Archaeological assessment
of
potential dam sites on the lower Orange River (Vioolsdrif & Komsberg)

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Commissioned by Burmeister & Partners (Namibia) on behalf of the Lower Orange River Management Study Consortium

Submitted 30 November 2003

QRS Job 49

EXECUTIVE SUMMARY

Evidence from previous archaeological surveys, and field sampling undertaken for the present study, shows that the mid-Pleistocene to recent Holocene and historical sequence is well represented in the lower Orange River valley. Dam construction will inundate important archaeological sites and possibly damage others in the course of construction. Of the two potential dam construction sites, the Vioolsdrif option would have the greater impact on the archaeological remains. It is recommended that a detailed archaeological survey and mitigation programme should form part of the feasibility study for dam construction. An integrated archaeological programme could be carried out in the space of approximately two field months. The results of such a programme would effectively mitigate damage to the archaeological record and provide a significant contribution to archaeological knowledge.

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INTRODUCTION

The Lower Orange River Management Study Consortium, headed by Ninham Shand Consulting Services in South Africa and Burmeister & Partners in Namibia, is carrying out a pre-feasibility study for the management of water resources in the Lower Orange River. One of the options to facilitate water management is the construction of a re-regulating and/or storage dam in the lower Orange River. Two alternative locations are under review: one upstream of Vioolsdrif, and another in the vicinity of Komsberg, downstream of Augrabies Falls, with a total of nine potential sites so far identified. The construction of a dam on the lower Orange River would involve major civil engineering works, and inundate part of the river valley, with considerable environmental consequences.

Due to the specialized nature of the field it has become the established practice to include archaeological surveys in the environmental assessment programme for large infrastructure projects[1]. Archaeological remains are protected under the National Monuments Act (28 of 1969)[2], and are recognized under the Draft Environmental Management Act (1998) as a component of the physical environment[3]. Pre-feasibility assessment, as presented here, is usually followed by detailed field survey at a level of intensity appropriate to the project in hand. Mitigation may entail full excavation of selected archaeological sites. In a multidisciplinary context, the archaeological study contributes to a variety of other components including land-use issues such as soil erosion, and vegetation dynamics. Archaeological assessment is a crucial part of both the environmental and cultural evaluation of large-scale planning and development.

[1] More than 40 archaeological assessments have been carried out since Namibian independence and these have documented more than 900 archaeological sites spanning 2 million years of prehistory.
[2] As amended until 1979 and remaining in force by virtue of Clause 140 of the Constitution of the Republic of Namibia. Section 12, paragraph 3 (a) applies.
[3] Draft Environmental Management Act (1998), Paragraph 1(c), Definitions.

Preliminary archaeological assessments[4] based on existing records only have indicated that while the relevant part of the lower Orange River is not well studied, it has considerable archaeological potential. It is also an area of known historical importance, due to the fact that overland links between South Africa and Namibia depended for more than one hundred years on ox wagon transport and the use of several "drifts", or crossing points on the Orange River[5].

Quaternary Research Services was commissioned to carry out a pre-feasibility assessment of the archaeology and historical features of the lower Orange River with specific reference to potential dam sites at Vioolsdrif and Komsberg. QRS was requested to consider the relative sensitivity of the sites, in general terms, on the basis of existing records and a brief field visit. The field visit was carried out between 3rd and 10th November, 2003, and included the Haib area near Noordoewer, as well as Ramansdrift, Gaibis, Goodhouse, Stolzenfels, Komsberg, Augrabies Falls, Daberas and Onseepkans. The object of the field visit was to test the general validity of available data for specific sites, and to obtain more detailed information on at least one example of an historical crossing point on the lower Orange River.

Field survey of the sample sites was carried out by transect and positions of all sites were recorded by hand-held GPS. Field records were compiled according to standard descriptive criteria and where possible the sites were photographed and/or sketched. A two-receiver DGPS was used to establish the elevation of sites that were suspected to be at risk of inundation.

