

# REPORT

## **The Mount Edgecombe Partial Interchange and Link Road at km 8,0 on Main Road 2, Section 1: Design Report**

Client: KwaZulu Natal Department of Transport

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## 1 Introduction

### 1.1 Background

The existing Main Road 2/1 is a single carriageway arterial road which commences at the Duff's Road Interchange at Main Road 25 (P93), viz. Kwa Mashu Highway, and ends at the Umdloti River Bridge in Verulam. The proposal by the Province of Kwazulu-Natal Department of Transport is to upgrade Main Road 2/1 by constructing a grade separation at the Phoenix Highway intersection and constructing a new partial directional interchange bypassing the existing Mount Edgecombe Interchange together with a link road to Main Road 79. This interchange will provide continuity and free-flow on Main Road 2/1 and forms part of the overall upgrading of the R102 corridor to the new King Shaka International Airport.

There are two grade separations and one underpass on this portion of Main Road 2/1. The first grade separation is at the existing Phoenix Highway intersection which is to be upgraded with additional turning lanes where required. This signalised grade separated interchange will tie in with the proposed cross-section for the future upgrading to 4 lanes of Main Road 2 South of this interchange through Mount Edgecombe and will allow free-flow for the Go Durban Bus Rapid Transit corridor which is to be constructed along the Phoenix Highway. The Mt Edgecombe Grade Separation is a new bridge required to form part of the proposed Mt Edgecombe partial interchange, which will provide a link from the future south bound carriageway of the R102 from Verulam, over the M41, en route to Mt Edgecombe and Durban. This grade separation is located at km 0,800 on the Southbound Offramp of the partial interchange. The underpass will form part of the Main Road 79 link to Main Road 2/1.

No major cross-drainage structures are required on this portion of Main Road 2/1, and all cross drainage is classified as minor and will be accommodated using standard pipe culverts.

### 1.2 Site Locality and Description

Figure 1 shows the locality plan for the upgrade of Provincial Road Main Road 2/1.

The portion of Main Road 2/1 under consideration is located in the Mount Edgecombe / Phoenix area North of Durban. The partial interchange commences just south of the Phoenix Highway intersection and terminates at the Trenance overpass. These limits of construction are 1,8 km apart.

## 2 Objective

The primary objective of this report is to communicate the proposed design for the Mt Edgecombe Partial Interchange and the associated structures. As such, secondary objectives include:

- Detailing the design determinants.
- Outlining alternatives to be considered and propose the design and structures which have been identified as the most suitable.
- Making recommendations based on the conclusions drawn.

