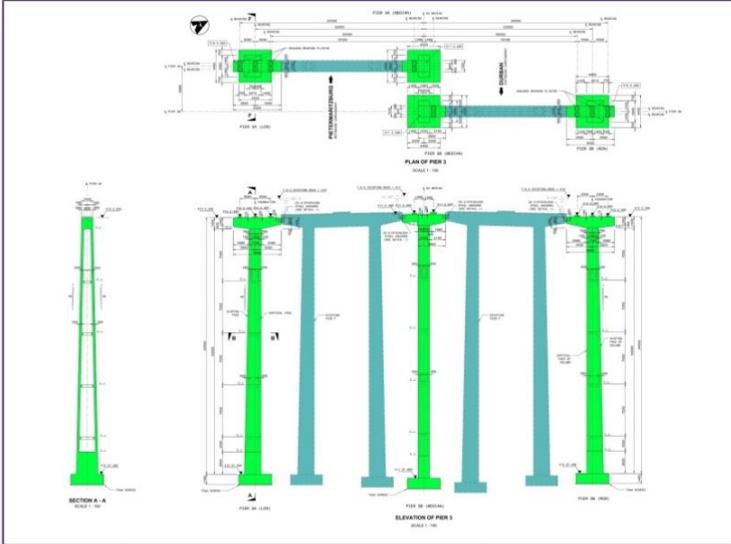


**CONTRACT: N.003-010-2017/2  
PARADISE VALLEY VIADUCT****Minutes of Meeting to Discuss Environmental Matters Relating to  
the Paradise Valley Viaduct on the N3 over the Paradise Valley  
Nature Reserve**

Held on Monday, 18 June 2018 at Paradise Valley Nature Reserve Hall

ITEM	DESCRIPTION	ACTION
1.	<b>WELCOME</b>	
	<p>The meeting was convened after an inspection of the site and Mr. Ravi Ronny welcomed all in attendance and gave a Brief Presentation of the upgrading on the N3 from eThekwini to Pietermaritzburg with specific reference to the N3 Section in the vicinity of Paradise Valley.</p> <p>He then introduced Mr. Dave Temple of SNA Civil and Structural Engineers (Pty) Ltd. to give a presentation of the Paradise Valley Viaduct on the N3 over the Nature Reserve.</p>	
2.	<b>ATTENDANCE</b>	
	<p><b>SANRAL Eastern Region</b></p> <ul style="list-style-type: none"><li>• Mr. Ravi Ronny</li><li>• Mr. Ridwaan Mahomed</li></ul> <p><b>eThekwini Nature Reserve</b></p> <ul style="list-style-type: none"><li>• Mr. Terry Stewart</li><li>• Mr. Greg Mullins (eThekwini Environmental)</li></ul> <p><b>Consulting Engineer: SNA</b></p> <ul style="list-style-type: none"><li>• Mr. Dave Temple</li><li>• Mr. Ken Malcomson</li><li>• Mr. Andrew Leibnitz</li></ul> <p><b>ACER Africa</b></p> <ul style="list-style-type: none"><li>• Ms. Ashleigh Mckenzie (Apology)</li><li>• Mr. Giles Churchill</li></ul>	

