

APPENDIX 2:

**NATIONAL ROUTE 2:
CONCEPT PLANNING REPORT**

MOUNT RUTH NODAL PRECINCT

MOUNT RUTH NATIONAL ROUTE N2 INTERCHANGE: CONCEPT PLANNING REPORT

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1. INTRODUCTION

1.1 Background

Stewart Scott International has been appointed by Buffalo City Municipality to undertake, amongst other tasks, the assessment and planning of the transport facilities for the Mount Ruth Nodal Precinct project.

Mount Ruth is located at Mdantsane, close to the N2 freeway between King William's Town and East London. The project is part of the Mdantsane Urban Renewal Programme. The aim of the Mount Ruth project is the development of a mixed land use node in a comprehensive and integrated manner, utilizing the public transportation accessibility provided by the Mount Ruth Railway Station and the proximity to the N2 national road.

This report covers the feasibility of providing an interchange on National Route 2 to serve the Mount Ruth Node, in the context of the overall transportation planning for the project. A brief description of the traffic surveys conducted to date is presented, followed by a discussion in respect of the interchange.

1.2 Scope of Work

The scope of work consists of the following tasks under Phase 1A – Transportation from the Terms of Reference.

1.2.1 National Route N2 Interchange at Mount Ruth

- Assessment of the physical feasibility of the proposed interchange in terms of geometry and traffic operations as well as impact on existing infrastructure;
- Assess viability of the interchange in terms of potential usage and impact thereof;
- Liaison with SANRAL;
- Alternatives and additional considerations.

1.2.2 Transport Systems at Mount Ruth Development Node

- Assessment of the future public transport operations to stations under full development of the rail between Berlin and East London as per the Public Transport Plan (PTP) with buses and taxis operating as feeders from Highway taxi rank and elsewhere;
- Assessment of taxi operations in terms of future projections for full development of the rail system as per the PTP, with the consideration for the implementation of a pilot bus service to the station;
- Assessment of accessibility to Mount Ruth Nodal Precinct as well as safety issues related to pedestrians and non-motorised transport from within the study area;
- Conducting rail passenger interview surveys to obtain origin and destination information;
- Establishment of pedestrian and non-motorised transport desire lines.

2. CORDON SURVEY

2.1 Outline of Procedure

With reference to the appended layout plan, observers were stationed at the major intersections used by traffic entering and exiting the Development Node, including the closest existing interchanges on the N2. These are :

- the Nahoon Dam N2 Interchange, east of Mount Ruth ;
- the Fort Jackson N2 Interchange, west of Mount Ruth ;
- Voortrekker Road (R102) and Billie Road intersection ;
- Voortrekker Road (R102) and Newlands Road intersection.

The observers recorded the registration numbers and the vehicle type (light, taxi, bus or heavy) at five minute intervals during two hour morning and evening periods. The time periods were 06:00 to 08:00 and 16:00 to 18:00 respectively. However, only the peak hour traffic volumes (07:00 to 08:00 and 16:00 to 17:00) have been considered in the analysis

From the survey, potential usage of the Interchange could be determined by comparing vehicles recorded at the two intersections (Billie Road and Newlands Road) with the vehicles recorded at the two on or off-ramps (Fort Jackson & Nahoon Dam interchanges).

2.2 Results

The results of the above investigations are included in Appendix A. The significance of this survey is that the traffic utilising the N2 amounts to approximately 18 percent of the outbound morning traffic leaving Billie and Newlands Roads. It could be mentioned the same for the inbound evening traffic entering these roads from the N2.

The results indicate that the bulk of the existing peak hour traffic through the proposed development node is en route to or from the N2. The rest is actually trips within the two intersections. The provision of an additional interchange at Mount Ruth would therefore alleviate congestion at the node and would not have a significant impact on current traffic volumes on the national road.

In addition, the travel time delays, *inter alia*, arising from vehicles accessing the N2 at Fort Jackson and Nahoon Dam interchanges could be used in an economic analysis as justification for a new interchange.

Data from the cordon survey is tabulated overleaf.

The distribution of the peak hour traffic leaving at the 4 survey stations is shown in Table 1.

