

**Phase 2 Cultural Heritage Documentation:**

**DOCUMENTATION OF FOUR CONCRETE ROAD BRIDGES ON SECTION 13 OF THE N11 NATIONAL ROUTE NORTH OF MOKOPANE, LIMPOPO PROVINCE**

**Prepared for:**

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**Submission of the report:**

It remains the responsibility of the client to submit the report to the South African Heritage Resources Agency (SAHRA) or relevant Provincial Heritage Resources Agency (PHRA) by means of the online SAHRIS System.



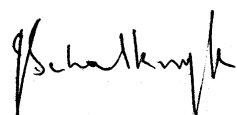
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**Specialist competency:**

Johan A van Schalkwyk, D Litt et Phil, heritage consultant, has been working in the field of heritage management for more than 40 years. Originally based at the National Museum of Cultural History, Pretoria, he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Eastern Cape Province, Northern Cape Province, Botswana, Zimbabwe, Malawi, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 70 papers, most in scientifically accredited journals. During this period, he has done more than 2000 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, roads, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.



J A van Schalkwyk  
Heritage Consultant  
January 2023



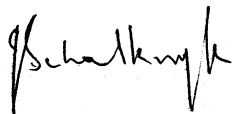
**SPECIALIST DECLARATION**

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I, J A van Schalkwyk, as the appointed independent specialist, in terms of the 2014 EIA Regulations (as amended), hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 (as amended) and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist



J A van Schalkwyk  
January 2023

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**Phase 2 Cultural Heritage Documentation:  
DOCUMENTATION OF FOUR CONCRETE ROAD BRIDGES ON SECTION 13 OF THE N11  
NATIONAL ROUTE NORTH OF MOKOPANE, LIMPOPO PROVINCE**

## **1. INTRODUCTION**

---

### **1.1 Background**

SANRAL propose to upgrade Section 13 of the N11, km 8,340 to km 24,280, from Mokopane northwards towards the Groblersbrug border post with Botswana, Mogalakwena Local Municipality, Limpopo Province.

A heritage survey of this section of the road was completed (Van Schalkwyk 2011) and submitted to SAHRA and the relevant PHRA, i.e., LIHRA. During the Phase 1 survey of this section of the road (Van Schalkwyk 2011b), four bridges were identified and after evaluation they were classified as Grade III heritage sites and that it has a high significance on a regional level. However, these bridges might be widened to accommodate an ever increasing traffic volume. Accordingly, these bridges were documented (Van Schalkwyk 2012) and the report was submitted to LIHRA for comments. The latter accepted the report and its recommendations (see Fig 1 below).

In May 2013 the Department of Environmental Affairs granted an Environmental Authorisation (EA) for the above development. However, the EA has lapsed in 2021 and a new basic assessment (BA) process needs to be undertaken. As more than ten years has passed since the original heritage report was submitted, it was decided to do a follow-up survey to confirm the *status quo* of the heritage sites and features.

An independent heritage consultant was appointed by *Chameleon Environmental* to re-survey the section of the road to determine if the upgrade would have any additional impacts on sites, features or objects of cultural heritage significance.

As to the four bridges, it was accepted that the *status quo* would remain, but it was decided to revisit them to confirm their current status.



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REF: 10/09/1032

ENQ: Nemauiuma N.N

DATE: 30/07/2013

PERMIT: 2003/009/44

RE: Proposed construction of a N11 Section 13 in Mokopane a distance of 24km including borrow pits and hard rock Quarry along the route, Limpopo Province

APPLICANT: ROYAL HASKONINGDHV (PTY) LTD TRADING AS ROYAL HASKONINGDHV.

The above matter refers,

Guided by the heritage impact assessment report, the LIHRA concurs with the findings laid by the heritage specialist that the development must go ahead.

However, experience taught that some heritage resources are often found during excavations and digging that takes place during construction. It is for this reason that we advise that should you during construction unearth objects of cultural significance, the LIHRA should be informed.

Our review team established that four bridges mentioned in HIA are more than 60 years, in terms of section 34 of NHRA, 25, 1999; such bridges may not be destroyed or disturbed without a valid permit from the Provincial Heritage Resources. This authorization does not give applicant the right to destroy or deface the identified heritage resources or bridges. Instead, the developer must ensure that the proposed work must be guided in the manner that would not cause or lead to any destruction of the identified heritage resources or bridges.

It is recommended that the identified graves should be fenced or clearly marked with danger tape during the entire duration of the project and 30 buffer zone must be allowed around the grave. The planning team should ensure that access to the grave is not limited in any way.

This memo serves to inform that from a heritage management point of view the LIHRA has no objection to the alteration of the bridges as long as all recommendations' made by Heritage Specialist are adhered to.

We trust that you will find the above matters in order.



HERITAGE SPECIALIST LIHRA: ADVISORY COMMITTEE

30/07/13

DATE

Fig. 1. Communication from LIHRA regarding their acceptance of the original heritage report and the proposed recommendations

## 1.2 Statement of significance

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

- A review of the technology and materials used in the construction of the two bridges was done.

- The history of the development of this section of the N11 was reviewed in an effort to determine an approximate date for the construction of the bridges.
- 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 N11 to determine how many “older” ones are still in existence.

From the above information it was determined that these bridges do not exhibit any remarkable construction techniques, nor can they be linked to any event or person and that similar bridges are still to be found along the route. But, considering that the rest of the route might also be upgraded at some stage and that the remaining bridges might then also be demolished, it was decided to err on the side of caution. Therefore, although bridges are viewed to have Grade III status, they are judged to have high significance on a regional level.

It was therefore recommended that the bridges should be documented before they can be demolished or altered, but on condition of SAHRA issuing a permit for the demolishing/alteration of the bridges.

This report presents the basic documentation of the four bridges.

## **2. STUDY APPROACH AND METHODOLOGY**

### **2.1 Methodology**

#### *2.1.1 Previous experience*

A number of bridges in the Steelpoort River (Limpopo Province) were documented as part of a larger project for the Dept. of Water Affairs and Forestry (Van Schalkwyk 2010) as well as the documentation of an old sandstone bridge in KwaZulu-Natal (Van Schalkwyk 2009), some bridges on the R104 (Van Schalkwyk 2011a) and on the N10 in Northern Cape Province (Van Schalkwyk 2015). Experience and terminology obtained during this project was applied for the current project.

#### *2.1.2 Literature*

Available literature, such as that of the US National Parks Services regarding documentation and conservation of bridges and other structures, were used as guideline.

An extensive archival search has revealed no information on the date of the construction of the bridges under discussion.

#### *2.1.3 Field survey*

The bridges were measured and photographed by members of Bijker Civil Design cc, which is presented with the description of each of the individual bridges.

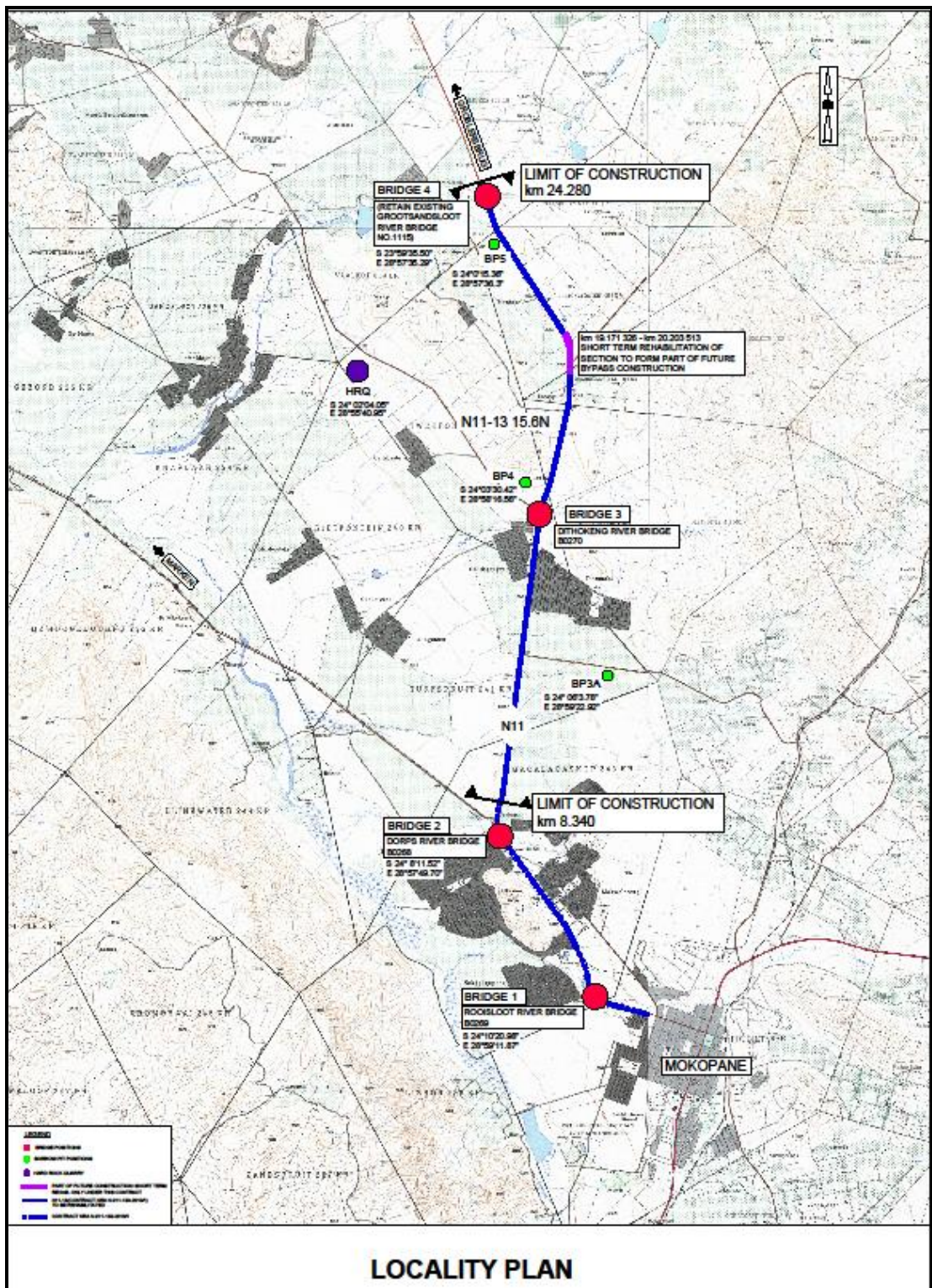


Fig. 2. The location of the four bridges

### 3. DESCRIPTION OF THE BRIDGES

#### 3.1 History of the N11



The original road is quite old, leading up to the Botswana border since early traders started to penetrate the interior. The missionary Livingstone passed through area and is said to have camped for some time in the region at a spot that has been declared as national heritage site under the old heritage legislation. The Berlin Mission Society also entered the area very early and established a mission station not far from the town of Piet Potgietersrust (now Mokopane), adjacent to the road.

Old maps such as that produced by Baines (1877) and Jeppe (1899) indicate the locality of a route roughly in the region of the current road, although it does not follow it exactly (Fig. 3 and 4).