The observations and conclusions of the assessment are presented below, as are recommendations for further work, as a suggested basis for Terms of Reference to

[4] ***A preliminary archaeological assessment of the lower Orange River***, Quaternary Research Services (Namibia) Report 40; ***A report on the heritage sensitivity of the lower Orange River Region between 20° East and the Fish River confluence***, Archaeology Contracts Office, University of Cape Town.
[5] The bridge at Noordoewer was commissioned in 1956, according to the Dept. of Transport Bridge Engineer's master list (Bridge No 65: TR 1/1).

be addressed by the archaeological component of the feasibility phase of the envisaged project.

OBSERVATIONS

Environmental setting

The course of the lower Orange River downstream from Augrabies Falls is deeply incised, with narrow, poorly developed alluvial terrace deposits. The surrounding area consists mainly of exposed Namaqua Metamorphic Complex rocks, with some granites belonging to the Vioolsdrif and Haib groups. Very extensive Quaternary outwash fans, with mainly dry, braided pattern drainage are an important feature of the terrain. With the exception of the narrow riparian forest covering the banks and islands of the Orange River, vegetation is limited to low scrub and scattered trees.

Three major components of the Orange River valley terrain are easily separated, viz:

1. **Gorge sections** (<1km wide), with steep rubble footslopes and poorly developed silt terraces.
2. **Narrow valley sections** (1 – 1.5km wide), with wide silt terraces and minor tributary valleys.
3. **Broad valley sections** (>1.5km wide), with silt and gravel terraces, and major tributary valleys.

Gorge-like sections of the Orange River are generally difficult of access, with silt terraces prone to undercutting or whole-scale removal during high floods. Narrow valley sections have relatively stable silt terrace relics, often showing some hummock dune development. Broad valley sections have well-preserved expanses of silt and gravel terrace, as well as extensive outwash fans from tributary streams. The distribution of these simplified terrain units highlights important differences in the respective terrain characteristics of the Vioolsdrif and Komsberg localities.

Figures given below are approximations, partly based on the annotated maps provided by the client:

VIOOLSDRIF OPTION

Downstream limit: 17°49'E; upstream limit 18°38'E

Upstream extent of inundation (chainage): minimum ***c*** 56km; maximum ***c*** 96km

Estimated areal extent of inundation by terrain unit:

Gorge sections:	Min.18.0 km^2	Max. 18.0 km^2
Narrow valley sections:	Min. 26.0 km^2	Max. 41.0 km^2
Broad valley sections:	Min. 29.0 km^2	Max. 35.0 km^2

KOMSBERG OPTION

Downstream limit: 19°40'E; upstream limit 20°15'E

Upstream extent of inundation (measured from map): ***c*** 63km

Estimated areal extent of inundation by terrain unit:

Gorge sections:	43.0 km^2
Narrow valley sections:	11.0 km^2
Broad valley sections:	13.0 km^2

Previous surveys

Two previous archaeological surveys have been carried out in the relevant part of the lower Orange River valley, although in both cases the main object of survey lay in the outer margins of the valley. However, both surveys provide some basis for estimation of archaeological potential and are briefly summarized below:

HAIB RIVER[6]: The lower reaches of the Haib River pass through a deep ravine which issues onto a narrow belt of low dunes marking the edges of the Orange River valley at approximately 17º 55'E. The field survey covered a total of 30km^2 and located 48 archaeological sites. The largest component of the survey area consisted of a high plateau some distance from the Orange River. Significant concentrations of both Holocene and Pleistocene stone artefact scatters were found in this component. The Haib and Orange River components of the survey area were

[6] Kinahan, J. 1997. ***Haib coppermine project environmental impact study: archaeological survey***. Report compiled for Parkman Namibia (Pty) Ltd. QRS Report 10.

smaller but showed a comparable range of archaeological sites, indicating that the Orange River valley and the plateau were important throughout the archaeological sequence. However, the predominant sites in the Haib and Orange River valley areas were the remains of nomadic pastoral encampments and historical or colonial sites.

The Haib River survey did not indicate any large concentrations of archaeological sites, or any single sites of outstanding significance. Of particular interest in the Haib River survey was the presence of several sites relating to early colonial settlement and to German military activity during the campaigns against the guerrilla leader Jakob Marenga in 1904 - 1907[7]. These sites included three military graves located on the bank of the Orange River, but well above the present maximum flood level. The historical archaeological sites are of interest because they relate to specific recorded events in the wider region. At the same time they allow local verification of these events by relating them to specific places in the landscape.

