Heritage documentation of four bridges on a SECTION OF THE N11 NATIONAL ROUTE NORTH OF MOKOPANE, LIMPOPO PROVINCE

HERITAGE DOCUMENTATION OF FOUR BRIDGES ON A SECTION OF THE N11 NATIONAL ROUTE NORTH OF MOKOPANE, LIMPOPO PROVINCE

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Declaration:

I, J.A. van Schalkwyk, declare that I do not have any financial or personal interest in the proposed development, nor its developers or any of their subsidiaries, apart from the provision of heritage assessment and management services.

J A van Schalkwyk (D Litt et Phil)
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July 2012

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HERITAGE DOCUMENTATION OF FOUR BRIDGES ON A SECTION OF THE N11 NATIONAL ROUTE NORTH OF MOKOPANE, LIMPOPO PROVINCE

1. INTRODUCTION

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade a section of National Route N11, Section 13 from Mokopane (KM 0.0) to (KM 24.1).

During a Phase 1 heritage 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.

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

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 does 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 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), as well as some bridges on the R104 (Van Schalkwyk 2011a). 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.

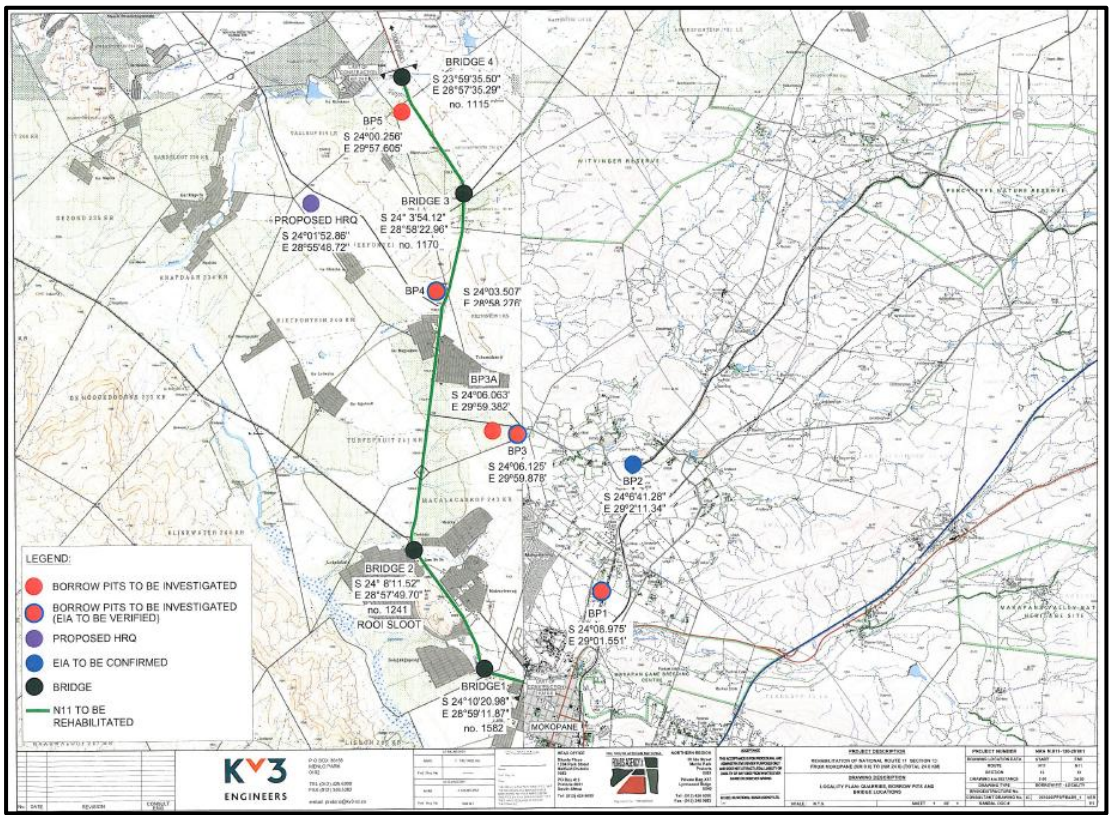


Fig. 1. Location of the various bridges in regional context.

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, 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. 2 and 3).

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.

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.

