

**PROPOSED STRENGTHENING (PARTIAL RECONSTRUCTION) OF
NATIONAL ROUTE 27 SECTION 7 & 8 BETWEEN WESTERN/
NORTHERN CAPE BORDER (KM 40.0) AND CALVINIA (KM 70.0)
CONTRACT R.027-080-2011/1D**

Heritage Impact Assessment conducted under Section 38 (8) of the National
Heritage Resources Act No 25 of 1999 as part of a Basic Assessment.



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EXECUTIVE SUMMARY

ACO Associates CC was appointed by CCA Environmental Pty Ltd to undertake an archaeological and cultural resources impact assessment as part of a basic assessment for the upgrading and strengthening of the R27 road between the towns of Nieuwoudtville and Calvinia, Northern Cape Province. The proposed activity will involve strengthening and rebuilding of the road in places, limited widening, as well as widening 3 of 4 bridges and possibly major culverts. Material for the strengthening in the form of gravel aggregates is to be sourced from 7 possible sources, 6 of which are expansions of existing borrow pits, and a further source in the form of re-utilising a spoil heap of a disused mine.

The field study identified impacts to archaeological material at two of the borrow pits which are of very low significance. No mitigation is deemed necessary.

The proposed activities will result in negligible impacts on all fronts apart from the impacts that could be generated through the proposed widening of the Calvinia bridge over the Oorlogskloof River. This bridge is more than 60 years old and is therefore generally protected under the provisions of the National Heritage Resources Act. Alteration of this structure will require a heritage-sensitive approach that is sympathetic to the age and heritage qualities of the bridge. An application for permission to modify a structure older than 60 years will have to be submitted to Heritage Northern Cape.

The proposed activity is considered acceptable.

Glossary

Archaeological material *Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Cultural landscape *A landscape that has historical and/or scientific significance.*

Heritage *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000)*

NHRA *National heritage Resources Act 25 of 1999*

Palaeontological *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

SAHRA *South African Heritage Resources Agency*

Structure (historic) *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

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1. INTRODUCTION

The South African National Roads Agency Limited (SANRAL) is proposing to strengthen and partially reconstruct certain structures on the R27, Sections 7 and 8, between the Western / Northern Cape border (km 40.0) and Calvinia (km 70.0). The proposed project is comprised of the following main components:

- Road works: The upgrading of the approximately 73-km road section by strengthening the existing layers and limited widening of the road.
- Bridges and culverts: The widening of three (of the four) bridges and the possible widening or reconstruction of some of the major culverts.
- Borrow pits: The development of a number of borrow areas (7) for the sourcing of road-building material and crushed aggregates.

ACO Associates CC was appointed by CCA Environmental PTY Ltd to conduct the heritage specialist study which is part of the Basic Assessment triggered by the proposed activity. This Heritage Impact Assessment is therefore conducted in terms of section 38.8 of the National Heritage Resources Act 25 of 1999.

The specialist terms of reference provided by CCA Environmental Pty Ltd required that the ACO fulfil the following terms of reference which are indicated below:

- Provide a broad, baseline description of the archaeological and cultural history resource potential of the study area, placing the sites in a local and regional context.
- Provide specific information relating to the archaeology and cultural history resources of each borrow pit and bridge site, with reference to locations and/or structures of special concern and their conservation significance, which can be used as baseline information for the assessment of potential impacts of the proposed activities and any activity alternatives.
- Identify, describe and assess the impacts of the proposed activities and any activity alternatives on archaeology and cultural history resources.
- Recommend appropriate, practicable mitigation measures that will reduce all major (significant impacts or enhance potential benefits, if any).
- Provide guidance on the requirement of any permits from the South African Heritage Resources Agency (SAHRA) and/or the relevant provincial heritage authority. If necessary, compile an application for permission for the proposed project in compliance with the National Heritage Resources Act (No. 25 of 1999) for submission to SAHRA and/or the relevant provincial heritage authority, if necessary.