Floor (1985) describes the development of National Routes on a country wide scale. By and large this started during the 1950s and really took off during the late 1960s. Due to the large scale of these developments, practicality took precedent over aesthetics, resulting in the construction of formless, no frills bridges like the ones under consideration.

Over time, the alignment of the route has also been changed (Fig. 5). This is possibly as a result of intensive urbanisation that started during the early 1960s.

Liebenberg et al (1984) describes the history of the development of concrete bridges. The local history does not differ much from that of concrete development in other parts of the world. With the development of pre-stressed and reinforced concrete it became easy to construct large numbers of shorter span bridges much cheaper than it would have been the case with iron or steel.

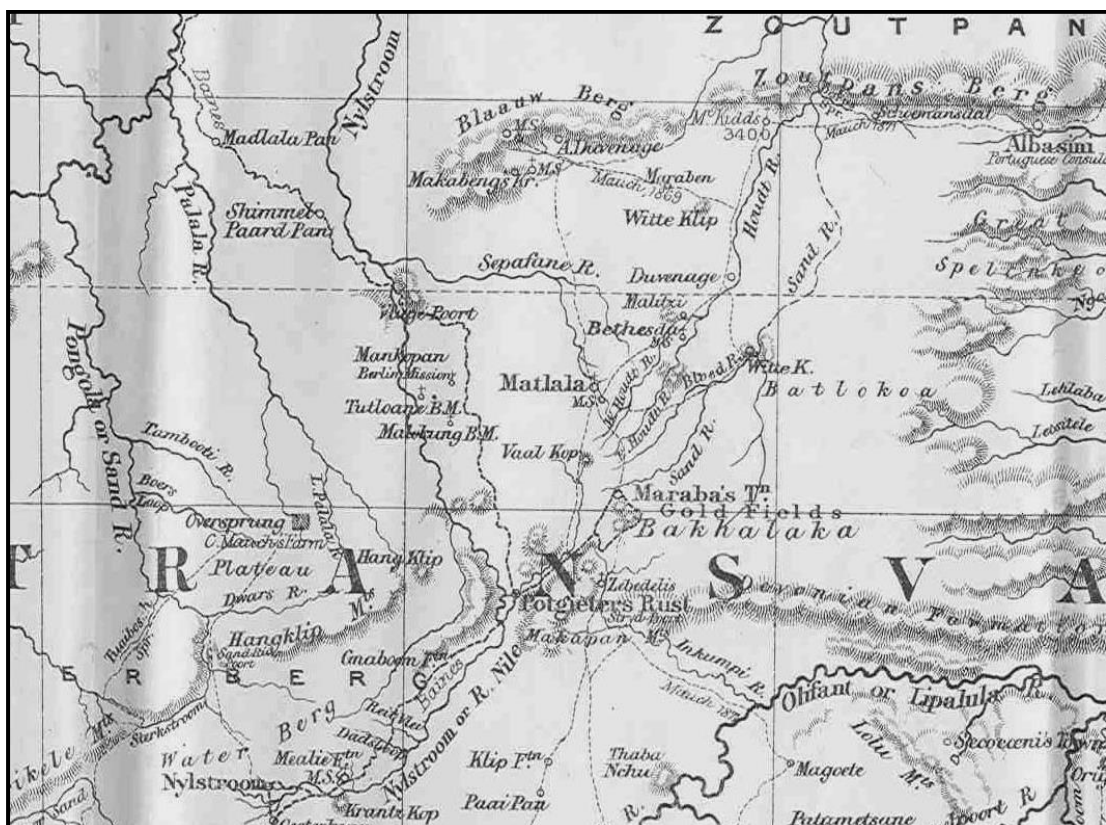


Fig. 3. Portion of Baines' map (1877), showing a track roughly in the region of the study area.

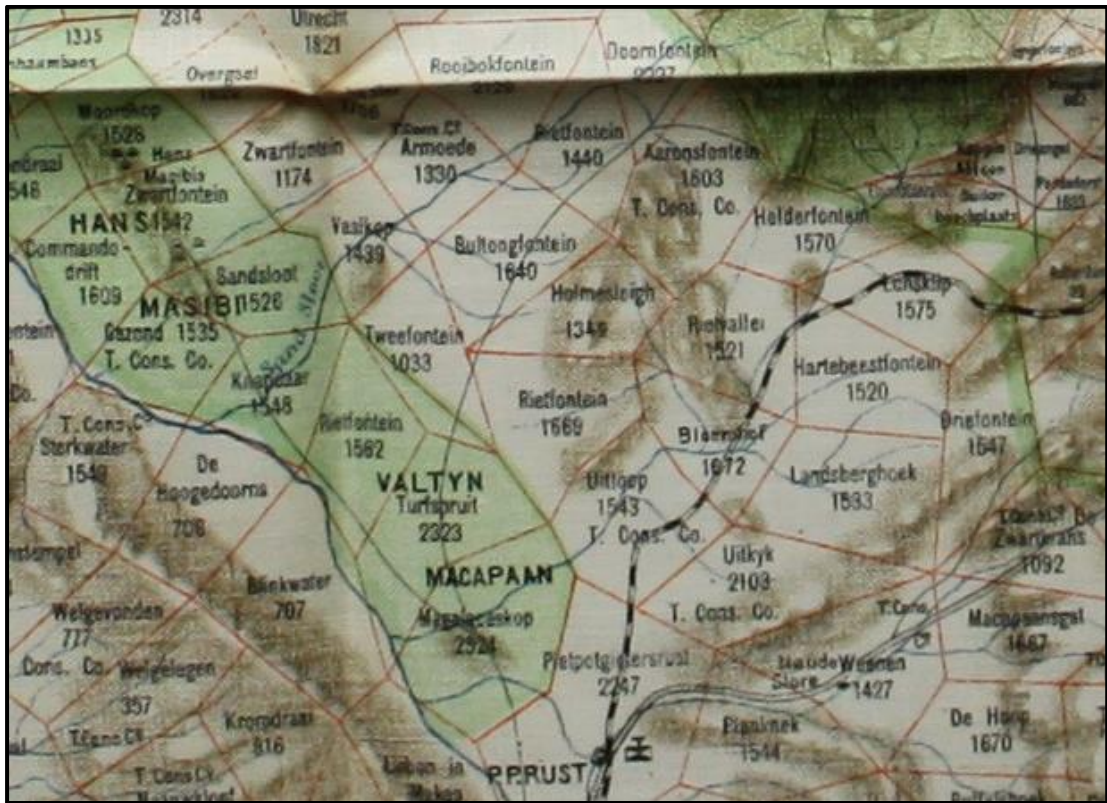


Fig. 4. Jeppe’s map dated to 1899, showing a route slightly to the east of the current road.

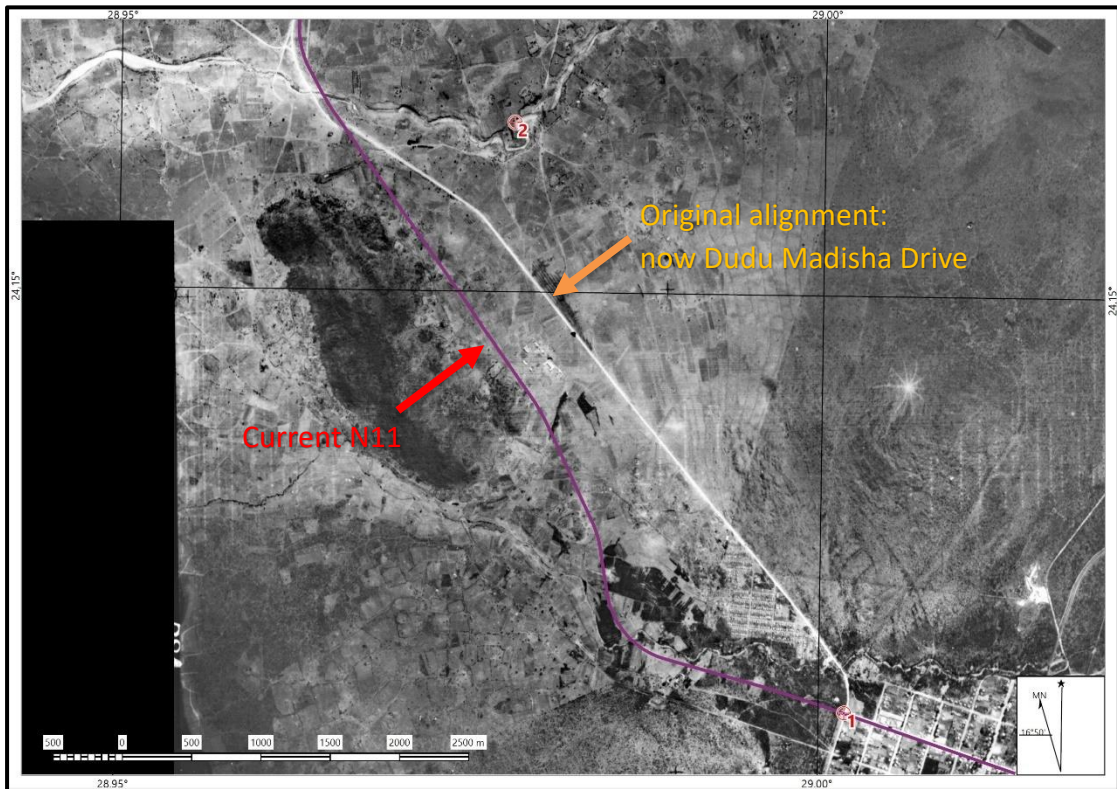


Fig. 5. The old alignment vs. the new N11 (NGI photographs: 323\_005\_00284 & 323\_005\_00284) (red wheel-crosses = calibration points)

### 3.2 Evaluation:

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 site. 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, all the sites currently known or which are expected to occur in the study area are evaluated to have a grading as identified in the table below.

<b>1. Historic value</b>				
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	
<b>2. Aesthetic value</b>				
Is it important in exhibiting particular aesthetic characteristics valued by a community or cultural group			No	
<b>3. Scientific value</b>				
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	
<b>4. Social value</b>				
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons			No	
<b>5. Rarity</b>				
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage			No	
<b>6. Representivity</b>				
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects			No	
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			No	
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	
<b>7. Sphere of Significance</b>		High	Medium	Low
International				
National				
Provincial				
Regional				Yes
Local				Yes
Specific community				
<b>8. Significance rating of feature</b>				
1.	Low			Yes
2.	Medium			
3.	High			

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

- A review of the technology and materials used in the construction of the bridge was done.
- The history of the larger region was reviewed to determine if any event of historical, cultural or political significance could be linked to the bridge.

## Bridge 1

### Site name:

Dorpsrivier Bridge

### Location:

The identified bridge is located on the farm Macalacaskop 243KR (Coordinates: S 24.17251, E 28.98665) in the Mokerong Magisterial District of Limpopo Province. It is located approximately 3,5 km northwest of the centre of the town of Mokopane on the N11 towards the border with Botswana (Fig. 4).

### Classification

This is a two span bridge of cast concrete. The bridge deck is supported by a single concrete column. The abutment and wing walls are all of concrete. The original railings are still in place and are now supported by Armco barriers. According to a panel on the bridge it dates to 1958.