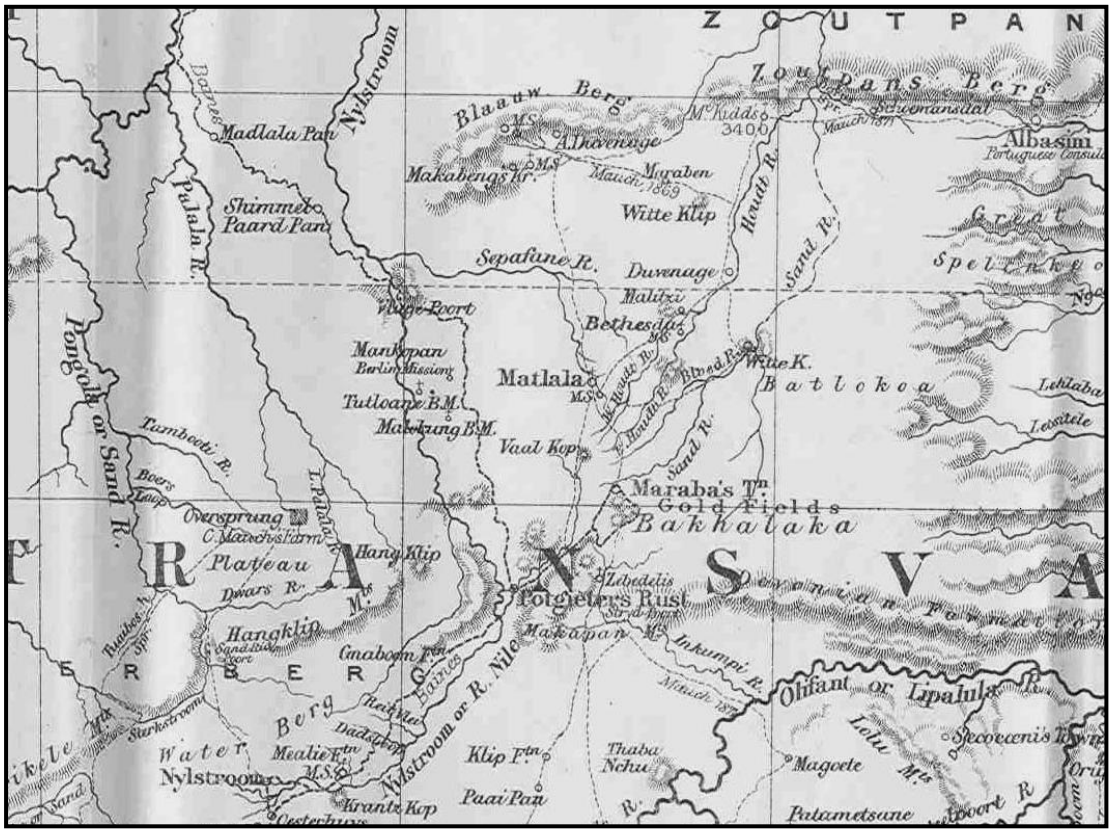


Fig. 2**.** Portion of Thomas Baines' map (1877), showing a track roughly in the region of the study area.

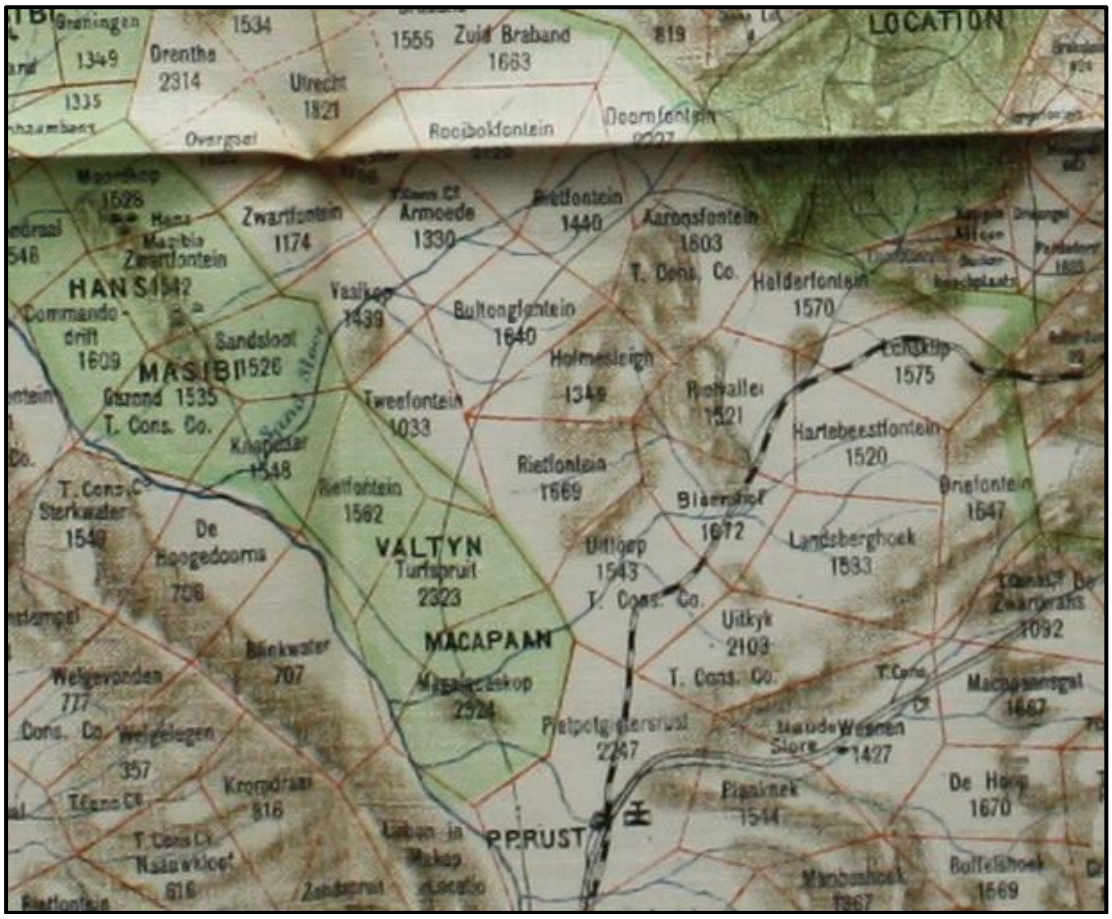


Fig. 3. Jeppe's map dated to 1899, showing a route slightly to the east of the current road.

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.

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			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
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			

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.

