Phase 2 Cultural Heritage Documentation:

THE PROPOSED DEMOLISHING OF AN OLD CONCRETE ROAD BRIDGE ACROSS THE MBOKOTWANA RIVER, N2 NATIONAL ROAD, TSOLO, EASTERN CAPE PROVINCE

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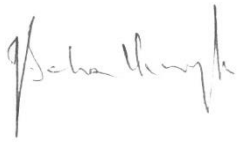

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December 2018

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1. INTRODUCTION

1.1 Background

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade a section of National Route N2, Section 19 between Nqadu (km 22,0) and Mzeke river (km 55,4) in the O R Tambo District Municipality of Eastern Cape Province.

During a Phase 1 heritage survey of the above-mentioned section of the road (Van Schalkwyk 2016), an old bridge was identified in close proximity of the current N2 road alignment. As the plan is to widen the road to accommodate an ever-increasing traffic volume, this structure would have to be demolished.

In accordance with the National Heritage Resource Act, an independent heritage consultant was appointed by Chameleon Environmental Consultants to document the identified bridge in anticipation of SAHRA giving permission for the demolishing of the bridge.

1.2 Technical summary

Heritage Resource	
Concrete road bridge	Mbokotwana River Bridge
Structures older than 60 years (NHRA, Section 34)	Places, buildings, structures and equipment of cultural interest

Property owner	SANRAL

Location	
Farm name	Xonkonxa 2
Magisterial district	Tsolo
District municipality	Mhlontlo
Topocadastral map	3128BD
Centre coordinate	S 31.28540; E 28.80991; Km reading: N2-19; 37,8E
Size of development footprint	Limited to the bridge feature

Significance of site/feature			
Generally Protected B	Grade IV-B	Low significance	Conservation by local authority. Site should be recorded before destruction. Destruction permit required from provincial heritage authority.

1.3 Statement of significance

The Mbokotwana River bridge is classified as a **two-span** bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by a single column (Fig. 1).

As no information could be obtained from any source on the construction of the bridge, the following approach was followed to determine its significance:

- A review of the technology and materials used in the construction of the bridge was done.
- The history of the development of this section of the N2 was reviewed in an effort to determine an approximate date for the construction of the bridge.
- The history of the larger region was reviewed to determine if any event of historical, cultural or political significance could be linked to any of the two bridges.
- A review was done of other bridges on the N2 and regional roads to determine how many such bridges are still in existence.

From the above information it was determined that this type of bridges do not exhibit any remarkable construction techniques, nor can it be linked to any event or person and that similar bridges are still to be found along many of the secondary roads.

The bridge has been evaluated to have Grade IVB significance and as such enjoy general protection under the Heritage Act (see **Addendum**, **Section 1**). Accordingly, it should be documented before it can be demolished, but only on condition of the PHRA/SAHRA issuing a permit for this.

Figure 1. Side view of the Mbokotwana River Bridge
(Eastern aspect)

1.3 Location

The bridge under discussion is located approximately 5,8 km northeast of the town of Tsolo in the Mhlontlo local district municipality of Eastern Cape Province (Fig. 2). It is located on the western side of the current N2 road at Km reading: N2-19; 37,8E, and falls inside the existing road reserve (Fig. 3).