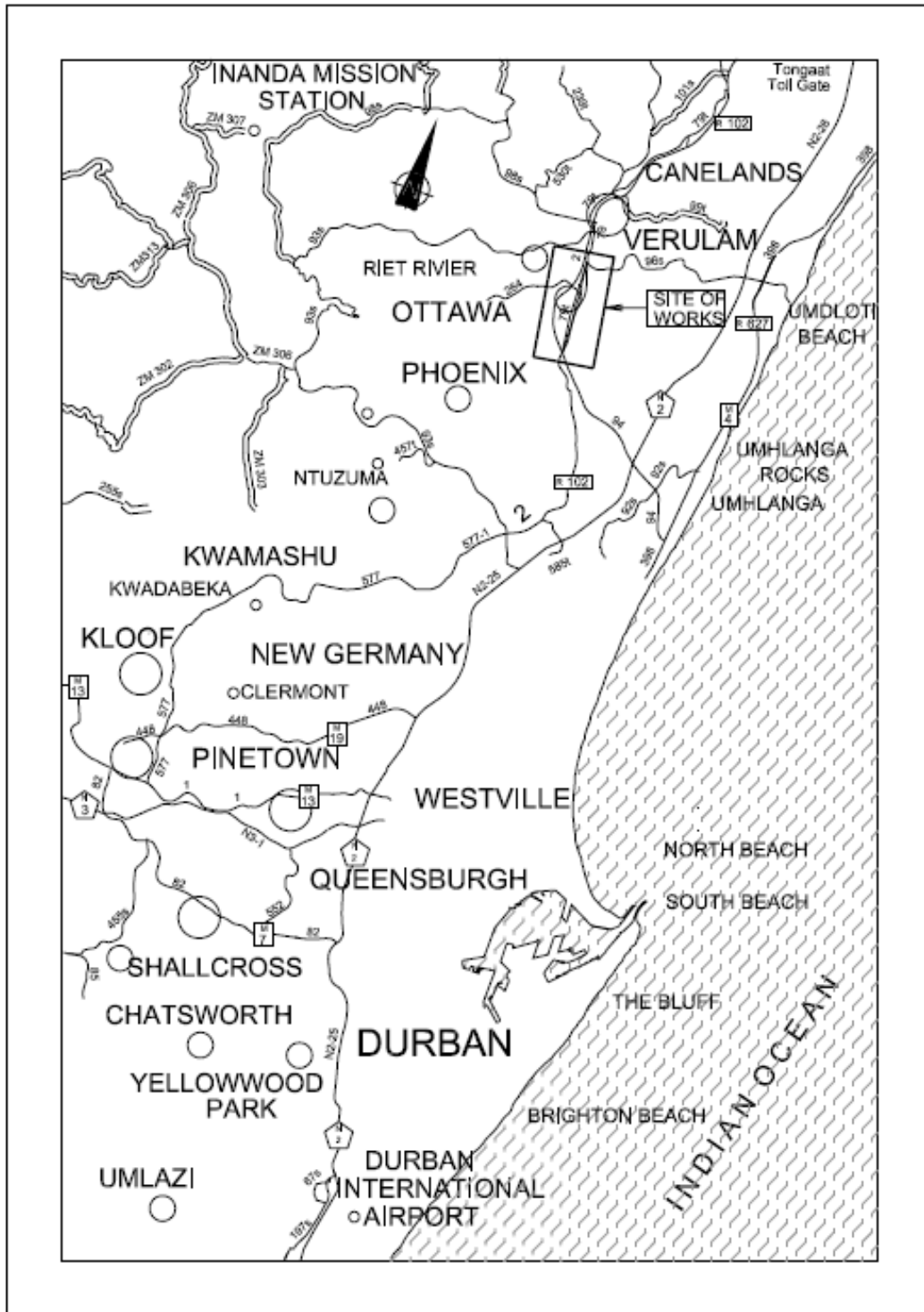


Figure 1: Locality Plan

### 3 Road Design

#### 3.1 Geometry

It has been proposed that roads in KwaZulu-Natal are classified using TRH 26: South African Road Classification and Access Management Manual produced by the Committee of Transport Officials (COTO). The following defined in the following schedule:-

Urban Classes	
U1	Urban principal arterial
U2	Urban major arterial
U3	Urban minor arterial
U4	Urban collector street
U5	Urban local street
U6	Urban walkway

It is proposed that this section of Main Road 2/1 be classified as a Class U2 Major Arterial. The route will be designed accordingly for a design speed of 80km/h. In order to remain within the minimum and maximum grade requirements a considerable volume of earthworks will be required.

The following horizontal alignment design criteria are proposed, determined from the SANRAL Geometric Design Guideline:-

- Minimum curve radius = 230 m (80 km/hr)
- Minimum length of curve = 150 m desired

The following vertical alignment design criteria are proposed, determined from the SANRAL Geometric Design Guideline:-

- Minimum k-value (crest) = 30 (80 km/hr)
- Minimum k-value (sag) = 30 (80 km/hr)
- Object height = 0.6m
- Maximum grade = 8%

The maximum superelevation rate of 8% was used for the Partial interchange.