### Statement of significance

This bridge shows no interesting or unique technological or engineering features and no significant event or person could be linked to it. However, as it will soon be 60 years old, it will enjoy general protection status under the Heritage Act. It is therefore documented (mapped and photographed) by a heritage specialist before it is upgraded.

Based on the above this bridge is viewed to have Grade III and have low significance on a regional level.

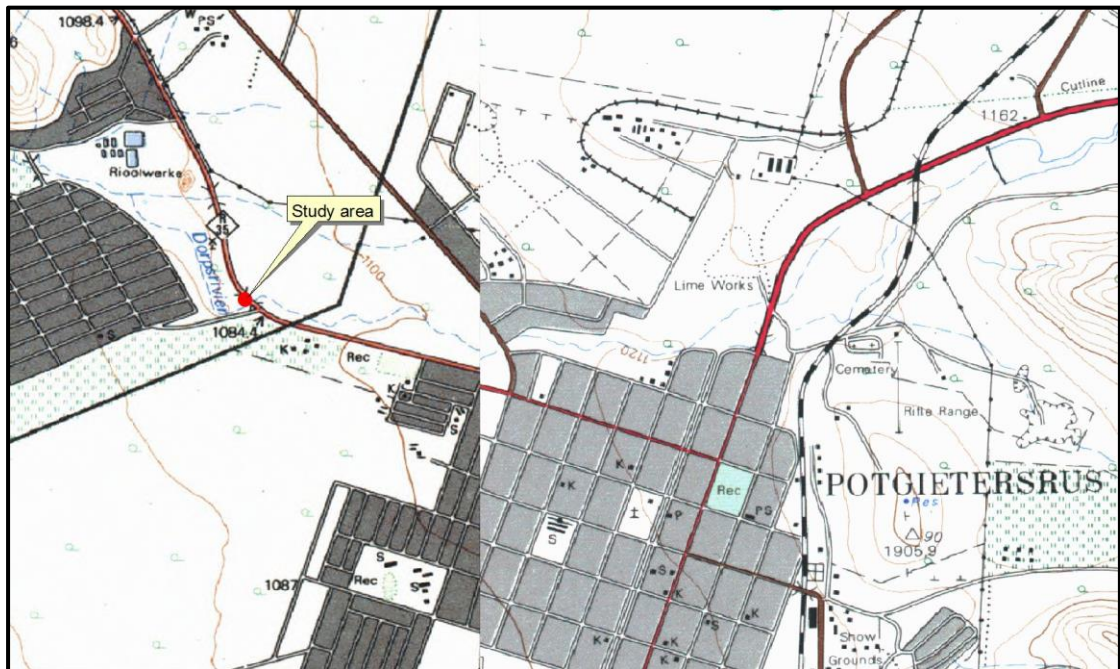


Fig. 6. Location of the Dorpsrivier bridge.  
(Map 2428BB: Chief Surveyor-General)

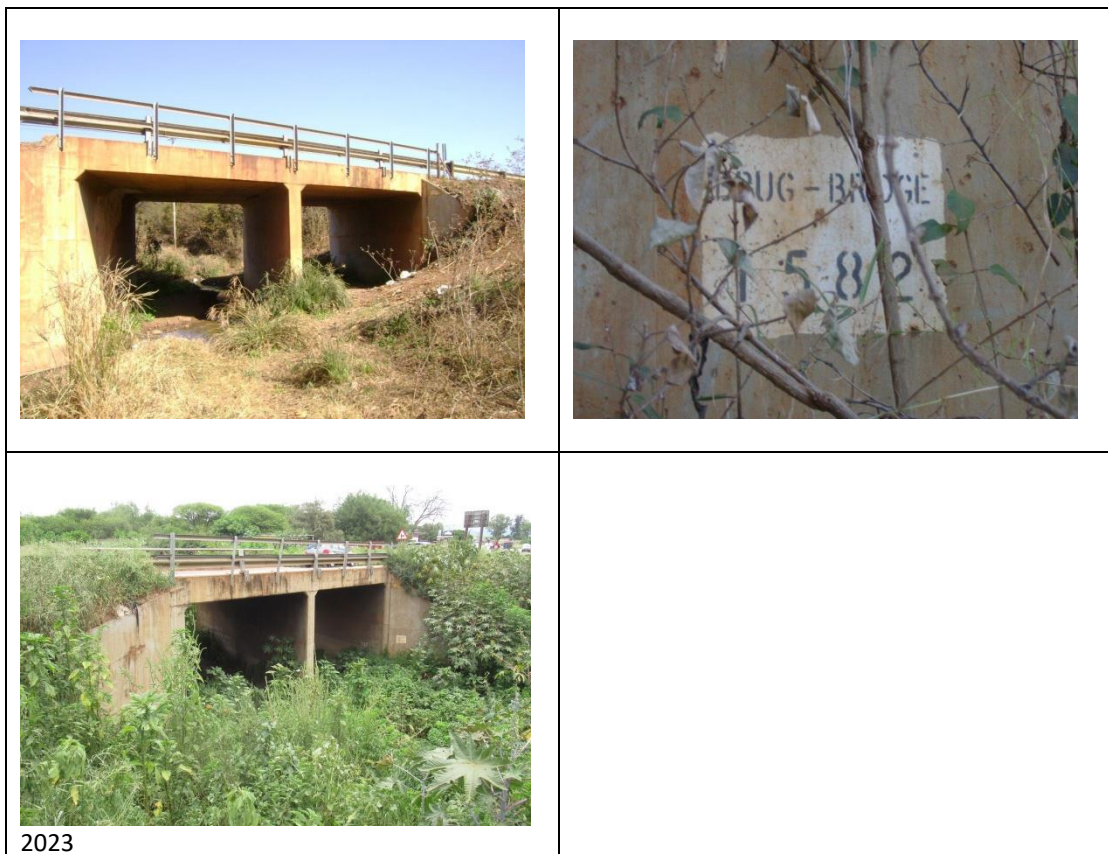


Fig. 7. Side-view of the bridge and its identification number.

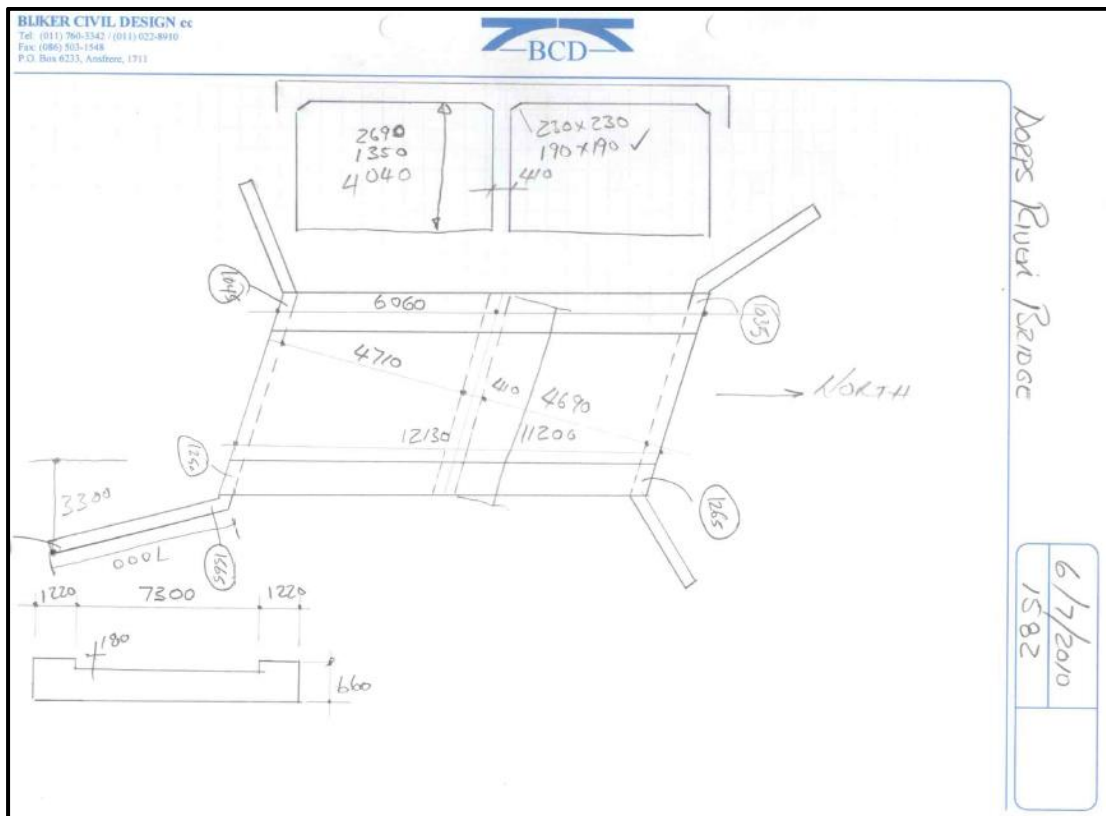


Fig. 8. The different dimensions of the bridge.  
(Information supplied by Bijker Civil Design cc)

### Materials

The material used in the construction of the bridge is largely 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 was 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.

### 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.

#### Abutment Wall:

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

The walls are constructed from concrete that was cast in slabs. The abutment walls are currently below water level and most likely going down to the bedrock. The height of the abutment walls (to water level) is 3 m and it is 12 m wide.



Abutment wall, north-eastern side

*Approach Road:*

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

The approach road runs between Mokopane and the Botswana border and carries a large volume of traffic.



Approach road, travelling north

*Bridge Deck:*

- The roadway portion of the bridge that carries the traffic.

The bridge deck consists of concrete, which is also part of the construction of the bridge and is then covered with a layer of tarmac. The total length of the bridge deck is just over 12 m.



Bridge deck seen from the top

*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.



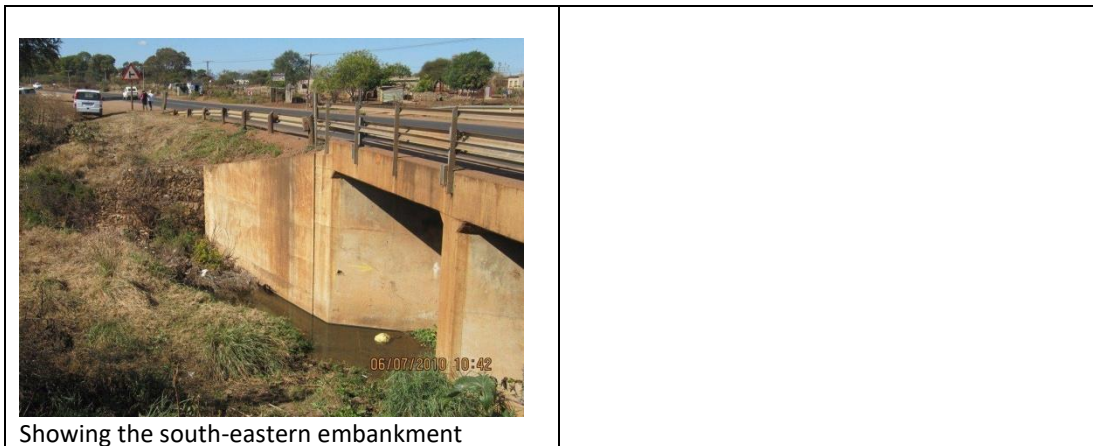
The location of the column

*Embankment:*

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

Formed by packing down soil to achieve the necessary height and then sloping down gradually the further away one moves from the river.