Table 1: Distribution of AM Peak hour traffic from cordon survey (percentage)

ORIGIN	DESTINATION	
	N2 – Fort Jackson off-ramp (to King William's Town)	N2 - Nahoon off-ramp (to East London)
Billie Road (from Mdantsane)	0,0%	22,5%
From Newlands Road	2,2%	4,4%

3. POLICIES AND PROCEDURES

This section refers the basic policies and procedures, as outlined by SANRAL, to be followed when planning a new interchange. These are mentioned in the report for reference and awareness purposes.

3.1 Planning Policy

The South African National Roads Agency Limited (SANRAL) has developed *Policy in Respect of Road Planning And Design (January 2003)* which should be adhered to in the planning of the National Route 2 interchange.

In terms of the SANRAL's *Geometric Design Guidelines*, rural interchanges are typically spaced at distances of eight kilometres apart or more. However, for urban environment a spacing of less than eight kilometres is acceptable. The spacing is also influenced by some other factors, including the developed urban environment which will be served by the interchange.

There are a number of controls guiding the selection of the most appropriate interchange. These include the following:

- Safety;
- Adjacent land use;
- Design speed of both the freeway and the intersecting road;
- Traffic volumes of the through and turning movements;
- Traffic composition;
- Number of required legs;
- Road reserve and spatial requirements;
- Topography;
- Service to adjacent communities;
- Economics.

Some of these factors are covered either as advantages or disadvantages under Sections 5 and 6 of this Report.

In accordance with the Policy, approval for new accesses will only be considered when SANRAL's requirements are met and properly motivated. Once approval in principle has been granted, final approval will only be granted once the design satisfies the requirements set out in the SANRAL Geometric Design Guidelines.

3.2 Environmental and Planning Procedures

The South African National Roads Agency Limited (SANRAL) has developed *Procedures For The Road Planning And Geometric Design (January 2003)* which should be adhered to in the planning of the National Route 2 interchange.

Environmental procedures are outlined in the document. In applying for the new interchange to the relevant Authorities, the following extract from the procedures should at least be covered in the application report from the requesting Authority:

- *The need for the access taking into account existing accesses and capacity constraints of possible future adjoining accesses;*
- *Land use and trip generation scenarios;*
- *Traffic flow conditions on the National Road resulting from the new access;*

- *Geometric layouts, including sight distances and cross sections for all the elements of the proposed new access;*
- *Signage and possible restrictions, if any;*
- *Environmental and social impact on traffic patterns in residential streets;*
- *Noise and air pollution;*
- *Financial analysis for the different elements of the proposed access, including proposals regarding cost responsibilities.*

It is clear that a full Environmental Impact Assessment, Traffic Impact Assessment and an Economic Analysis will be required in order to motivate for the provision of a new interchange at Mount Ruth.

3.3 Initial SANRAL Comments

During initial discussions, SANRAL expressed general reservations with regard to additional interchanges on national roads. The chief concern is that municipalities are tempted to take the easy option in transport planning by dumping commuter traffic onto national roads. The effectiveness of the national road network is then compromised.

At Mount Ruth, however, there are a number of arguments which can be made in favour on an interchange. Broadly speaking, these relate to the origin and destination of existing traffic, road user safety (pedestrians in particular), and multi-nodal transport planning. The issues are discussed in greater detail in the subsequent sections of this Report.

4. EXISTING INFRASTRUCTURE

From Mount Ruth station, the closest access points to the N2 are the existing diamond interchanges at Fort Jackson and at Nahoon Dam. The Fort Jackson Interchange is situated approximately 5.2 km west of the Mount Ruth Node, while the Nahoon Dam Interchange is approximately 3.8 km to the east.

The above two interchanges can be accessed via the provincial main road R102 which runs parallel to the national route. Between Fort Jackson and Nahoon Dam, there are two main intersections onto the R102, namely the Billie Road and Newlands Road intersections. Both are in close proximity to the Mount Ruth station and neither have designated auxiliary lanes.

There is reportedly a high accident rate at the intersections. In addition, a high number of pedestrians access the station from the Newlands area, which is to the north of the railway line and the N2. The number of pedestrians is one of the prime safety issues associated with the current situation and indeed with the proposed development.

The R102 is basically a two lane single carriageway road with surfaced shoulders approximately 1.5 m wide. It is fairly heavily trafficked and the level of service is probably sub-standard for the current volumes. There are no formal bus bays or taxi stops. Vehicles were noted stopping on the surfaced carriageway to drop off or pick up passengers.

