TERMS OF REFERENCE FOR SPECIALIST STUDIES

FOR INCLUSION IN

BASIC ASSESSMENT REPORT 24/2011

PROPOSED PERIODIC MAINTENANCE OF SECTION 11 OF THE N10

GROBLERSHOOP-LAMBRECHTSDRIFT

NORTHERN CAPE

OCTOBER 2011

Contents

1. Background Information

SANRAL SOC intends to undertake periodic maintenance on Section 11 of the N10, between Groblershoop (Km 0,0) and Lambrechtsdrift (Km 61,1), and has therefore requested a quotation for environmental practitioner services. This quotation has to include the cost of an archaeological survey.

The proposed maintenance works will comprise the following:

- Widening of four bridges, from a current width of approximately 7 m to 10,4 m, including new parapets
- Repairs/pretreatment of 8,6 km of existing road pavement, followed by a surface seal constructed on the existing levels
- Repairs/pretreatment of 52,5 km of existing pavement to the existing levels, including the widening and strengthening of the existing gravel shoulders to a minimum width of 7,4 m, followed by a surface seal constructed on existing levels
- Improvement of nine resting areas, including strengthening and/or additional pavement layers and surfacing constructed to new levels
- Geometric/safety improvements at four intersections
- Upgrading of four intersections and nine resting areas
- Treatment of existing road surfacing with various forms of localised repairs
- Resealing of the existing road over a distance of 61,1 km

2. Specialist Studies

2.1 Desired Approach for a Specialist Study

- Outline the study approach
- Identify and describe assumptions
- Identify sources of information
- Perform gap analysis
- Describe affected environment
- Describe nature of effects
- Perform sensitivity analysis
- Identify current and future risks
- Quantify and describe impacts
- Assess and evaluate impacts
- Identify and assess alternatives
- Propose and evaluate mitigation
- Summarise impacts after mitigation
- Propose monitoring programme

2.2 General Requirements for Specialist Reports

The specialist report must supply a non-technical summary of the study, as many interested and/or affected parties are not skilled. Compilation of the report should be guided by the Environmental Impact Assessment Regulations (GG 33306, GN R. 543, dated 18 June 2010, in terms of the National Environmental Management Act (Act No 107 of 1998)). Reports should include the following:

- Executive summary
- Definition of scope, including the purpose for which the report was prepared
- Description of research methodology, including:
    - Review of available information
    - Establishment of baseline conditions
    - Field surveys and data collection
- Methodology adopted in preparing the report, including:
    - Description of assumptions
    - Uncertainties or knowledge gaps
- Criteria used

- Identification and prediction of impacts, including:
    - Description of findings
    - Potential implications of the impact of the proposed activity on the environment
    - Identification of alternatives
- Results, recommendations, mitigation and monitoring requirements
- Maps, figures, tables and graphs
- Description of consultation processes undertaken during the course of the study
- Summary and copies of comments received during consultation processes
- Any other information requested by the competent authority or the EAP
- Complete reference list
- Details of the specialist who prepared the report
- Curriculum Vitae, indicating expertise of the specialist to conduct the specialist study
- Declaration of the independence of the specialist compiling the report

2.3 Additional Requirements for Archaeological Reports

Archaeological reports should make specific reference to the following:

- The built environment, and specifically structures older than 60 years
- Cultural landscapes
- Living heritage

2.4 Deliverables

Reports must be submitted to the Environmental Assessment Practitioner in both pdf and MS Word format, and must be complete, with figures and appendices in the correct order. A submission deadline will be negotiated between the EAP and the specialist on appointment.

An invoice, made out to Van Zyl Environmental Consultants must be submitted with the report. Please note that Van Zyl Environmental Consultants is not registered for VAT.

Reports should be submitted on time to ensure that the critical route of the Environmental Project Process Schedule stay on track and on time. In the event of late submission of a report, penalties of R 500 per day will be subtracted from the invoice delivered.