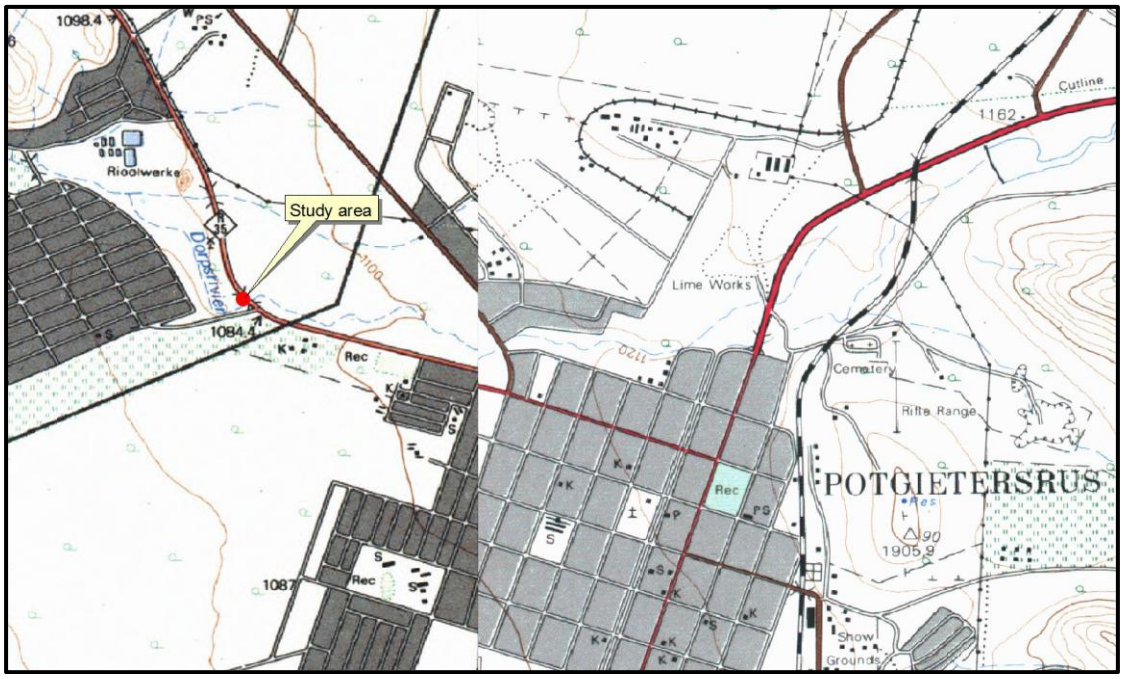


Fig. 4. Location of the Dorpsrivier bridge.
(Map 2428BB: Chief Surveyor-General)

Fig. 5. Side-view of the bridge and its identification number.

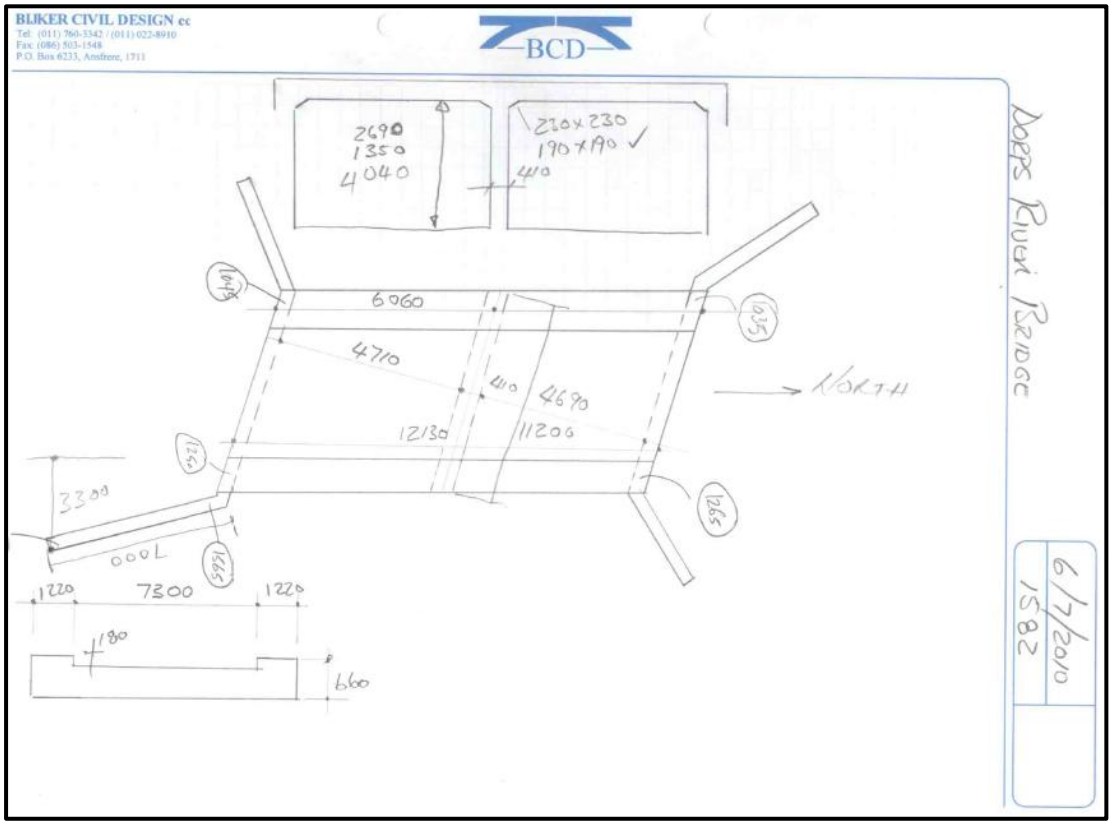


Fig. 6. The different dimensions of the bridge.
(Information supplied by Bijker Civil Design cc)

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.