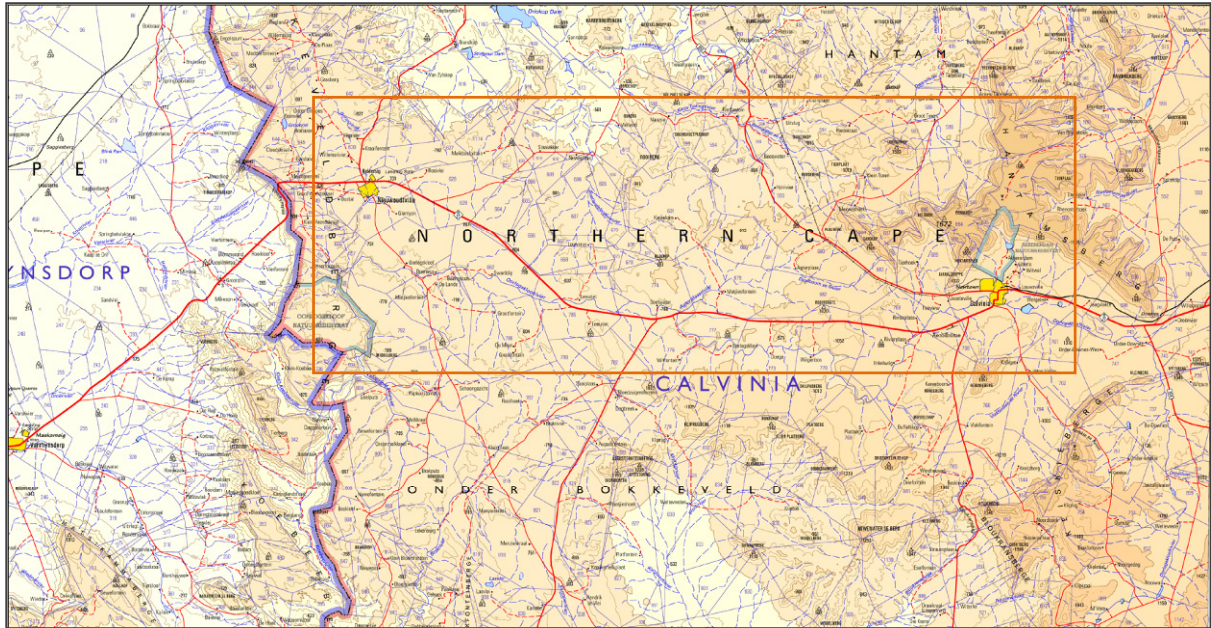


Figure 1: After 1:250 000 map sheets of 3118 (Calvinia) showing the approximate location of the R27 study area between Calvinia (east) and Nieuwoudville (east)

1.1 The proposed activity

The R27 was recently strengthened to a point immediately east of the town of Nieuwoudville. The proposed project is to continue the strengthening of the road as far as Calvinia. The road is consistently used by heavy and light vehicles alike with the result that certain areas are showing signs of wear and the tarmac is deteriorating. The sub-base therefore needs to be replaced and new asphalt applied. In areas the road will be slightly widened. None of the repairs will take place outside of the existing road reserve being mostly confined to the existing road footprint.

Bridges: Three of 4 bridges will need to be widened by between 1.2 and 1.7m

Borrow pits: The 7 borrow pits which have been identified as potential options for the sourcing of materials and aggregate are expansions of 6 existing borrow pits and the utilising of the spoils from a disused Iceland spar mine. Most of the raw material sources are very close to the R27 however one lies on farm land north of Nieuwoudville. It is important that material is sourced as close as possible to the proposed work to limit the expense and negative environmental implications of long distance haulage.

Water sources: Water for the road works will be obtained from local sources close to the route – rivers, boreholes and wind pump dams. Since all of those sources identified so far exist, no major landscape modification is expected to take place.