The lack of a pedestrian sidewalk means that people walk on the carriageway.

The road surface is reasonably sound with occasional cracking and potholing. Deformations and edge break were noted in places. Although a detailed visual assessment has not been carried out, it would appear that rehabilitation measures and a reseal are required.

Similar comments to the above are applicable to some parts of Billie Road and many of Newlands Road arterials where occasional resealing of potholes is evident.

With regard to the R102, if no interchange was provided at Mount Ruth, then the provincial road would probably have to be widened to a dual carriageway status in order to adequately serve the development.

5. INTERCHANGE OPTIONS

5.1 Benefits of Interchange

As noted in Section 3.3 of this Report, an interchange on the N2 at Mount Ruth can be justified for a number of reasons. The main benefits of an interchange can be summarised as follows :

- the interchange will reduce travel times for existing traffic using the N2 from the Mount Ruth and Newlands areas.
- traffic from Newlands wanting to access the N2 would not have to travel through the development node, thus relieving some congestion and conflict at the Newlands / R102 intersection.
- by removing through traffic, an interchange will facilitate transport planning within the development node.
- access to a hospital and a teachers training college would be improved.
- access between urban Mdantsane and peri-urban Newlands would be improved.

It should be noted that without an interchange, consideration will have to be given not only rehabilitation of the R102, but also to improving the level of service. Upgrading to a dual carriageway road would possibly be necessary.

5.2 Location of Interchange

5.2.1 Newlands Road

At first glance, it may seem obvious to construct an interchange that would utilise the existing bridge where the freeway crosses Newlands Road. However, this option would result in longer distance traffic using the existing Newlands / R102 intersection. In fact, right-turn movements at the intersection could actually increase. All traffic to Newlands and Mdantsane would also be passing through the node.

In addition, the construction of an interchange at the existing Newlands Road would encroach on a significant portion of the land available for development. The loss of any land would be detrimental to the development.

It is considered that an interchange at the existing Newlands Road bridge would not be in the overall interest of the nodal development in terms of traffic flow and the creation of a safe residential and commercial environment.

5.2.2 Billie Road(1)

An alternative scheme would be to provide an interchange on an extension of Billie Road. Whereas this would require the construction of a road bridge across the freeway and the relocation of a portion of Newlands road, there are many benefits in terms of traffic management in the development.

In particular, through traffic is completely separated from local traffic wanting to access the station, the commercial and the residential areas. In general, the environment will be enhanced and pedestrians will be more easily accommodated.

A further advantage is that traffic using the existing Billie Road / R102 intersection would be reduced. In fact, it may be possible to close the intersection altogether, depending on the internal road layout of the nodal development. The only access to the R102 would be at Newlands Road.

5.2.3 Billie Road(2)

A third alternative interchange, termed Parclo AB by the SANRAL guidelines, has similar characteristics to the above option but with additional advantages. It involves the relocation of the R102 / Newlands intersection together with the re-alignment of a portion of the R102. This will have an advantage of creating an integrated inter-modal public transport facility by the location of the proposed taxi/bus terminal close to the Mount Ruth railway station.

The significance of this alternative is the minimisation of conflict between pedestrians and traffic. Pedestrians will have a direct route from the station to the taxi/bus facility without the need for crossing the road. Traffic safety at the new intersection will also be improved by the introduction of a traffic circle.

On a longer term, a direct route from the Mdantsane Highway taxi rank to the development could be created by the extension of Toyana Road over the rail (east of the station) to the R102 Road which could further be extended by a pedestrian bridge over the N2 to accommodate pedestrians.

5.2.4 Other Locations

There are a wide variety of possible locations for an interchange in the vicinity of Mount Ruth. However, any other location would mean significant changes and relocation of existing roads. Newlands Road is a particular concern, as the further it moves from its current location, then the greater the length to be reconstructed with a corresponding increase in cost.

5.3 Additional Considerations

As noted above, without an interchange consideration will have to be given not only rehabilitation of the R102, but also to improving the level of service. Upgrading to a dual carriageway road would possibly be necessary.