Showing the south-eastern embankment

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 six upright sections of pipe 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.

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


South-eastern revetment

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:

Rooisloot 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.

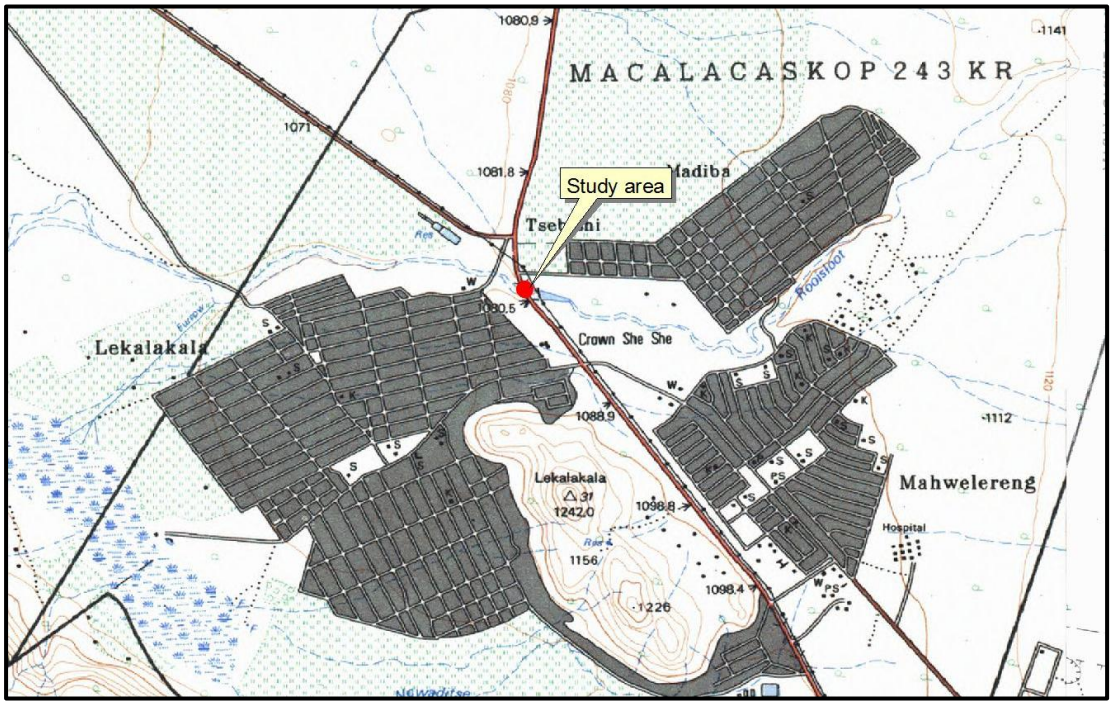


Fig. 7. Location of the Rooisloot bridge.
(Map 2428BB: Chief Surveyor-General)

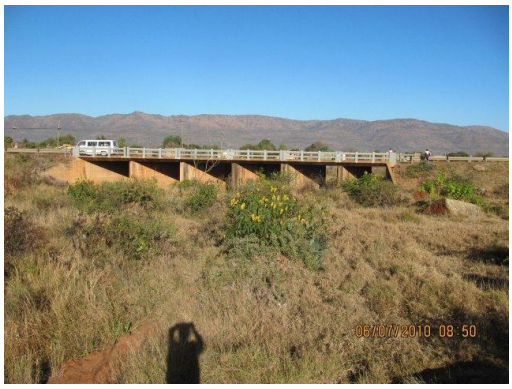


Fig. 8. Side-view of the bridge and its identification number.