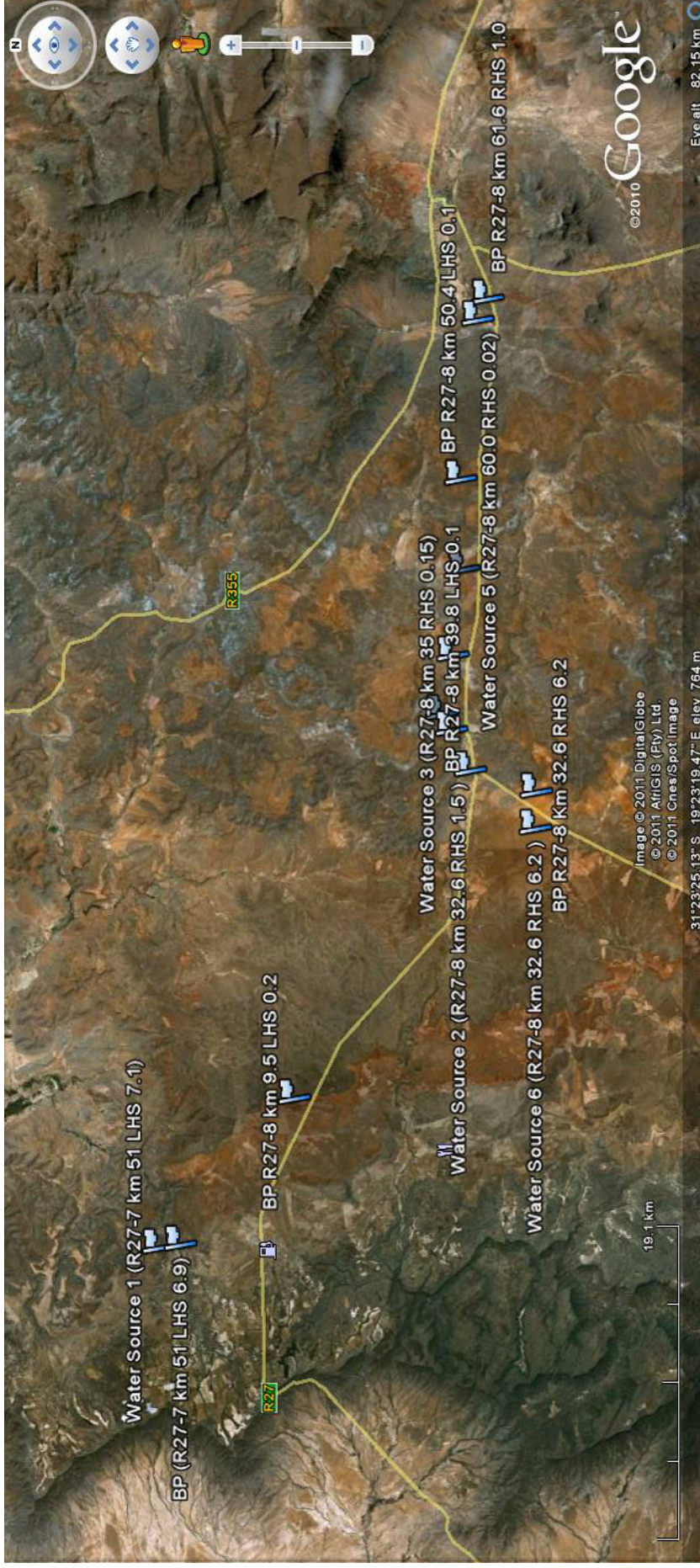


Figure 2. Locations of borrow pits and water sources.

2. DESCRIPTION OF THE ENVIRONMENT

The study area is the R27 between Calvinia and Nieuwoudtville in the Northern Cape. The landscape in question forms part of the high Karoo plateaux above the great escarpment. It is characterised by a sparse population, open plains punctuated by hills and mountains. The geology consists of shales and sandstones interrupted by dolerite extrusions and dykes. The main commercial activity is stock farming, however the region experiences a seasonal economic boost with the annual influx of tourists during the spring flower season. Out of season this is an isolated part of country with small permanent populations on sparse farms and in the towns of Calvinia and Nieuwoudtville.

In terms of heritage, the area has not been well studied. The vernacular architecture of Nieuwoudtville and surrounds has attracted some interest, especially the Vernacular Society of South Africa who have implemented an in-house programme to record and photograph ruins and old farm houses at the Soutpan settlement that are under threat (Amschwand 2007).

Nieuwoudtville is one of the more recent *Kerkdorpië*s (church towns) in the area founded in 1897. It has a characteristic home grown architecture based on the use of local sandstone. Calvinia is also a *Kerkdorpie* but somewhat earlier in age and having been founded in the mid-19th century (Fransen 2006), contains some good examples of 19th century buildings. Many of the small church towns of the Cape evolved from *Nagmaal* outspans – places where farming families would congregate on a monthly basis to attend a religious service, exchange and purchase goods and socialise.

