegal dumping and overgrown vegetation which block the road. Ngonyama Road's width further reduces at the approach to the river crossing. The river crossing is shown in **Figure 3.4**.

Vehicle operations along this section are severely impeded by erosion furrows. The gradient of the road becomes steeper along the decline until the road is intercepted by the river. Photos of this section of Ngonyama Road are shown in **Figure 3.5**.

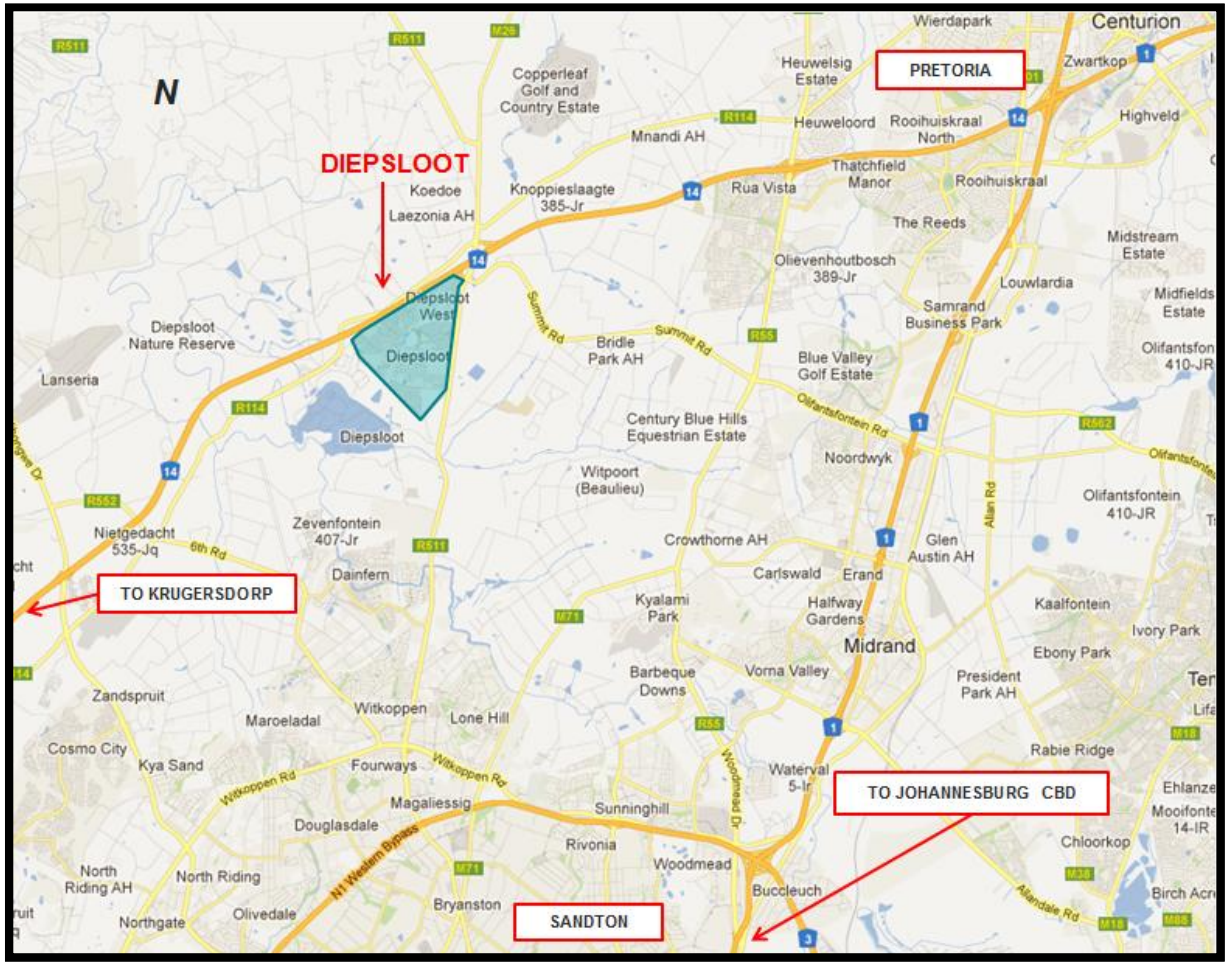


Image: Google

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 3.1**
TITLE:	**Regional Road Network**	**Date:**	**October 2012**

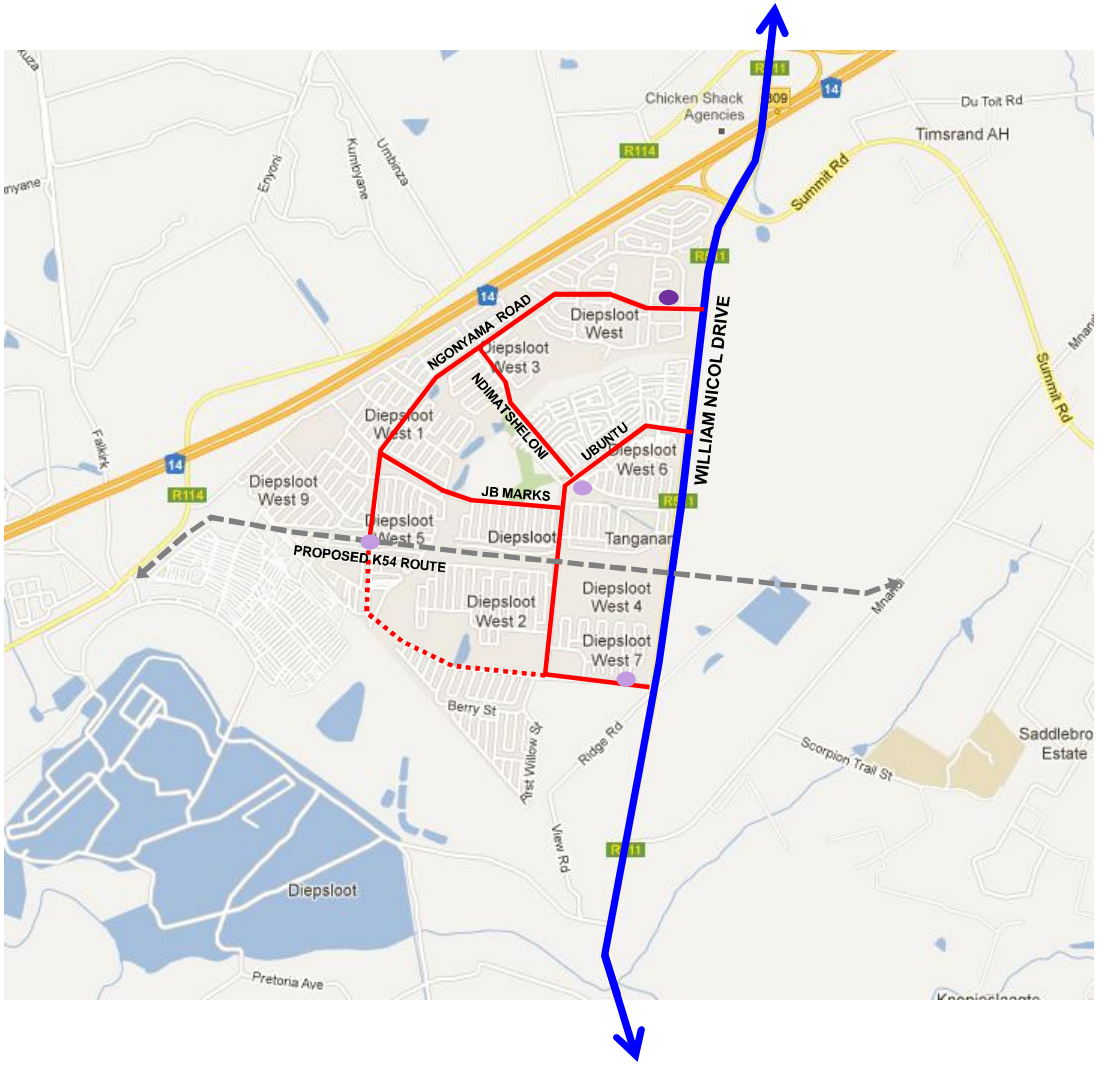


Image: Google

Key/Legend:

- VEHICULAR MOVEMENT
- PROPOSED ROUTES
- PROPOSED K-ROUTES
- PROPOSED BRT-ROUTES
- EXISTING FORMAL RANK
- EXISTING INFORMAL RANK

WSP

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment
Ref:	Figure 3.2
TITLE:	Local Road Network
Date:	October 2012

Surfaced Section of Ingonyama Road near William Nicol Drive. The surfaced section terminates 190m west of the Ingonyama Road / William Nicol Drive intersection

Key/Legend:

WSP

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 3.3**
TITLE:	**Surfaced Section of Ingonyama Road**	**Date:**	**October 2012**

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 3.4**
TITLE:	**Existing River Crossing Along Ingonyama Road**	**Date:**	**October 2012**

The road width of the gravel section that follows the paved road at William Nicol Drive is limited by farrows that have resulted from erosion and a series of rubbish dumps.

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 3.5**
TITLE:	**Gravel Section of Ingonyama Road**	**Date:**	**October 2012**

3.3 Non-Motorised Transport

3.3.1 Pedestrians

The surrounding land uses which include schools, small business, hawkers, the shopping centre etc. and the taxi route which is accommodated on Ngonyama and Ubuntu Roads generate large volumes of pedestrian movement.

Pedestrians choose to use the informal river crossing as the nearest pedestrian bridge is located 480m north of the crossing and the river width is at its narrowest at the proposed Ngonyama Road crossing.

Non-motorised transport infrastructure has not been provided on Ngonyama Road. On sections where vehicle occurrences are higher along Ngonyama Road, i.e. from William Nicol Drive to Ubuntu Road, pedestrians walk on the sides of the road. However pedestrians use the entire width of the road from the section of Ngonyama Road which lies netween Ubuntu Road and the river crossing.

Pedestrian movement along Ngonyama Road is shown on **Figure 3.6**.

3.3.2 Special Needs Passengers

A large number of children make use of Ngonyama Road more especially because schools and parks are located within proximity of the road. The state of the road and its steep gradient makes movements particularly difficult for the elderly, those on wheelchairs and prams and people with conditions and disabilities.

The poor road conditions result in few motorists using the gravel section of the road.

The road width of the gravel section that follows the paved road at William Nicol Drive is limited by farrows that have resulted from erosion and a series of rubbish dumps.

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 3.6**
TITLE:	**Gravel Section of Ingonyama Road**	**Date:**	**October 2012**

4. Existing Public Transport

4.1 Commuter Buses

There are currently no Metrobus routes within Diepsloot. Putco Soweto Bus Routes only penetrate up to the southern boundary of the Diepsloot area.

4.2 Commuter Rail

Gauteng's commuter railway network does not extend to Diepsloot.

4.3 Metered Taxis

Diepsloot is one of the regions within the City of Johannesburg where metered taxi operations are non-existent.

4.4 Minibus Taxis

Diepsloot is one of the major origins of minibus taxi passengers within the City of Johannesburg. There are high levels of informal minibus taxi ranks with more than 90% of minibus taxi bays being located informally. Minibus Taxi departures during the morning peak are proportionately higher (per 1000 population) than in any other region, with minibus taxi utilisation rates being greater than 100% during the morning peak.

4.4.1 Minibus Taxi Ranks

Diepsloot currently has one formal minibus taxi facility located in the north of Diepsloot supported by a number of informal minibus taxi facilities. The existing informal minibus taxi facilities are located in Diepsloot's Extensions 5,6 and 7 as shown in **Figure 4.1.**

The City of Johannesburg's Transportation Department is currently in the process of updating the previous Current Public Transport Record (CPTR). This data was not available at the time of preparing this report. However, the surveyed routes as per the 2001-2002 CPTR are as shown in **Table 4.4.1**.

Table 4.4.1: Diepsloot Minibus Taxi Facilities (CPTR 2001-2002)

Rank Code	Facility Name	Physical Location	Type of Service	Status	Minibus Taxi Association (TA)
JR012	Diepsloot (5)	Diepsloot Ext. 5	Commuter	Informal	Bryanston TA
JR013	Diepsloot (1)	Diepsloot Ext.1	Commuter	Informal	ATA
JR014	Diepsloot (2)	Diepsloot Ext.2	Commuter	Informal	Bryanston TA, Faraday TA
JR015	Diepsloot (4)	Diepsloot Ext.4	Commuter	Informal	Faraday TA

Source: Current Public Transport Record (CPTR) Johannesburg Metropolitan Municipality (2001-2002).

Source: Diepsloot Urban Development Framework & Business Plan, May 2010

Key/Legend:

WSP

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 4.1**
TITLE:	**Diepsloot Extensions**	**Date:**	**November 2012**

4.4.2 Minibus Taxi Routes

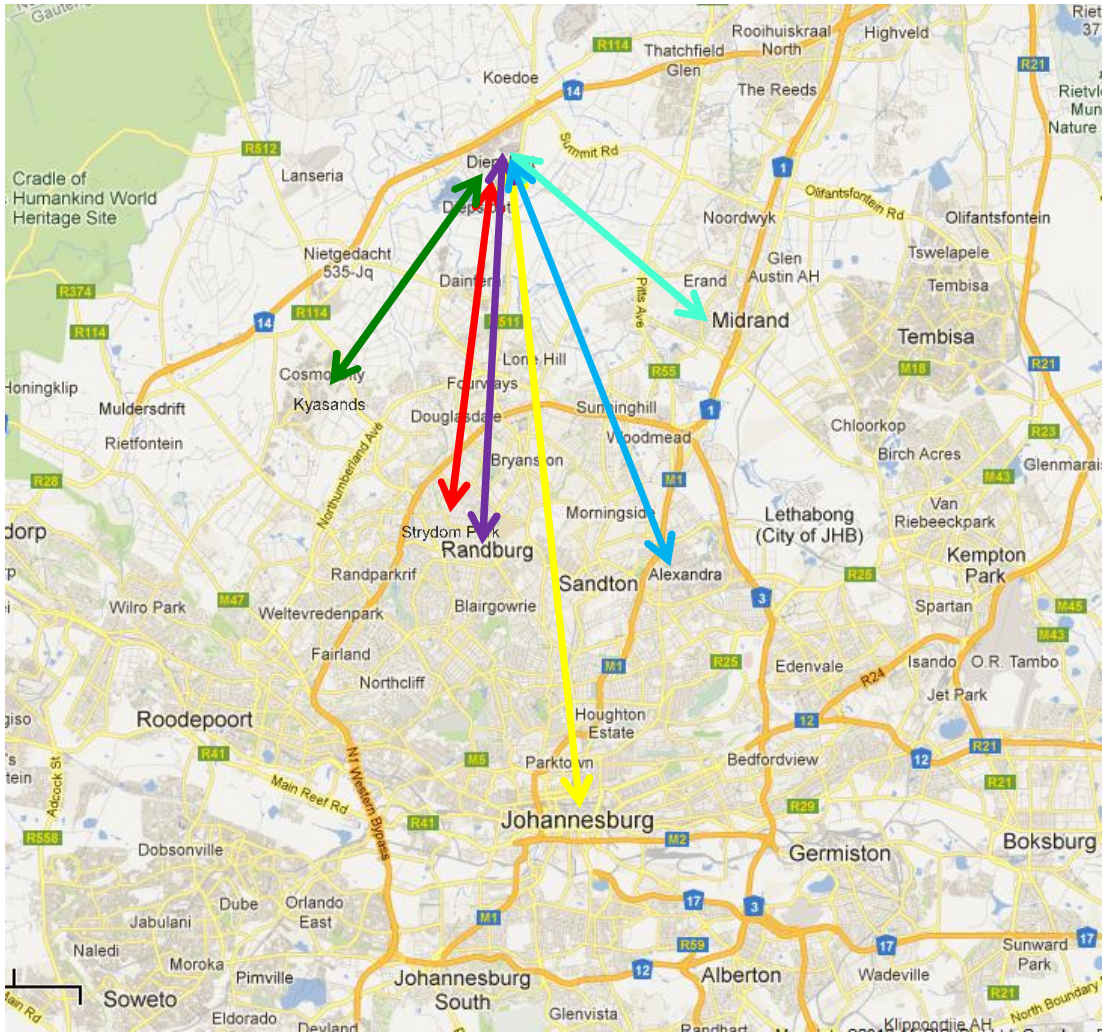
The surveyed routes, as per the CPTR are as shown in **Table 4.2.2**. The key areas which are serviced by minibus taxis are shown graphically in **Figure 4.5.** Detailed descriptions of the routes/network on which minibus taxi routes are operated were not provided in the CPTR.