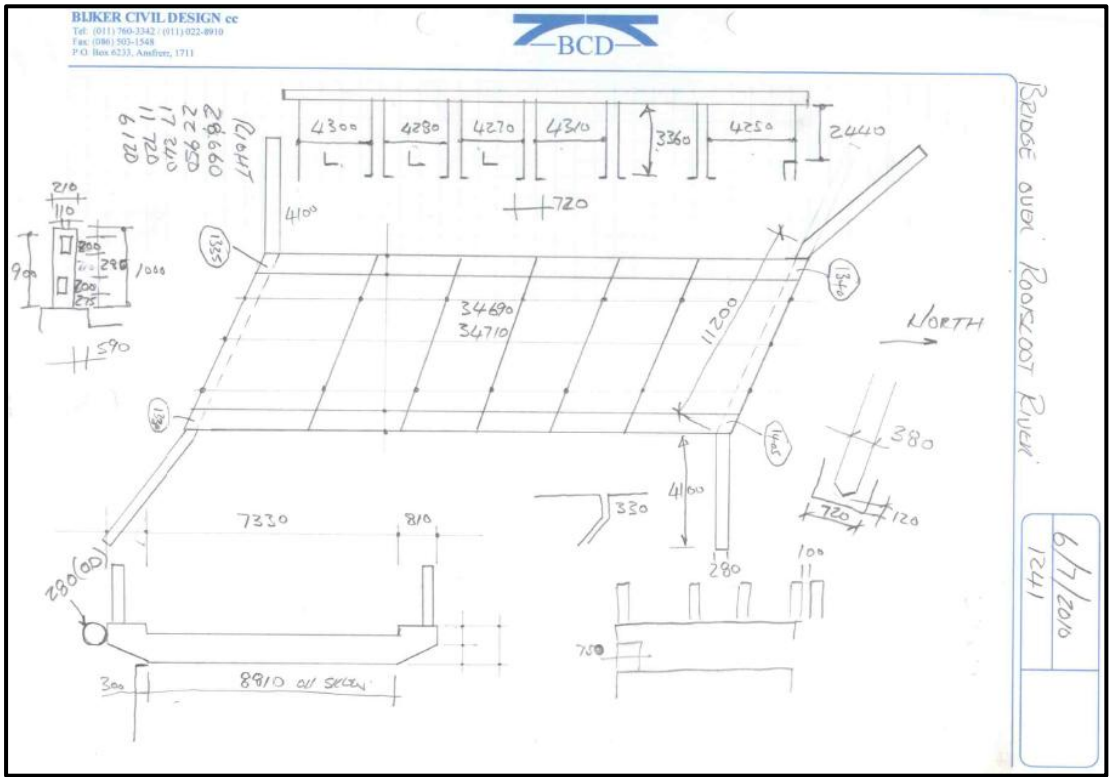


Fig. 9. The different dimensions of the bridge.
(Information supplied by Bijker Civil Design cc)

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.

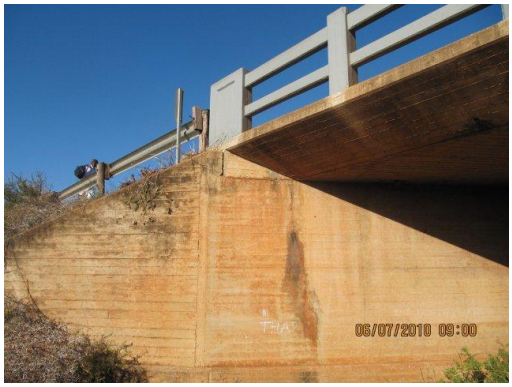
Bridge elements

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 two abutment walls (to water level) is 2,75 m and it is 11 m wide.

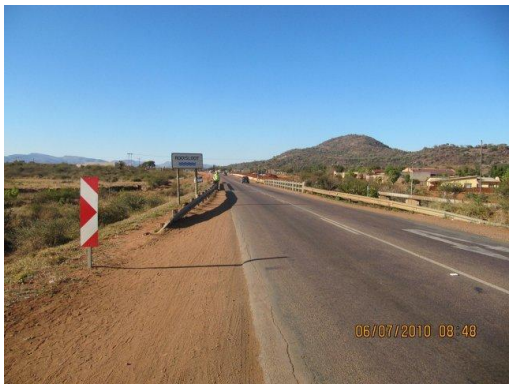


Abutment wall, south-eastern side

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.

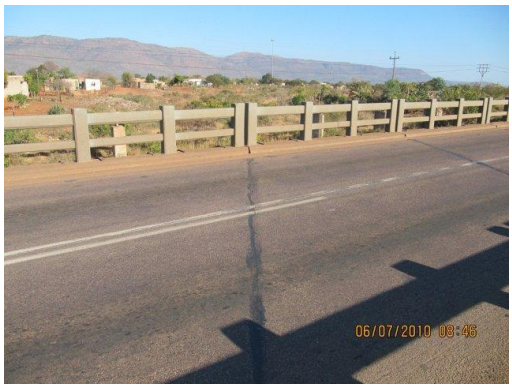


Approach road, travelling north

Bridge Deck:

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

The bridge deck consists of 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.

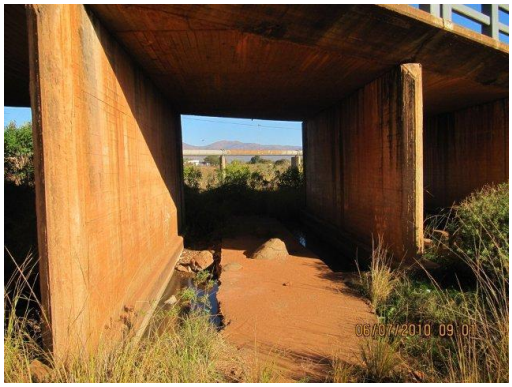


Bridge deck seen from the top

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.

Showing the embankments on both sides of the bridge.

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 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.

Railing on eastern side of bridge

Revetment:

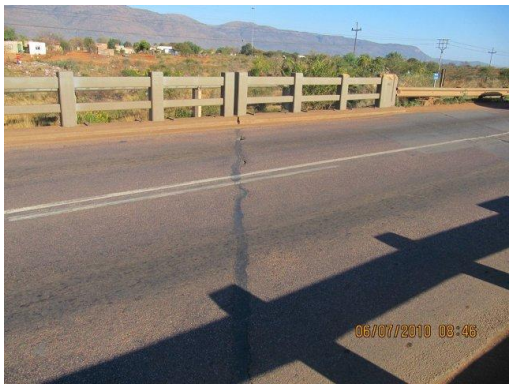
- A facing of masonry or stones to protect an embankment from erosion.

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

South-eastern revetment

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.