The Hantam Mountains to the north of Calvinia has not been subjected to any archaeological research programs or surveys in the past and virtually nothing is known of this area. There are numerous web pages which report on the rock art of the Oorlogskloof Nature Reserve which is located 70 km south-west. A literature search has only produced one published account, namely that of Mr. J Hollman who reported on numerous rock shelters containing rock art in the Koebee River valley, about 40 km south of Oorlogskloof. Mr. D Morris (2007) of the McGregor Museum has undertaken a contract survey for the upgrading of railway infrastructure north of Loeriesfontein and discovered a small shelter with a Middle Stone Age scatter on the Krom River (D. Morris pers comm.). ACO has conducted two small surveys in the Calvinia District but did not identify any significant archaeological material.

The shales of the Karoo represent one of the world's most significant repositories of palaeontological material, however assessment of this aspect of the study area was not included in the terms of reference for this project.

3. LEGISLATION

The National Heritage Resources Act, No 25 of 1999 (Section 38 (1)) makes provision for a compulsory notification of the intent to development when any development exceeding 5000 sq.m. in extent, or any road or linear development

exceeding 300m in length is proposed. Section 38 (8) of the NHRA relates to impact assessments undertaken as part of an Environmental Impact Assessment.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).
- Palaeontological material is protected under the National Heritage Resources Act but is exempt in instances where material is mined for industrial use.

4. IDENTIFICATION OF IMPACTS

4.1 Method.

The field study involved visiting the proposed borrow pit sites and bridges that were to be modified, and checking the water sources. The study team consisted of Tim Hart and David Halkett. They drove the upgrade route and walked loops and transect around any areas of land that would be subject to modification (5th- 10 May 2011). The purpose of this was to identify any heritage material (archaeology, built environment, graves and any other features of heritage significance) protected under the general and specific conditions of the NHRA. During the course of the study it became evident (as was expected) that archaeological material was present at almost every locality but at such low densities (less than 1 artefact per 30 sq. m) that definable sites could not be identified. Where densities exceeded 1 artefact per 10 sq.m, the sites were recorded and plotted using a Garmin GPS with a high sensitivity chip set on WGS84 map datum. Photographs were taken of all heritage features located.

No particular restrictions were encountered during the study. The team was able to access all relevant areas; visibility was generally good due to the thin ground cover of the upper Karoo. An assumption was made that the building style of the Oorlogsrivier Bridge at Calvinia was attributable to the firm Murray and Stewart Ltd who are known to have built similar bridges in the same province during the first half of the 20th century.

4.2 Identified impacts

Borrow pits. The field inspection of the borrow pits (examples Plates 3-4) indicated that heritage impacts were minimal. All the sites are situated in a rural context, and

all will be rehabilitated after use in compliance with current environmental standards. In only two instances did archaeology occur at frequencies of 1 artefact per 10 sq.m. The impacts associated with these two occurrences are of very low significance, and no mitigation is proposed. Observations are summarised in Appendix A. Walk paths of the team are indicated in Appendix B.

Water sources. The proposed water sources consist of boreholes, wind pump reservoirs, rivers (when they are flowing) and dams. No heritage impacts were identified that would result from the pumping of water from these sources.

Bridges. Of the 4 bridges on the route, one of these is of heritage significance. The other three bridges are standard South African road bridges (Plate 1) built circa 1955-1965. These are not unique and are not generally protected.

The Calvinia bridge (km 67) however, is a 4 pier concrete arch bridge typical of bridges built by the engineering firm Murray and Stewart Ltd shortly after the establishment of the company circa 1930 (Plate 2). Archival research conducted by ourselves and CCA Environmental Pty Ltd has revealed that the bridge was constructed in 1937-38 (Figures 3) to replace an earlier concrete bridge which was washing away (see Appendix A). The Calvinia bridge is significant on account of its age, its aesthetic qualities and gateway position at the western “entrance” to Calvinia. Similar examples exist at Keimoes, Upington as well as over the Fish River in the Eastern Cape (Middleton) and at a rail crossing over the Gamka River at Laingsburg. No doubt there are others which have not been documented.