Documentation of
FOUR BRIDGES ON THE N10 NATIONAL ROAD BETWEEN UPINGTON AND GROBLERSHOOP, NORTHERN CAPE PROVINCE

DOCUMENTATION OF FOUR BRIDGES ON THE N10 NATIONAL ROAD BETWEEN UPINGTON AND GROBLERSHOOP, NORTHERN CAPE 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)
Heritage Consultant
April 2012

EXECUTIVE SUMMARY

DOCUMENTATION OF FOUR BRIDGES ON THE N10 NATIONAL ROAD BETWEEN UPINGTON AND GROBLERSHOOP, NORTHERN CAPE PROVINCE

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade National Route N10 between Upington and Groblershoop in Northern Cape Province. The roadwork would include the upgrading of four bridges.

In accordance with the National Heritage Resource Act, an independent heritage consultant was appointed by **Van Zyl Environmental Consultants** to evaluate the identified bridges in anticipation of SAHRA giving permission for the upgrading of the bridges.

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 the N10 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 four bridges.

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. Therefore, the bridges are judged to have low significance on a regional level.

Therefore, from a heritage point of view it is recommended that the proposed development be allowed to continue, on condition of SAHRA's acceptance of the documentation presented.

J A van Schalkwyk
Heritage Consultant
April 2012

TABLE OF CONTENTS

LIST OF FIGURES

DOCUMENTATION OF FOUR BRIDGES ON THE N10 NATIONAL ROAD BETWEEN UPINGTON AND GROBLERSHOOP, NORTHERN CAPE PROVINCE

1. INTRODUCTION

It is the intention of the South African National Roads Agency Limited (SANRAL) to upgrade National Route N10 between Upington and Groblershoop in Northern Cape Province. The roadwork would include the upgrading of four bridges.

South Africa's heritage resources, also described as the 'national estate', comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), Act 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

In accordance with the National Heritage Resource Act, an independent heritage consultant was appointed by **Van Zyl Environmental Consultants** to evaluate the identified bridges in anticipation of SAHRA giving permission for the upgrading of the 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 bridges on the R104 (Van Schalkwyk 2011) and a sandstone bridge in KwaZulu-Natal (Van Schalkwyk 2009). Experience and terminology obtained during this project was applied during 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 in the documentation process.

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 heritage consultant did not visit the various bridges and this evaluation is based solely on information supplied by the consultant, Van Zyl Environmental Consultants. This includes information on the location and size of the bridges as well as a number of photographs.

3. DESCRIPTION OF THE BRIDGES

3.1 **Historic overview**

Little information on the history of the N10 is available and the following is put together from a number of sources.