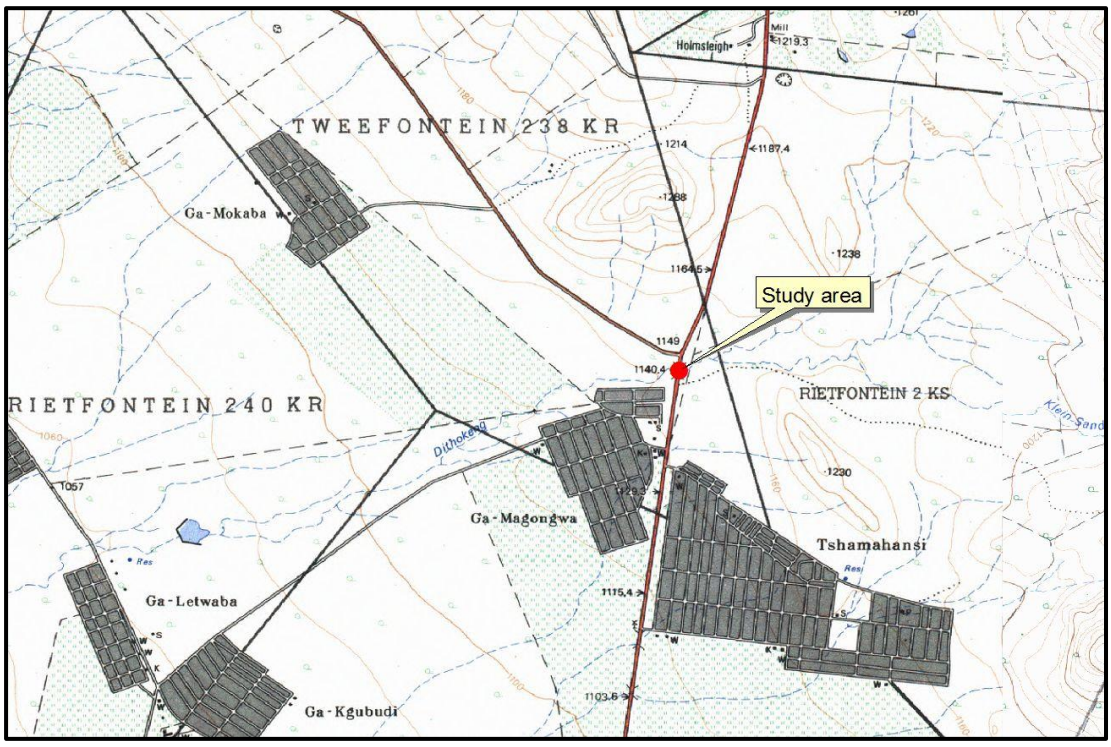


Fig. 10. Location of the Dithokeng bridge.
(Map 2428BB: Chief Surveyor-General)

Fig. 11. Side-view of the bridge and its identification number.

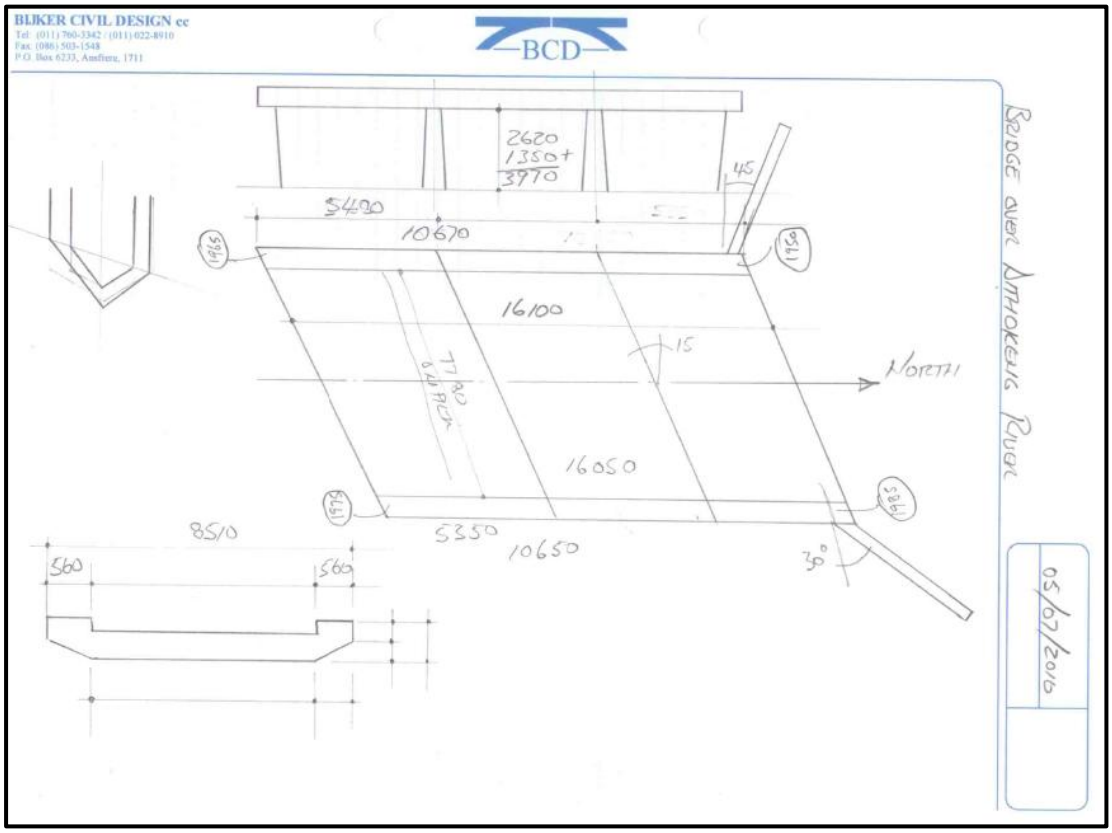


Fig. 12. The different dimensions of the bridge.
(Information supplied by Bijker Civil Design cc)

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.