STOLZENFELS[8]: An extensive Quaternary outwash fan is located on the western flank of a heavily weathered massif of intrusive mafic rock in the vicinity of Stolzenfels in the Orange River valley at 19º 40' E. A linear survey covering 28km of the outwash fan in the direction of Blydeverwacht located a total of nine archaeological sites. Five of the sites were early to mid-Pleistocene stone artefact occurrences in the main body of the outwash fan and on the coarse gravel footslopes of the adjacent massif. These probably represent material dispersed by sheet erosion from further upslope.

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[7] See ***Die Kämpfe der deutschen Truppen in Südwestafrika, auf Grund emtlichen Materials bearbietet von der Kriegsgeschichtlichen Abteilung I des Großen Generalstabes*** (Vol 2) Berlin 1907.

[8] Kinahan, J. 1999. ***An archaeological survey of the Aries to Auas powerline route***. Report commissioned by Walmsley Environmental Consultants (Pty) Ltd. for the Namibia Power Corporation. QRS Report 14.

The remaining four sites included a suspected burial cairn and two groups of stone features representing nomadic pastoral encampments consisting of circular arrangements of anchor stones for portable mat houses. These more recent sites were also located on the outwash fan, one having been partly destroyed by gully erosion. The Stolzenfels sites showed that landscape features such as outwash fans could be associated with a broad range of archaeological sites, although this may reflect local erosion cycles rather than patterns of human settlement.

Expected site distribution

The occurrence of archaeological sites in these two sample areas is strongly influenced by local terrain conditions, the broad valley sections being the most important, archaeologically. Using the inundation area estimates and the results of the previous surveys as a basis it is estimated that the minimum inundation at Vioolsdrif would affect about 219 archaeological sites, while the maximum inundation would affect about 286. The Komsberg option would affect about 113 archaeological sites.

VIOOLSDRIF OPTION

Gorge sections: $0.5/km^2 \times 18km^2$ = estimated 9 archaeological sites for minimum and maximum inundation.

Narrow valley sections: $2.5/km^2 \times 26km^2$ = estimated 65 archaeological sites for minimum inundation; $2.5/km^2 \times 41km^2$ = estimated 102 archaeological sites for maximum inundation.

Broad valley sections: $5.0/km^2 \times 29km^2$ = estimated 145 archaeological sites for minimum inundation; $5.0/km^2 \times 35km^2$ = estimated 175 archaeological sites for maximum inundation.

KOMSBERG OPTION

Gorge sections: $0.5/km^2 \times 43km^2$ = estimated 21 archaeological sites

Narrow valley sections: $2.5/km^2 \times 11km^2$ = estimated 27 archaeological sites

Broad valley sections: $5.0/km^2 \times 13km^2$ = estimated 65 archaeological sites

Test sampling

To test the estimates based on the previous surveys, limited field sampling was carried out in both locations, with the following results:

VIOOLSDRIF OPTION

Goodhouse to Gaidip

About one half (20km) of the Orange River valley between Goodhouse and Gaidip, a distance of approximately 40km, is typical narrow valley terrain, while the remaining half is typical broad valley terrain. Only the northern bank was traversed in detail, although the southern bank at Ramans Drift was also examined. The section between Goodhouse (Silwerstroom) and Ramans Drift has well preserved silt terraces, with hummock dunes, as well as some gravel terrace and outwash fans. The narrow valley section was rather poor archaeologically, although the terrain has been extensively disturbed by large-scale irrigation projects. The undisturbed terrain yielded only two archaeological sites, a drystone structure (QRS 49/12) and an isolated burial cairn (QRS 49/13).