<b>3.</b>	<b>PARADISE VALLEY VIADUCT OVER THE UMBILO RIVER</b>	
<b>3.1</b>	<p><b>INTRODUCTION</b></p> <ul style="list-style-type: none"> <li>• The existing Bridge consists of 8 Spans approximately 33m in length supported by 2 Piers at each support and a Trestle Beam supporting the Super Structure of Precast Beams and Slabs.</li> <li>• The proposed widening of the Bridge is carried out by adding one additional Pier to the outside and the inside of each Bridge.</li> <li>• The Median opening between the two Bridges is closed and a back to back F-Shape New Jersey Barrier forms the separation between the two decks.</li> <li>• In total the Bridge is widened to almost double its existing width to accommodate the extra Lanes required for the N3 at this position.</li> <li>• The new Piers are designed to replicate the shape and height of the existing ones and the Trestle Beams are also similar.</li> <li>• The Deck Construction is carried out using Precast Beams with cast in-situ slabs minimising the effect of construction over Paradise Valley.</li> </ul>	
<b>3.2</b>	<p><b>WORK WITHIN SANRAL ROAD RESERVE</b></p> <ul style="list-style-type: none"> <li>• Apart from the access to the Bridge for the Contractor and his Site Office / Camp Site, the Construction of the Bridge is completely within the SANRAL Road Reserve.</li> <li>• The deck construction as previously stated, is carried out using Precast Beams launched from one end with cast in-situ slabs minimising the effect of construction over Paradise Valley.</li> <li>• Effectively the major work of the Construction of the Sub Structures within the Road Reserve will be the Foundations and the Piers which can be carried out with minimum disruption to the Reserve.</li> </ul>	
<b>3.3</b>	<p><b>EXISTING AND WIDENED BRIDGE</b></p> <ul style="list-style-type: none"> <li>• As stated above, the existing Bridge Sub-Structures are replicated to provide for an Aesthetic Solution for the Bridge.</li> <li>• The following drawing shows an elevation of the existing Piers and Trestle Beam with the new Piers and Trestle Beams on the sides and in the median.</li> </ul>  <p>The drawing consists of three main parts: a plan view at the top, a section view on the left, and a detailed elevation view at the bottom. The plan view, titled 'PLAN OF PIERS', shows the layout of the bridge piers and trestle beams, with existing structures in blue and new additions in green. The section view, titled 'SECTION A-A', shows the vertical profile of a pier. The elevation view, titled 'ELEVATION OF PIERS', shows the side view of the piers and trestle beams, with existing structures in blue and new additions in green. The drawing includes various dimensions, labels, and a north arrow.</p>	



**Piers in Water**



**Existing Bridges**



**Piers in Water**



**Piers downstream and Footbridge**

#### 3.4

#### EXISTING AND PROPOSED PIERS

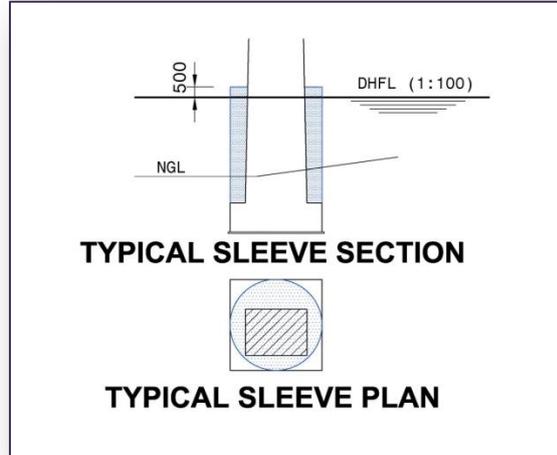
- **Existing Piers**  
Consist of 2 Rectangular Hollow Box Piers with Trestle Beam to Support Super Structure. Pier height 35,5m.
- **Proposed Piers**  
Consist of an Additional 2 Rectangular Hollow Box Piers with New Trestle Beams to Support the New Super Structure.

3.5

**ALTERNATIVE OF PIER CONSIDERED**

- **Alternative Round Piers**

These consist of the Rectangular Hollow Box Piers as above with Circular Jackets around the Lower Part of the Piers up to 500mm above the 1:100 Year Flood.



3.6

**HYDRAULIC CALCULATIONS FOR RECTANGULAR AND ROUND PIERS**

3.6.1

**EXISTING AND PROPOSED NEW PIERS**

- **Two Shapes of Piers were Investigated**
  - Rectangular to match existing
  - Rectangular to match existing with Round Jackets up to Flood level for the 5 piers in the water.
- **Hydraulic Considerations**
  - It was thought that the flow around circular piers would be more efficient and reduce debris build up.
  - Hydraulic calculations indicate that the Round Piers in fact dam up the water to a greater extent than the rectangular piers.
  - For a 1:100 year flood as indicated the:
    - DHFL without Piers = 248,78
    - DHFL with Rectangular Piers = 249,02
    - DHFL with Round Piers = 249,31
- The Rectangular Piers are approximately 45° to the flow and provide a cut water to the flow and have the smallest effect on the flow. Relative to the flow of water the piers have a diamond shape.
- Channelization around the Piers was considered but with the rocky nature of the river it is both difficult and unlikely to improve the flows and therefore not recommended to the meeting.
- SNA proposed a Debris Trap could be constructed up-stream of the Bridge using 300mm gum poles approximately 5m apart about 100m upstream of the Piers in an arc and debris collected and can be removed when required. Robust Indigenous Trees could also be planted to perform this function.
- We recommend that the circular columns are not constructed as they will not improve the flow regime under the Bridge. For Debris Control we recommend that a Debris Trap is constructed upstream as described above.