*Guide rail:*

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

The guide rail is a raised platform of concrete, edged with angle iron that runs the length of the bridge. It is about 10cm high and about 30cm wide.



*Pylon:*

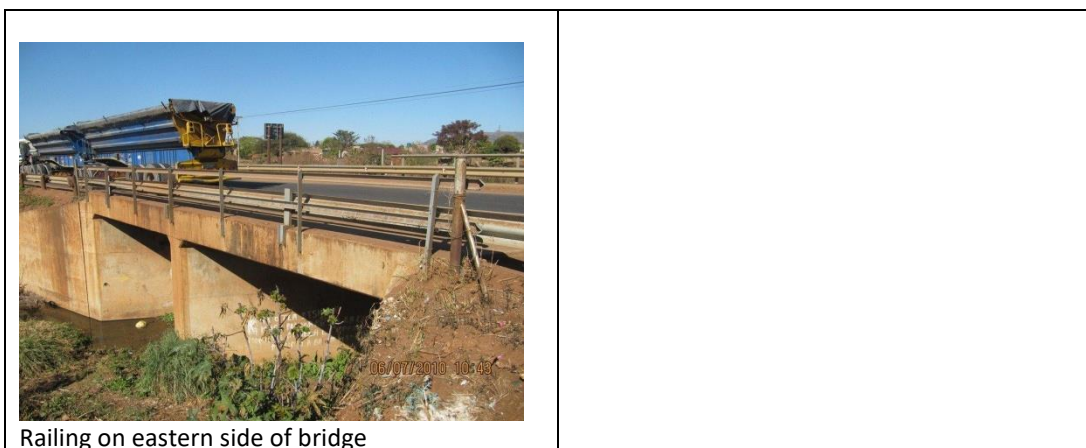
- A monumental vertical structure marking the entrance to a bridge or forming part of a gateway.

This bridge has no pylons.

*Railing:*

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

The original railings are made of six upright sections of pipe which supports two horizontal bars running the length of the bridge. The railings are now supported by Armco barriers



*Revetment:*

- A facing of masonry or stones to protect an embankment from erosion.

In the case of this bridge the revetments have at a later stage been strengthened by the installation of gabions.



Conservation Issues

Apart from the embankments that had to be strengthened by the installation of gabions, this structure is still sound.

## Bridge 2

### Site name:

Roosisloot Bridge

### Location:

The identified bridge is located on the farm Macalacaskop 243KR (Coordinates: S 24.13650, E 28.96373) in the Mokerong Magisterial District of Limpopo Province. It is located approximately 7,5 km northwest of the centre of the town of Mokopane on the N11 towards the border with Botswana (Fig. 7).

### Classification

This is a six span bridge of cast concrete. The bridge deck is supported by a five concrete columns. The abutment and wing walls are all of concrete, although the upstream side of the walls have been strengthened with stone revetments that were cemented in. The railings are of prefabricated cement and were probably added at a later date. A date of 1953 was found on one of the pylons of the bridge.

### Statement of significance

This bridge shows no interesting or unique technological or engineering features and no significant event or person could be linked to it. However, as it will soon be 60 years old, it will enjoy general protection status under the Heritage Act. It is therefore documented (mapped and photographed) by a heritage specialist before it is upgraded.

Based on the above this bridge is viewed to have Grade III and have low significance on a regional level.

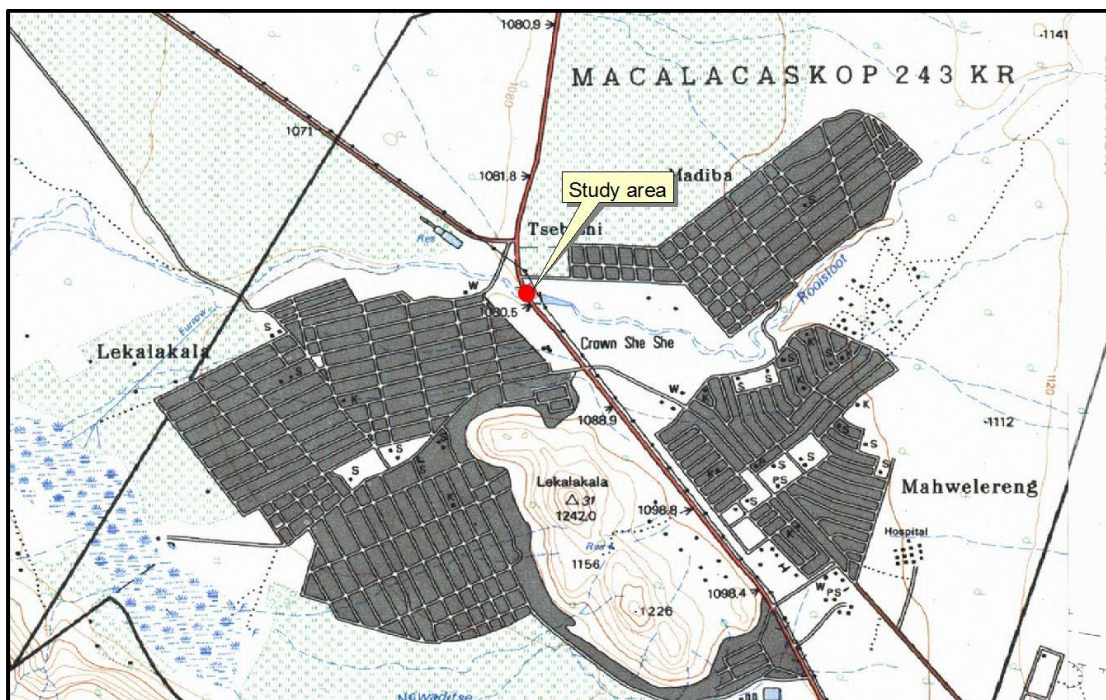
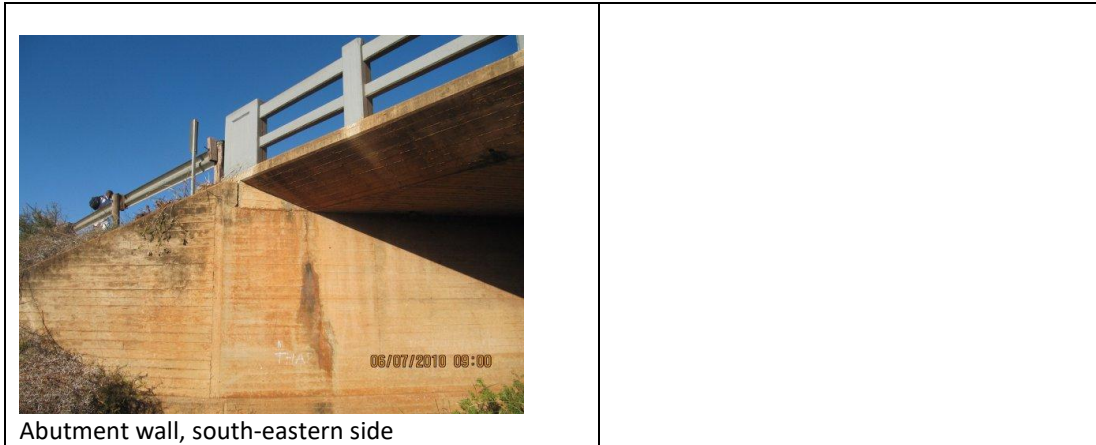


Fig. 9. Location of the Roosisloot bridge.  
(Map 2428BB: Chief Surveyor-General)



Fig. 10. Side-view of the bridge and its identification number.

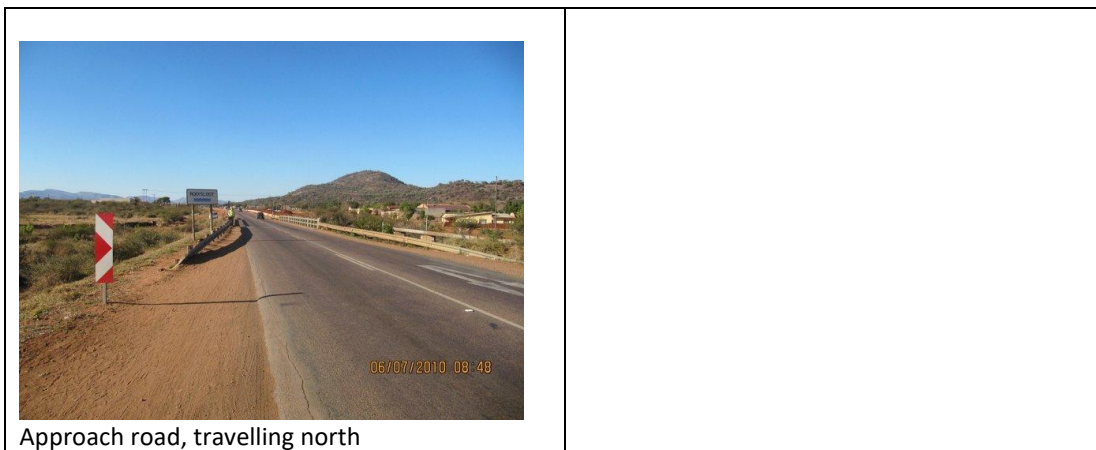




*Approach Road:*

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

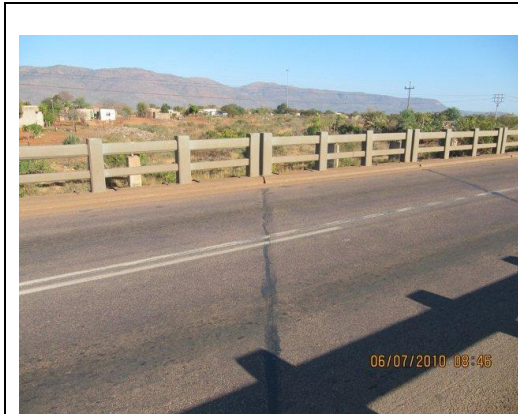
The approach road runs between Mokopane and the Botswana border and carries a large volume of traffic.



*Bridge Deck:*

- The roadway portion of the bridge that carries the traffic.

The bridge deck consists of six concrete sections reinforced by girders, which is also part of the construction of the bridge and is then covered with a layer of tarmac. The total length of the bridge deck is approximately 34 m.

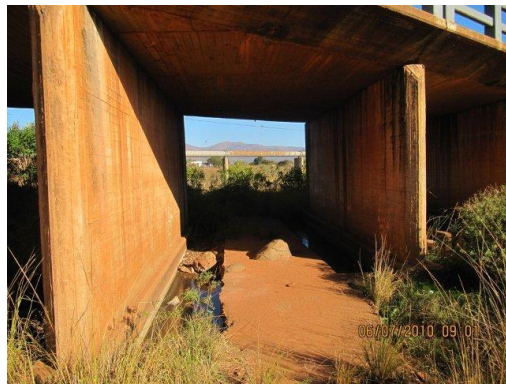


Bridge deck seen from the top

*Columns:*

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

Five columns support 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. The foundation of the column is boat shaped to accommodate the flow of water.