It is proposed to widen the bridge by 6.15 m to the downstream side only so as to retain as much as possible of the existing historical substructure. The additional structure would be designed in the form of arch-type piers in order to match the existing design style. The physical footprint of the bridge substructure would increase by approximately 41.1 m² as a result of the additions. The existing balustrades pose a safety hazard as they are substandard and would not be capable of absorbing current vehicle impact loads in the event of an accident. It is therefore proposed to replace the balustrades in order to comply with the minimum required safety standards for the bridge. Detailed design proposals for this bridge are not yet available at this stage. It will be undertaken by specialist bridge design engineers to ensure compliance with both SANRAL safety standards and heritage requirements to conserve the historical structure (CCA Environmental Pty Ltd 2011).

Cultural landscape. The landscape qualities of the study area are dominantly rural and natural with no important sites or places of heritage significance close to any of the proposed activities, hence no impacts are expected. There will be some temporary visual scarring during construction which will be remediated during rehabilitation. This however is a visual impact which is not the core subject matter of this specialist report.

Plate 1 Standard Bridge at Soetwater crossing

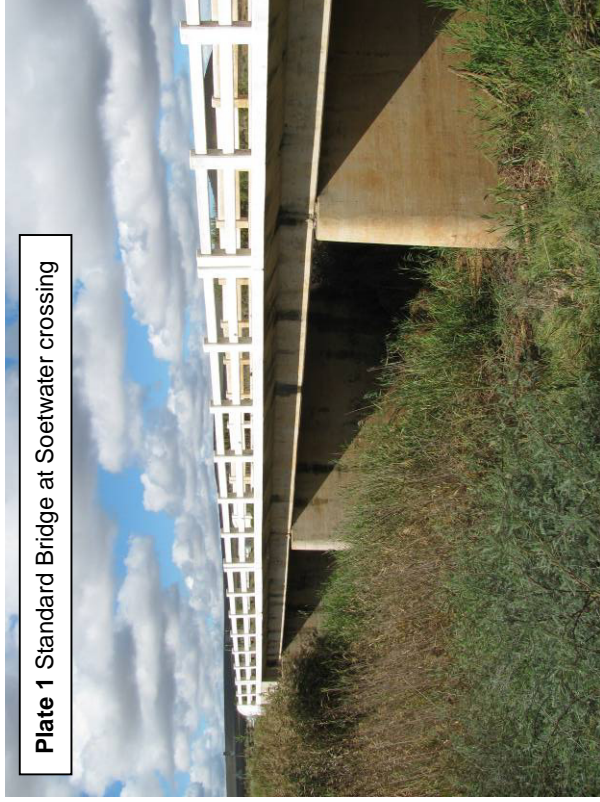


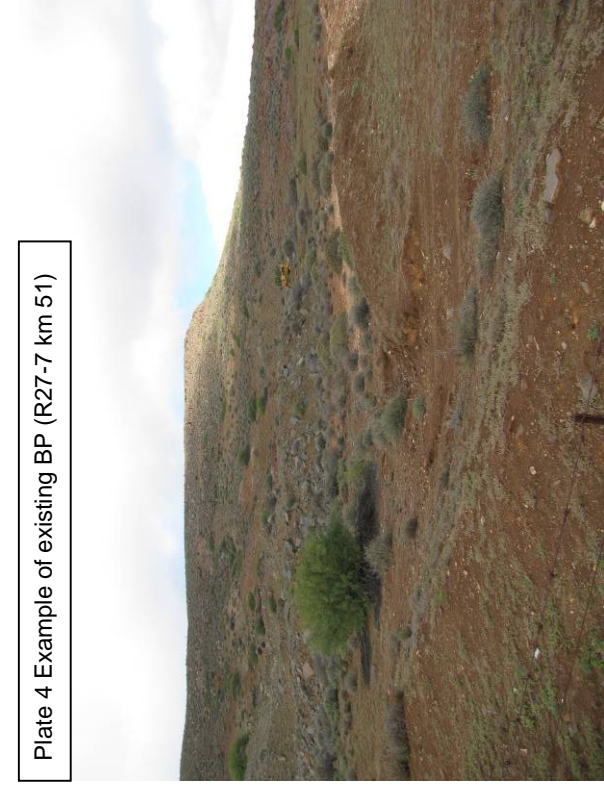
Plate 2 Historical Oorlogspoort bridge at Calvinia (km 67)