Table 4.2.2: Diepsloot Minibus Taxi Routes

Origin	Destination	Route Code	No of Vehicle Trips	Average Vehicle Capacity	Service Capacity	No.of Passengers	% Utilisation
Diepsloot (1)	Randburg(P692)	J0107	n/a	n/a	n/a	n/a	
	Johannesburg (P26)	J0108	12	8	100	118	118%
	Strijdompark(P510)	J0109	n/a	n/a	n/a	n/a	
	Kyasand(P495)	J0110	13	13	173	173	100%
	Midrand (P491)	J0111	3	10	30	28	93%
	Alexandra (P480)	J0115	28	11	330	391	118%
Diepsloot (2)	Alexandra (P480)	J0116	13	10	133	142	107%
	Johannesburg (P26)	J0117	9	11	105	126	120%
	Strijdompark (P510)	J0118	n/a	n/a	n/a	n/a	
	Kyasand(P495)	J0119	15	13	202	225	111%
	Midrand (P491)	J0120	11	13	146	162	111%
	Honeydew (P511)	J0121	n/a	n/a	n/a	n/a	
	Randburg (P692)	J0124	n/a	n/a	n/a	n/a	
Diepsloot (5)	Alexandra (P480)	J0130	4	12	50	45	90%
	Johannesburg (P26)	J0131	n/a	n/a	n/a	n/a	
	Strijdompark (P510)	J0132	n/a	n/a	n/a	n/a	
	Kyasand(P495)	J0133	n/a	n/a	n/a	n/a	
	Midrand (P491)	J0134	n/a	n/a	n/a	n/a	
	Honeydew (P511)	J0135	n/a	n/a	n/a	n/a	
Diepsloot (4)	Alexandra (P480)	J0138	1	15	15	10	67%
	Johannesburg (P26)	J0139	n/a	n/a	n/a	n/a	
	Strijdompark (P510)	J0140	n/a	n/a	n/a	n/a	
	Kyasand(P495)	J0141	12	14	172	179	104%
	Midrand (P491)	J0142	n/a	n/a	n/a	n/a	
	Honeydew (P511)	J0143	n/a	n/a	n/a	n/a	

Source: Current Public Transport Record (CPTR) Johannesburg Metropolitan Municipality (2001-2002).

According to **Table 4.2.2** the average vehicle utilisation was 103%, which means that on average the minibus taxis wait till full to leave the informal taxi facility. Therefore the minibus taxi capacity meets the demand.



Source: Current Public Transport Record (CPTR) 2001-2002, City of Johannesburg .
Image: Google

Key/Legend:

- Kyasands
- Strydom Park
- Randburg
- Johannesburg
- Alexandra
- Midrand

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 4.2**
TITLE:	**Minibus Taxi Routes**	**Date:**	**November 2012**

5. Planned or Proposed Major Developments

The following mixed-use developments are planned /proposed in the area:

- Northern Farms (Diepsloot Extension 8) to the south of Diepsloot;
- Tanganani Extensions to the east of Diepsloot
- Steyn City

The proposed development's traffic impact has not been considered for incorporation in this traffic study, as we could not obtain the Traffic Study prepared for the above developments at the time of completion of this report. However, the developments' traffic impact may be considered in a separate report pending approval of the projects by the relevant authorities.

6. Planned Future Roads

6.1 Introduction

A number of future provincial routes are planned in the vicinity of Diepsloot. These include K54 (K52) and K46 (R511/William Nicol Drive) which are discussed in the following section.

A diagram illustrating the provincial roads planning is shown in **Figure 6.1.**

6.2 K54 (K52)

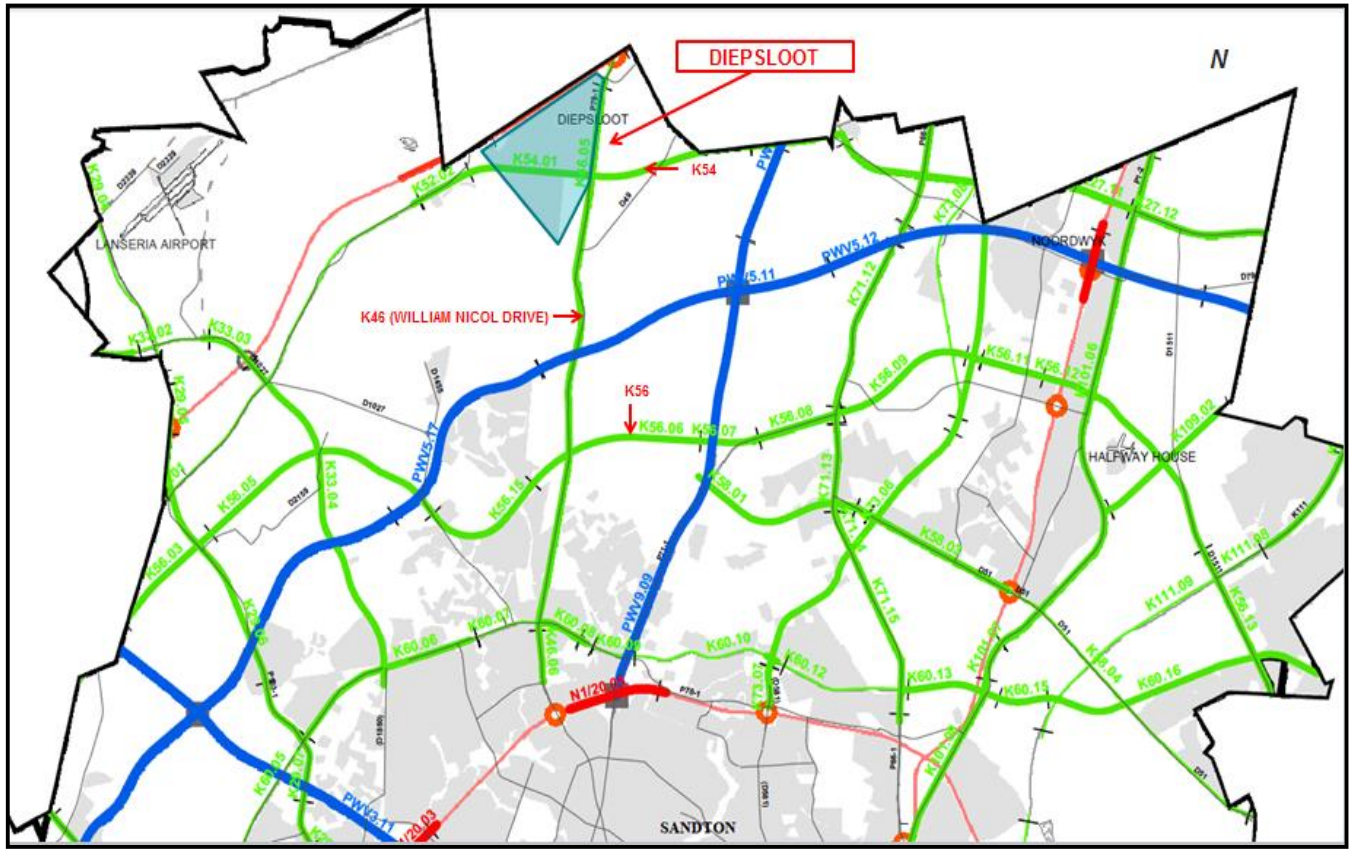
The route is planned as a conventional dual carriageway, which follows an east-west alignment through the Diepsloot Township. The K54 will provide a connection between Midrand (in the east) and Krugersdorp (in the south-west). It will also provide an access to an interchange on the planned PWV9 highway in Midrand. The PWV9 will link the western suburbs of Tshwane with the northern suburbs of Johannesburg. The implementation of the K54 will alleviate the congestion on William Nicol Drive (R511) and reduce travel times for vehicles travelling from Diepsloot to the south of Johannesburg.

It has been designed as a rural dual carriageway with a design speed of 100km/hr and a road reserve width of 62 m. The 62 m road reserve will enable the accommodation of up to four lanes through lanes (two lanes per direction) in the ultimate stage.

Access intersections have been planned along the K54 (between William Nicol Drive and N14) with Ubuntu and Ngonyama Roads.

The road and intersection reserves for the K54, within the Diepsloot Township, are occupied by squatters at present.

Selected relevant drawings from the basic planning of K54 are included in **Appendix A.**



Source: Gautrans

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 6.1**
TITLE:	**Gauteng Strategic Road Network**	**Date:**	**October 2012**

6.3 K46 (William Nicol Drive/R511)

The route is planned as a conventional dual carriageway, which follows a north-south alignment east of the Diepsloot Township. The K46 will provide a connection between Sandton (to the south) and Diepsloot (to the north). The upgrading of the K46 will result in increased capacities along the route and improve the current vehicular traffic delays.

It has been designed as a rural dual carriageway with a design speed of 100km/hr and a road reserve width of 62 m. The 62 m road reserve will enable the accommodation of up to 6 through lanes (3 through lanes per direction in the ultimate stage) as well as bus lanes in the median.

Construction of the K46 to the south of Diepsloot, in the Steyn City area is currently underway whilst construction in the north adjacent to Diepsloot will take place in the future. The upgrade of William Nicol (R511) to K-route standards will also include a reconfiguration of the three Diepsloot accesses off William Nicol.

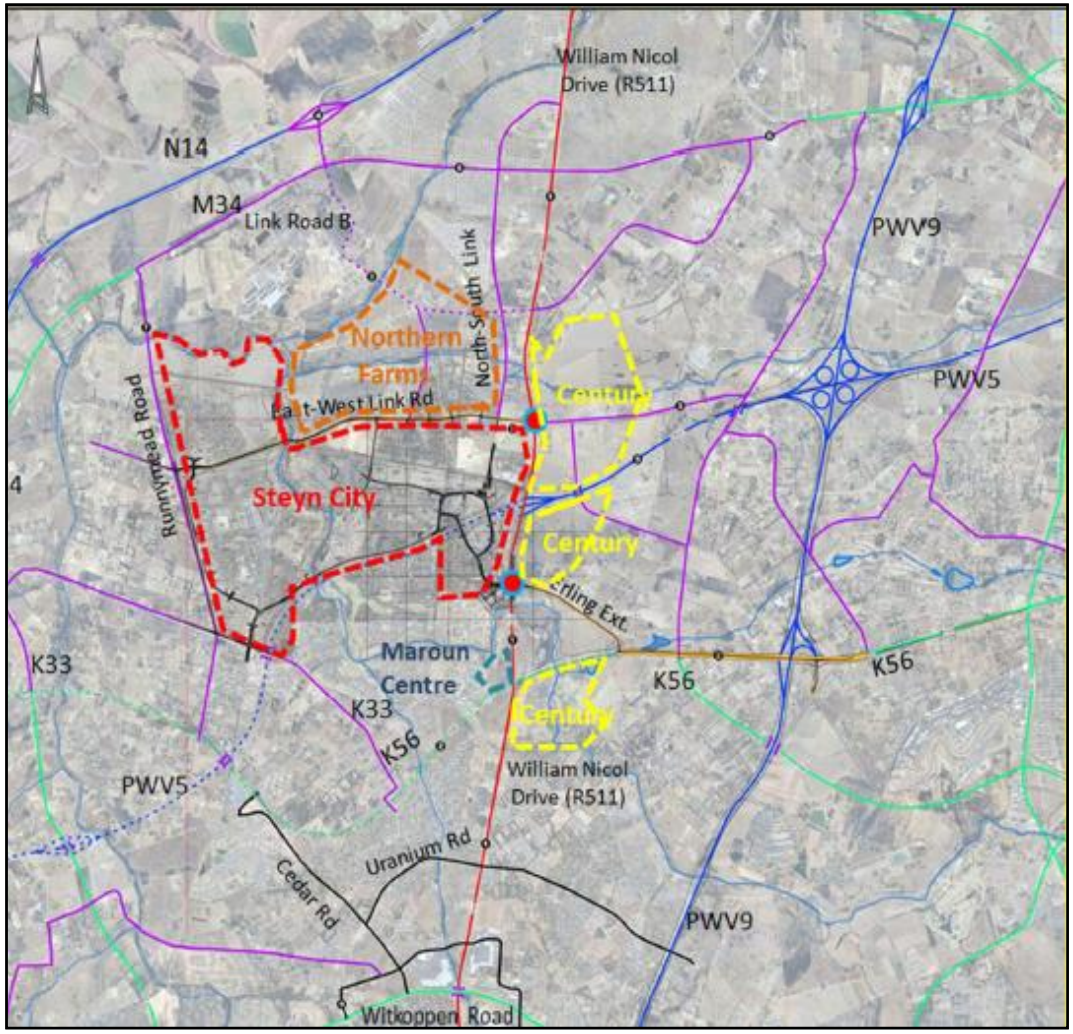
6.4 Steyn City Road Masterplan

WSP prepared the 'Steyn City Road Masterplan' in August 2011. The masterplan presented a road network plan for the Northern Fourways area. The Steyn City Road Masterplan supports the access needs of the planned mixed-use and residential developments to the south and east of Diepsloot.

The Roads Masterplan considered the following developments:

- Northern Farm (Diepsloot Ext 8);
- Steyn City; and
- Century Developments (various east of William Nicol Road)

The proposed roads masterplan also considered the Gauteng Strategic Network to illustrate the connectivity of the area as a whole. The proposed roads masterplan is shown in **Figure 6.2**. The report proposes that Ubuntu Road be extended to form a north-south link providing connectivity between Diepsloot and the planned developments in the south. Link Road B is proposed to connect with the N14 at a proposed interchange in the west.



Source: Steyn City Roads Masterplan Report, August 2010

Key/Legend:

- PWV ROUTES / FREEWAYS
- K-ROUTES
- LINK ROADS BY STEYN CITY
- WILLIAM NICOL UPGRADES
- PLANNED DEVELOPMENT LINKS
- COMMITED DEVELOPMENT LINKS
- FUTURE PLANNING

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 6.2
TITLE:	Steyn City Road Masterplan	Date:	October 2012

7. Existing Traffic

7.1 Traffic Surveys

New intersection traffic count surveys were undertaken on 18 October 2012, Thursday, during the AM (06:00 – 10:00) and PM (15:00 – 18:00) peak periods by Messrs Traffic Counting Solutions (TCS') at the following intersections:

- Station 1 - William Nicol Drive (R511) & Ngonyama Road (1st Avenue);
- Station 2 - Ngonyama Road (1st Avenue) & Achilles Street;
- Station 3 - Ngonyama Road & Ubuntu Road (Peach);
- Station 4 - Ngonyama Road & JB Marks Road;
- Station 5 - Ubuntu Road & JB Marks Road;
- Station 6 – Ngonyama Road and Ndimatsheloni Street;
- Station 7 – Ubuntu Road and Ndimatsheloni Street;
- Station 8 - Ngonyama Road & South Avenue; and
- Station 9 - Ngonyama Road & North Avenue

The traffic count station locations are illustrated in **Figure 7.1**

An additional intersection count was undertaken at the Ngonyama Road (1st Avenue) & Abel Street intersection on 27 November 2012 during the AM (06-09:00) and PM (15:00-18:00) peak periods. The intersection location is shown in **Figure 7.1.**

The Ngonyama Road (1st Avenue) & Abel Street intersection was undertaken to supplement the existing traffic data and to determine the effect of minibus taxi movements at the Ngonyama Road (1st Avenue) & Ubuntu Road intersection, where an informal taxi rank is located.