#### 3.2 Typical Cross Sections

The Main Road 2/1 will be a dual carriageway with two through lanes, a raised median island, 1.50 m slow shoulders and turning lanes as required at the Phoenix Highway Interchange. There will be pedestrian sidewalks protected by guardrails on both sides of Main Road 2/1 up to the MR79 link. The partial interchange offramp will have two lanes exiting the M41 and the onramp will be a single lane.

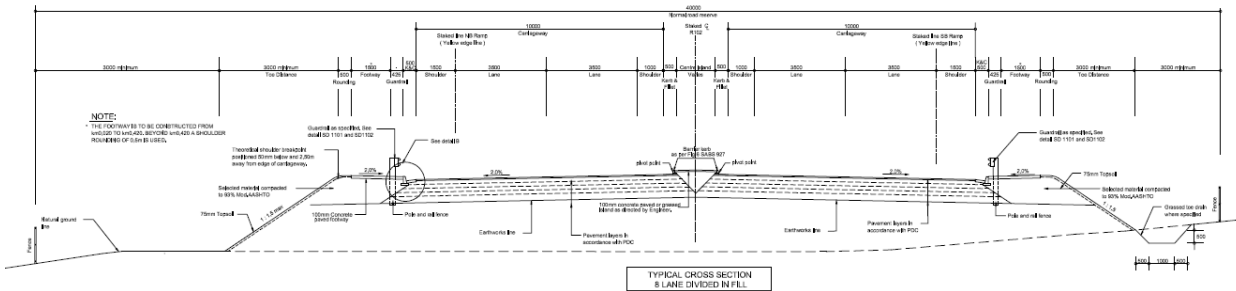


Figure 2: Proposed typical road cross section

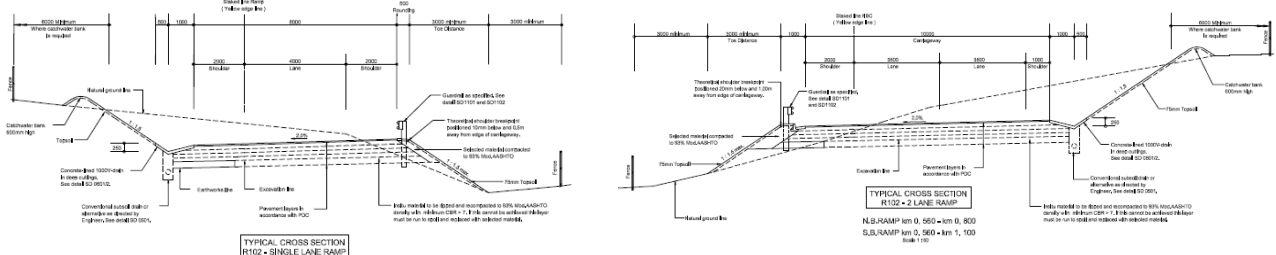


Figure 3: Proposed typical ramp cross section

### 3.3 Drainage

It is proposed that formal drainage will be constructed in accordance with the typical cross sections, consisting of concrete-lined v-drains through the cuts and concrete pipe culverts (with headwalls and apron slabs) where necessary.

### 3.4 Pavement

No pavement layers currently exist for the majority of the length of the proposed route as the section of Main Road 2/1 on the existing alignment is to be lifted to the grade separation at the Phoenix Highway. It is proposed that the pavement design consist of the following:

- 20mm Ultra thin friction course
- 30mm Asphalt surfacing
- 150mm G1 Base
- 250mm C3 Subbase
- 150mm G7 Upper selected layer
- 150mm G9 Lower selected layer
- 250mm G10 Gravel subgrade

### 3.5 Retaining Walls

The portion of Main Road 2/1 located south of the Phoenix Highway is in a well developed area and as such several retaining walls will be required to restrict the construction to the current road reserve, to avoid unnecessary land acquisition or expropriation.