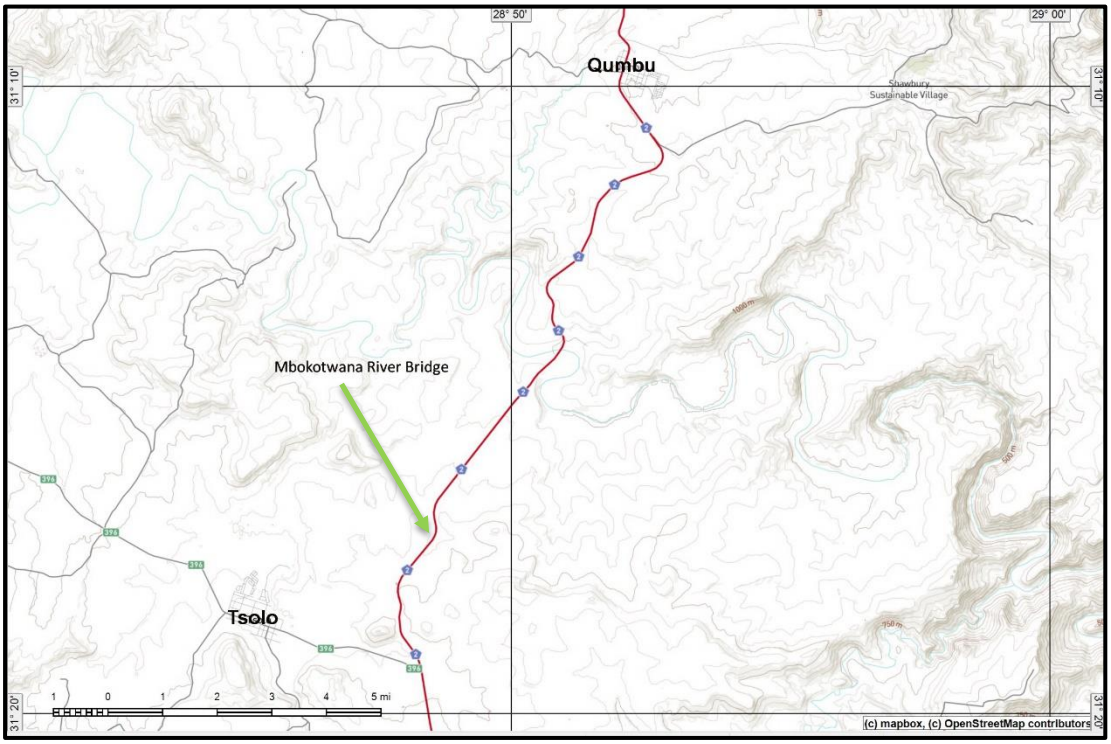

Figure 2. Location of the Mbokotwana River Bridge

Figure 3. The old bridge (arrowed) in relation to the current bridge
(Image: Google Earth)

2. STUDY APPROACH AND METHODOLOGY

2.1 Methodology

2.1.1 Previous experience
A number of different types of bridges were documented in full – see list of references in Section 10 below. This is in addition to more than 400 structures that have been documented at a basic level, all of which have been incorporated into a digital database.

2.1.2 Literature
Available literature, especially that of the US National Parks Services regarding documentation and conservation of bridges and other structures were studied.

2.1.3 *Field survey*
The bridge was documented over a period of two days, 13 to 14 August 2018. This involved taking relevant measurements and photographing the various technical aspects of the bridge.

3. HISTORY OF THE BRIDGE

From archival sources (see Section 6.1) it is clear that a number of bridges were built in the larger region starting during the latter half of the nineteenth century. Significantly, however, the rivers mention are the Tsitsa, Inxu, and Xoponkxa Rivers. From the descriptions, it seems that all these bridges are on roads linking Tsolo to Maclear or Tsolo to Qumbu, with no mention being made of a road or bridge across the Mbokotwana River.

One of the oldest maps of the region, showing the development of infrastructure in the region, such as roads and bridges, is the Imperial War Map dating to 1902 (Fig. 4). However, with reference to the road under discussion, this is very unspecific. One point of reference that is taken as approximately correct, is the Tsitsa River Bridge to the south of Qumbu.