The traffic data for the above intersections has been utilised in the intersection capacity assessments and a copy of the traffic survey data is included in **Appendix B.**

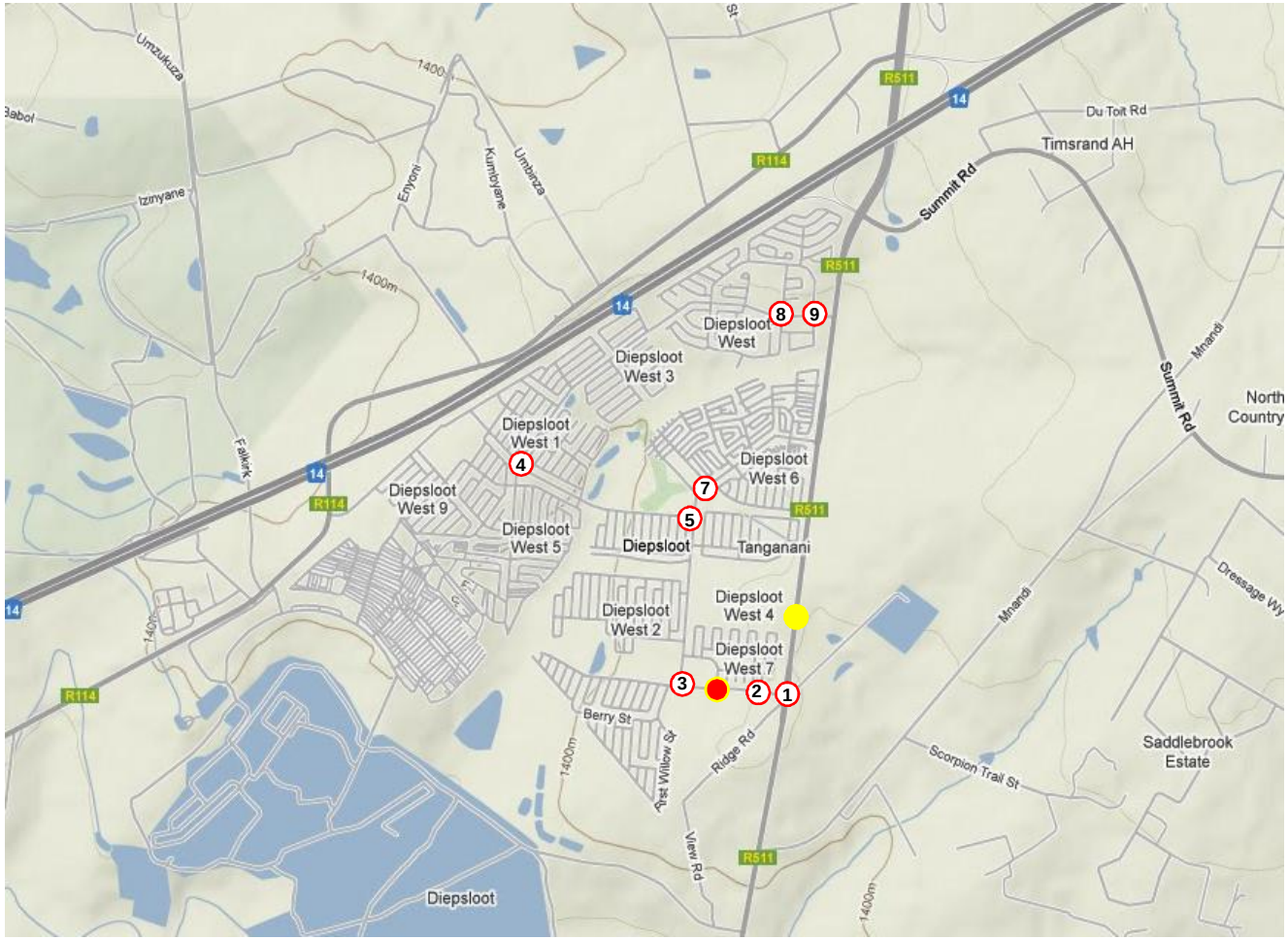


Image: Google

Key/Legend:

1. William Nicol Drive (R511) / Ingonyama Rd
2. Ingonyama Rd / Achilles Str
3. Ingonyama Rd / Ubuntu Road
4. Ingonyama Rd / JB Marks Road
5. Ubuntu Rd / JB Marks Road
7. Ubuntu Rd / Ndimatsheloni
8. Ingonyama Rd / South Ave
9. Ingonyama Rd / North Ave

Illegal Access off William Nicol Drive (R511)

Additional Count Location

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 7.1
TITLE:	New intersection traffic count locations	Date:	October 2012

7.2 Traffic Volumes from Surveyed Data

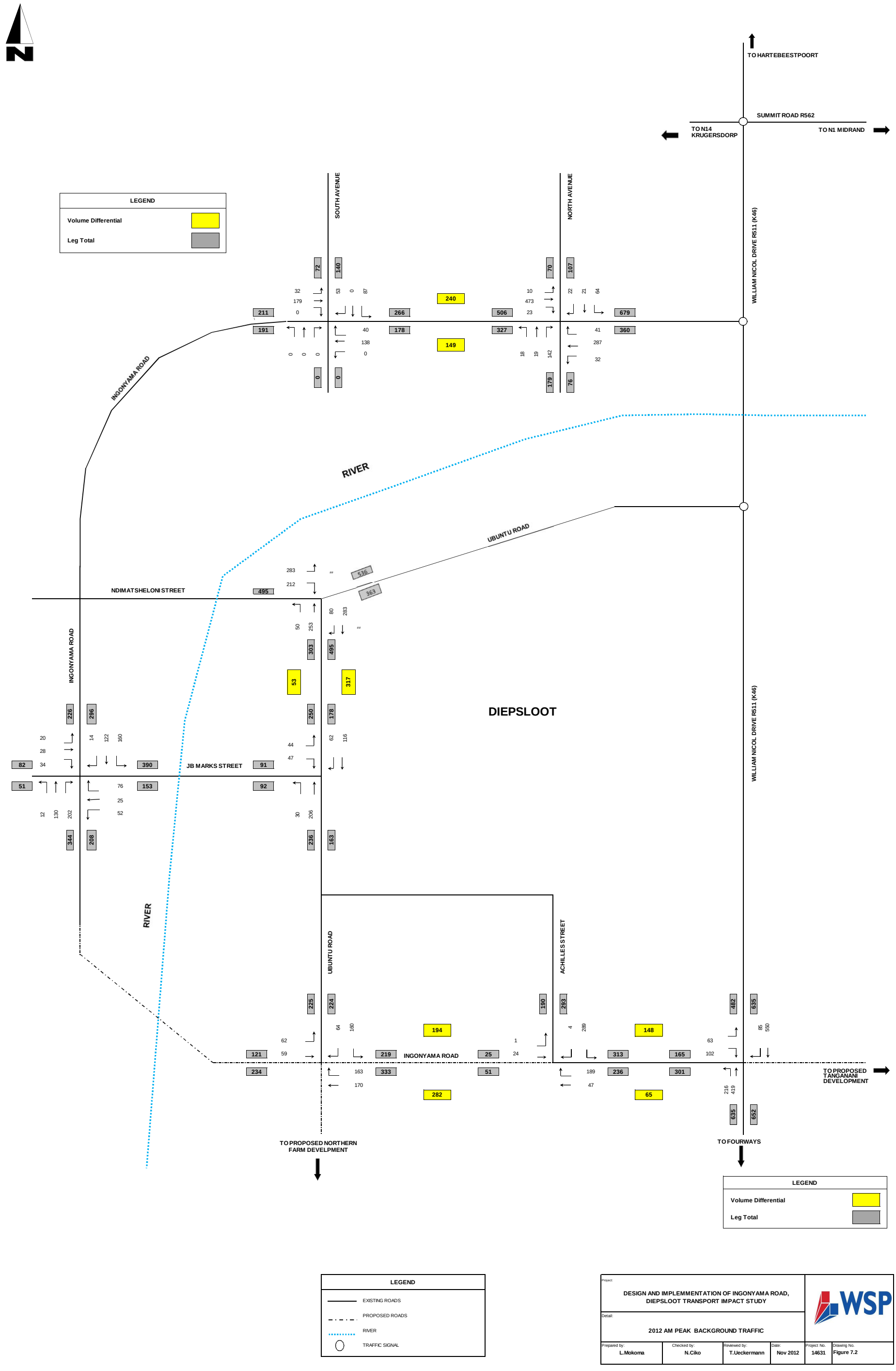
The assessment of the traffic survey data during the peak hour analysis revealed discrepancies in the link volumes between intersections. The large discrepancies were not expected as most of the links have few accesses between the intersections. It should be noted that these affected links are in close proximity to informal taxi ranks and holding areas within Diepsloot. The affected links are located between the following count stations:

- Stations 1 and 2;
- Stations 2 and 3
- Stations 5 and 7; and
- Stations 8 and 9.

The differences in the link volume ranged between 53 veh/hr. and 317 veh/hr. The volume differences are shown in **Figure 7.2.** The differences were due to mid-block U-turn movements, taxi operations as well as poor roadway conditions, amongst other factors.

The traffic count surveys have noted that the Diepsloot internal road network was heavily congested and this resulted in excessive delays throughout Diepsloot. The majority of the delays were attributed to illegal traffic operations on the road network.

The traffic count surveyors further noted that minibus taxi marshals periodically stopped the flow of traffic on the main roads to allow access to minibus taxis at adjacent informal taxi ranks. Illegal minibus taxis stop on prohibited sections of the road, further increasing the vehicle delays experienced.


TO HARTEBEESTPOORT
SUMMIT ROAD R562
TO N14
KRUGERSDORP
TO N1 MIDRAND
WILLIAM NICOL DRIVE R511 (K46)
LEGEND
Volume Differential
Leg Total
SOUTH AVENUE
NORTH AVENUE
INGONYAMA ROAD
RIVER
UBUNTU ROAD
NDIMATSHELONI STREET
JB MARKS STREET
DIEPSLOOT
ACHILLES STREET
INGONYAMA ROAD
TO PROPOSED TANGANANI DEVELOPMENT
TO PROPOSED NORTHERN FARM DEVELPMENT
TO FOURWAYS
LEGEND
Volume Differential
Leg Total
LEGEND
EXISTING ROADS
PROPOSED ROADS
RIVER
TRAFFIC SIGNAL
Project:
DESIGN AND IMPLEMMENTATION OF INGONYAMA ROAD, DIEPSLOOT TRANSPORT IMPACT STUDY
Detail:
2012 AM PEAK BACKGROUND TRAFFIC
Prepared by: L.Mokoma
Checked by: N.Ciko
Reviewed by: T.Ueckermann
Date: Nov 2012
Project No. 14631
Drawing No. Figure 7.2

7.3 Traffic Conditions based on Site Observations

Site observations were carried out during the AM and PM peak periods by the WSP traffic team to investigate the variance in traffic volumes between the intersections and to also validate the observations of the traffic count vendors. The result of the site observations are discussed in the sections which follow.

7.3.1 Informal Minibus Taxi Ranks

There are a total of 7 minibus taxi ranks along Ngonyama and Ubuntu Roads. One of these is a formal rank which was constructed in 2011 and is located in the north of Ngonyama Road. The remainder of the minibus taxi ranks are informal.

The informal taxi ranks which are located near or adjacent to the section of Ngonyama Road which will be upgraded (study area) include the following:

- Diepsloot Mall;
- Ngonyama Road and Ubuntu Road intersection; and
- To the north of the Diepsloot watercourse, where Ngonyama Road is disconnected.

The locations of the informal taxi ranks are shown in **Figure 7.3 to 7.5.**

The minibus taxi ranks are located on vacant land, with some minibus taxi ranks holding over 100 vehicles during the AM peak and attracting a large number of commuters. Adjacent roads and intersections become holding areas for minibus taxis during the peak periods when these informal ranks are at capacity during the peak periods. This results in congestion and obstructions in sight distances as cars and minibus taxis make their way through the narrow streets as a result of minibus taxis holding in the road way.

7.3.2 Illegal Minibus Taxi Operations

The most common illegal behaviour observed were the U-turns. This occurs as minibus taxis avoid the use of the gravel roads, particularly between Station 2 and Station 3 on the southern side of Ngonyama Road. In the peak hour, a large number of pedestrians and vehicular traffic (mostly minibus taxis use the roads); minibus taxis were counted twice by traffic counters which resulted in large link volume differentials between adjacent intersections.

The observations by the traffic counters that minibus taxi marshals disrupt the general traffic flow on the main roads to allow access for minibus taxis was witnessed on Ubuntu Road between Station 5 and 7. Traffic was stopped to allow access for a number of minibus taxis. The right turns, by minibus taxis, into and out of the informal taxi rank together with random stops by minibus a taxis further increased the congestion on Ubuntu Road.

The illegal minibus taxi operations are shown in **Figures 7.3 to 7.5**.

Image: Google

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 7.3
TITLE:	Informal Taxi Locations in Diepsloot	Date:	November 2012

Image: Google

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 7.4
TITLE:	Informal Taxi Locations in Diepsloot	Date:	November 2012

Source: Google

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 7.5
TITLE:	Informal Taxi Locations in Diepsloot	Date:	November 2012

8. Trip Generation

8.1 Introduction

The following 3 nodes are planned within the study area as discussed in **Chapter 2** of this report:

- The proposed Shopping Centre Node located adjacent to the Diepsloot Mall;
- Quarry Node at the intersection of Ngonyama and Ubuntu Road; and
- Link Node at the river crossing on Ngonyama Road.

The land use proposals for the development of the three nodes are discussed in the following sections.

8.2 The Shopping Centre Node

Land use proposals for the node include a transport interchange, medium density housing and existing residential properties with additional business rights. **Figure 8.1** shows the location of the Shopping Centre Node.

8.2.1 Transportation Interchange

As per the Diepsloot UDF, should the node be developed, the transport interchange will accommodate the informal taxi rank that is located adjacent to the Diepsloot Mall (Diepsloot UDF, 2010). The interchange will need to be linked to the proposed BRT station on William Nicol Drive which will result in an improvement in mode integration in the area. The implementation of a transport interchange will require a separate traffic study which is not part of the scope of this project.

8.2.2 Residential Units

A de-densification and migration plan is the foundation of the housing strategy in Diepsloot. The housing beneficiaries in the area will be moved to new allocated housing. Other beneficiaries may be relocated to Orange Farm and the Tanganani residential development.

The proposed medium-density housing will accommodate some of the existing informal dwellers within Diepsloot. It is thus not expected to generate additional trips along Ngonyama Road, also considering that there will be a reduction in housing density from the informal to the formal structures (with the premise that the informal structures are removed).

Source: Diepsloot Urban Development Framework and Business Plan, 2010

Key/Legend:

EXISTING LAND USES

- INDUSTRIAL
- BUSINESS
- COMMUNITY FACILITY
- PLACE OF WORSHIP
- EDUCATION
- TRANSPORT
- PUBLIC OPEN SPACE
- PARKS
- SPORTS AND RECREATION

PROPOSED LAND USES

- EXISTING RES 1 WITH ADDITIONAL BUSINESS RIGHTS
- HIGH DENSITY HOUSING
- MEDIUM DENSITY HOUSING
- INDUSTRIAL
- BUSINESS
- PLACE OF WORSHIP
- EDUCATION
- CONSOLIDATION OF EXISTING EDUCATION FACILITY
- TRANSPORT

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 8.1**
TITLE:	**Proposed Land Uses – Shopping Centre Node**	**Date:**	**October 2012**

8.2.3 Business Rights

Trip generation will depend on the business uses that can operate in the area. The *Consolidated Johannesburg Town Planning Scheme* for 2011 lists the allowable business establishments for home enterprises. Businesses such as restaurants, taverns, spaza shops etc. that generally generate significant trips are prohibited from operating in residential units. A modest impact on the road system is expected.

8.3 Quarry Node

The node is envisioned to have high density mixed use housing, community facilities, open spaces industrial areas and a buy-back centre. A land use plan of the node is shown in **Figure 8.2**.