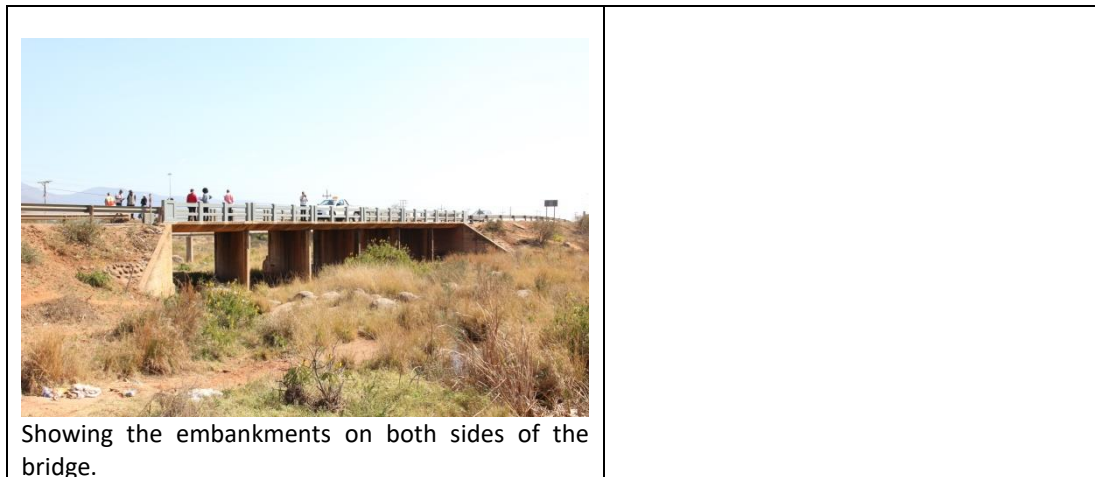


The location of the columns

*Embankment:*

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

Formed by packing down soil to achieve the necessary height and then sloping down gradually the further away one moves from the river.



*Guide rail:*

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

The guide rail is a raised platform of concrete, edged with angle iron that runs the length of the bridge. It is about 10cm high and about 30cm wide.



*Pylon:*

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

This bridge has four similar pylons – one on each corner of the bridge. They have either the date or the number of the bridge on them. They are 75 x 55 cm in size.

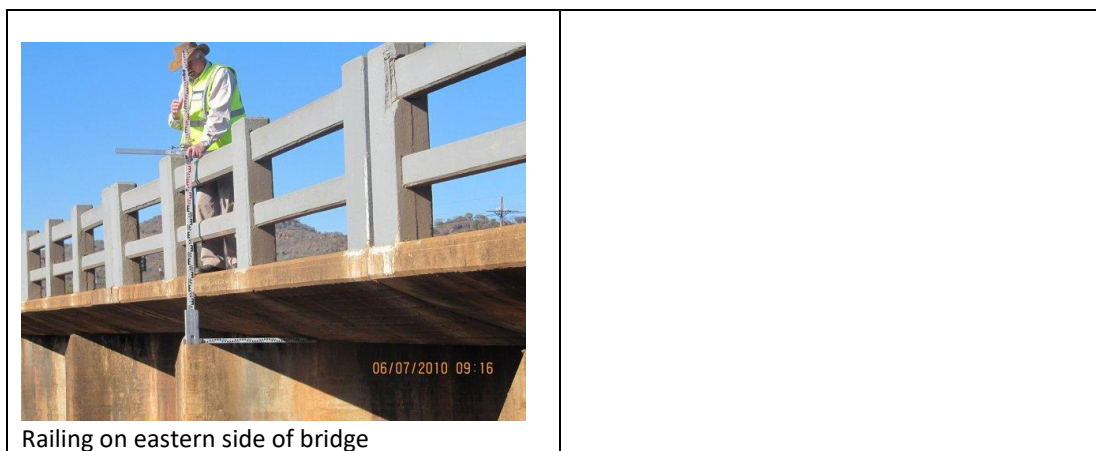




*Railing:*

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

The railings consist of a number of uprights and two horizontal bars attached to them. The railings are cast in solid concrete and forms an integral part of the bridge deck.



*Revetment:*

- A facing of masonry or stones to protect an embankment from erosion.

The revetment walls are constructed from large stones that have been cemented into place.



Conservation Issues

The joints where the various spans come together show signs of damage and consequent repairs.



### Bridge 3

Site name:

Dithokeng Bridge

Location:

The identified bridge is located on the farm Tweefontein 238KR (Coordinates: S 24.06501, E 28.97309) in the Mokerong Magisterial District of Limpopo Province. It is located approximately 15,8 km north of the centre of the town of Mokopane on the N11 towards the border with Botswana (Fig. 10).

Classification

This is a three span bridge of cast concrete. The bridge deck is supported by two concrete columns. The abutment and wing walls are all of concrete and some stone revetments were added to protect them from erosion. The original railings are still in place and are now supported by Armco barriers. A date of 1952 is painted on one of the abutment walls.

Statement of significance

This bridge shows no interesting or unique technological or engineering features and no significant event or person could be linked to it. However, as it will soon be 60 years old, it will enjoy general protection status under the Heritage Act. It is therefore documented (mapped and photographed) by a heritage specialist before it is upgraded.

Based on the above this bridge is viewed to have Grade III and have low significance on a regional level.

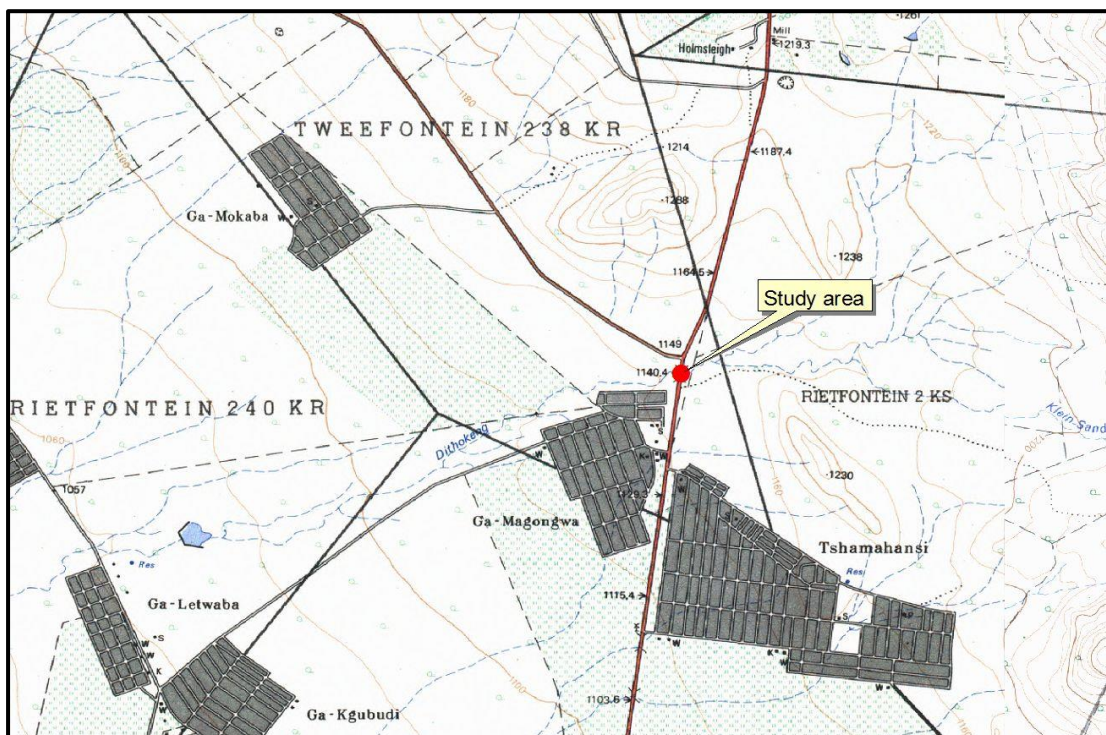


Fig. 12. Location of the Dithokeng bridge.  
(Map 2428BB: Chief Surveyor-General)



Fig. 13. Side-view of the bridge and its identification number.

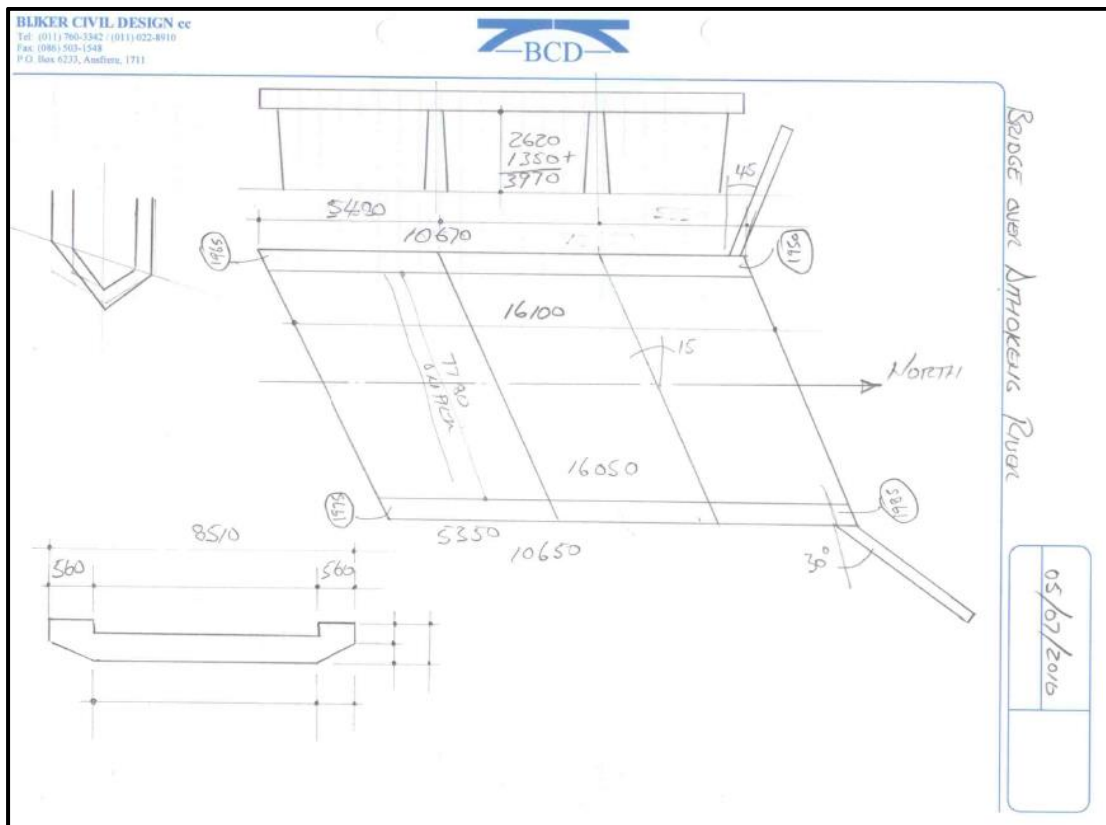


Fig. 14. The different dimensions of the bridge.  
(Information supplied by Bijker Civil Design cc)

### Materials

The material used in the construction of the bridge is largely 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 was 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.