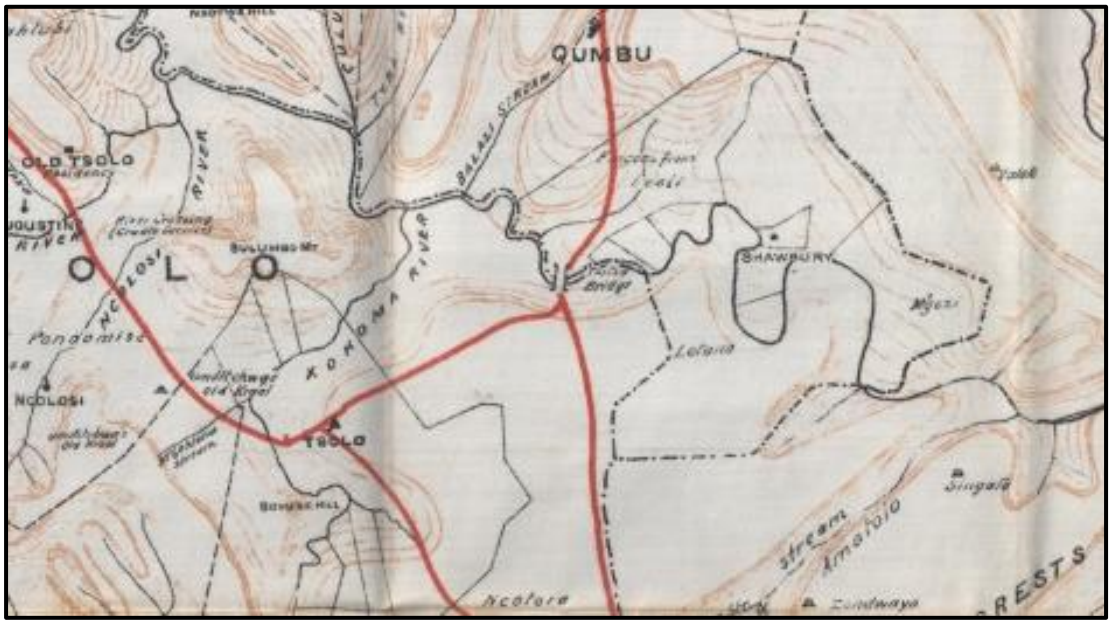

Figure 4. Imperial War Map of the region, dating to 1902

Figure 5. The 1:250 000 map showing the modern roads in relation to the Imperial War Map (above)

From the aerial photograph dating to 1948 (Fig. 6), the road can be seen to approximately follow the current alignment. From this it is deduced that, when the current N2 was constructed, the road alignment was adapted to bypass the old bridge. In all probability the old bridge was still used to carry traffic up to the completion of the new bridge.

The current alignment was probably completed during the 1970s, as this was a period when the National Roads (N roads) were developed over long distances in the country as a whole (Floor 1985) (Fig. 7).

On the 1982 version of the topographic map (Fig. 8), it can be seen that the N2 route follows the current alignment. The implication of this is that the old bridge was already defunct by then.

Figure 6. Aerial photograph of the relevant section the road and the bridge location, dating to 1948 (Photo: 207_031_12543)

Figure 7. Development of the National Freeways by 1972
(Floor 1985)

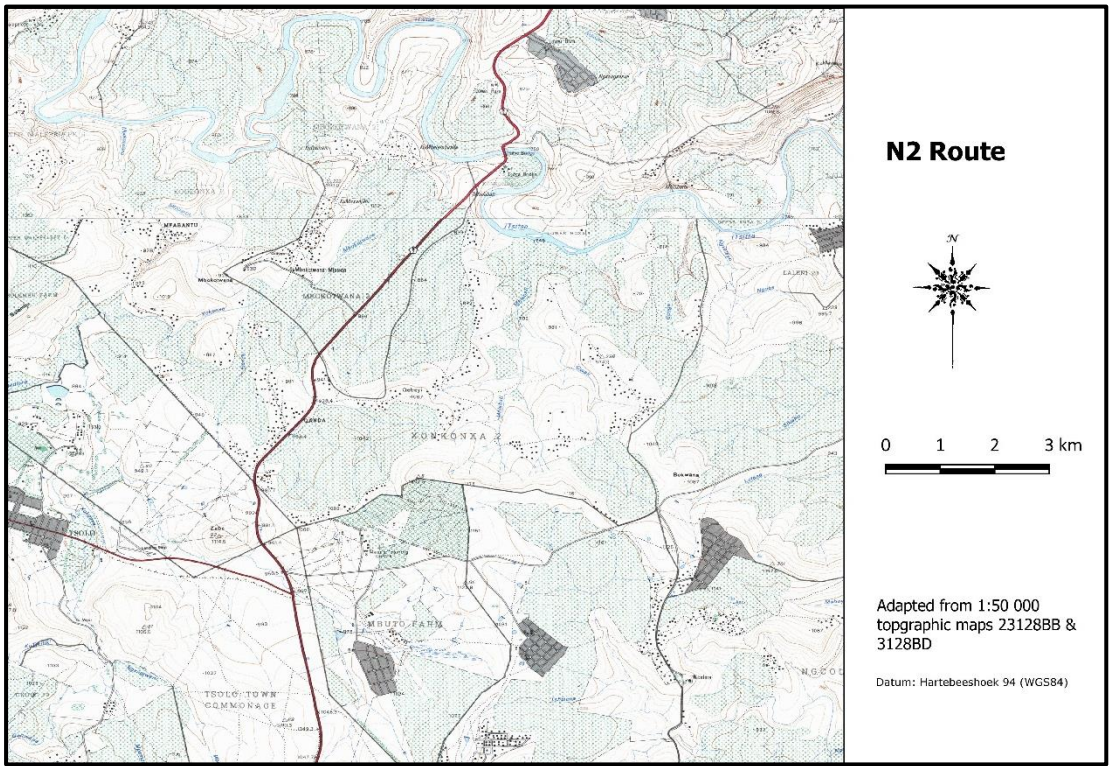

Figure 8. The alignment of the N2 as indicated on the 1982 version of the topographic map

4. TECHNICAL DETAIL

The Mbokotwana River bridge is classified as a **two-span** bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by a single column. It is constructed from re-enforced cast concrete.