The existing land uses will be reshuffled and formalised to create the desired node. Housing beneficiaries in Diepsloot will be relocated to formal housing within the node. No significant additional trips on Ngonyama Road are expected from these developments.

8.4 Link Node

The link node will be a reconfiguration and formalisation of existing land uses. A land use plan of the node is shown in **Figure 8.3**.The taxi rank at the edge of Ngonyama Road will be relocated to the edge of the watercourse and the informal settlement will be replaced by high-density housing, parks and open public spaces.

8.5 Summary

The trip generation potential of the proposed developments along Ngonyama Road has not been estimated as the proposed land uses will be a reconfiguration and formalisation of existing land uses.

The formalisation of informal taxi ranks to formal facilities requires a separate traffic study and is not part of the scope of this traffic study.

Source: Diepsloot Urban Development Framework and Business Plan, 2010

Key/Legend:

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 8.2**
TITLE:	**Proposed Land Uses – Quarry Node**	**Date:**	**October 2012**

Source: Diepsloot Urban Development Framework and Business Plan, 2010

Key/Legend:

EXISTING LAND USES

- EDUCATION
- PUBLIC OPEN SPACE

PROPOSED LAND USES

- EXISTING RES 1 WITH ADDITIONAL BUSINESS RIGHTS
- HIGH DENSITY HOUSING
- BUSINESS
- COMMUNITY FACILITY
- PARKS
- HARD PUBLIC SPACE
- EXISTING HIGH DENSITY HOUSING WITH ADDITIONAL BUSINESS RIGHTS

LEGEND

- FLOOD LINES / WATERCOURSE
- WATERWAYS
- 30m ENVIRONMENTAL BUFFER
- STUDY AREA
- PEDESTRIAN BRIDGES
- PUBLIC REALM AND ROAD UPGRADES

WSP

PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 8.3**
TITLE:	**Proposed Land Uses – Link Node**	**Date:**	**October 2012**

9. Capacity & Improvement Analysis

9.1 Definitions

The following definitions from the 2010 Highway Capacity Manual (TRB, 2010) are used in this chapter.

Capacity	The maximum sustainable hourly flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic and control conditions
Volume	The total number of vehicles or other roadway users that pass over a given point or section of a lane or roadway during a given time interval, often 1h
Volume to Capacity (v/c) Ratio	The ratio of flow rate to capacity for a system element
Level of Service (LOS score)	A numerical output from a traveller perception model that typically indicates the average rating that travellers would give a transportation facility or service under a given set of conditions. The levels of service for signalised and non-signalised intersections as defined in the Highway Capacity Manual (HCM) are tabulated in **Table 9.2.2.**

9.2 Modelling Software

The software SIDRA Intersection v.5 was used in analysing the operation and capacity of the intersections under investigation. SIDRA is an advanced micro-analytical traffic evaluation tool that employs lane-by-lane and vehicle drive-cycle models coupled with an iterative approximation method to provide estimates of capacity and performance statistics i.e. delay, queue length, stop rate, etc. (Akcelik & Associates, 2006)

The SIDRA intersection software is for use as an aid for the design and evaluation of the following intersection types:

- Signalised intersections (fixed-time, pre-timed and actuated),
- Signalised pedestrian crossings,
- Single point interchanges (signalised)
- Roundabouts
- Two-way stop control,
- All-way stop control, and

- Give-way (yield) sign control

Although SIDRA is a single intersection analysis package, it can perform traffic signal analysis as an isolated intersection (default) or as a co-ordinated intersection by specifying platooned arrival data. The flexibility of SIDRA allows its application to many other situations, including uninterrupted traffic flow conditions.

9.2.1 Revised level of service method for vehicles in HCM 2010

In SIDRA Intersection v5.1, Level of Service (LOS) results are given for all major road lanes and movements except any continuous lanes. Usually LOS A or B will result due to zero delay (or geometric delay only for turning vehicles). However, LOS results are not given for major road approaches in line with the Highway Capacity Manual (HCM) 2010, unlike in earlier versions of SIDRA Intersection.

The method used for vehicle level of service at Approach and Intersection level is summarised in **Table 9.2.1.**

Table 9.2.1: Method used for level of service at Approach and Intersection level

LOS Method	Site Type	Approach LOS	Intersection LOS
Delay (HCM 2000) Delay & v/c (HCM 2010) Delay (RTA NSW)	Two-Way Sign Control (Stop or Give-Way / Yield)	Average approach delay for Minor Road approaches N/A for Major Road approaches	N/A
	Others	Average approach delay	Average intersection delay
Degree of Saturation (SIDRA Method) ICU Method	All Site Types	Highest (worst movement / lane) degree of saturation for the approach	Highest (worst movement / lane) degree of saturation for the intersection

A revised LOS method for vehicles was introduced in HCM 2010 (TRB, 2010). It offers an important variation on the Delay (HCM 2000) method in using both the average control delay and the v/c (demand volume / capacity) ratio, or degree of saturation for LOS determination.

It uses delay thresholds which are the same as in the Delay (HCM 2000) method, but assigns LOS F when v/c > 1.0 (oversaturated conditions) irrespective of delay, as seen in **Table 9.2.2**.

Table 9.2.2: Delay & v/c (HCM 2010) definitions for LOS based on delay and v/c ratio

Level of Service for **v/c ≤ 1.0**	Average delay per vehicle in seconds (d)			Level of Service for **v/c > 1.0**
	Signals	"SIDRA Roundabout LOS" option	Sign Control (*HCM 2010 default for roundabouts*)	All Intersection Types
A	d ≤ 10	d ≤ 10	d ≤ 10	**F**
B	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15	**F**
C	20 < d ≤ 35	20 < d ≤ 35	15 < d ≤ 25	**F**
D	35 < d ≤ **55**	35 < d ≤ **50**	25 < d ≤ **35**	**F**
E	**55** < d ≤ 80	**50** < d ≤ 70	**35** < d ≤ 50	**F**
F	80 < d	70 < d	50 < d	**F**

Note: v/c (demand volume / capacity) ratio, or degree of saturation: v/c > 1.0 represents oversaturated conditions.

9.3 Traffic Scenarios

The following traffic scenarios were analysed during the morning peak hour:

- 2012 AM Peak Background Traffic

9.4 Intersections

The following intersections were assessed in terms of current traffic operations and capacity:

- Station 1: William Nicol Drive (R511) & Ngonyama Road (1st Avenue);
- Station 2: Ngonyama Road (1st Avenue) & Achilles Street;
- Station 3: Ngonyama Road (1st Avenue) & Ubuntu Road (Peach);
- Station 4: Ngonyama Road & JB Marks Road;
- Station 5: Ubuntu Road & JB Marks Road;
- Station 7: Ubuntu Road & Ndimatsheloni Road;
- Station 8: Ngonyama Road & South Avenue; and
- Station 9: Ngonyama Road & North Avenue
- Station 10 :Ngonyama Road (1st Avenue) & Abel Street;

9.5 2012 Background Traffic

The capacity analysis results for the 2012 Background Traffic or 'base year' scenario are discussed hereafter. More detailed analysis results are provided in **Appendix C.** Note that conventional modelling techniques such as SIDRA may not yield the correct results due to the use of the road network in Diepsloot i.e. illegal operations, u-turns, taxis etc. Also see **section 9.6.**

9.5.1 Station 1: William Nicol Drive (R511) & Ngonyama Road (1st Avenue)

The intersection geometry of William Nicol Drive (R511) & Ngonyama Road (1st Avenue) is shown in **Figure 9.5.1.**

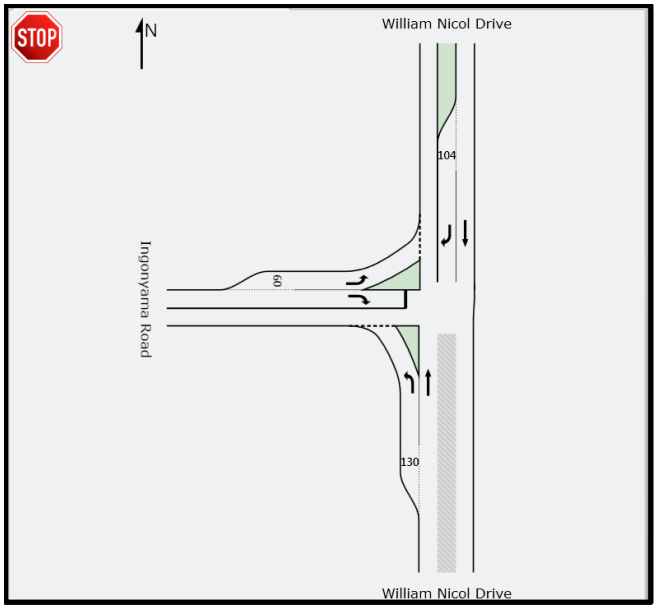


Figure 9.5.1: Existing Geometry of William Nicol Drive (R511) & Ngonyama Road (1st Avenue)

A summary of the analysis results is as follows:

- The southbound (right turning) movement on Ngonyama Road operates at LOS F with an average delay of 187.8 seconds;
- The northbound movement (left-turning) movement on Ngonyama Road operates at LOS B with an average delay of 11.2 seconds; and
- The combined level of service for the Ngonyama Road link is LOS F with an average delay of 120.3 seconds.

NOTE: Average delays of 25 to 35 seconds were observed on site for the right turning movement (southbound) on Ngonyama Road. Based on Table 9.2.2 the south bound movement should operate at

LOS D. The vehicles experience shorter delays as the intersection operates as a three-way stop as traffic along William Nicol Drive (R511) makes way for traffic along Ngonyama Road.

9.5.2 Station 2: Ngonyama Road (1st Avenue) & Achilles Street

The intersection geometry of Ngonyama Road (1st Avenue) & Achilles Street is shown in **Figure 9.5.2.**

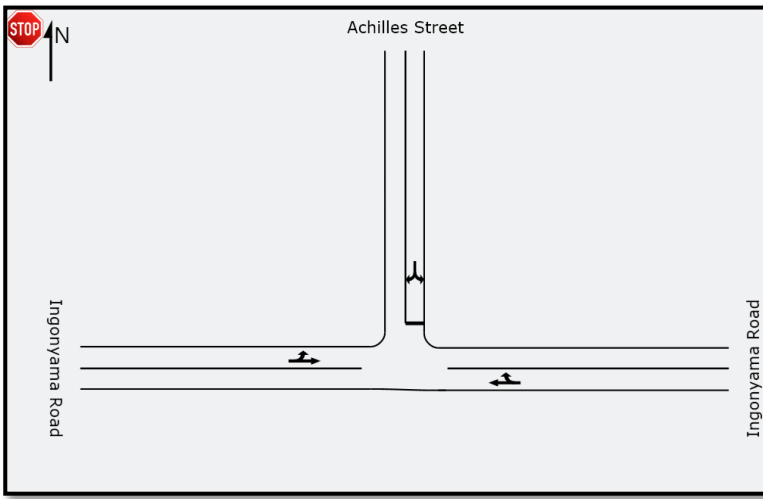


Figure 9.5.2: Existing Geometry of Ngonyama Road (1st Avenue) & Achilles Street

A summary of the analysis results is as follows:

- The major road approach LOS is not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements; and
- Achilles Street operates at LOS B with an average delay of 10.9 seconds during the AM peak hour.

9.5.3 Station 3: Ngonyama Road (1st Avenue) & Ubuntu Road (Peach)

The intersection geometry of Ngonyama Road (1st Avenue) & Ubuntu Road (Peach) is shown in **Figure 9.5.3.**

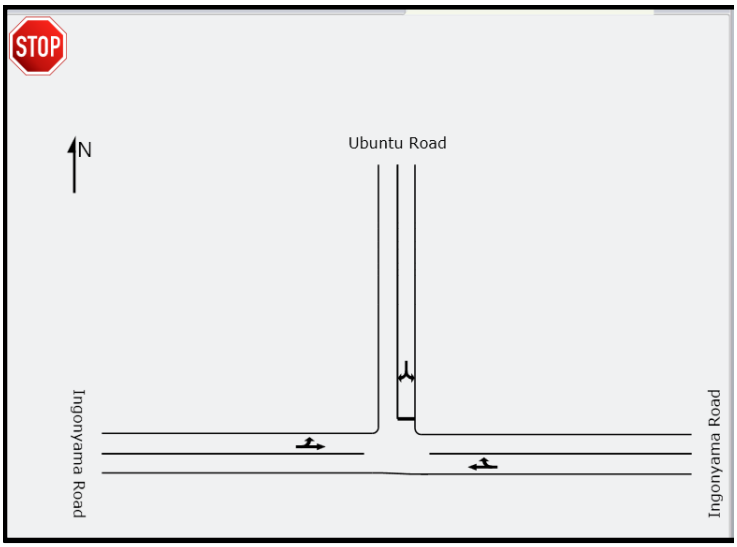


Figure 9.5.3: Existing Geometry of Ngonyama Road (1st Avenue) & Ubuntu Road (Peach)

A summary of the analysis results is as follows:

- The major road approach LOS is not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements; and
- Ubuntu Road operates at LOS B with an average delay of 13.1 seconds during the AM peak hour.

9.5.4 Station 4: Ngonyama Road & JB Marks Road

The intersection geometry of Ngonyama Road (1st Avenue) & JB Marks Road is shown in **Figure 9.5.4.**

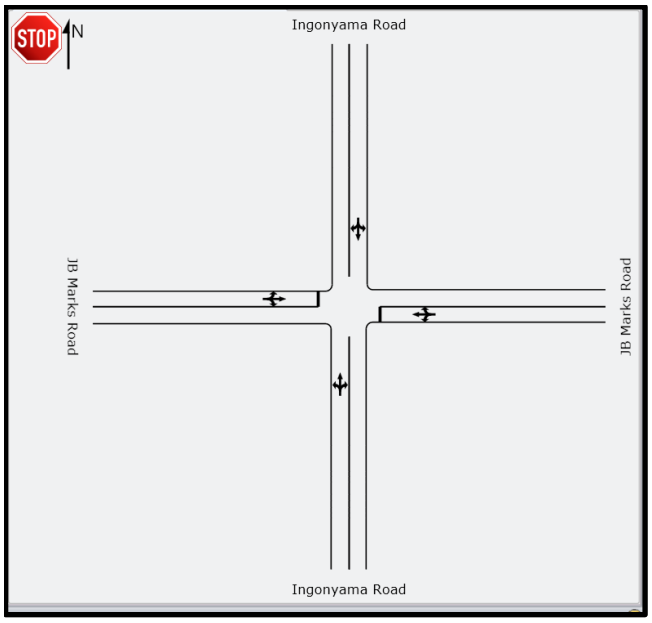


Figure 9.5.4: Existing Geometry of Ngonyama Road (1st Avenue) & JB Marks Road

A summary of the analysis results is as follows:

- Ngonyama Road South approach operates at LOS B with an average delay of 13.0 seconds during the AM peak hour.
- Ngonyama Road North approach operates at LOS A with an average delay of 6.7 seconds during the AM peak hour.
- The eastern approach of JB Marks Road operates at LOS C with an average delay 18.9 seconds during the AM peak hour; and
- The western approach of JB Marks Road operates at LOS C with an average delay of 17.4 seconds during the AM peak hour.