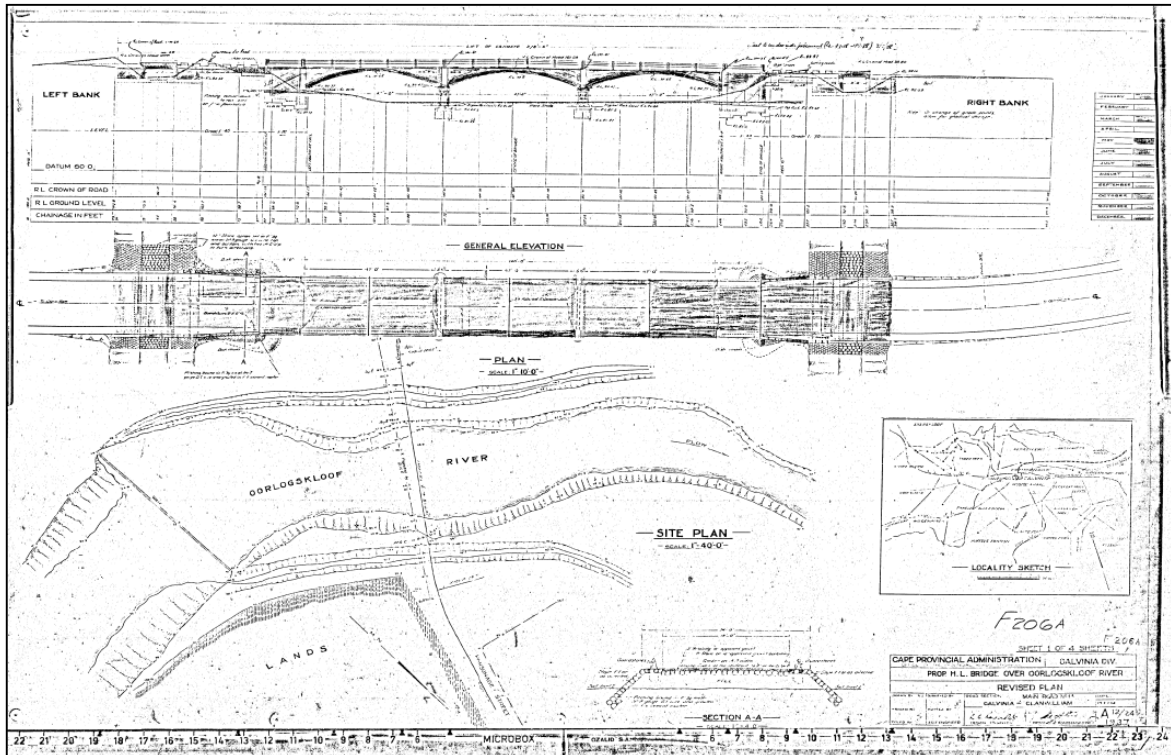


Plate 3 Example of existing BP (R27-8 km 9.5)



Plate 4 Example of existing BP (R27-7 km 51)