It seems, statistically speaking, that this type of concrete bridge was mostly used for roads. Depending on the length of the obstacle that had to be spanned, any number of columns (vertical support structures) can be added (Fig. 9).

Figure 9. Examples of bridges of similar material and construction

5. DESCRIPTION OF THE BRIDGE

5.1 *Materials*

The material used in the construction of the bridge is cast concrete. The latter technique, although used to some extent prior to that, came into 'fashion' only during the Second World War as iron, and for that matter all metals, were declared a strategic resource. The use of iron was limited to the minimum and was only used for guide rails and other railings, as well as for reinforcing the concrete.

5.2 *Construction techniques*

The abutment walls were constructed by means of cast concrete. The bridge deck was constructed of similar material and in all probability reinforced with metal rods.

5.3 *Bridge elements*

The various elements making up the bridge will be discussed and illustrated in alphabetic order by first defining it, then describing it and lastly by illustrating it. For measurements, refer to the technical drawing in Figure 10 below.

Abutment Wall:

- Part of a structure which supports the end of a span or accepts the thrust of an arch; it often supports and retains the approach embankment.

This was constructed from cast concrete and rests on a foundation reaching down below water level. The foundation 'step out' from the abutment wall.

Abutment wingwall:

- Extensions of a retaining wall as part of an abutment; used to contain the fill of an approach embankment.

The wingwalls were constructed from concrete. In contrast to most bridges of this design, the wingwalls runs parallel to the road, not angling outwards.

Northwest corner

Southwest corner

Approach road:

- The road leading up to the bridge on both sides.

This is currently a dirt road, but presumable was tarmac in the past.

	

Bridge deck:

- The roadway portion of a bridge that supports the traffic.

This consists of a flat cast concrete superstructure and is commonly re-enforced with steel.

	

Columns:

- Vertical structure member used to support the load of the bridge deck.

A single column supports the bridge deck. It is from cast concrete and is set at a slight angle to the bridge deck in order to be parallel to the stream bed. Currently, this is used to house a pipeline, probably carrying water.

	

Deck floor:

- The top layer on which the traffic crosses.

This consists of a layer of re-enforced concrete. The concrete layer also served as part of the construction of the bridge deck.

Embankment:

- Angled grading of the ground, leading up to the bridge.

Due to the low level of the bridge as well as the steep, nearly perpendicular river banks, the latter was cut away to accommodate the bridge. In some cases, erosion started to take place, cutting away the soil. This was prevented by installing gabions.

Guide rail:

- A low railing alongside the outer edge of a bridge deck used to protect vehicles and pedestrians from going to close to the edge.

The guide rail is a raised platform of concrete, which, in this particular case also serves as a pedestrian walkway. It seems if the edge of the guide rail originally was strengthened with angle iron, but most of it has been removed.

Gutters

- A system for draining excess water from the system.

Four drainage gutters are found per side. It is basically a steel pipe sited at an angle through the bridge deck next to the guide rail.

Inlet – top

Outlet - bottom

Pylon:

- A monumental vertical structure marking the entrance to a bridge or forming part of a gateway.

No pylons were identified. However, a round concrete foundation with a hole that probably housed a pole of some sort were identified in the location where pylons are usually found – the left-hand entrance, irrespective of the approach, south or north, of the bridge.

Railings:

- Consists of steel structure made up of a number of upright sections or stanchions, on which horizontal railings are suspended.

The original handrails were removed some time ago and only the fittings embedded into the concrete bridge deck remains.

End section mounting

Central section mounting

Superstructure:

- The part of the bridge that spans the obstacle, e.g. river.

The concrete deck was cast in-situ and has a slightly skew angle (c. 12°).

