

**HERITAGE SCOPING STUDY:
PROPOSED KLEINBERG OFF-STREAM DAM, UPPER
DAM, DIVERSION WEIR AND PIPELINES,
SANDDRIFTKLOOF NEAR DE DOORNS, HEX VALLEY,
WESTERN CAPE**

Prepared for

Holland And Associates Environmental Consultants

On behalf of

**The Hex Valley Water Users Association
(HVWUA)**

August 2012



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1. LIST OF DEFINITIONS AND ACRONYMS	3
2. INTRODUCTION	4
3. PROJECT COMPONENTS	5
3.1 Background	5
3.2 Options	6
3.3 Other project components	11
4. SUMMARY OF THE HERITAGE ENVIRONMENT OF THE PROJECT AREA.....	11
4.1 Palaeontology.....	11
4.2 Archaeology	11
5. ISSUES TO BE ADDRESSED IN THE EIA	13
6. CONCLUSIONS.....	13
6.1 Palaeontology.....	13
6.2 Archaeology	13
6.2.1 Cemeteries and graves.....	13
6.3 Built environment.....	13
6.4 Options rating	14
7. REFERENCES	14

1. LIST OF DEFINITIONS AND ACRONYMS

Archaeology: *Remains resulting from human activity which is 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.*

Early Stone Age: *The archaeology of the Stone Age between 300 000 and 2 500 000 years ago.*

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).*

Holocene: *The most recent geological time period, and the more recent part of the Quaternary Period which commenced 11.7 ka years ago.*

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Palaeontology: *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.*

Pleistocene: *The earlier of the two epochs of the Quaternary Period, from about 2 million to 10,000 years ago*

Acronyms

AIA	Archaeological Impact Assessment
ESA	Early Stone Age (older than approximately 300 ka)
GPS	Global Positioning System
HIA	Heritage Impact Assessment (integrating specialist heritage components)
HWC	Heritage Western Cape
LSA	Late Stone Age (approximately the last 20 ka)
MSA	Middle Stone Age (approximately 300 - 30 ka)
NHRA	National Heritage Resources Act, No 25 of 1999
NID	Notice of intent to develop application
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority (HWC)
SAHRA	South African Heritage Resources Agency (National heritage)

2. INTRODUCTION

Holland and Associates Environmental Consultants have been appointed by the Hex Valley Water Users Association (HVWUA) to undertake a Scoping and Environmental Impact Reporting Process (i.e. a full Environmental Impact Assessment), in accordance with the National Environmental Management Act (NEMA) (No. 107 of 1998, as amended), 2010 EIA Regulations. Aurecon South Africa (Pty) Ltd submitted a report to Hex Valley Water Users in March 2013 in response to their request to conduct an overview investigation to determine the optimal solution regarding the implementation of the proposed off-channel Kleinberg Dam.

ACO Associates cc has been tasked with undertaking the Heritage Impact Assessment (HIA) for the project as part of the overall EIA. A Notice of Intent to Develop (NID) submission has been made to Heritage Western Cape (HWC) and a response has been received (Appendix 1). Based on the potential for heritage resources occurring in the affected area, an HIA has been requested that has as its main focus both archaeology and palaeontology. A palaeontological study will be undertaken by Dr John Almond.

The project is located in the Sanddriftkloof to the north of the N1 between the towns of Worcester and De Doorns in the Hex Valley region of the western Cape (Figure 1). It is located downstream of the existing Roode Elsberg Dam and upstream of the confluence of the Sanddrift and Amandel Rivers.



Figure 1: Location of the proposed dam (red dot) in regional context

The context of the proposed dam in relation to the catchment areas is shown in Figure 2 below and will provide reference for section 3.