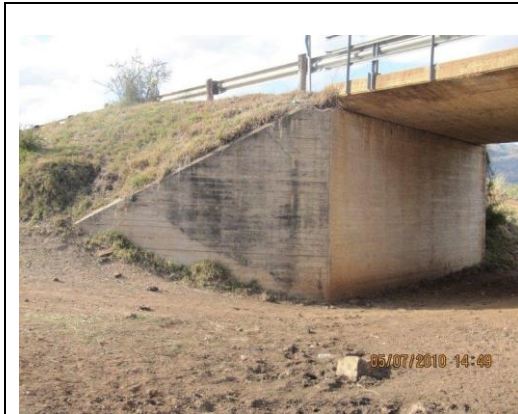
### Bridge elements

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.

#### *Abutment Wall and wingwalls:*

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

The walls are constructed from concrete that was cast in slabs. The abutment walls are currently below water level and most likely going down to the bedrock. The height of the two abutment walls (to water level) is 4 m and it is 8 m wide.



Abutment wall, north-eastern side

*Approach Road:*

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

The approach road runs between Mokopane and the Botswana border and carries a large volume of traffic.

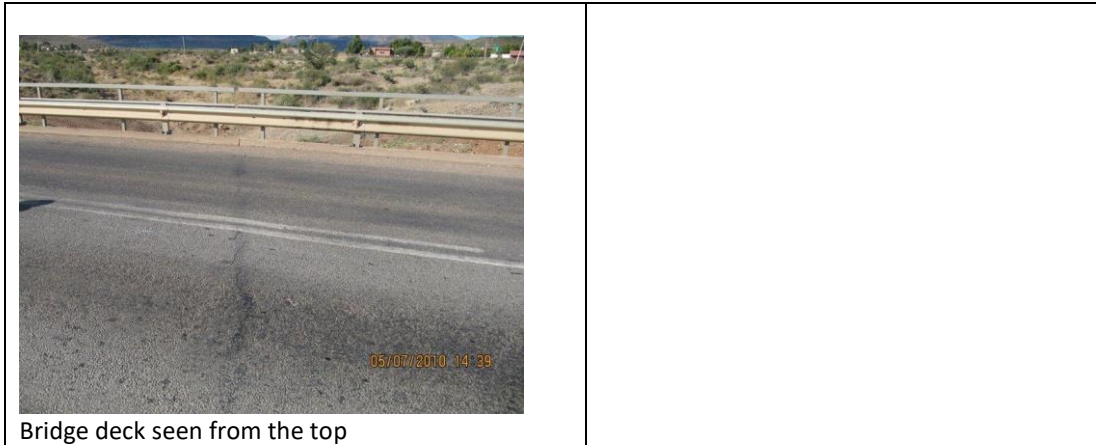


Approach road, travelling north

*Bridge Deck:*

- The roadway portion of the bridge that carries the traffic.

The bridge deck consists of three concrete slabs reinforced by girders. The top layer of the bridge deck consists of concrete, which is also part of the construction of the bridge and is then covered with a layer of tarmac. The total length of the bridge deck is approximately 16 m.



*Columns:*

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

Three columns support 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.



*Embankment:*

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

Formed by packing down soil to achieve the necessary height and then sloping down gradually the further away one moves from the river.



*Guide rail:*

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

The guide rail is a raised platform of concrete, edged with angle iron that runs the length of the bridge. It is about 10cm high and about 30cm wide.



The guide rail

*Pylon:*

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

This bridge has no pylons.

*Railing:*

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

The original railings are made of ten upright sections of steel which supports two horizontal bars running the length of the bridge. The railings are now supported by Armco barriers.





Railing on eastern side of bridge

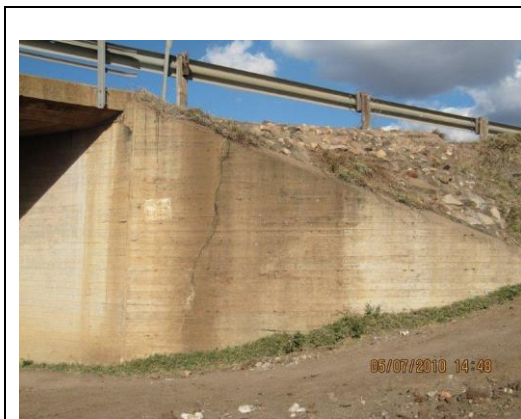
*Revetment:*

- A facing of masonry or stones to protect an embankment from erosion.

This bridge has no real revetments.

Conservation Issues

The bridge shows large cracks in the abutment wing walls.



## Bridge 4

### Site name:

Groot Sandsloot Bridge

### Location:

The identified bridge is located on the farm Armoede 823LR (Coordinates: S 23.99312, E 28.95990) in the Potgietersrus Magisterial District of Limpopo Province. It is located approximately 23,4 km north of the centre of the town of Mokopane on the N11 towards the border with Botswana (Fig. 13).

### Classification

This is a two span bridge of cast concrete. The bridge deck is supported by a single concrete column. The abutment and wing walls are all of concrete. The original railings are still in place and are now supported by Armco barriers. No date could be found on this bridge, but it is assumed to be in the same time-frame (1950s) as that of the other bridges.

### Statement of significance

This bridge shows no interesting or unique technological or engineering features and no significant event or person could be linked to it. However, as it will soon be 60 years old, it will enjoy general protection status under the Heritage Act. It is therefore documented (mapped and photographed) by a heritage specialist before it is upgraded.

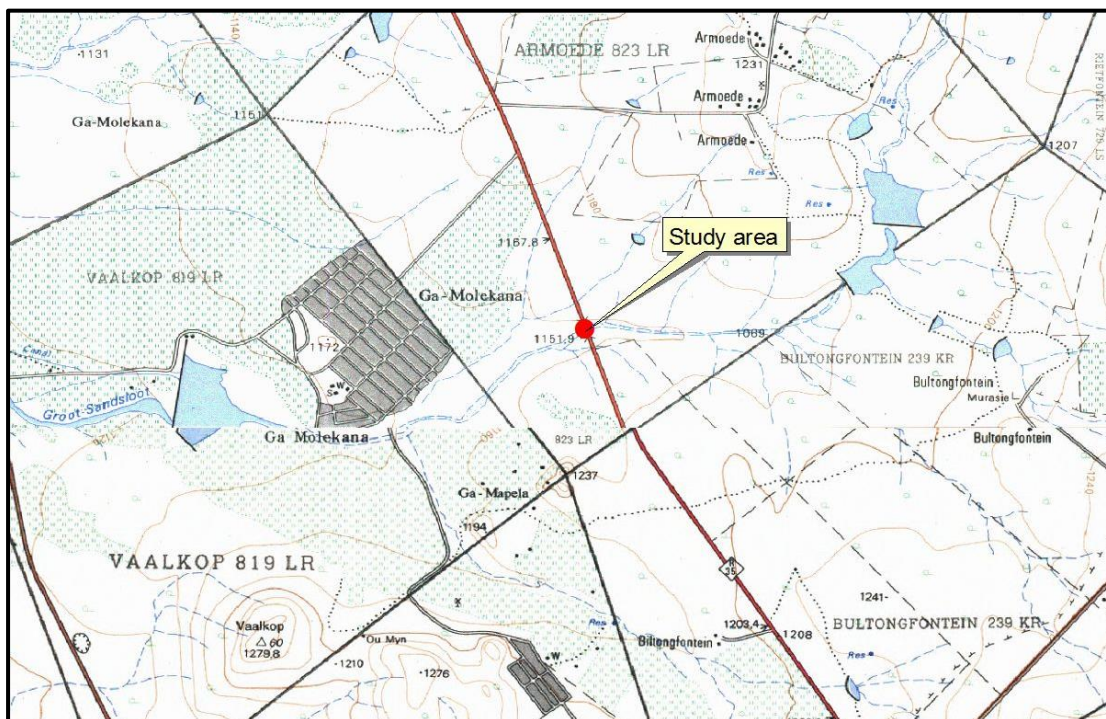


Fig. 15. Location of the Groot Sandsloot bridge.  
(Map 2328DD: Chief Surveyor-General)



Fig. 16. Side view and identification number of the bridge.

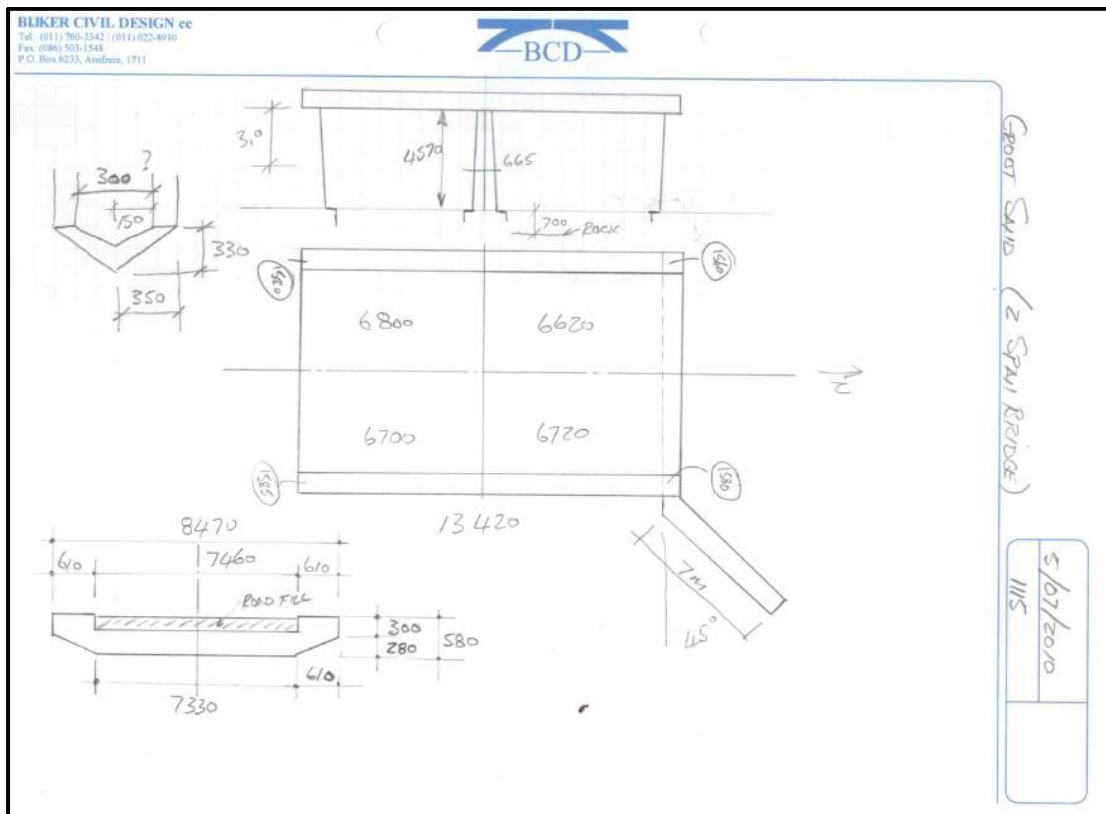


Fig. 17. The different dimensions of the bridge.  
(Information supplied by Bijker Civil Design cc)

### Materials

The material used in the construction of the bridge is largely 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 was 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.