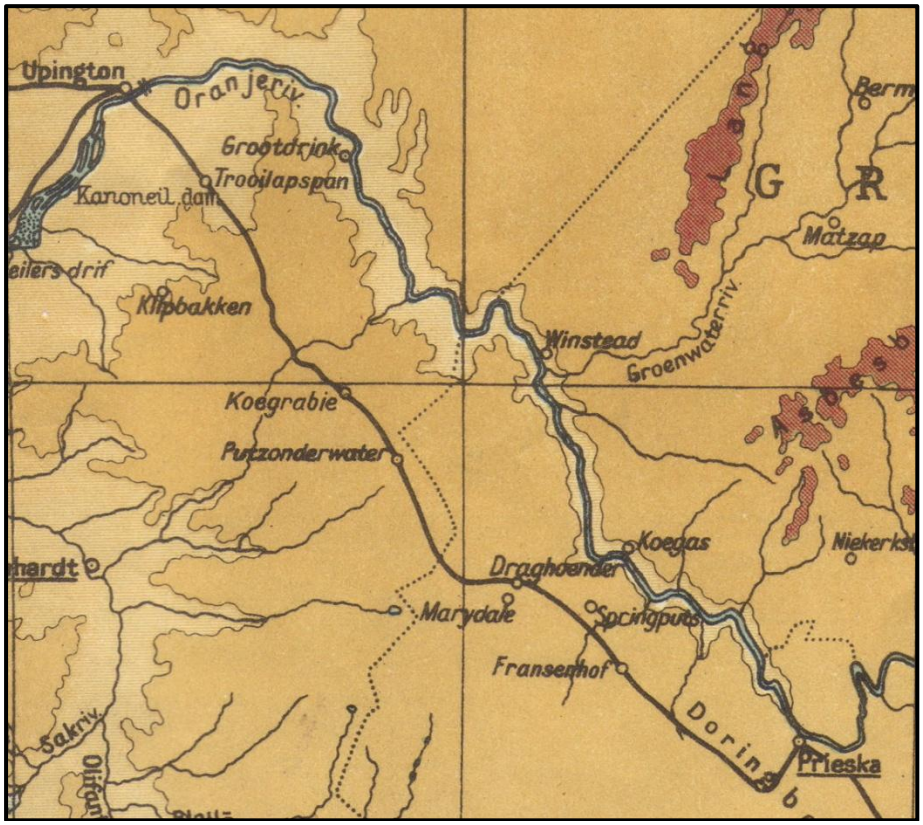

Fig. 1 Original alignment of the road.

It seems that originally the route south-eastwards from Upington to Prieska and further south followed a much more direct alignment, which was still in use by 1949 (Fig. 1). Based on the dates obtained from the various bridges, it seems as if the current alignment was constructed during the early 1950s. However, this does not imply that a road did not exist as a district road, which would have being required as a result of intensive farming activities in the region. It was only in 1977 decided to retain national route numbering for certain sections of existing roads, which seems to have led to the naming of the existing N10 national road (Floor 1985: 63).

3.2 **Bridge 1 – Saalskop Rivier Bridge**

Location:

Map: 2821DD; Local Municipality: !Kheis; Farm: Boegoeberg 48; Coordinates: -28.76478, 21.84758

Construction date:
1958

Fig. 2. Views of the bridge.

3.2.1 *Classification*

The Saalskop Rivier Bridge can be classified as a **three span** bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by two columns.

3.2.2 *Materials*

The material used in the construction of the bridge is cast concrete. The latter technique, although used to some extent prior to that, came into 'fashion' only during the Second World War as iron and for that matter all metals 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.

3.2.3 *Bridge elements*

The various elements making up the bridge will be discussed and illustrated in alphabetic order.

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.

Approach Road:

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

The approach road runs between Upington and Groblershoop and carries a large volume of traffic.

Bridge Deck:

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

The bridge deck seems to be a single concrete slab 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.

Columns:

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

Two columns support the bridge deck. They are all from cast concrete and are set at a slight angle to the bridge deck in order to be parallel to the stream bed. The foundations of the columns are 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.

Pylon:

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

The pylons are rounded shaped slabs of concrete located on the corners of the bridge. Usually the number of the bridge and the date of construction are added to this.

Railing:

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

The original railings were of concrete consist of a number of uprights and two horizontal railings attached to them. The current railings are reinforced by Armco crash barriers.

Revetment:

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

The revetment walls are constructed from cast concrete. The base of the wings has a foundation that possibly extends down to the bedrock.

3.2.4 *Conservation Issues*

The bridge in itself is in good repair, showing no signs of natural decay or damage from plant life.

3.3 **Bridge 2 – Kalkwerfsloot River Bridge**

Location:
Map: 2821DB; Local Municipality: !Kheis; Farm: Boegoeberg 48; Coordinates: -28.65264, 21.76219

Construction date:
1957

Fig. 3. Views of the bridge.

3.3.1 *Classification*

The Kalkwerfsloot Rivier Bridge can be classified as a **four span** bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by three columns.

3.3.2 *Materials*

The material used in the construction of the bridge is cast concrete. The latter technique, although used to some extent prior to that, came into 'fashion' only during the Second World War as iron and for that matter all metals 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.

3.3.3 *Bridge elements*

The various elements making up the bridge will be discussed and illustrated in alphabetic order.

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.

Approach Road:

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

The approach road runs between Upington and Groblershoop and carries a large volume of traffic.

Bridge Deck:

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

The bridge deck seems to be a single concrete slab 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.

Columns:

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

Two columns support the bridge deck. They are all from cast concrete and are set at a slight angle to the bridge deck in order to be parallel to the stream bed. The foundations of the columns are 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.

Pylon:

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

The pylons are rounded shaped slabs of concrete located on the corners of the bridge. Usually the number of the bridge and the date of construction are added to this.

Railing:

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

The original railings were of concrete consist of a number of uprights and two horizontal railings attached to them. The current railings are reinforced by Armco crash barriers.