At Ramans Drift, the Orange River passes through a typical broad valley section, with wide expanses of silt and gravel terrace, particularly well developed on the northern bank. At this point the river is accessible from both north and south, via wide sandy stream courses that served as wagon routes in the late eighteenth century and throughout the nineteenth century. Evidence of the historical importance of Ramans Drift is well preserved on both sides of the Orange River. On the northern side of the river the remains of a nineteenth century trading post (QRS 49/10) include three large drystone enclosures, a small cemetery and a very extensive refuse dump with large quantities of bottle glass, iron barrel hooping, iron wagon tyres, harness pieces, wagon axles and other items. Nearby are several drystone livestock enclosures (QRS 49/9). Overlooking the trading post is a fortified lookout point with loopholes (QRS 49/1), and a commanding view of the approaches from downstream and from both sides of the Orange River.

At the end of the nineteenth century a German colonial police post was established at Ramans Drift. A number of mudbrick buildings were erected at the post and one of these is still standing, in a modified form (QRS 49/3). Near the police post is a German military cemetery containing twenty-three graves (QRS 49/2). All but four of the graves date from 1905 – 1907, the period of the final Nama uprising[9]. The remaining graves date from 1914, or the outbreak of World War I. A cluster of ruined buildings on the southern bank of the river, almost immediately opposite the German post, is all that remains of a Cape Mounted Police post (QRS 49/4, 5 & 6). The grave of a policeman who drowned at the site in 1908 (QRS 49/8) indicates that border controls were in place at the drift before the outbreak of war. It is possible that the two posts were strengthened in 1914: a lookout point is visible on the summit of a prominent hilltop immediately to the north of the German post, and there is a corresponding fortification on the Cape side, occupying the crest of a slightly higher peak.

Upstream from Ramans Drift, the next section of broad valley terrain is at Gaidip, where access to the north is possible at a number of points. The ruins of nineteenth century mission buildings are still visible at both Gaidip and Houms River, five kilometres further upstream. A broad outwash fan and gravel terraces cover long stretches of the southern bank on this section. The field sampling of the Goodhouse to Gaidip section of the Vioolsdrif dam option confirms three basic observations from the Haib River survey:

1. Narrow valley sections without access via tributary streams have low densities of archaeological sites.
2. Broad valley sections with access via tributary streams have significant densities of archaeological sites.
3. Historical drifts have significant densities of important material remains.

[9] Bley, H. 1996. ***Namibia under German rule.*** Studien zur Afrikanischen Geschichte Bd. 5. Grindelberg. See also Footnote 7.

It should be noted that the proximity of the archaeological sites to the present banks of the Orange River renders them highly vulnerable to flooding. In the case of the various grave sites at Ramans Drift, for example, the elevation of the graves in relation to the possible inundation level of the dam is as follows:

Highest level:		
Storage dam ($3002m^3 \times 10^6$)	239masl (Min.)	251masl (Max.)
Grave sites:		
QRS 49/2	232.6masl (Average; n=4)	
QRS 49/10	246.1masl (Average; n=6)	
QRS 49/11	232.3masl (Average; n=3)	
Lowest level:		
Re-regulating dam ($260m^3 \times 10^6$)	201masl (Min.)	213masl (Max.)

These figures indicate that the graves would lie marginally above the lowest inundation level, and below the highest level. The Ramans Drift graves are fairly representative of graves in the Orange River valley.

KOMSBERG OPTION

Stolzenfels to Augrabies

Since the previous survey of Stolzenfels very large-scale irrigation projects have been established, and both the northern and the southern banks of the Orange River have been extensively modified. Much of this development has taken place on the upper (gravel) terraces of the river and on the lower slopes of the outwash fans. The previous survey showed that the main concentration of archaeological sites was associated with this setting. Minor archaeological occurrences were associated with granite outcrops. These observations were confirmed by the present survey. Although no specific archaeological sites were found on this section, thin scatters of stone artefact material were found among granite outcrops in the Daberas area.

This indicates that more detailed fieldwork would probably locate localized concentrations of archaeological remains.