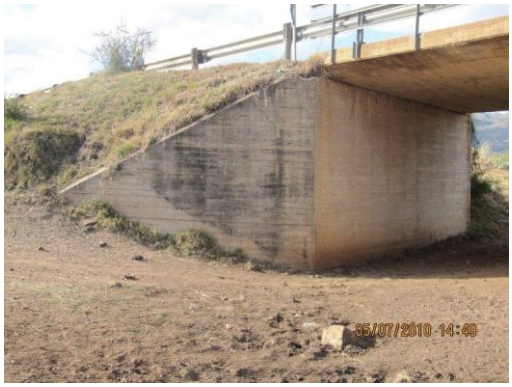
Bridge elements

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.

Bridge deck seen from the top

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.

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.

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	

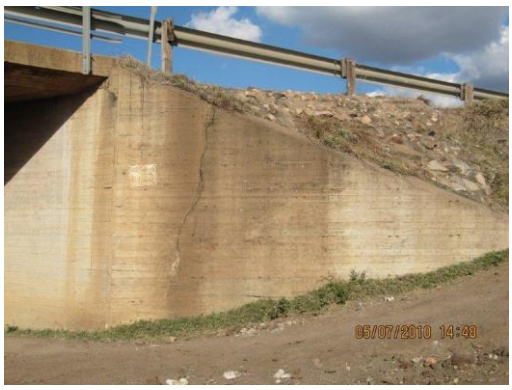
Revetment:

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

This bridge has no real revetments.

Conservation Issues

The bridge show 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.

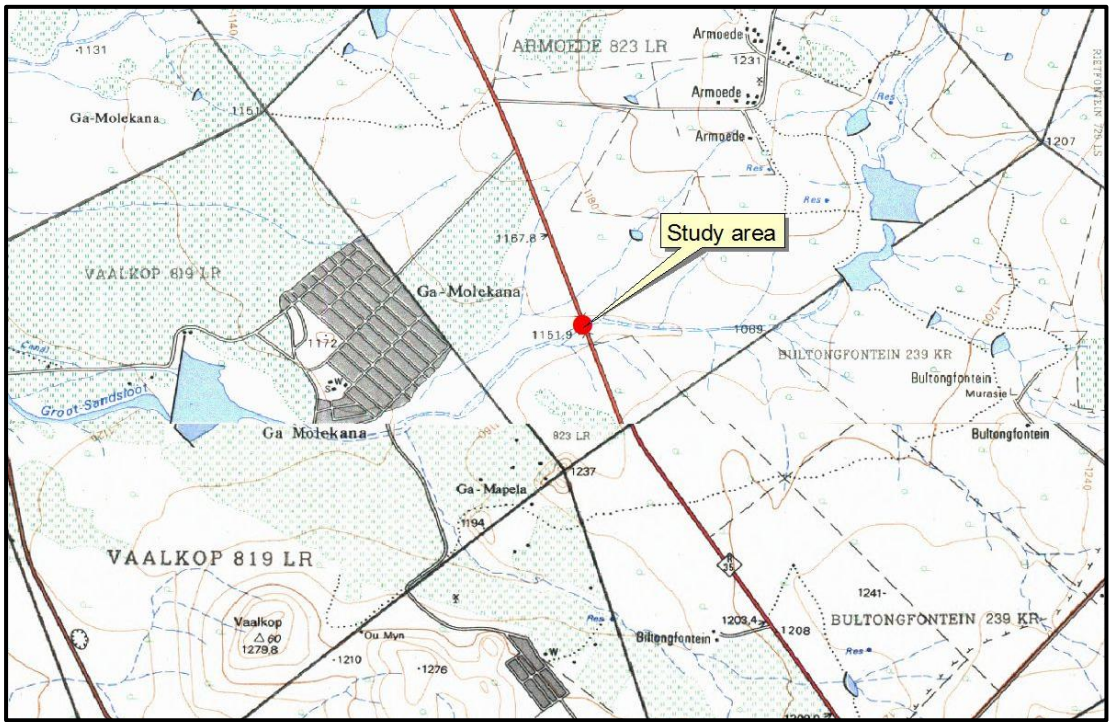


Fig. 13. Location of the Groot Sandsloot bridge.
(Map 2328DD: Chief Surveyor-General)

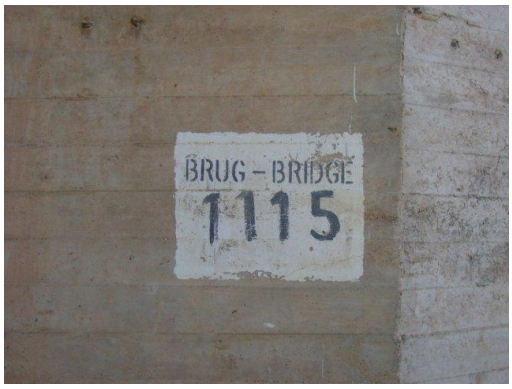


Fig. 14. Side view and identification number of the bridge.