Trunk Road 16 Section 3		BRIDGE	2497
Bridge Reference Numbers			
Bridge Number	:	2497	
Bridge Name	:	Oorlogskloof River No 4	
File Number	:	Unknown	
Index Number (General Arrangement)	:	A12/24	
Progress Plan Number	:	F206A	
Bridge Location			
D.R.E. Area	:	Caras	
R.S.C. Area	:	Noordweste	
Bridge Warrant History			
Warrant 1	:	New Location	
Bridge Type Information			
Crossing Type	:	Road over River	
Bridge Type	:	Fixed Arch Bridge with Spandrel Walls	
Deck Type	:	Arch under Fill	
Deck Material Type	:	Ordinary Reinforced Concrete	
Deck Construction Type	:	In-Situ Construction	
Balustrade Type	:	R.C. Stanchion with Precast Railing	
Bearing Type	:	Steel Roller	
Expansion Joint Type	:	Filled Gap	
Abutment Type	:	R.C. Cellular Box	
Pier Type	:	Solid R.C. Wall	
Foundation Type	:	Spread Footing	
Founding Material Type	:	Unknown	
Bridge Dimensions			
Skew (degrees)	:	90	
Radius (m)	:	On Straight	
Number of Spans (side view)	:	3	
Number of Main Spans	:	3	
Maximum Span Length (m)	:	14.30	
Overall Length (m)	:	53.50	
Number of Carriageways	:	1	
Number of Traffic Lanes	:	2	
Carriageway Width (m)	:	5.50	
Number of Footwalks	:	2	
Overall Width (m)	:	7.20	
Vertical Clearance (m)	:	3.00	
Bridge Design Information			
Design Authority	:	CPA (Roads Department)	
Design Date (year/month)	:	37/06	
Design Flood Return Period	:	Unknown	
Design Discharge (cub m/s)	:		
Design Flood Level (m)	:		
Maximum Depth of Flow (m)	:		
Design Freeboard (m)	:		
Highest Known Flood Level (m)	:		
Design Code	:	CPA (Before 1977)	
Traffic NA/HA Loading	:	Unknown	
Traffic NB/BB Loading	:	Unknown	
Traffic NC/HC Loading	:	Unknown	
Traffic (NC+2/3NA) Loading	:	No	
Bridge Construction Information			
Construction Authority	:	Divisional Council	
Completion Date (year/month)	:	38/06	
Construction Cost (Rands)	:	6780	
Report date : 2 Feb 1994			

Figure 3 Details of Oorlogskloof Bridge (Provincial Engineers archive NC B2497, NC F206A)

4.3 Assessment of impacts

Two areas of potential impacts to heritage have been identified. These are evaluated below.

Built environment. Impacts to the built environment involve the potential changing of a bridge structure that shows very little evidence of change in that last 70-80 years.

The bridge deck and balustrades do not comply with modern load requirements and its alteration has become necessary for safety considerations. The design approach of limiting the bridge widening to one side only has been adopted in order to preserve as much of possible of the original structure. In addition, the design would retain the essential arch form to match the existing design style and characteristics. Without mitigation the impact of alterations to Bridge NB38 has been assessed as of local extent, permanent duration and high intensity, with an associated significance rating of **Medium**. With mitigation the impact will be **low**.

Table 1. Impacts to built environment (Calvinia Bridge at km 67)

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Permanent	Permanent
Intensity	Medium	Low
Probability	High	High
Confidence	High	High
Significance	Low	Low
Cumulative impact	Medium	Low
Nature of Cumulative impact	This relates to the loss or modification of early bridge structures in response to modern traffic needs. Although other similar bridges are known, of which 3 at Keimoes are undergoing modification, the exact number of surviving early bridges in RSA are unknown, hence the extent of cumulative impact is not gaugeable.	
Degree to which impact can be reversed	Major physical modifications are not reversible unless this is specified as a design requirement.	
Degree to which impact may cause irreplaceable loss of resources	As yet unknown.	
Degree to which impact can be mitigated	The impact can be mitigated significantly by use of sympathetic design and engineering.	

Archaeology. Archaeological material is highly context sensitive, which means that its disturbance or removal from site of origin destroys its significance. Disturbance or destruction can occur as a result of any activity that involves ground surface disturbance or alterations to the landscape. The impacts that result from this are generally permanent, but the significance of the impact relates to the rarity or importance of the archaeological material, and the extent to which it will be disturbed.

Borrow pits represent a possible source of impact as they involve disturbance of the land surface.

Table 2: Assessment of impacts to pre-colonial archaeology.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local
Duration	Indefinite	Indefinite
Intensity	Very low	Very low
Probability	Medium	Medium
Confidence	High	High
Significance	Low	Low
Cumulative impact	Low	Low
Nature of Cumulative impact	Diffuse scatters of artefacts are to be found throughout the Karoo although good quality archaeological sites are quite rare in the western areas. Since the material identified is highly diffuse, but common, the cumulative impacts are negligible.	
Degree to which impact can be reversed	Impacts to archaeological material are not reversible, however the material identified in this study is of such low significance, that irreversibility of any impacts is of no consequence.	
Degree to which impact may cause irreplaceable loss of resources	The archaeological material located is typical, and found elsewhere. No irreplaceable loss of resources is expected.	
Degree to which impact can be mitigated	Mitigation is not warranted.	