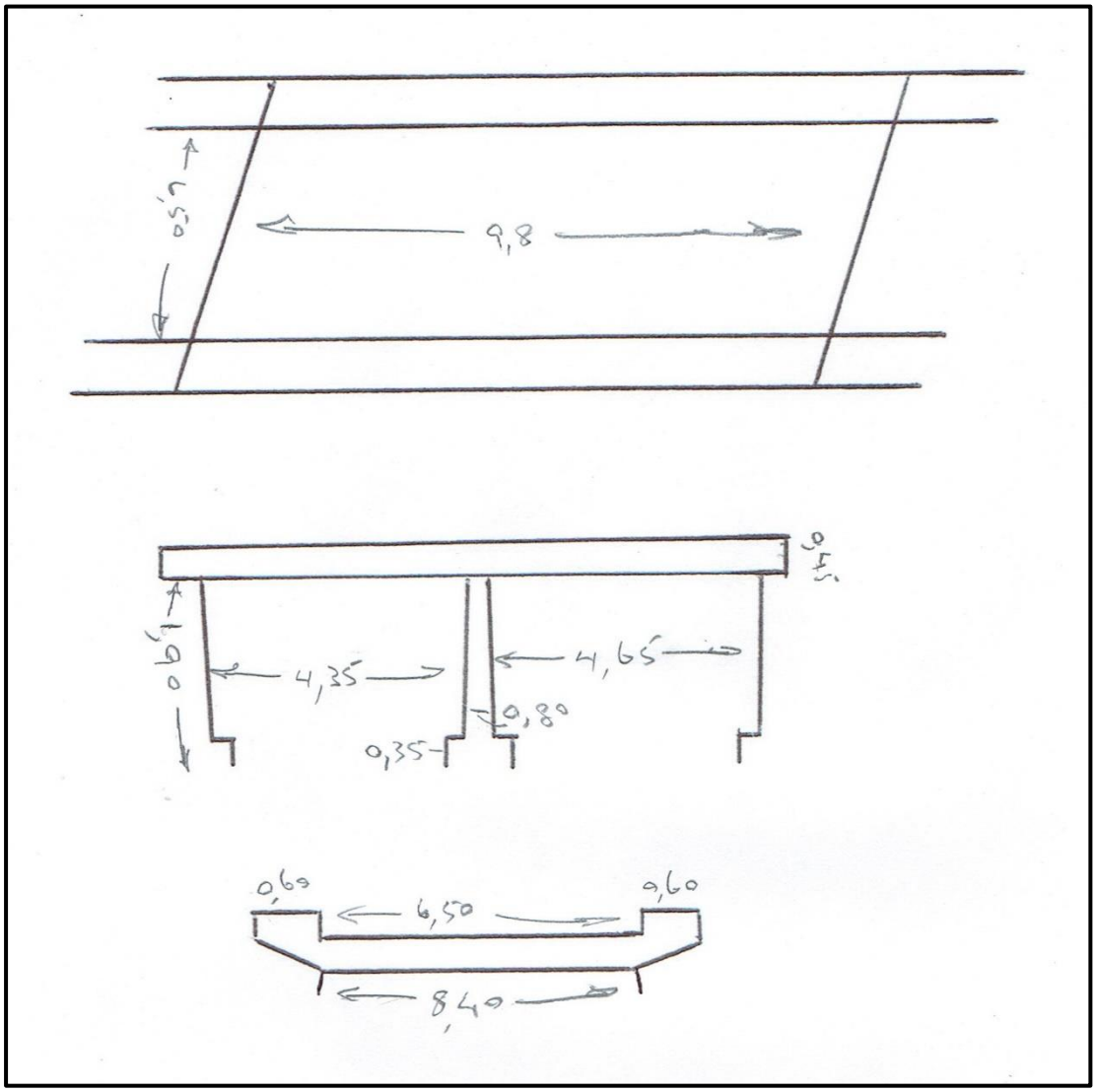

Figure 10. Technical drawings of the bridge

6. REFERENCES

6.1 Data bases

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Heritage Atlas Database, Pretoria
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6.2 Literature

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6.3 Archival sources, maps and aerial photographs

1: 50 000 Topocadastral maps
Google Earth
Aerial photographs: Chief Surveyor-General

7. ADDENDUM

7.1 Determination of significance

A matrix was developed whereby the criteria as set out in Sections 3(3) and 7 of the NHRA, No. 25 of 1999, were applied for the structure. This allowed some form of control over the application of similar values for similar sites. Three categories of significance are recognized: low, medium and high. In terms of Section 7 of the NHRA, the structure is evaluated to have a grading as identified in the table below.

1. Historic value			
Is it important in the community, or pattern of history			No
Does it have strong or special association with the life or work of a person, group or organisation of importance in history			No
Does it have significance relating to the history of slavery			No
2. Aesthetic value			
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group			No
3. Scientific value			
Does it have potential to yield information that will contribute to an understanding of natural or cultural heritage			No
Is it important in demonstrating a high degree of creative or technical achievement at a particular period			No
4. Social value			
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons			No
5. Rarity			
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage			No
6. Representivity			
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects			Yes
Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class			Yes
Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.			No
7. Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			Yes
Local			Yes
Specific community			
8. Significance rating of feature			
1. Low			Yes
2. Medium			
3. High			