Revetment:

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

The revetment walls are constructed from cast concrete. The base of the wings has a foundation that possibly extends down to the bedrock.

3.3.4 *Conservation Issues*

The bridge in itself is in good repair, showing no signs of natural decay or damage from plant life.

3.4 **Bridge 3 – Ezelfontein River Bridge**

Location:
Map: 2821DB; Local Municipality: !Kheis; Farm: Boegoeberg 48; Coordinates: -28.61024, 21.75726

Construction:
1957

Fig. 4. Views of the bridge.

3.4.1 *Classification*

The Ezelfontein Bridge can be classified as a **three span** bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by two columns.

3.4.2 *Materials*

The material used in the construction of the bridge is cast concrete. The latter technique, although used to some extent prior to that, came into 'fashion' only during the Second World War as iron and for that matter all metals 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.

3.4.3 *Bridge elements*

The various elements making up the bridge will be discussed and illustrated in alphabetic order.

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.

Approach Road:

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

The approach road runs between Upington and Groblershoop and carries a large volume of traffic.

Bridge Deck:

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

The bridge deck seems to be a single concrete slab 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.

Columns:

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

Two columns support the bridge deck. They are all from cast concrete and are set at a slight angle to the bridge deck in order to be parallel to the stream bed. The foundations of the columns are 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.

Pylon:

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

The pylons are rounded shaped slabs of concrete located on the corners of the bridge. Usually the number of the bridge and the date of construction are added to this.

Railing:

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

The original railings were of concrete consist of a number of uprights and two horizontal railings attached to them. The current railings are reinforced by Armco crash barriers.

Revetment:

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

The revetment walls are constructed from cast concrete. The base of the wings has a foundation that possibly extends down to the bedrock.

3.4.4 *Conservation Issues*

The bridge in itself is in good repair, showing no signs of natural decay or damage from plant life.

3.5 **Bridge 4 – Boom Rivier Bridge**

Location:
Map: 2821BC; Local Municipality: //Khara Heis; Farm: Lambrechtsdrift; Coordinates: -28.49456 21.69144

Construction date:
1956

Fig. 5. Views of the bridge.

3.5.1 *Classification*

The Boom Rivier Bridge can be classified as a four span bridge as the spanning superstructure extends from one vertical support, called abutment, to another, being supported by four columns.

3.5.2 *Materials*

The material used in the construction of the bridge is cast concrete. The latter technique, although used to some extent prior to that, came into ‘fashion’ only during the Second World War as iron and for that matter all metals 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.

3.5.3 *Bridge elements*

The various elements making up the bridge will be discussed and illustrated in alphabetic order.

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.

Approach Road:

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

The approach road runs between Upington and Groblershoop and carries a large volume of traffic.

Bridge Deck:

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

The bridge deck seems to be a single concrete slab 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.

Columns:

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

Two columns support the bridge deck. They are all from cast concrete and are set at a slight angle to the bridge deck in order to be parallel to the stream bed. The foundations of the columns are 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.

Pylon:

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

The pylons are rounded shaped slabs of concrete located on the corners of the bridge. Usually the number of the bridge and the date of construction are added to this.

Railing:

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

The original railings were of concrete consist of a number of uprights and two horizontal railings attached to them. The current railings are reinforced by Armco crash barriers.

Revetment:

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

The revetment walls are constructed from cast concrete. The base of the wings has a foundation that possibly extends down to the bedrock.

3.5.4 *Conservation Issues*

The bridge in itself is in good repair, showing no signs of natural decay or damage from plant life.

4. 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 four bridges was done.
- The history of the development of the N10 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.

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. Therefore, the bridges are judged to have low significance on a regional level.

Therefore, from a heritage point of view it is recommended that the proposed development be allowed to continue, on condition of SAHRA's acceptance of the documentation presented.

5. REFERENCES

5.1 **Data bases**

Chief Surveyor General
Environmental Potential Atlas, Department of Environmental Affairs and Tourism.
Heritage Atlas Database, Pretoria.
National Archives of South Africa

5.2 **Literature**

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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.

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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.

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4.3 **Maps and aerial photographs**

1: 50 000 Topocadastral maps
Google Earth