9.5.5 Station 5: Ubuntu Road & JB Marks Road

The intersection geometry of Ubuntu Road & JB Marks Road is shown in **Figure 9.5.5.**

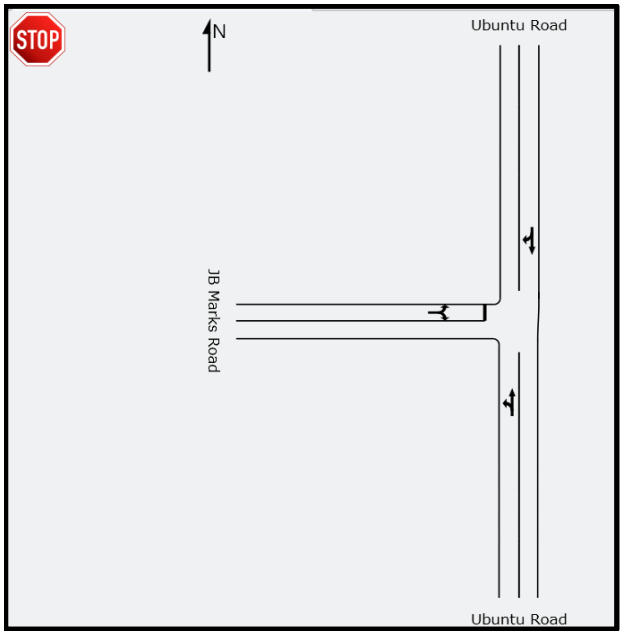


Figure 9.5.5: Existing Geometry of Ubuntu Road & JB Marks Road

A summary of the analysis results is as follows:

- The southern approach of Ubuntu Road operates at LOS A with negligible delays during the AM peak hour;
- The northern approach of Ubuntu Road operates at LOS A with an average delay of 4.1 seconds during the AM peak hour;
- JB Marks Road operates at LOS C with an average delay of 15.0 seconds during the AM peak hour.

9.5.6 Station 7: Ubuntu Road & Ndimatsheloni Road

The intersection geometry of Ubuntu Road & Ndimatsheloni Road is shown in **Figure 9.5.6.**

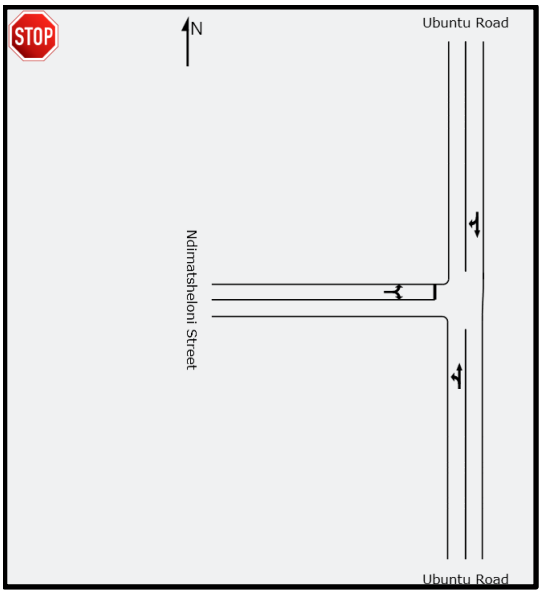


Figure 9.5.6: Existing Geometry of Ubuntu Road & Ndimatsheloni Street

A summary of the analysis results is as follows:

- The southern approach of Ubuntu Road operates at LOS A with negligible delays during the AM peak hour;
- The northern approach of Ubuntu Road operates at LOS A with an average delay of 3.7 seconds during the AM peak hour;and
- Ndimatsheloni Street operates at LOS F with an average delay of 156.4 seconds during the AM peak hour.

NOTE: Ndimatsheloni currently experiences longer delays as a result of the minibus taxi movements along Ubuntu Road.

9.5.7 Station 8: Ngonyama Road & South Avenue

The intersection geometry of Ngonyama Road & South Avenue is shown in **Figure 9.5.7.**

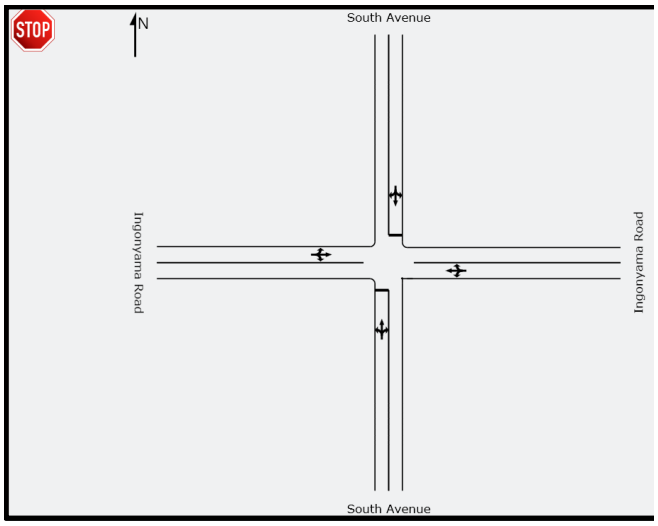


Figure 9.5.7: Existing Geometry of Ngonyama Road & South Avenue

A summary of the analysis results is as follows:

- Ngonyama Road operates at LOS A with negligible delays during the AM peak hour;
- The southern approach of South Avenue operates at LOS B with an average delay of 13.7 seconds during the AM peak hour; and
- The northern approach of South Avenue operates at LOS B with an average delay of 13.3 seconds during the AM peak hour; and

9.5.8 Station 9: Ngonyama Road & North Avenue

The intersection geometry of Ngonyama Road & South Avenue is shown in **Figure 9.5.8.**

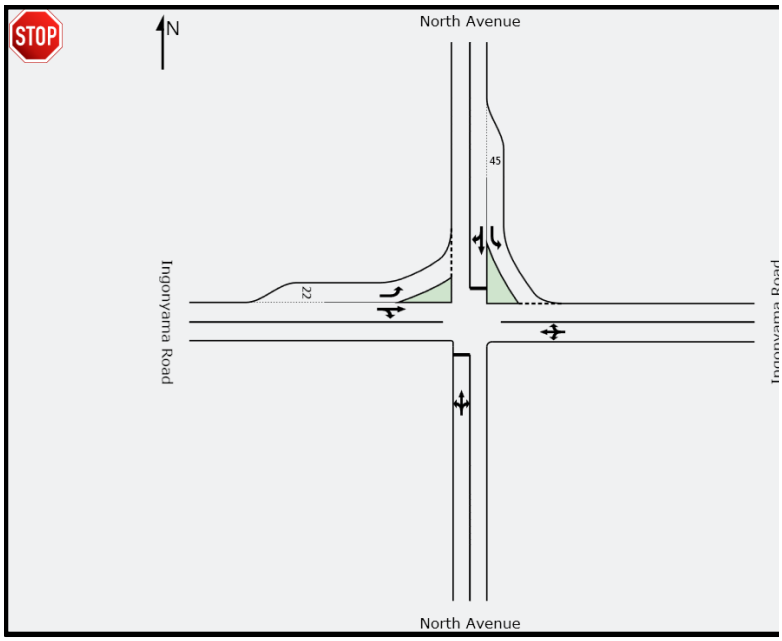


Figure 9.5.8: Existing Geometry of Ngonyama Road & North Avenue

A summary of the analysis results is as follows:

- Ngonyama Road operates satisfactorily with negligible delays during the AM peak hour;
- The southern leg of North Avenue operates at LOS F with an average delay of 100.3 seconds during the AM peak hour; and
- The northern leg of North Avenue operates at LOS C with average delay of 17.5 seconds during the AM peak hour.

NOTE: The northern leg of North Avenue provides access to the formal Diepsloot Taxi Rank. Site observations show that the right turning movement experiences longer delay due to insufficient gaps along Ngonyama Road. Traffic backs up from the Ngonyama Road/William Nicol intersection, which is located to the east of this intersection.

9.5.9 Station 10:Ngonyama Road (1st Avenue) & Abel Street

The intersection geometry of Ngonyama Road (1st Avenue) & Abel Street is shown in **Figure 9.9.**

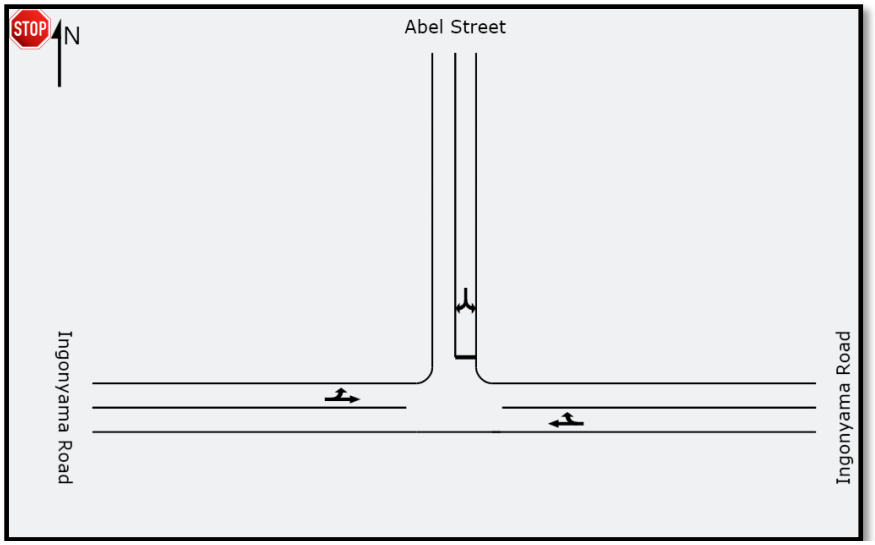


Figure 9.5.9: Existing Geometry of Ngonyama Road (1st Avenue) & Abel Street

A summary of the analysis results is as follows:

- The major road approach LOS is not applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements; and
- Abel Street operates at LOS B with an average delay of 12 seconds during the AM peak hour;

9.6 Discussion of SIDRA Analysis Results

Using the existing intersection geometries and traffic volumes for the intersections along Ngonyama Road and Ubuntu Road; the SIDRA software generally reflects shorter delays and thus satisfactory levels of service during the AM peak hour.

These results are thus different from the site observations which showed higher vehicular delays as a result of illegal U-turns, illegal accesses between intersections which result in large volume differentials between intersections. Also SIDRA cannot emulate the ‘chaos’ which exists on the ground as a result of illegal driver behaviour. The intersections were analysed as if all the vehicles at the intersections operate within the legal driving framework.

The model cannot emulate and forecast the disruptions resulting from illegal driver behaviour. The intersection operations were modelled as per the traffic volumes and the geometric layout.

The site visit and observations and the traffic data showed that traffic operations within the Diepsloot network needs to be improved. The completion of Ngonyama Road will result in improvements in the overall traffic flow on the network as the bottlenecks along Ngonyama Road and Ubuntu Road will be eased by the shorter alternative route.

9.7 Proposed Intersection Upgrades

The capacity analysis results for the proposed intersection geometries of the following intersection are discussed thereafter:

- William Nicol Drive (R511) & Ngonyama Road (1st Avenue) and
- Ngonyama Road (1st Avenue) & Ubuntu Road (Peach).

More detailed analysis results are provided in **Appendix C.**

9.7.1 William Nicol Drive (R511) & Ngonyama Road (1st Avenue)

The existing and proposed intersection geometry of WilliaNgonyama Road (1st Avenue) & Abel Street is shown in **Figure 9.7.1 and 9.7.2** respectively.

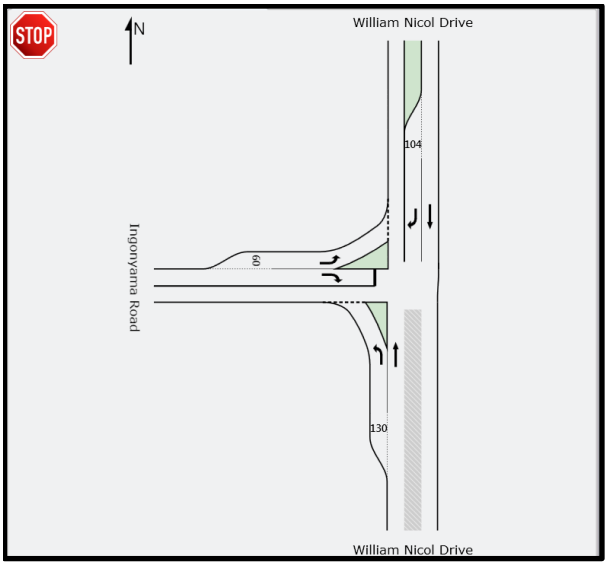


Figure 9.7.1: Existing Geometry of Ngonyama Road & William Nicol Drive

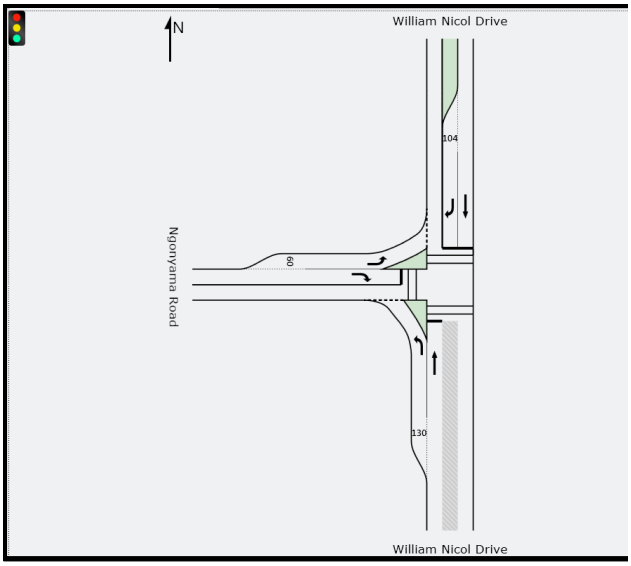


Figure 9.7.2: Proposed Geometry of Ngonyama Road & William Nicol Drive

A cycle time of 80 seconds with a phase split of 79% and 21 % for William Nicol Drive and Ngonyama Road respectively was modelled on SIDRA. A summary of the analysis results for the signalised intersection is as follows:

- The southern leg of William Nicol Drive will operate at LOS A with an average delay of 5.8 seconds;
- The northern leg of William Nicol Drive operate at LOS A with an average delay of 6.3 seconds;
- Ngonyama Road operates at LOS C with an average delay of 30.5 seconds; and
- The overall intersection level of service is LOS A with an average delay of 8.8 seconds.

9.7.2 Ngonyama Road (1st Avenue) & Ubuntu Road (Peach)

The existing and proposed intersection geometry of William Ngonyama Road (1st Avenue) & Abel Street is shown in **Figure 9.7.3 and 9.7.4** respectively.

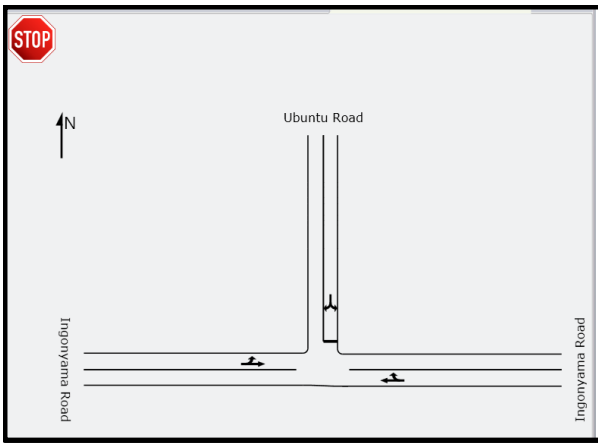


Figure 9.7.3: Existing Geometry of Ngonyama Road & Ubuntu Road

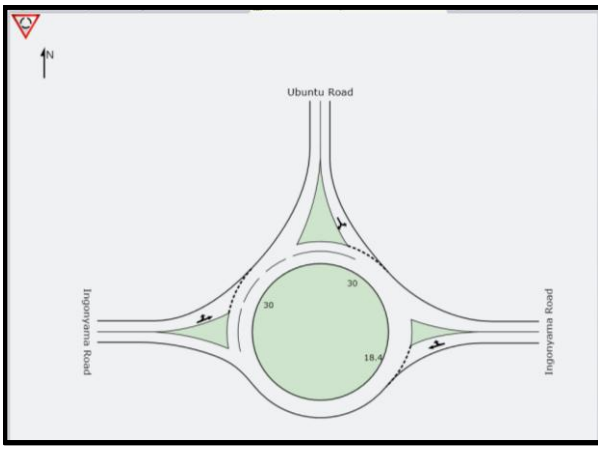


Figure 9.7.4: Proposed Geometry of Ngonyama Road & Ubuntu Road

A traffic circle is proposed at the Ngonyama Road & Ubuntu Road intersection. The following are advantages for implementing traffic circles at junctions:

- To improve the operation of an existing junction by reducing the dominance of one traffic flow;
- Facilitate access and reducing delay at side roads
- Improves capacity at overloaded junctions
- Accident remedial measures – reduce the number of accidents at a junction and to reduce the severity of accidents at a junction
- Traffic Calming – usually implemented as part of an area wide traffic calming scheme and also to reduce traffic speeds and increase driver awareness

10. Ngonyama Road Layout

10.1 Functional Road Classification for Urban Roads

The Draft South African Road Classification and Access Management Manual (SARCAMM) classify roads based on the function / role within the road network system. Roads normally satifsfy the functions listed below:

- Mobility Roads - Serve major nodes of development and predominantly cater exclusively for through traffic; and
- Access / Activity Street – Have little or no through traffic, are intended to serve individual properties and must not serve traffic travelling through the area.