4.4 Mitigation

Mitigation is proposed for the Calvinia road bridge over the Oorlogsrivier. Modification of the bridge will need to be permitted by the Northern Cape Heritage Authority (Ngwao Boswa Kapa Bokone).

- Ensure that the addition and modifications to Bridge NB38 adheres to the design style and characteristics of the existing arch bridge.
- Change the fabric of the structure only where unavoidable.
- Ensure that the appropriate design solution for the proposed modifications is acceptable to the responsible heritage authority, Heritage Northern Cape, as well as the project proponent, SANRAL.
- Commission a systematic recording of fabric of Bridge NB38 prior to alteration by means of measured drawings and a photographic survey.
- Undertake a comprehensive photographic survey of the site before work commences and during construction to generate an archive of information.
- Lodge a compact disc containing the above information with the Provincial Heritage Authority and SAHRA.

5. DISCUSSION AND RECOMMENDATIONS

The proposed activities will result in negligible impacts on all fronts apart from the impacts that could be generated through the proposed widening of the Calvinia bridge over the Oorlogsrivier. This is a matter which will require a non-standard approach that is sympathetic to the age and heritage qualities of the bridge.

All of the other activities proposed are acceptable in heritage terms. The proposed activities are therefore supported.

- Human remains: Human remains can be found anywhere on the landscape. Any finds made during excavation of borrow pits must be reported to SAHRA Archaeology Unit in Cape Town (Dr Maria-Gracia Gilamberti) who will advise as to the necessary action (telephone 021 4624502).
- A copy of the Basic Assessment should be sent to SAHRA (111 Harrington Street, Cape Town) and Ngwao Boswa Kapa Bokone (22 Abbottoire Road, Ashburnham, PB X504, Kimberly 8300).

6. REFERENCES

Amshwand, N. 2007. Soutpan – A farm on the edge. Vassa Journal 18, Dec 2007.

CCA Environmental Pty Ltd 2011. Draft Basic Assessment Report on Proposed strengthening of R27 Section 7 & 8 between Western/Northern Cape border and Calvinia

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Fransen, H 2006. The old towns and villages of the Cape. Jonathan Ball.

Hollman, J. 1993. Preliminary report on the Koebee rock paintings, Western Cape Province, South Africa. South African Archaeological Bulletin 48: 16-25.

Appendix A. Summary of observations.

Location of heritage feature	Observations	Required action/mitigation	Co-ordinate
Borrow Pit R27-7 km 51 LHS 6.9	<p>Site 1. Very ephemeral LSA scatter (hornfels) associated with lee of small dolerite outcrop, also ESA quartzite radial core, several hornfels MSA flakes making up a dispersed mixed assemblage. Overall about 1 occurrence per 10 sq.m.</p>	No action required.	31°20'1.73"S 19° 7'10.03"E
Borrow Pit R27-8 km 61.6 RHS 1.0	<p>Site 2. Outcrops of black dolerite with no engravings observed, ephemeral scatter of patinated hornfels including 1 notched piece, retouched piece but overall less or approximately 1 occurrence per 10 sqm.</p>	No action required.	31°30'38.92"S 19°42'55.85"E
Bridge at km 67, west of Calvinia, Oorlogsrivier.	<p>Four pier concrete arch bridge is similar to Murray and Stewart bridges built before WW2.</p> <p>Once known as the Hantam bridge, bridge was officially named Orrlogskloof bridge after 1922. The first wooden bridge was built in 1917. This was replaced by a concrete bridge in 1918 (carried on long straight piers). The first concrete bridge, which suffered from undercutting and erosion was replaced by the existing bridge (designed in 1937 and completed in 1938). (CA PAS 4/56)</p> <p>Being greater than 60 years old it is generally protected. Has aesthetic and contextual value.</p>	Permit for alteration required from Northern Cape heritage authority. Prepare a design that respects form and style of existing.	31°28'46.52"S 19°46'13.39"E

Appendix B. Walk paths

Archaeological sites indicated by yellow triangles.