### 3.6 Geotechnical Investigation

A geotechnical investigation has been carried out on the site, including both test pits and several boreholes for the structures and the larger cut and fills. The results of this investigation have been used in

both the structural design and the cut and fill bank slopes. The need for additional geotechnical investigation shall be identified during the detailed design process.

### **3.7 Other services**

According to the available records there are currently water, Telkom and Eskom services in the vicinity of Main Road 2/1.

### **3.8 Guardrails**

There are existing sections of guardrail currently on this portion of Main Road 2/1. Guardrails will need to be constructed according to the typical cross sections and in accordance with the KZN Department of Transport Standard Detail Drawing SD 1101/B.

### **3.9 Road Signage and Markings**

The road signage will be carried out in accordance with the latest edition of the South African Road Traffic Signs Manual (SARTSM) and comply with the latest editions of the Southern African Development Community (SADC) Road Traffic Signs Manual.

All road markings will comply with the latest edition of the South African Road Traffic Signs Manual (SARTSM).

### **3.10 Access Management**

Mobility on the road is adversely impacted by the number and spacing of intersections and accesses on it. According to TRH26, a Class 2 Road should have accesses with at least 800 m spacings ( $\pm 15\%$ ). This spacing is based on an 80 km/h design speed. The P79 link road is approximately 300m from the Phoenix Highway Grade Separation; however this link does not make any allowance for crossing manoeuvres which would impede traffic flow.

### **3.11 Bus Bays and Pedestrian Walkways**

The location of formalised bus and taxi bays could be considered under this project if so required. These will be according to drawing SD 0305/C, from the Province of KwaZulu Natal, Department of Transport, Standard Details.

The position of pedestrian walkways has been considered and included in this design. The recommended design speed of 80km/hr for Main Road 2/1 represents a risk to the significant number of pedestrians travelling along the road edge, therefore necessitating the need for walkways protected by guardrails along the length of Main Road 2/1.

### **3.12 Accommodation of Traffic during Construction**

Maintaining a safe flow of traffic during construction is to be carefully planned and executed. Although detours may be considered, specifically for the construction of the Phoenix Highway Grade Separation, construction will predominantly be done by means of half width construction for the existing Main Road 2/1.

The layout of construction areas, detours and temporary construction signage is to be in accordance with the latest South African Road Traffic Signs Manual (SARTSM). The establishment of areas for contractor operations is necessary to minimize the impact on safety of both motorist and worker.



## **4 Alternatives Considered**

### **4.1 Road Alignment**

As part of the Go Durban IRPTN the ETA has plans to upgrade the Mt Edgecombe interchange as part of the Cornubia development. The proximity and configuration of this interchange does not make provision for a northbound onramp and a southbound off-ramp for Main Road 2/1 and the M41 and as such it was decided to continue the Main Road 2/1 through the vacant lot between the M41 and the current P79 and intersect before the Trenance overpass. A previous design was done which included an at-grade intersection with the Phoenix Highway, however due to the addition of the BRT lanes on the Phoenix Highway, a grade separation was chosen in order to improve the overall flow of Main Road 2/1.

An at-grade intersection was considered for the P79 link from Main Road 2/1; however the intersection spacing to the Phoenix Highway is insufficient so an underpass was decided upon. An auxiliary lane has been included for the M79 onramp onto Main Road 2/1 to allow enough space for the vehicles to weave before the Phoenix Highway.

### **4.2 Structures**

The Mt Edgecombe Partial Interchange Grade Separation was designed previously and is a two-span cast-in-situ prestressed concrete structure.

The Phoenix Highway Grade Separation considered two options, namely a single span and a two span option. Due to the width of Main Road 2/1 as well as the ultimate width of the Phoenix Highway once the BRT lanes have been included, it was decided that a two span option would be preferred due to the reduced deck depth. The underpass structure is to be a single span culvert type structure due to the varying depth of the ramp fills.

## **5 References**

The Geometric Design Guidelines. (SANRAL)  
TRH 26, South African Road Classification and Access Management Manual. (2012)