An urban area is defined as “an area that has been subdivided into erven, whether formal or informal. It includes areas on which townships have been formally declared as well as informal settlements”.

Table 10.1 indicates the Urban Road Functional Classification System with a description of each of the road classes.

Table 10.1: Urban Road Functional Classification System

Road Class	Description / Characteristics
Class U1 – Urban Principal Arterials	■ Serve the major economic activity centres of urban areas and also as connectors to the Rural Class 1 routes.
Class U2 – Urban Major Arterials	■ Serve the larger economic activity centres of an urban area; ■ Traffic corridors with high traffic volumes and long trip lengths; and ■ They should be continuous with a minimum length of about 5km.
Class U3 – Urban Minor Arterials	■ Function as through routes on a district scale. ■ While still carrying predominantly through traffic, they serve shorter distance trips; and ■ They would carry traffic volumes of between 10 000 and 40 000 vehicles per day
Class U4 – Urban Collector Streets	■ Collector Streets are used to penetrate local neighbourhoods with the purpose of collecting and (distributing) traffic between local streets and the arterial system; ■ Should not carry any through traffic, but only traffic with an origin or destination along or near to the street ■ The majority of the traffic using the collector will have a destination in the street itself or in a local street leading of the collector.
Class U4A – Commercial Collector Street	■ Found in areas with commercial, business, industrial, shopping and mixed-use residential developments ■ High percentage of heavy vehicle traffic and public transport ■ Examples – CBD streets, Shopping Centre Streets, Activity Spines and Industrial Distributors; ■ Road Length not to greater than 3km.
Class U4B – Residential Collector Street	■ Found in Residential areas and almost exclusively serve residential traffic and public transport.

Source: Draft South African Road Classification and Access Management Manual, July 2011

10.2 Classification of Ngonyama Road

The classification of the surrounding road network, based on the road functions, is as shown in **Figure 10.1.** Based on the classification of the surrounding road network, proposed land uses and the characteristics of the various road classes, Ngonyama Road is classified as a Class U4A Commercial Collector.

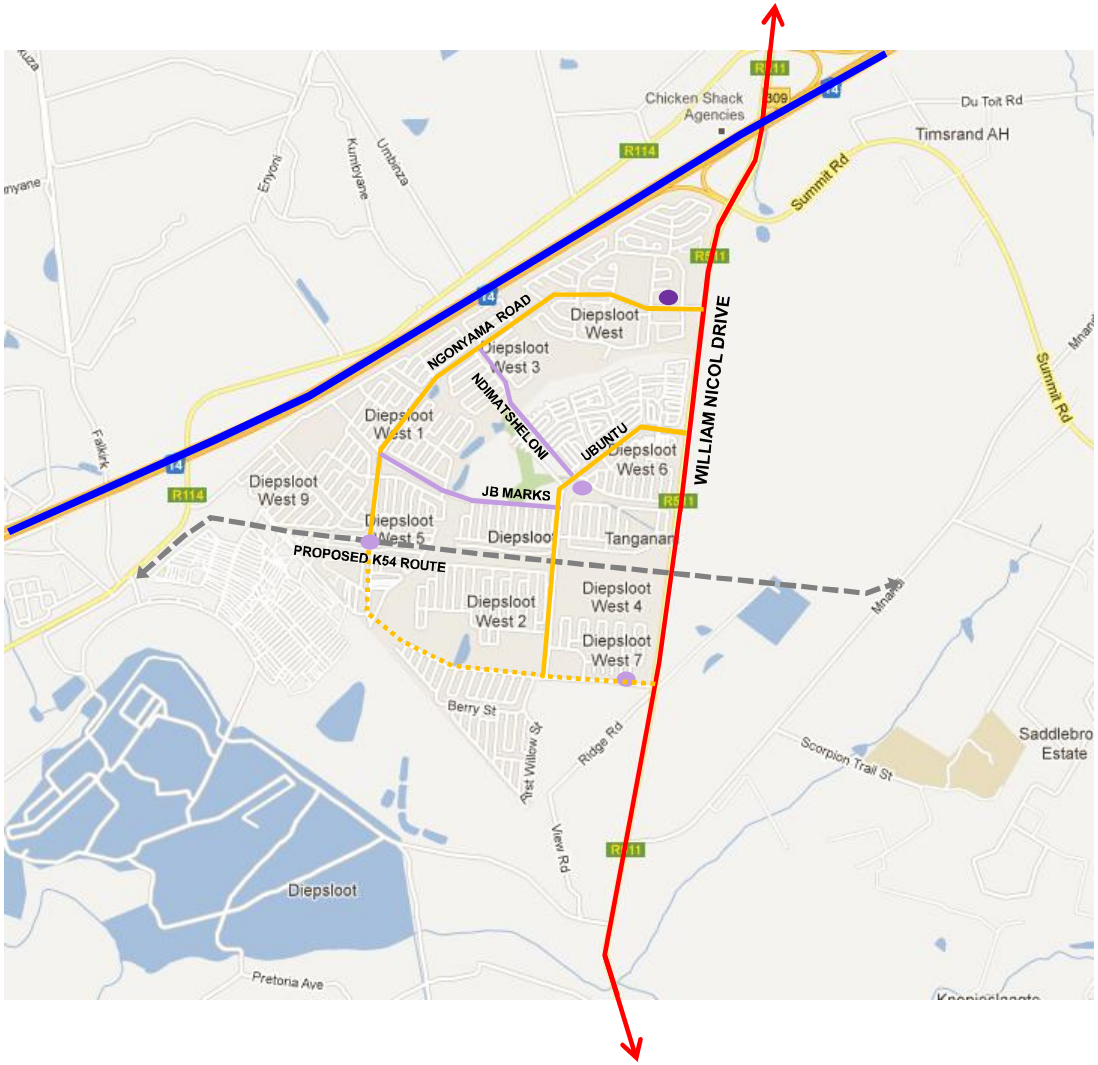


Image: Google

Key/Legend:

- CLASS U1 – URBAN PRINCIPAL ARTERIALS
- CLASS U3 – URBAN MINOR ARTERIALS
- CLASS U4 – URBAN COLLECTOR STREETS
- CLASS U5 – URBAN LOCAL STREETS

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 10.1
TITLE:	Functional Road Classification	Date:	November 2012

10.3 Required Intersection Spacing

According to the Draft SARCAMM the minimum access for a Class U4A street is as follows:

- Urban Signals - 200 – 300m; and
- Urban Roundabouts and priority - 200 – 300m.

The proposed locations of the intersections which meet the minimum requirement are shown in **Figure 10.2.**

It should be noted that the current implementation of Ngonyama Road was not able to adhere to this intersection spacing due to the poor state of the roads gaining access off Ngonyama Road.

It has since been decided that the implementation Ngonyama Road will allow access to all the access roads off Ngonyama Road. Thus access management along Ngonyama Road should be enforced upon the upgrade of the access roads.

10.4 Proposed Road Cross Section

According to the SARCAMM the typical road reserve width of a Class 4A road ranges between 20m to 40m. The available road reserve width of Ngonyama Road varies from 11 m to 15.70 m due to the encroachment by the residents along Ngonyama Road.

Ngonyama Road is proposed as a single carriageway with a cross section which includes the following elements:

- 3m road lane width
- 2m sidewalks on both sides of the road;
- 2m cycle path on one side of the road;

The proposed road cross sections for the full length of Ngonyama Road are included in **Appendix D**.

Source: Name of Source, Date

Key/Legend:

- Proposed Road Link
- Existing Road Link
- Approved Intersection Locations
- Intersection to be removed due to visibility limitations

WSP

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 10.2
TITLE:	Proposed Location of Intersections	Date:	November 2012

11. Pedestrian & Cyclist Requirements

11.1 Pedestrian Facilities along Ngonyama Road

11.1.1 Basic Needs of Pedestrians

The proposed pedestrian and cyclist facilities along Ngonyama Road should aim to satisfy the following basic pedestrian and cyclist needs:

- Safety;
- Accessibility;
- Convenience
- Comfort;
- Environment; and
- Economy

The main aim is to provide pedestrian and cycle links between the residential areas and public facilities that are likely to attract significant numbers of non-motorised transport (NMT) to warrant the provision of dedicated facilities. The public facilities include minibus taxi ranks, retail centres which include informal markets and other community facilities.

11.1.2 Classification of Cycleways

Table 11.1 shows the different types of cycleways.

Table 11.1.: Four different types of cycleways

Bicycle Roads	Class I	Bicycle roads, which are independently aligned and not typically provided in the road reserve and provided for exclusive use of cyclists
	Class II	Bicycle roads within the road reserve, provided parallel to a street or road and provided for the exclusive use of cyclists
Bicycle Ways	Class III	Bicycle ways that are specifically marked on the road or street
	Class IV	Bicycle ways are not specifically marked on the road or street and the lanes are shared with other traffic.

11.1.3 Technical Requirements

The following geometric features of Class 4 Road are recommended for sidewalks and cycleways and should be applied at design stage.

It is recommended that road lanes on Class 4 roads should be widened to allow for space for bicycles as opposed to providing separate facilities for vehicles and bicycles, due to the limitation of available space to provide additional facilities such as cycleways.

The minimum width of the cycle lane should be 1.2m excluding kerb and gutter on roads where parking is not provided. The cyclist requires a minimum of 1.2 m of the 4.2m wide lane assuming 3m is for general vehicular traffic.

A summary of the applicable geometric and other technical requirements are provided in **Table 11.2.**

Table 11.2: Technical Requirements for pedestrian facilities

	Speed Limit	Facility Width and Conditions [DoT, 2002]
Cyclists Facilities		
2-way bicycle road (Class I)	**N/A**	Acceptable: 3,0m Desirable: 3.5m
Pedestrian Facilities		
Sidewalks	< 80km/h	Minimum: 1.5m Desirable: 1.8m Without buffer strip: 1.8m Buffer Strip: 0.6m (absolute min)

Adapted from BB10,Gautrans, August 2005

According to **Table 11.2** the acceptable 2-way bicycle road width is 3.0m. However, the available road width can only accommodate a cycle path of 2.0m.

11.1.4 Sizing of Pedestrian Sidewalks along Ngonyama Road

Walking has a significant mode share in the study area, this has prompted the need for adequate walkways along Ngonyama Road. For the purpose of sizing the pedestrian sidewalks along Ngonyama Road, pedestrian counts were undertaken on 18 October 2012 from 06h00 to 18h00 at the following intersections:

- Location 1 – JB Marks Road
- Location 2 – Ngonyama Road
- Location 3 - Ngonyama Road & Ubuntu Road and
- Location 4 - Ngonyama Road & Achilles Street.

The pedestrian count data is included in **Appendix E**.

The sizing of sidewalks was based on the pedestrian walkway LOS. Pedestrian walkway LOS is a quantitative stratification of a performance measure that represent quality of service, measured on an A-F scale, with LOS A representing the best operating conditions from the travellers perspective and LOS F the worst (HCM, 2010).

The space per pedestrian and the pedestrian flow rate are measures used to determine the level of service .A level of service of D is deemed as an acceptable operating standard.

A summary table of the Peak 15 minute volume and the Peak 15 minute Pedestrian Flows is provided in **Table 11.3.**

Table 11.3: The summary table for 15 minute peak pedestrian movements

LOCATION	DIRECTION OF FLOW	PEAK 15 MIN VOLUME	PEAK 15 MIN FLOW (p/min/m)	CURRENT LOS
Station 1	East	153	10	**A**
Station 2	East	287	19	**B**
Station 3	South	71	5	**A**
Station 4	West	104	7	**A**

The analysis indicates that the current pedestrian pathways are operating satisfactorily. A formal sidewalk of 1.5m, on both sides of the road, will be adequate to cater for the existing pedestrian volumes along Ngonyama Road.

Ramps should be provided at all intersections to accommodate special needs passengers on wheelchairs. Physical barriers such as bollards may be used to constrain pedestrians from entering the roadway.

11.2 Pedestrian Bridges

The JDA requested that a high level analysis be conducted to determine the feasibility of implementing two pedestrian bridges at the following locations over the existing Diepsloot watercourse:

- Location 1 to the north of JB Marks and
- Location 2 towards the end of Ngonyama Road.

The proposed pedestrian bridge locations are shown in **Figure 11.1.**

11.2.1 Existing Land Use

a) Location 1 (JB Marks Road)

The existing land use along JB Marks Road adjacent to the Diepsloot rivercourse is characterised by informal tracers, semi-formal businesses and community facilities as shown in **Figure 11.2.**

Pedestrians currently make use of JB Marks Road to move between the informal settlements to the east to Diepsloot Ext 1 to the west. Based on site observation there is no existing pedestrian movement which crosses the watercourse as shown for Location 1 in **Figure 11.1**.

b) Location 2 (Ngonyama Road)

The existing land use along Ngonyama Road adjacent to Diepsloot watercourse consists mainly of informal settlements, informal taxi ranks and informal traders. There is heavy pedestrian movement which includes vulnerable users; i.e., school children, that use the crossing as shown in **Figure 11.3.**

The pedestrians using this crossing move from Diepsloot Ext.2 to Diepsloot Ext 5 and the Adelaide Tambo settlement.

11.2.2 Roads

a) Location 1 (JB Marks Road)

JB Marks Road is classified as a Class U5 Urban Local street which has high volumes of public transport vehicles. As a result, a number of passengers access the minibus taxi service along JB Marks Road.

b) Location 2 (Ngonyama Road)

Ngonyama Road is classified as a Class U4 Urban Collector Streets which has high volumes of public transport vehicles and heavy pedestrian presence.