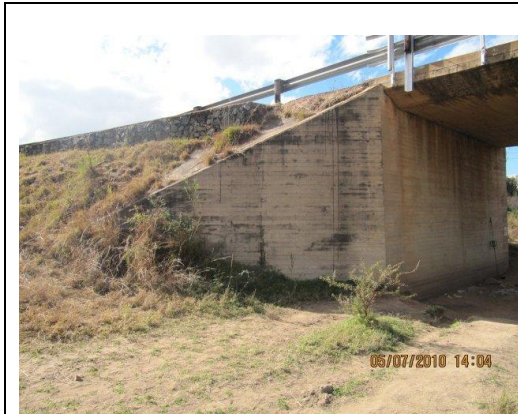
### Bridge elements

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.

#### *Abutment Wall and Wingwall:*

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

The walls are constructed from concrete that was cast in slabs. The abutment walls are currently below water level and most likely going down to the bedrock. The height of the two abutment walls (to water level) is 4,6 m and it is 7 m wide.



Abutment wall, north-eastern side

**Approach Road:**

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

The approach road runs between Mokopane and the Botswana border and carries a large volume of traffic.

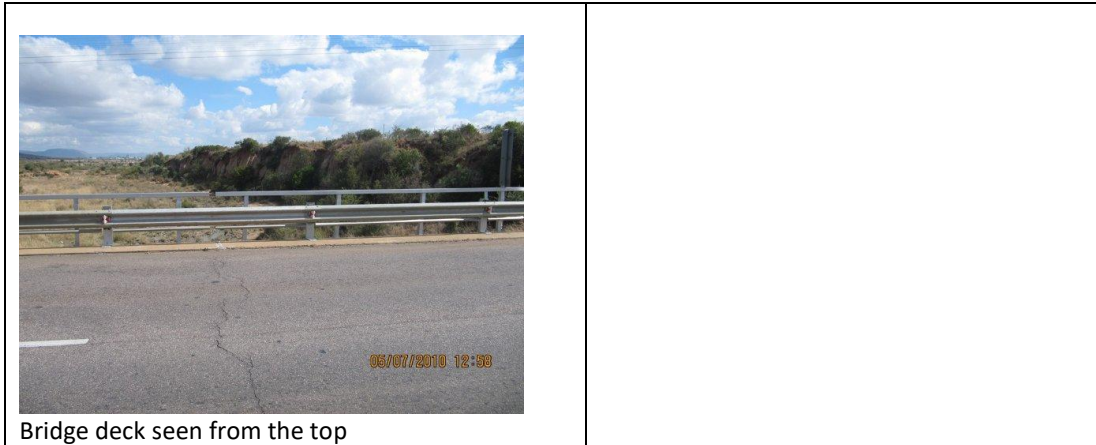


Approach road, travelling north

**Bridge Deck:**

- The roadway portion of the bridge that carries the traffic.

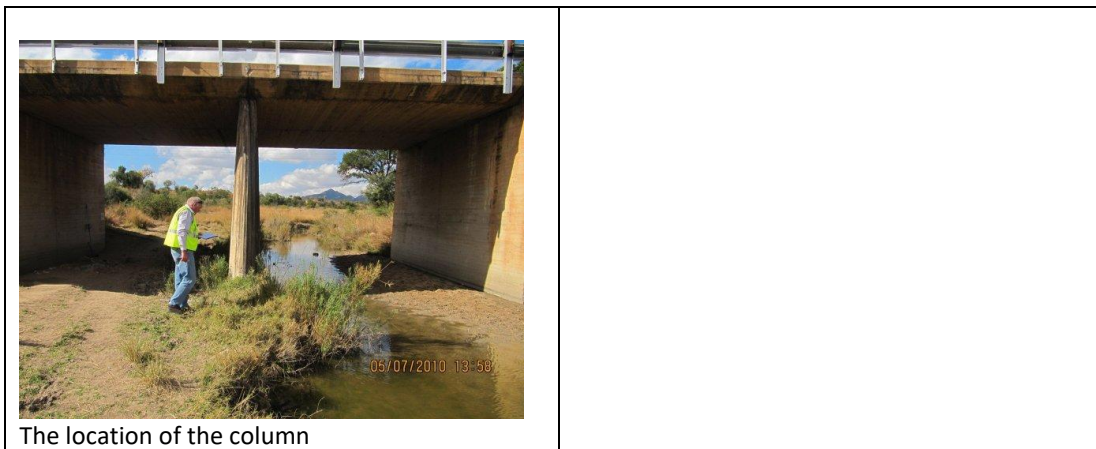
The bridge deck consists of two concrete slabs reinforced by girders. The top layer of the bridge deck consists of concrete, which is also part of the construction of the bridge and is then covered with a layer of tarmac. The total length of the bridge deck is approximately 13 m.



*Columns:*

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

One columns support 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. The foundation of the column is boat shaped to accommodate the flow of water.



*Embankment:*

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

Formed by packing down soil to achieve the necessary height and then sloping down gradually the further away one moves from the river.



*Guide rail:*

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

The guide rail is a raised platform of concrete, edged with angle iron that runs the length of the bridge. It is about 10cm high and about 30cm wide.



*Pylon:*

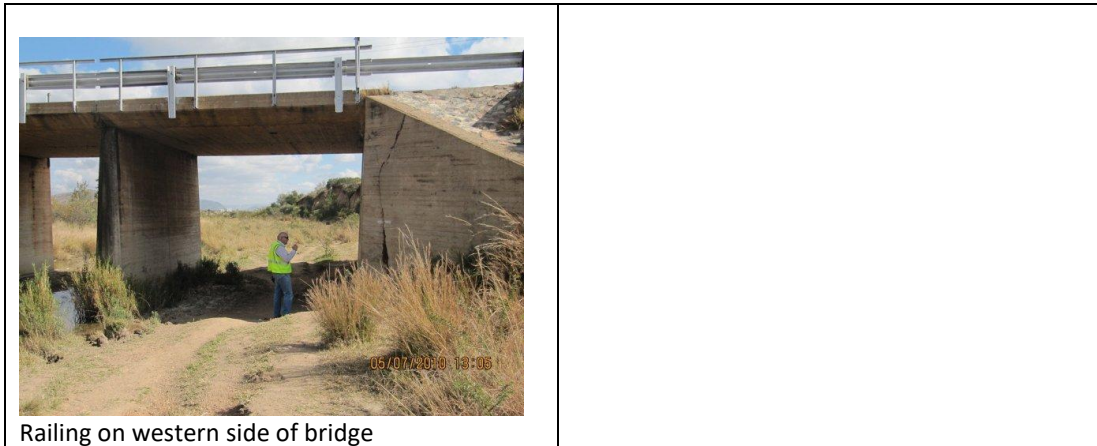
- A monumental vertical structure marking the entrance to a bridge or forming part of a gateway.

This bridge has no pylons.

*Railing:*

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

The original railings are made of ten upright sections of steel which supports two horizontal bars running the length of the bridge. The railings are now supported by Armco barriers.



*Revetment:*

- A facing of masonry or stones to protect an embankment from erosion.

The revetments on this bridge have recently been strengthened by the installation of gabions.



Conservation Issues

The bridge shows large cracks in the abutment walls as well on the bridge deck.





#### 4. REFERENCES

##### 4.1 Data bases

Chief Surveyor General  
 Environmental Potential Atlas, Department of Environmental Affairs and Tourism.  
 Heritage Atlas Database, Pretoria  
 National Archives of South Africa  
 SAHRA Archaeology and Palaeontology Report Mapping Project (2009)  
 SAHRIS Database

##### 4.2 Literature

Baines, T. 1877. *The gold regions south eastern Africa*. London: Edward Stanford.

Bergh, J.S. (red.). 1998. *Geskiedenisatlas van Suid-Afrika: die vier noordelike provinsies*. Pretoria: J.L. Schaik.

Floor, B.C. 1985. *The history of National Roads in South Africa*. Cape Town: CTP Printers.

Joubert, E. 1955. *Road transport in South Africa during the 19th century*. School of Librarianship. Cape Town: University of Cape Town.

Liebenberg, A.C., Trümpelman, V. & Kratz, R.D. 1984. Construction and related design aspects of a large span concrete arch bridge. *The Civil Engineer in South Africa* 26(4):189, 192-194, 195-197, 201, 204.

Van Schalkwyk, J.A. 2009a. *Heritage impact scoping report for the proposed Vanmag Mining development, Mokerong magisterial district, Limpopo Province*. Unpublished report 2009/JvS/015. Pretoria.

Van Schalkwyk, J.A. 2009b. *Documentation of an old sandstone bridge across the Flagstone Spruit, N11 national route, southwest of Ladysmith, kwaZulu-Natal Province*. Unpublished report 2009/JvS/0043.

Van Schalkwyk, J.A. 2010. *Documentation of heritage resources in the Steelpoort River valley, Mpumalanga and Limpopo Provinces*. Unpublished report for Dept. Water Affairs and Forestry.

Van Schalkwyk, J.A. 2011a. *Documentation of four bridges on road R104 between Pretoria and Bronkhorstspuit, Gauteng Province*. Unpublished report 2011/JvS/049. Pretoria.

Van Schalkwyk, J.A. 2011b. *Heritage impact assessment for the proposed upgrade of a section of the N11 national route north of Mokopane, Limpopo Province*. Unpublished report 2011/JvS/065 Pretoria.

Van Schalkwyk, J.A. 2012. *Documentation of four bridges on road R104 between Pretoria and Bronkhorstspuit, Gauteng Province*. Unpublished report 2012/JvS/036. Pretoria.

Van Schalkwyk, J.A. 2015. *Documentation of a number of bridge and culvert structures on the N10 national road between Upington and Groblershoop, Northern Cape Province*. Unpublished report 2015/JvS/033. Pretoria.

#### **4.3 Maps and aerial photographs**

Jeppe, F. 1899. *Jeppe's map of the Transvaal or South African Republic*. Pretoria: Surveyor General.

1: 50 000 Topocadastral maps

Aerial photographs

## **5. ADDENDUM**

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### **1. Indemnity and terms of use of this report**

The findings, results, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and the author reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. The author of this report will not be held liable for such oversights or for costs incurred as a result of such oversights.

Although the author exercises due care and diligence in rendering services and preparing documents, he accepts no liability and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the author and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

## 2. Assessing the significance of heritage resources and potential impacts

A system for site grading was established by the NHRA and further developed by the South African Heritage Resources Agency (SAHRA 2007) and has been approved by ASAPA for use in southern Africa and was utilised during this assessment.