3.6.2	<p><b>PREFERRED SHAPE – RECTANGULAR</b></p> <p>The following was agreed to in the meeting:</p> <ul style="list-style-type: none"> <li>• Observed flood levels correspond well with the calculated flood levels.</li> <li>• <b>The square (diamond shaped) pier was accepted by the meeting as the optimal shape.</b></li> <li>• Concern about debris build up between piers rather than on a single pier. Effect of this to be investigated and reported on.</li> <li>• Increasing the depth of channel was rejected as it would require blasting. Suggested that possibly the western side of the channel be opened up to increase the stream bed width. This area is previously disturbed (clay). Existing foot paths will have to be realigned. SANRAL agreed that this could be done under their contract.</li> <li>• eThekweni requested that the impact of smaller floods (1 in 5 year, 1 in 10 year and 1 in 20 year) be investigated as well related to the possible channelization.</li> <li>• It was noted that flood events are becoming more frequent, as a result of the development of West Meade industrial area, located upstream.</li> <li>• The construction of an upstream debris trap was not accepted by eThekweni.</li> </ul>	<p>SNA</p> <p>SNA</p> <p>SNA</p>
3.7	<p><b>MITIGATION MEASURES TO ADDITIONAL PIERS IN RIVER</b></p> <p>SNA reported on the mitigation measures related to the additional piers in the 1:100 year flood level.</p> <ul style="list-style-type: none"> <li>• The design of the widening of the existing decks by means of extending the trestle beam of the existing pier supports was investigated.</li> <li>• This option would result in the strengthening of the existing trestle pier which was highly overstressed and was not feasible. The proposed design was finalised with the input of SANRAL's Bridge Network Manager to achieve a functional design which minimised the effect on the natural environment. This design incorporated the addition of an extra column on either side of the existing columns and the extension of the trestle beam.</li> <li>• The rectangular shape of the columns together with the skewness of the river crossing provides a cutwater to the pier columns (Diamond Shape).</li> <li>• A round column (Jacket) could be constructed around the pier columns to above the 1:100 flood line which may assist in reducing the risk of trapped debris during flood events. It has been proved that this does not have the desired effect related to the actual conditions on site. Refer to 3.6.1</li> <li>• All Foundations have been designed to be below the natural ground level to minimize the restriction of the waterway.</li> <li>• Proper maintenance of the upstream catchment will reduce the debris load of the stream.</li> </ul>	
4.	<p><b>CLOSING OFF CONSTRUCTION SITE TO PUBLIC</b></p>	
	<p>It was agreed that if managed properly the partial access to the Reserve downstream of the bridge could be attained.</p> <ul style="list-style-type: none"> <li>• Construction Duration: 12-15 Months in Stages</li> <li>• Access to the following in the Reserve was discussed: <ul style="list-style-type: none"> <li>- Hiking Trails</li> <li>- Public View Sites</li> </ul> </li> </ul>	



<b>7.</b>	<b>OTHER MATTERS</b>	
	<ul style="list-style-type: none"> <li>• eThekweni Nature Reserve requested that higher parapets be installed on the bridge as there is a history of items being thrown from the roadway into the valley (including bodies). SANRAL agreed to investigate options.</li> <li>• The extent of road reserve as per SANRAL's records were not agreed to by eThekweni (Terry Stewart). SNA / SANRAL will obtain the title deeds to clarify this.</li> </ul>	<p style="text-align: center;">SANRAL</p> <p style="text-align: center;">SNA</p>
<b>8.</b>	<b>CLOSURE</b>	
	<ul style="list-style-type: none"> <li>• The meeting was closed without further meetings being required until construction of the Bridge.</li> </ul>	