Several long traverses were made on both the northern and southern banks of the Orange River in both the Komsberg and Daberas areas without locating any significant archaeological remains. The survey was not therefore able to confirm the predicted distribution, other than in a negative sense. However, available information indicates that the density of archaeological sites would be very low even in the narrow valley sections[10]. More than two thirds of the Komsberg option consists of a gorge-like valley without terraces and extremely difficult of access. These conditions suggest that the lower part of the Komsberg option would have few archaeological sites and that the upper part would have virtually none. Historical remains relating to events of the late nineteenth and early twentieth centuries, such as the Anglo-Boer War and the subsequent rebellion lead by Manie Maritz, are well preserved within the Augrabies Falls National Park.

CONCLUSIONS

1. The distribution of archaeological sites in the lower Orange River valley is strongly influenced by local terrain conditions. Previous surveys have shown that gorge-like and narrow valley sections are poor in archaeological sites, compared to broad valley sections with access via tributary streams. Test sampling carried out for the present survey has confirmed these observations.
2. Estimates based on the previous surveys and the test sampling indicate that the construction of the Vioolsdrif dam option will affect between 219 and 286 archaeological sites, while the Komsberg dam option could affect as many as 113 archaeological sites. The results of the previous surveys and test sampling confirm that graves and historical sites in general would be most affected by the Vioolsdrif option. Komsberg would have a relatively low impact on the archaeological sites.

[10] Hoff, A. 1997. South African Archaeological Bulletin 52: 21-37; Morris, A. 1992. ***The Skeletons of Contact***. Witwatersrand University Press; Smith, A.B. 1995. ***Einiqualand***, University of Cape Town Press.

3. The impact of dam construction at both sites would be strongly influenced by the choice of site, by the construction of access routes and by the positioning of ancillary works such as borrow pits, and the location of construction villages. However, the highly predictable distribution of the sites means that it is possible to integrate archaeological survey results with project planning and to mitigate the potential impact of dam construction.

RECOMMENDATIONS

The lower Orange River valley between Vioolsdrif and Augrabies Falls is not well known, archaeologically, but available evidence shows that the full mid-Pleistocene to recent Holocene sequence is represented in the area. The known field relations of the archaeological record are also rather unique, given the perennial nature of the Orange River and its importance as an historical frontier between South Africa and Namibia. For these reasons, it is important to include detailed archaeological assessment in the environmental component of the feasibility study.

It is recommended that both the Vioolsdrif and Komsberg options merit full archaeological survey. The location of archaeological sites should be established at an early stage in the feasibility study, so that adequate mitigation measures can be adopted. In the case of dam construction and inundation of the Orange River valley and the lower reaches of its tributaries it is recommended that:

1. The total area of inundation should be surveyed to provide a baseline record of the basin archaeology and to select sites for mitigation.
2. All access routes, as well as potential borrow pits, construction village sites, contractors' laydown areas and any other site of impact should be covered by the archaeological assessment.
3. Documentation of the basin archaeology should include detailed geomatic survey and database compilation to international standards.
4. Sites should be selected for mitigation on the basis of two criteria:
    a. importance of the site as a local component of the archaeological distribution.

   b. possible uniqueness of the site within the regional or subregional archaeological distribution.
5. All sites selected for mitigation should be tested as a preliminary step to final selection for full mitigation.
6. The archaeological survey and mitigation process should be integrated with the construction programme by means of flagging on sensitive sites, provision of guidelines for contractors and basic archaeological background information for project staff.
7. The archaeological survey and mitigation process should aim toward the production of a coherent account of the basin archaeology, in the form of a detailed monograph.

A preliminary estimate of the requirements and duration of the archaeological survey and mitigation is as follows:

VIOOLSDRIF OPTION

Survey: 2 archaeologists x 30 field days + 30 report writing days
4 000 km vehicle travel costs
Hire of survey equipment x 15 days

Mitigation: 2 archaeologists x 30 field days + 30 report writing days
Report production costs, including GIS
Radiocarbon dating (4 units) & other analytical services
Supply of packaging & curation requirements

KOMSBERG OPTION

Survey: 2 archaeologists x 10 field days + 10 report writing days
4 000 km vehicle travel costs
Hire of survey equipment x 5 days

Mitigation: 2 archaeologists x 5 field days + 5 report writing days
Report production costs, including GIS
Radiocarbon dating (2 units) & other analytical services
Supply of packaging & curation requirements.