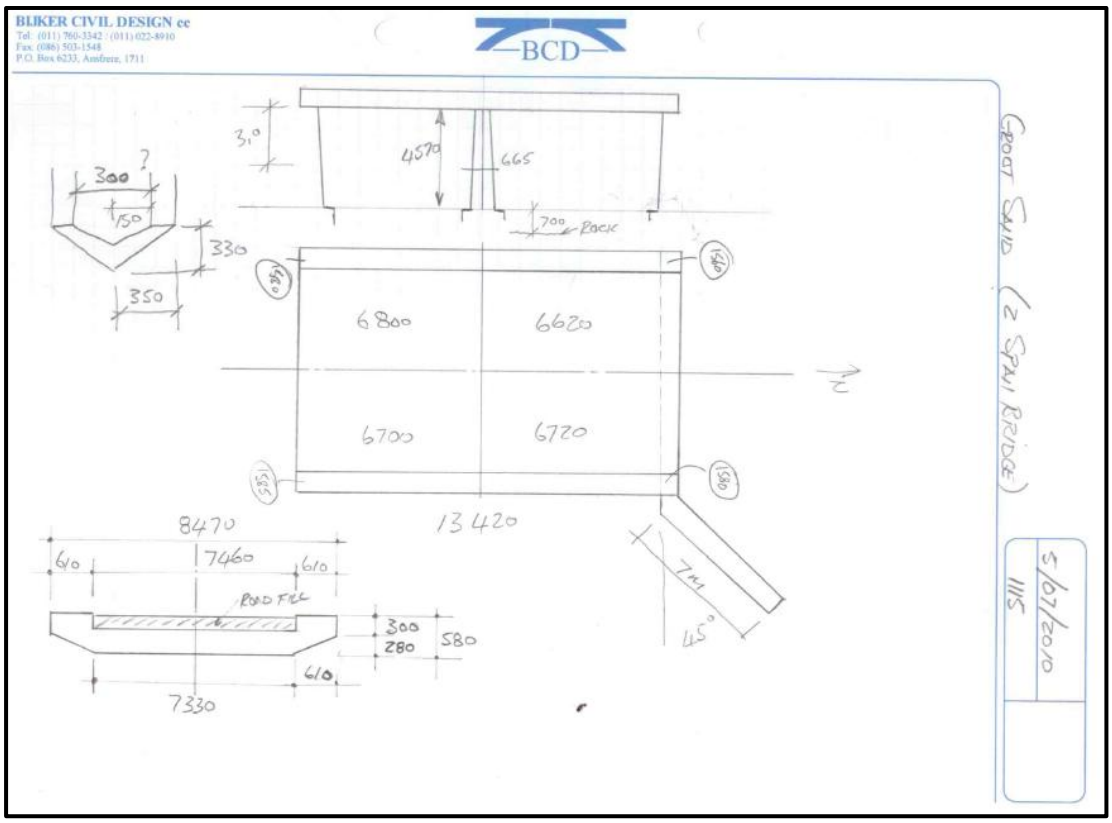


Fig. 15. The different dimensions of the bridge.
(Information supplied by Bijker Civil Design cc)

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.

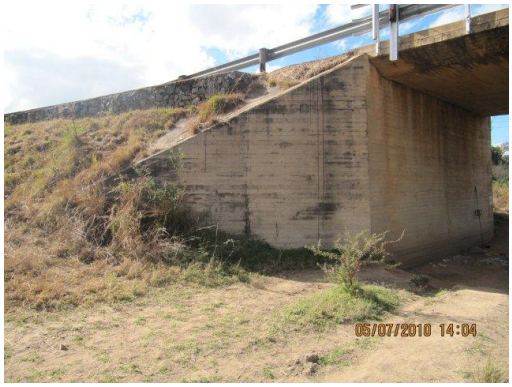
Bridge elements

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.

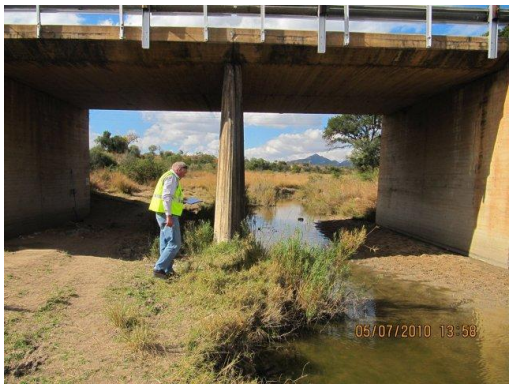
The bridge deck consists of two concrete slabs reinforced by girders. The top layer of the bridge deck consists of concrete, which is also part of the construction of the bridge and is then covered with a layer of tarmac. The total length of the bridge deck is approximately 13 m.

Bridge deck seen from the top

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.



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.

Showing the embankment

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:

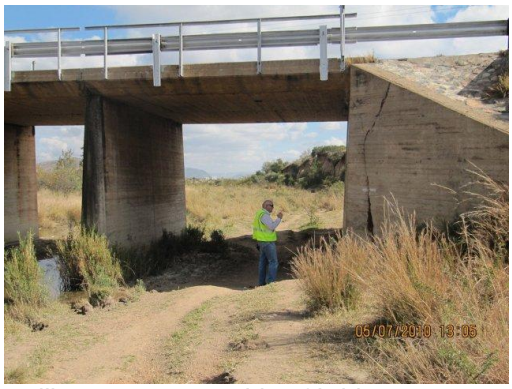
- A monumental vertical structure marking the entrance to a bridge or forming part of a gateway.

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 western side of bridge

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.


The western side of the bridge

Conservation Issues

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

4. REFERENCES

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4.3 **Maps and aerial photographs**

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1: 50 000 Topocadastral maps

APPENDIX 1. RELEVANT LEGISLATION

All archaeological and palaeontological sites, and meteorites are protected by the National Heritage Resources Act (Act no 25 of 1999) as stated in Section 35:

(1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8)(a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

In terms of cemeteries and graves the following (Section 36):

(1) Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit.

(2) SAHRA must identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with the grave referred to in subsection (1), and must maintain such memorials.

(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.