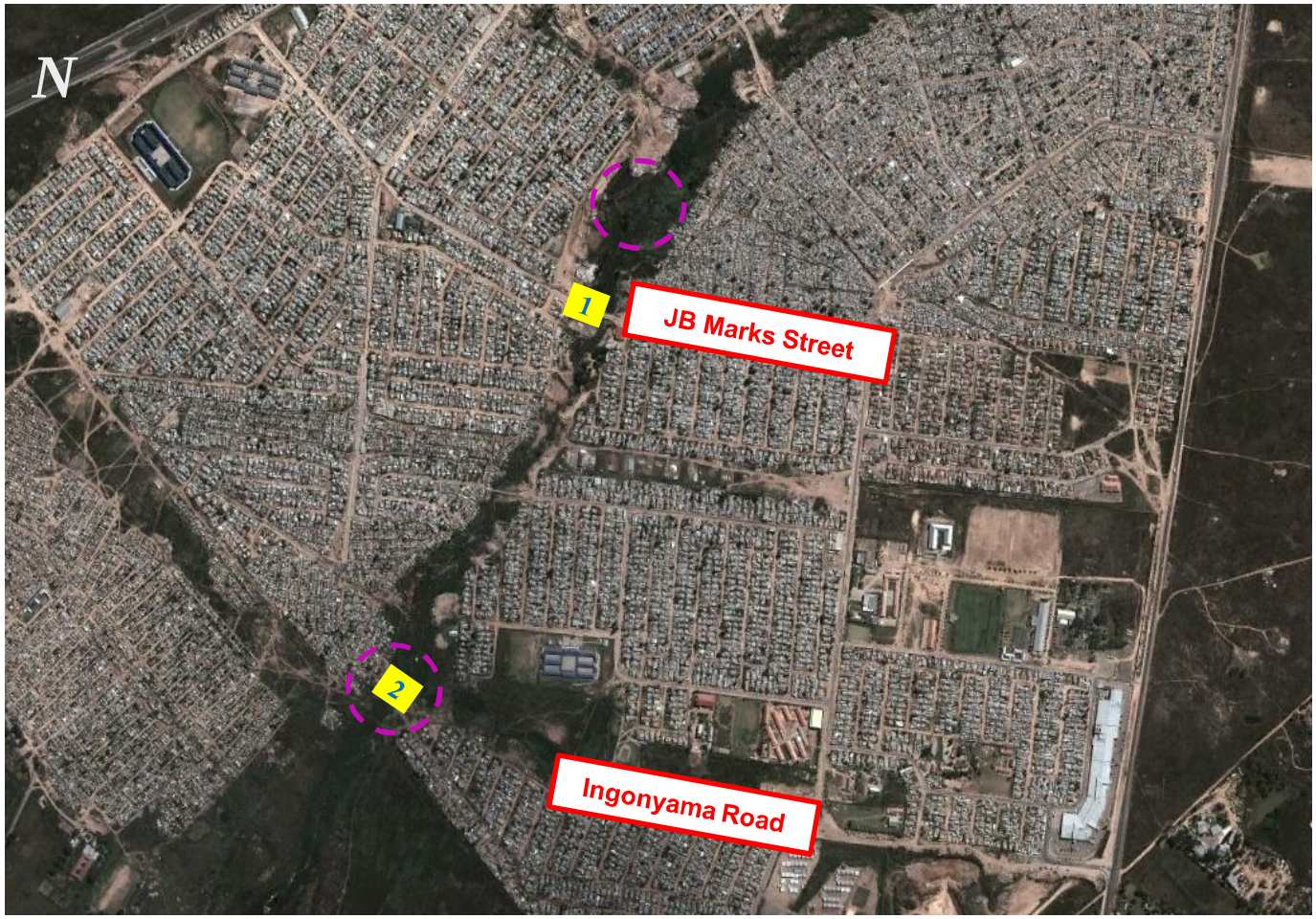


Image: Google

Key/Legend:

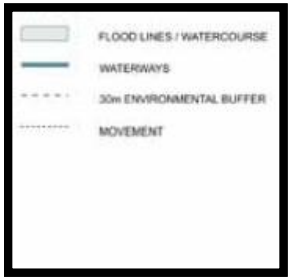
- Locations Requested by the JDA
- 1 — Locations Assessed

WSP

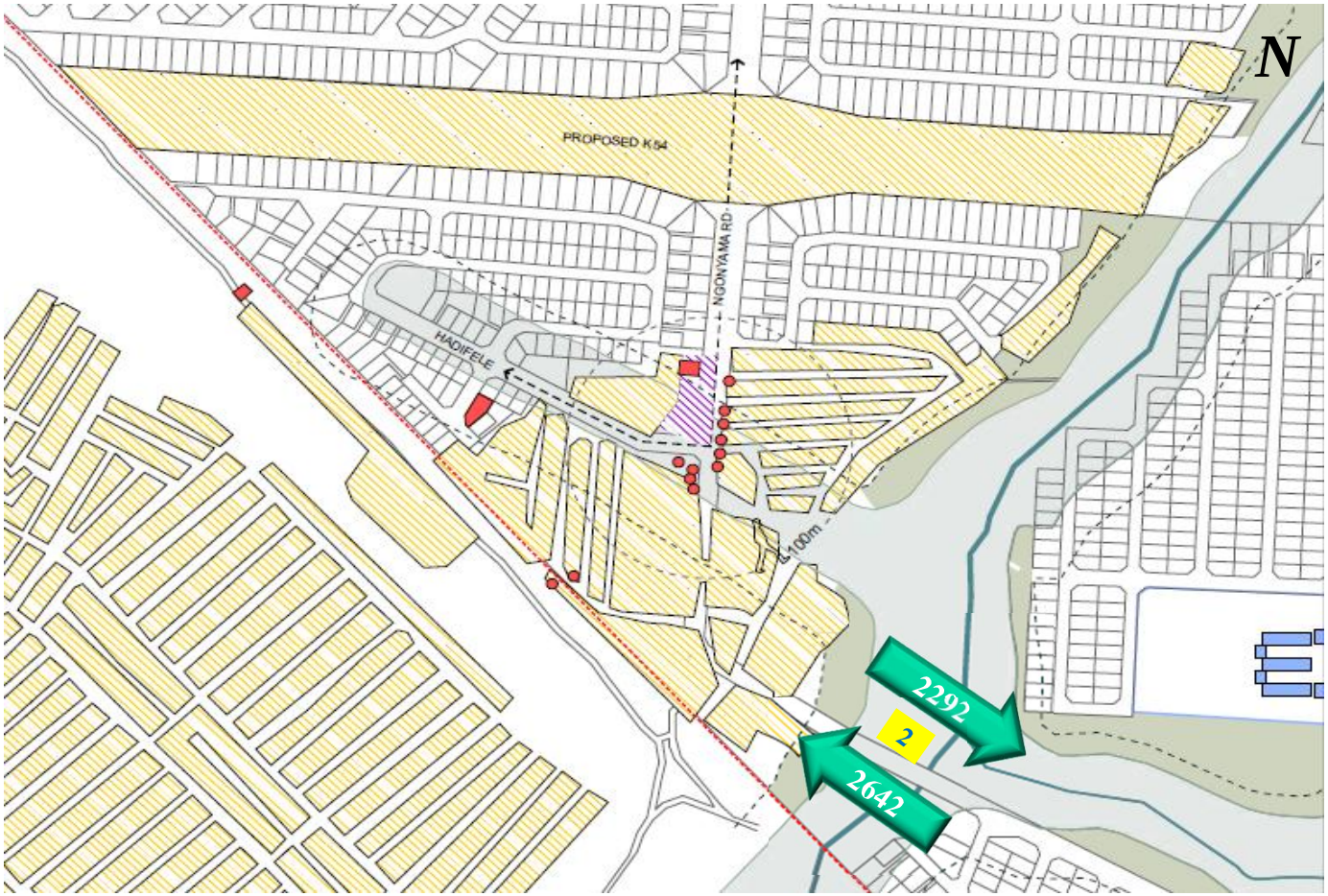
PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment
Ref:	Figure 11.1
TITLE:	Pedestrian Bridge Investigation Locations
Date:	November 2012

Source: Diepsloot Urban Development Framework and Business Plan, 2010

Key/Legend:



PROJECT:	**Design and Implementation of Ingonyama Road Transport Impact Assessment**	**Ref:**	**Figure 11.2**
TITLE:	**Existing Land Uses at Location 1**	**Date:**	**November 2012**



Source: Diepsloot Urban Development Framework and Business Plan, 2010

Key/Legend:

- INFORMAL TRADE
- INFORMAL AND SQUATTER
- INFORMAL TAXI RANK
- BUSINESS
- PUBLIC OPEN SPACE
- FLOOD LINES / WATERCOURSE
- WATERWAYS
- 30m ENVIRONMENTAL BUFFER
- STUDY AREA
- MOVEMENT

WSP

PROJECT: Design and Implementation of Ingonyama Road Transport Impact Assessment

Ref: Figure 11.3

TITLE: Existing Land Uses at Location 2

Date: November 2012

11.2.3 Existing Public Transport Facilities

a) Location 1 (JB Marks Road)

Ngonyama Road and JB Marks Road are two of the main routes within the Diepsloot Township which are used by public transport vehicles, i.e. minibus taxis.

There are currently no observed formal public transport stops along JB Marks Road as shown in **Figure 11.4**.

b) Location 2 (Ngonyama Road)

Ngonyama Road has a public transport stop which is situated adjacent to the Diepsloot Mall. A number of public transport stops have been proposed along Ngonyama Road as part of the 'Design and Implementation of Ngonyama Road' project.

11.2.4 Existing Pedestrian and Bicycle Facilities

a) Location 1 (JB Marks Road)

The pedestrian sidewalks which are provided along JB Marks Road are disjointed and are not continuous throughout the length of the road. The existing sidewalks need to be rehabilitated.

There is currently no provision made for bicycle movement within the existing road reserve of JB Marks Road.

b) Location 2 (Ngonyama Road)

There is currently no provision made for the movement of pedestrians and cyclists along Ngonyama Road, as pedestrians currently make use of the full width of the gravel section of Ngonyama Road.

11.2.5 Barriers and Safety

a) Location 1 (JB Marks Road)

Pedestrians are currently using JB Marks Road to move between the informal settlements and Diepsloot Extension to the west as this is safer than crossing the watercourse.

It is currently not safe for pedestrians to cross the stream using JB Marks as the portion of JB Marks that goes over the streams does not have guardrails to prevent people from falling over into the watercourse. The lack of guardrails at this location of JB Marks Road is shown in **Figure 11.4.**

b) Location 2 (Ngonyama Road)

Pedestrians are currently crossing the watercourse at this location in large numbers in spite of the signage warning people not to cross because of the potential danger from being swept away by stormwater.

N

Source: WSP Site Visit, 2 November 2012

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.4
TITLE:	JB Marks Road – Public Transport Infrastructure	Date:	November 2012

11.2.6 Pedestrian Volumes

New manual 12 hour pedestrian counts were undertaken on 18 October 2012, Thursday, from 06:00 to 18:00 by Messrs Traffic Counting Solutions (Pty) Ltd at the locations indicated in **Figure 11.1.**

The pedestrian volumes for the AM and PM peak periods are shown in **Figures 11.5 to 11.6** and the variations in the flow of pedestrians for the 12 hour survey period at Location 1 and Location 2 is shown in **Figures 11.7 to 11.8** respectively.

a) Location 1 (JB Marks Road)

There is a constant flow of pedestrians throughout the 12 hour survey period. A total of 4 261 pedestrians were counted at Location 1 with 2 216 and 2 045 pedestrians in the eastbound and westbound directions respectively.

The observed peak hour at Location 1 is from 17:00 to 18:00 with a total of 930 pedestrians with 430 and 447 pedestrians in the eastbound and westbound directions respectively.

b) Location 2 (Ngonyama Road)

There is a constant flow of pedestrians throughout the 12 hour survey period. A total of 4 934 pedestrians were counted at Location2 with 2 292 and 2 642 in the eastbound and westbound direction respectively.

The observed peak hour at Location 2 is from 17:00 to 18:00 with a total of 693 pedestrians with 255 and 438 pedestrians in the eastbound and westbound directions respectively.

11.2.7 Pedestrian Fatalities

Pedestrian fatality data for both Location 1 and Location 2 was not available for assessment.

11.2.8 Summary

There is existing pedestrian demand at both Location 1 and Location 2 as shown by the pedestrian volumes. However, pedestrians are not currently safe at both locations. Pedestrian infrastructure should be provided and/ or upgraded.

Pedestrian guardrails should be provided along Location 1 (JB Marks Road) to improve pedestrian safety and prevent pedestrians from accidentally falling into the watercourse below.

The upgrading of the missing link of Ngonyama Road will result in the construction of bridge to go over the watercourse. The implementation of this bridge should allow for the pedestrian movement and also provide buffers to protect pedestrians from vehicular traffic.

An example of a method to protect pedestrians is shown in **Figure 11.9.**

N

Image: Google

Key/Legend:

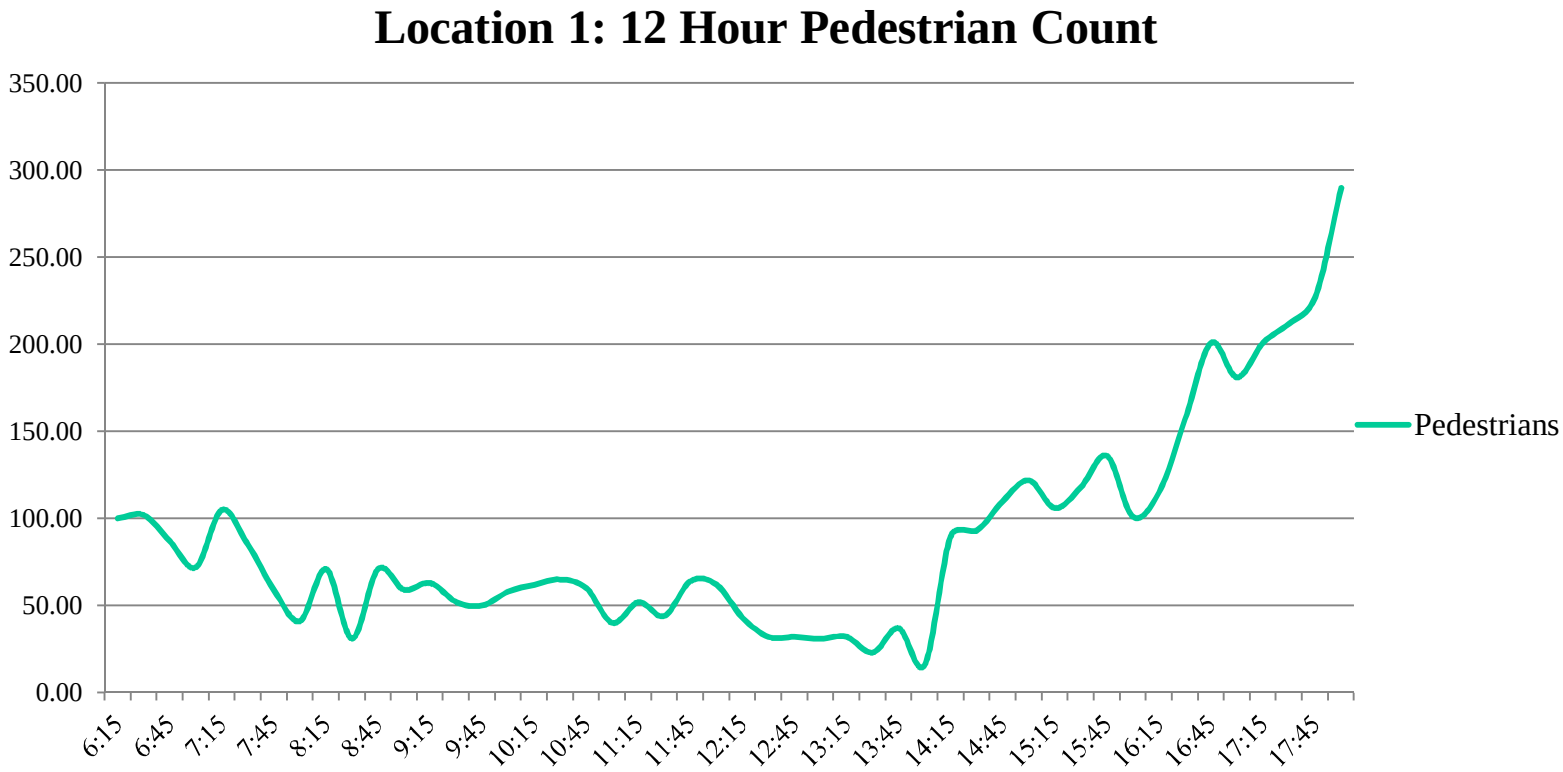
PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.5
TITLE:	AM Peak Period Pedestrian Volumes	Date:	November 2012