### 2.1 Significance of the identified heritage resources

According to the NHRA, Section 2(vi) the **significance** of a heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

### Matrix used for assessing the significance of each identified site/feature

1. SITE EVALUATION			
<b>1.1 Historic value</b>			
Is it important in the community, or pattern of history			
Does it have strong or special association with the life or work of a person, group or organisation of importance in history			
Does it have significance relating to the history of slavery			
<b>1.2 Aesthetic value</b>			
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group			
<b>1.3 Scientific value</b>			
Does it have potential to yield information that will contribute to an understanding of natural or cultural heritage			
Is it important in demonstrating a high degree of creative or technical achievement at a particular period			
<b>1.4 Social value</b>			
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons			
<b>1.5 Rarity</b>			
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage			
<b>1.6 Representivity</b>			
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects			
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			
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.			
<b>2. Sphere of Significance</b>			
		High	Medium
International			
National			
Provincial			
Regional			
Local			
Specific community			
<b>3. Field Register Rating</b>			
1.	National/Grade 1: High significance - No alteration whatsoever without permit from SAHRA		
2.	Provincial/Grade 2: High significance - No alteration whatsoever without permit from provincial heritage authority.		
3.	Local/Grade 3A: High significance - Mitigation as part of development process not advised.		

4.	Local/Grade 3B: High significance - Could be mitigated and (part) retained as heritage register site	
5.	Generally protected 4A: High/medium significance - Should be mitigated before destruction	
6.	Generally protected 4B: Medium significance - Should be recorded before destruction	
7.	Generally protected 4C: Low significance - Requires no further recording before destruction	

## 2.2 Significance of the anticipated impact on heritage resources

All impacts identified during the HIA stage of the study will be classified in terms of their significance. Issues would be assessed in terms of the following criteria:

### Nature of the impact

A description of what causes the effect, what will be affected and how it will be affected.

### Extent

The physical **extent**, wherein it is indicated whether:

- 1 - The impact will be limited to the site;
- 2 - The impact will be limited to the local area;
- 3 - The impact will be limited to the region;
- 4 - The impact will be national; or
- 5 - The impact will be international.

### Duration

Here it should be indicated whether the lifespan of the impact will be:

- 1 - Of a very short duration (0–1 years);
- 2 - Of a short duration (2-5 years);
- 3 - Medium-term (5–15 years);
- 4 - Long term (where the impact will persist possibly beyond the operational life of the activity); or
- 5 - Permanent (where the impact will persist indefinitely).

### Magnitude (Intensity)

The magnitude of impact, quantified on a scale from 0-10, where a score is assigned:

- 0 - Small and will have no effect;
- 2 - Minor and will not result in an impact;
- 4 - Low and will cause a slight impact;
- 6 - Moderate and will result in processes continuing but in a modified way;
- 8 - High, (processes are altered to the extent that they temporarily cease); or
- 10 - Very high and results in complete destruction of patterns and permanent cessation of processes.

### Probability

This describes the likelihood of the impact actually occurring and is estimated on a scale where:

- 1 - Very improbable (probably will not happen);
- 2 - Improbable (some possibility, but low likelihood);
- 3 - Probable (distinct possibility);
- 4 - Highly probable (most likely); or
- 5 - Definite (impact will occur regardless of any prevention measures).

### Significance

The significance is determined through a synthesis of the characteristics described above (refer to the formula below) and can be assessed as low, medium or high:

$S = (E+D+M) \times P$ ; where

S = Significance weighting

E = Extent  
 D = Duration  
 M = Magnitude  
 P = Probability

Significance of impact		
Points	Significant Weighting	Discussion
< 30 points	Low	Where this impact would not have a direct influence on the decision to develop in the area.
31-60 points	Medium	Where the impact could influence the decision to develop in the area unless it is effectively mitigated.
> 60 points	High	Where the impact must have an influence on the decision process to develop in the area.

### Confidence

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political context is relatively stable.
- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation and socio-political context is fluid.
- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

### Status

- The status, which is described as either positive, negative or neutral.

### Reversibility

- The degree to which the impact can be reversed.

### Mitigation

- The degree to which the impact can be mitigated.

Nature:		
	Without mitigation	With mitigation
<b>Construction Phase</b>		
Probability		
Duration		
Extent		
Magnitude		
Significance		
Status (positive or negative)		
<b>Operation Phase</b>		
Probability		
Duration		
Extent		
Magnitude		
Significance		
Status (positive or negative)		
Reversibility		
Irreplaceable loss of resources?		
Can impacts be mitigated		

### 3. Mitigation measures

- *Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.*

Impacts can be managed through one or a combination of the following mitigation measures:

- Avoidance
- Investigation (archaeological)
- Rehabilitation
- Interpretation
- Memorialisation
- Enhancement (positive impacts)

For the current study, the following mitigation measures are proposed, to be implemented only if any of the identified sites or features are to be impacted on by the proposed development activities:

- (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and applies where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources. The site should be retained *in situ* and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall). Depending on the type of site, the buffer zone can vary from
  - 10 metres for a single grave, or a built structure, to
  - 50 metres where the boundaries are less obvious, e.g. a Late Iron Age site.
- (2) Archaeological investigation/Relocation of graves: This option can be implemented with additional design and construction inputs. This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated. Mitigation is to excavate the site by archaeological techniques, document the site (map and photograph) and analyse the recovered material to acceptable standards. This can only be done by a suitably qualified archaeologist.
  - This option should be implemented when it is impossible to avoid impacting on an identified site or feature.
  - This also applies for graves older than 60 years that are to be relocated. For graves younger than 60 years a permit from SAHRA is not required. However, all other legal requirements must be adhered to.
    - Impacts can be beneficial – e.g. mitigation contribute to knowledge
- (3) Rehabilitation: When features, e.g. buildings or other structures are to be re-used. Rehabilitation is considered in heritage management terms as an intervention typically involving the adding of a new heritage layer to enable a new sustainable use.
  - The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
  - Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.
    - Conservation measures would be to record the buildings/structures as they are (at a particular point in time). The records and recordings would then become the ‘artefacts’ to be preserved and managed as heritage features or (movable) objects.
    - This approach automatically also leads to the enhancement of the sites or features that are re-used.

- (4) Mitigation is also possible with additional design and construction inputs. Although linked to the previous measure (rehabilitation) a secondary though 'indirect' conservation measure would be to use the existing architectural 'vocabulary' of the structure as guideline for any new designs.
  - The following principle should be considered: **heritage informs design**.
    - This approach automatically also leads to the enhancement of the sites or features that are re-used.
  
- (5) No further action required: This is applicable only where sites or features have been rated to be of such low significance that it does not warrant further documentation, as it is viewed to be fully documented after inclusion in this report.
  - Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation to ensure that no undetected heritage/remains are destroyed.



#### 4. Chance find procedures

***A general approach to this is set out in Section 9 of the main body of the HIA report and is equally applicable to general heritage sites and features as to burial grounds and graves.***

- A heritage practitioner should be appointed to develop a heritage induction program and conduct training for the ECO, as well as team leaders, in the identification of heritage resources and artefacts;
- An appropriately qualified heritage consultant should be identified to be called upon if any possible heritage resources or artefacts are identified;
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities be halted;
- The qualified archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and impact on the heritage resource;
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered;
- Should the heritage consultant conclude that the find is a heritage resource protected in terms of the NHRA (1999) Sections 34, 35, 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), he or she should notify SAHRA and/or the relevant PHRA;
- Based on the comments received from SAHRA and/or the PHRA, the heritage consultant would present the relevant terms of reference to the client for implementation;
- Construction/Operational activities can commence as soon as the site has been cleared and signed off by the archaeologist.

## 5. Curriculum vitae

### Johan Abraham van Schalkwyk

#### Personal particulars

Date of birth: 14 April 1952  
Identity number: 520414 5099 08 4  
Marital status: Married; one daughter  
Nationality: South African

#### Current address: home

62 Coetzer Ave, Monument Park, Pretoria, 0181  
Mobile: 076 790 6777; E-mail: jvschalkwyk@mweb.co.za

#### Qualifications

1995 DLitt et Phil (Anthropology), University of South Africa  
1985 MA (Anthropology), University of Pretoria  
1981 BA (Hons), Anthropology, University of Pretoria  
1979 Post Graduate Diploma in Museology, University of Pretoria  
1978 BA (Hons), Archaeology, University of Pretoria  
1976 BA, University of Pretoria

#### Non-academic qualifications

12th HSRC-School in Research Methodology - July 1990  
Dept. of Education and Training Management Course - June 1992  
Social Assessment Professional Development Course - 1994  
Integrated Environmental Management Course, UCT - 1994

#### Professional experience

Private Practice  
2017 - current: Professional Heritage Consultant

#### National Museum of Cultural History

1992 - 2017: Senior researcher: Head of Department of Research. Manage an average of seven researchers in this department and supervise them in their research projects. Did various projects relating to Anthropology and Archaeology in Limpopo Province, Mpumalanga, North West Province and Gauteng. Headed the Museum's Section for Heritage Impact Assessments.  
1978 - 1991: Curator of the Anthropological Department of the Museum. Carried out extensive fieldwork in both anthropology and archaeology

#### Department of Archaeology, University of Pretoria

1976 - 1977: Assistant researcher responsible for excavations at various sites in Limpopo Province and Mpumalanga.

#### Awards and grants

1. Hanisch Book Prize for the best final year Archaeology student, University of Pretoria - 1976.
2. Special merit award, National Cultural History Museum - 1986.
3. Special merit award, National Cultural History Museum - 1991.
4. Grant by the Department of Arts, Culture, Science and Technology, to visit the various African countries to study museums, sites and cultural programmes - 1993.
5. Grant by the USA National Parks Service, to visit the United States of America to study museums, sites, tourism development, cultural programmes and impact assessment programmes - 1998.
6. Grant by the USA embassy, Pretoria, under the Bi-national Commission Exchange Support Fund, to visit cultural institutions in the USA and to attend a conference in Charleston - 2000.
7. Grant by the National Research Foundation to develop a model for community-based tourism - 2001.

8. Grant by the National Research Foundation to develop a model for community-based tourism - 2013. In association with RARI, Wits University.

#### **Publications**

Published more than 70 papers, mostly in scientifically accredited journals, but also as chapters in books.

#### **Conference Contributions**

Regularly presented papers at conferences, locally as well as internationally, on various research topics, ranging in scope from archaeology, anthropological, historical, cultural historical and tourism development.

#### **Heritage Impact Assessments**

Since 1992, I have done more than 2000 Phase 1 and Phase 2 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, roads, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

#### **Latest publications**

Van Schalkwyk, J.A. 2020. A cognitive approach to ordering of the world: some case studies from the Sotho- and Tswana-speaking people of South Africa. In Whitley, D.S., Loubser, J.H.N. & Whitelaw, G. (eds.) *Cognitive Archaeology. Mind, Ethnography, and the Past in South African and Beyond*. London: Routledge. Pp. 184-200.

Namono, C. & Van Schalkwyk, J.A. 2020. Appropriating colonial dress in the rock art of the Makgabeng plateau, South Africa. In Wingfield, C., Giblin, J. & King, R. (eds) *The pasts and presence of art in South Africa: Technologies, Ontologies and Agents*. University of Cambridge: McDonald Institute for Archaeological Research. Pp. 51-62.