However, some improvements to the R102 will still be necessary even with an interchange. The lack of pedestrian sidewalks and stops for public transport are serious concerns. The accommodation of pedestrians via overpasses or underpasses will require due consideration in the detailed planning of the development.

Consideration should also be given to the traffic flow at the station entrances. The provision of large roundabouts (traffic circles) is an effective solution used in other countries. There are many examples of pedestrian underpasses surfacing in the centre of a roundabout, allowing people to proceed in any direction without actually crossing a roadway.

Whereas this report has dealt with the N2 interchange, there are further road access issues to be considered. For example, a direct link from Billie Road to the southern station entrance will be required. These issues will be covered in a separate transport planning report under Phase 1A of the project.

Finally, a new interchange at Mount Ruth could be incorporated into long term transport planning for the greater Buffalo City area. In particular, it could be utilised for a future road linking the West Bank at East London to Potsdam.

6. ALTERNATIVE LAYOUTS

The alternative layouts described in Section 5.2 above are shown in Appendix B as Layout 1 – Newlands Road and Layout 2 – Billie Road respectively. The Newlands Road alternative produces a diamond shaped interchange. For the Billie Road option, a partial clover layout is preferred as this will reduce the impact on the land available for development.

Some of the advantages and disadvantages of the two layouts are summarised below:

Layout 1 – Newlands Road

Advantages :

- Limited effect on existing infrastructure and dwellings ;
- Makes use of existing freeway bridge ;
- Relatively economical – rough order of cost between R 10.0 and R 14.0 million.

Disadvantages :

- Encroaches on land available for development ;
- All traffic has to pass through the development node ;
- Potential bottleneck on the R102 and Newlands Road intersection ;
- Dangerous Billie Road / R102 intersection remains ;
- Major arterial intersection located on or close to a potential public transport transfer terminal, increasing risk of conflict ;
- Increased risk of conflict with pedestrians due to increased vehicle traffic on R102.

Layout 2 – Billie Road (1)

Advantages :

- Creates a direct link between Newlands and Mdantsane as Billie Road will flow into Newlands Road ;
- No adverse potential conflict with the proposed Mount Ruth Development ;
- Through traffic is eliminated from the development ;
- Existing Billie Road / R102 intersection could be eliminated ;
- Less development land required for construction of interchange.

Disadvantages :

- Greater impact on existing dwellings north of the freeway ;
- New structure require across the N2 freeway ;
- Extension of Billie Road and relocation of Newlands Road required ;
- More expensive – rough order of cost between R 15.0 and R 23.0 million.

Layout 3 – Billie Road (2)***Advantages :***

- Creates a direct link between Newlands and Mdantsane as Billie Road will flow into Newlands Road ;
- No adverse potential conflict with the proposed Mount Ruth Development ;
- Through traffic is eliminated from the development ;
- Less development land required for construction of interchange ;
- Integrated multi-modal public transport facility ;
- Minimised vehicle / pedestrian conflict ;
- Improved road safety ;
- Long term direct access south of the station.

Disadvantages :

- Greater impact on existing dwellings north of the freeway ;
- New structure require across the N2 freeway ;
- Extension of Billie Road and relocation of Newlands Road required ;
- More expensive – rough order of cost between R 20.0 and R 28.0 million.

The Billie Road (2) option is preferred as it best supports the ideals inherent in the multi – land use nodal development.

7. CONCLUSIONS

In conclusion, the provision of a new interchange at Mount Ruth would be of considerable benefit to the traffic planning and engineering associated with the development node.

The preferred location for the interchange is on an extension of Billie Road (Layout 3). A new bridge over the N2 freeway and the relocation of a portion of Newlands Road is required.

The cost of the preferred option is likely to range between R 20.0 and R 28.0 million. The wide range is due to uncertainty in the extent and nature of earthworks required and in the founding conditions for the structures.

Failure to provide an interchange would result in severe traffic problems within the development node. The upgrading of the R102 between the Fort Jackson and Nahoon Dam interchanges, a distance of 9.0 km, would probably be required. However, a short term approach would be the realignment of the R102, a distance of approximately 1,5km which is within the development node.

The cost of upgrading the R102 to a dual carriageway could be as expensive as an interchange.

The national roads agency SANRAL may raise concerns regarding the construction of additional interchanges on a national road. However, with the correct motivation backed by detailed investigations, any concerns can be allayed.

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