N

Source: Google

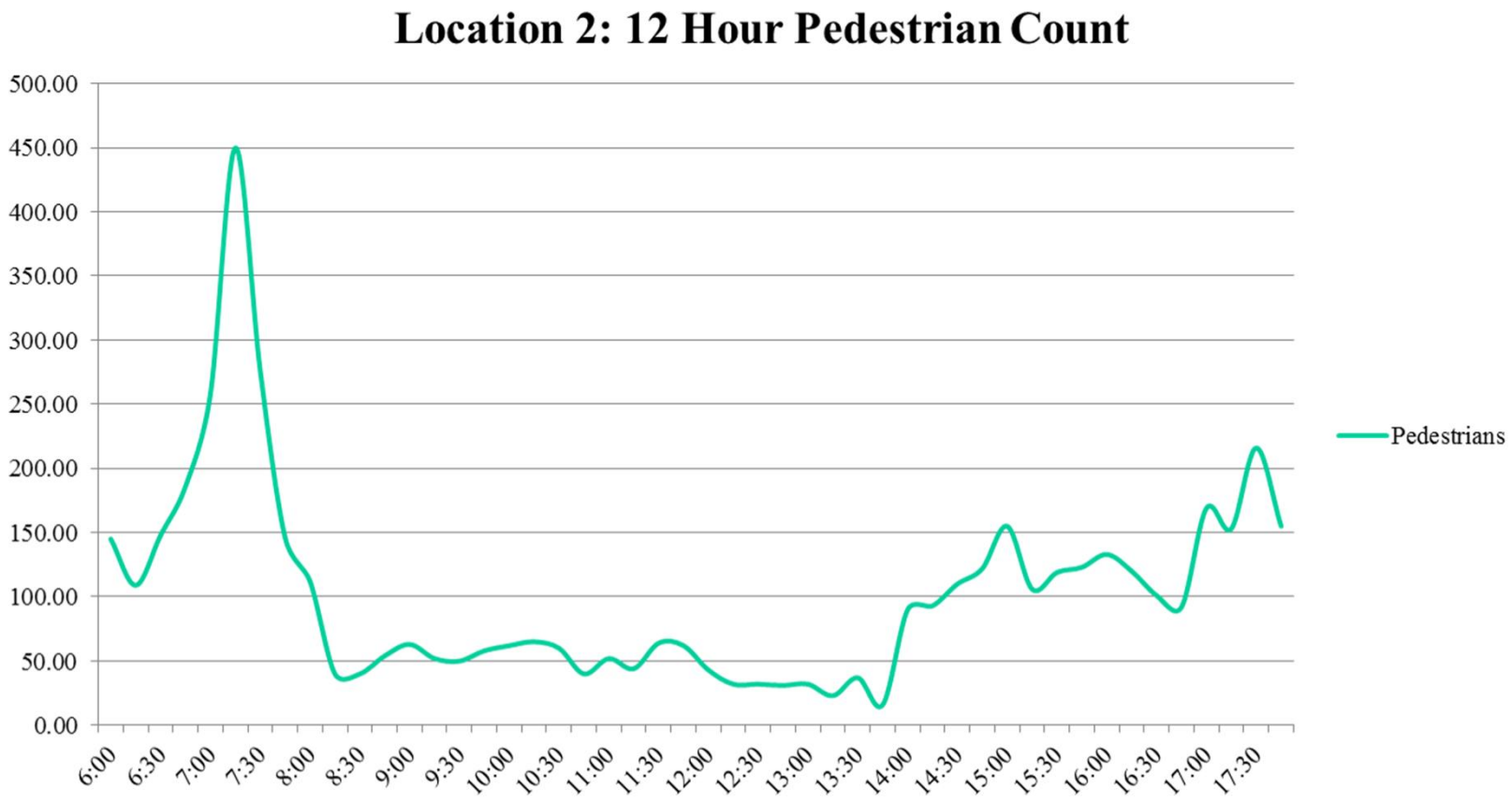
Key/Legend:

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.6
TITLE:	PM Peak Period Pedestrian Volumes	Date:	November 2012



Source: WSP

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.7
TITLE:	12 Hour Pedestrian Flow at Location 1	Date:	November 2012



Source: WSP

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.8
TITLE:	12 Hour Pedestrian Flow at Location 2	Date:	November 2012

Source: Name of Source, Date

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 11.9
TITLE:	Methods to Protect Pedestrians	Date:	November 2012

12. Public Transport Requirements

12.1 Introduction

It is envisaged that public transport provision will mainly be by means of minibus taxis and commuter buses in the form of Bus Rapid Transit (BRT).

12.2 Public Transport Facilities (Bus and Minibus Taxis)

The Diepsloot UDF proposes intermodal transport interchanges at the Shopping Centre and Link Nodes. It is envisaged that these public transport interchanges will replace the existing informal minibus taxi facilities.

The investigation into the sizing of the intermodal transport interchanges is not part of the scope of this traffic study and will require a separate traffic study to assess the upgrading of the informal facilities to intermodal transport interchanges as envisioned in the Diepsloot UDF. Issues to be addressed in the traffic study should include the following:

- Existing Minibus Taxi Services and Existing Passenger Demand;
- Existing Need for the Integration of Public Transport Services;
- Estimates of Future Passenger Demand & Analysis ;
- Stakeholder Consultation with minibus taxi associations and commuters; and
- Presentation of alternative conceptual layouts.

The investigation into the sizing of the intermodal transport interchanges is not part of the scope of this traffic study and will require an additional study to assess the

12.3 Proposed Public Transport Stops

“The location of public transport stops is critical to the success of public transport. The design and location of stops requires balancing many different needs. The more stops there are, there more accessible the public transport services are, but this also means higher costs and slower trips”.(http://busmeister.wikispaces.com). Therefore the careful location of a public transport stop can significantly improve the public transport service.

12.3.1 Type of Public Transport Stops

The three main options for locating a public transport stop relative to the street grid are the following:

- Midblock – The public transport stop is located between intersections;
- Nearside – The public transport stop is located before the intersection; and
- Farside – The public transport stop is located after the intersection.

Generally the midblock public transport stop does not obstruct sight distances at an intersection and results in fewer conflicts between waiting and walking pedestrians. Therefore it is proposed that the public transport stops along Ngonyama Road be located between the intersections.

12.3.2 Location and Spacing of Public Transport Stops

Public transport stops should be located close to the origins and destinations of users. According to *the UTG1 Guidelines for the Geometric Design of Urban Arterial Roads*, 1996, 2-3 stops per kilometre is appropriate depending on the development density.

Diepsloot residents currently use public transport services, mainly minibus taxis, to gain access to economic activities within the surrounding areas of Fourways, Sandton, etc. In order to further promote the use of public transport services, public transport stops should be no more than 300m apart. They should also be arranged to be within 400m (i.e. five minutes' walk) of every individual dwelling.

The proposed location of public transport stops is shown in **Figure 12.1.**

WSP

PROJECT:	Design and Implementation of Ingonyama Road Transport Impact Assessment	Ref:	Figure 12.1
TITLE:	Proposed Location of Public Transport Stops	Date:	November 2012

12.3.3 Configuration of Public Transport Stops

The following two options are proposed for the configuration of the public transport stops:

- Option A – Bay Type Bus Stop (Staggered on a single carriageway) and
- Option B – Kerb Side Bus Stop (Staggered on a single carriageway).

Option A and B are shown in **Figure 12.2**.

The public transport stops are staggered to allow for the safe passage of other vehicles and to avoid collisions when buses leave in opposite directions at the same time.

The two proposals only accommodate the length of one bus. The reason is to encourage the correct use of the public transport stops and not create additional informal ranks within Diepsloot. The minibus taxis should be encouraged to use the existing formalised minibus taxi facility for holding and loading purposes.

12.3.4 Consultation

The two options should be discussed between the public transport operators, local authority and the Johannesburg Metropolitan Police Department (JMPD) to obtain consensus on the most suitable location and preferred public transport stop configuration.

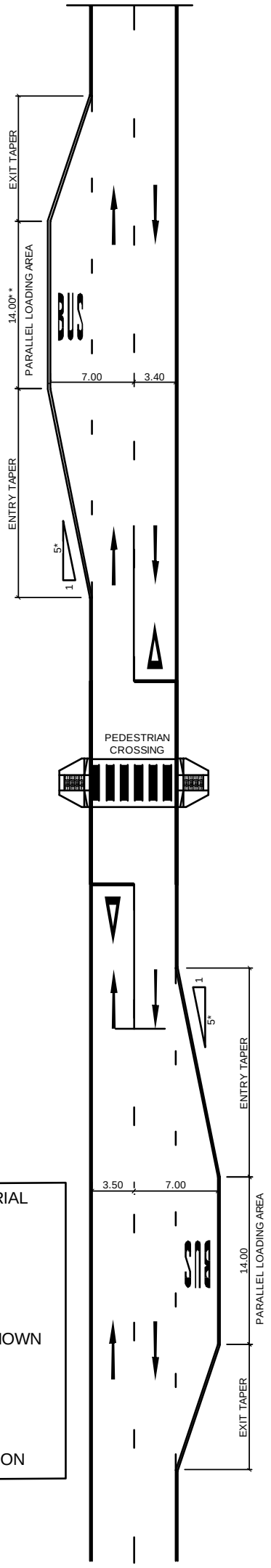
12.4 Proposed BRT Planning

The proposed Diespsloot-Fourways – Randburg BRT route needs to be confirmed together with the timeframes for its development.

OPTION A

STAGGERD BUS STOP ON SINGLE CARRIAGEWAY

BAY TYPE STOP



* 1:10 ON HIGHER ARTERIAL

* *SPACE REQUIRED FOR BUS

NOTE:

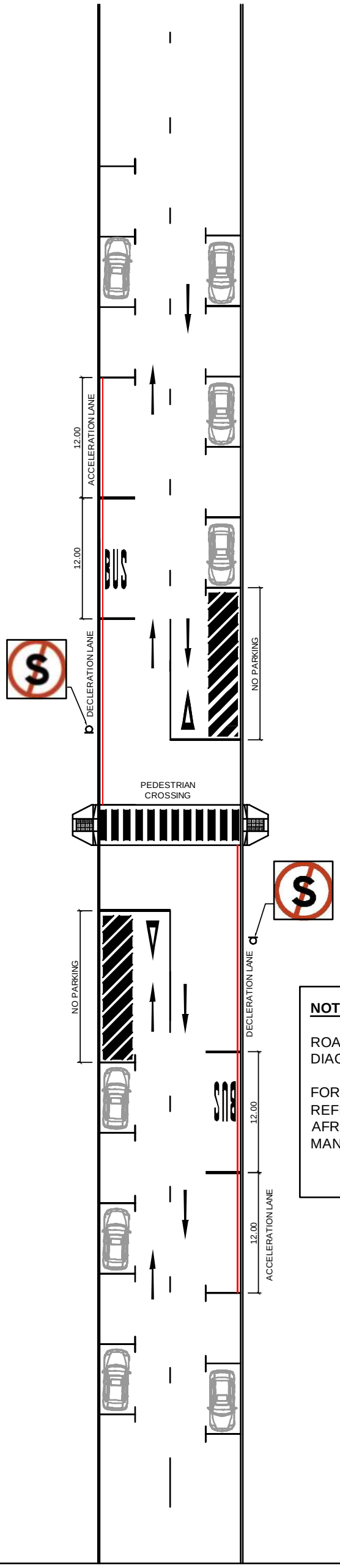
ROAD MARKINGS ARE SHOWN DIAGRAMATICALLY.

FOR MARKINGS DETAILS REFER TO THE SOUTH AFRICAN ROAD SIGNS MANUAL, CURRENT EDITION

OPTION B

STAGGERD BUS STOP ON SINGLE CARRIAGEWAY

KERB SIDE BUS STOP



NOTE:

ROAD MARKINGS ARE SHOWN DIAGRAMATICALLY.

FOR MARKINGS DETAILS REFER TO THE SOUTH AFRICAN ROAD SIGNS MANUAL, CURRENT EDITION

FIGURE 12.2

13. Conclusions & Recommendations

In summary the following conclusions are made:

- Ngonyama Road is a major access and connector road stretching from the north and south of the Diepsloot Township;
- The Diesploot UDF has identified Ngonyama Road as an activity street as it currently fosters numerous small businesses along its length resulting in a vibrant street character;
- Despite the importance of Ngonyama Road within the Diepsloot Township, it forms an incomplete road system which results in inefficient vehicular movement throughout the Diepsloot area;
- Large sections of the study area are characterised by gravel road which is severely eroded with no stormwater provision. Ngonyama Road's width reduces further at the approach to the river crossing;
- The proposed construction of Ngonyama Road will include a complete road and a river crossing which will complete the missing link. The missing section of Ngonyama road measures approximately 4km in length;
- The Diepsloot Urban Development UDF) proposes three development nodes within the Ngonyama Road study area viz.; the Shopping Centre Node adjacent to the Ngonyama Road & William Nicol Drive intersection, The Quarry Site and Link Node;
- The Diepsloot Economic Activity Analysis assessed the existing economic conditions and trends and modelled the potential economic impact of the priority interventions which are proposed in the Diepsloot UDF. Of relevance to the study area is the is the proposal that economic development in Diepsloot should focus on the Shopping Centre Node.
- The CoJ proposed an SPTN link connecting the Diepsloot-Fourways-Randburg areas which will enable Diepsloot residents improved access to major employment centres within CoJ and an improved public transport network;
- The land uses along Ngonyama Road include schools, small business, informal traders and a shopping centre. These land uses generate significant pedestrian movement.
- Diepsloot is one of the major origins of minibus taxi passengers within the CoJ with high levels of informal minibus taxi ranks with more than 90% of minibus taxi bays being located informally
- There are currently no Metrobus routes within Diepsloot and Gauteng's commuter railway network does not extend to Diepsloot and metered taxi operations are non-existent;
- The K46 is planned as a dual carriageway which follows a north-south alignment east of the Diepsloot Township and Ngonyama Road will connect to the planned K46 (currently William Nicol Drive)
- Intersection traffic surveys conducted during the AM and PM peak periods showed that Diepsloot's internal road network was congested and this resulted in excessive delay throughout the road network. The major cause of the delays was attributed to illegal traffic operation of minibus taxis on the road network.
- The intersections were assessed in terms of current traffic operations and capacity;
    - The Ngonyama Road / William Nicol Drive intersection – The southbound (right-turning) movement on Ngonyama Road experiences long delays during the AM peak hour;
    - For the short-term it is proposed that the existing intersection Ngonyama Road/William Nicol Drive intersection is signalised, the intersection geometry is likely to change once the Gauteng Province upgrades William Nicol Drive to a dual carriageway.

- It is proposed that the Ngonyama Road/Ubuntu Road intersection be converted into a traffic circle to improve traffic flow and traffic safety. The traffic circle will act as a traffic calming tool.

- Ngonyama Road is classified as a Class U4A Commercial Collector. The required intersection spacing along Ngonyama Road is between 200m to 300m. This intersection spacing could not be achieved due the poor condition of the roads gaining access off Ngonyama Road (west of Ubuntu Road);
- The construction of the missing link of Ngonyama Road, west of Ubuntu Road, will allow access to all accesses off Ngonyama Road. Thus access management along this section of Ngonyama Road should be enforced upon the upgrade of the adjoining roads.
- The available road reserve width of 11 m to 15.7 m does not meet typical road reserve width of a ClassU4A road which ranges between 20 m to 40 m. This is due to the encroachment on the road reserve by residents of Ngonyama Road.
- Ngonyama Road is proposed as a single carriageway with a cross-section which includes a 3m road lane width, a 2m sidewalk on both sides of the road and a 2m cycle path
- Pedestrian surveys show that there is existing pedestrian demand over the existing river crossing which is located within the missing link of Ngonyama Road.
- The upgrading of the missing link of Ngonyama Road will include the construction of a bridge and the bridge should allow for safe movement of pedestrians and also provide buffers to protect pedestrians from vehicular traffic
- The Diepsloot UDF proposes intermodal transport interchanges adjacent to the Shopping Centre and link nodes, the investigation into the sizing of the intermodal transport interchanges was not part of the scope of this project;
- In order to promote the use of public transport, public transport stops should not be placed more than 300m part
- The acceptable configuration of public transport operators along Ngonyama Road should be discussed between public transport operators, local authority and the JMPD to obtain consensus on the most suitable location and the preferred public transport stop configuration.

Based on the findings of this TIS, it is recommended that the missing link of Ngonyama Road be implemented with the provision that the proposed road upgrading measures are implemented.

14. References

The following references have been used in the compilation of this report.

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