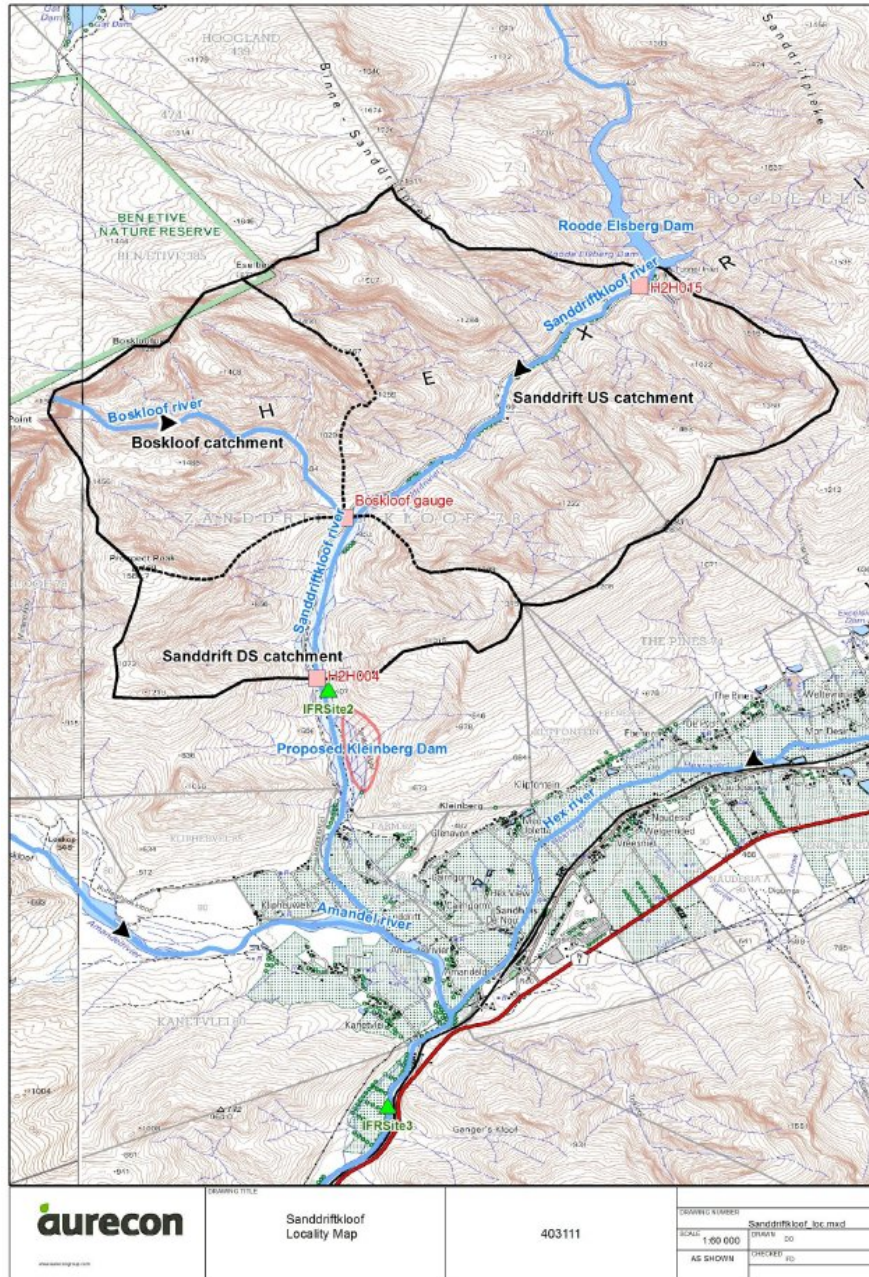


Figure 2: The context of the proposed dam in relation to the catchment areas

3. PROJECT COMPONENTS

3.1 Background

In their March 2013 report, Aurecon describe the project thus: The Kleinberg Dam is an off-channel reservoir being proposed for construction in the Hex River Valley in the Western Cape, South Africa. It is envisaged that surplus water from the Sanddriftkloof River would be abstracted in the wet winter months for storage and subsequent use for irrigation purposes in the summer months in addition to water supply to the Breede Valley Municipality throughout the year.

Part of the motivation for the new dam is to provide compensation water to the Worcester East region, which abstracts water from the Hex River downstream of the Hex Valley. These compensation releases are made and managed in accordance with the agreement of understanding between the relevant parties, however, currently, no such releases are possible, and therefore the Kleinberg Dam would be implemented to enable the Hex Valley WUA to honour this agreement.

In addition to these releases the dam would also supply nearby irrigation users that are currently being supplied from the Roode Elsberg Dam. More details of this water supply scheme as well as of the proposed dam can be found in a previous report (Aurecon, 2012).

3.2 Options

The proposed Kleinberg Dam Scheme consists of an off-channel reservoir located on the left bank of the Sanddriftkloof River with the possible addition of an additional off-channel reservoir further upstream, namely the Boskloof Dam. The selection of this scheme was made after several other potential schemes were disqualified for various (mostly environmental) reasons. Its purpose would be store water from winter abstractions and make it available to irrigators and other users during the drier summer months.

The provision of two reservoirs in the Sanddriftkloof River instead of a single large dam is being considered since, at its present location, the main Kleinberg Dam is unable to provide sufficient pressure to a number of nearby irrigation users. The Boskloof Dam on the other hand, being located at a higher elevation, is able to meet these user's requirements. Additionally, the proposed N1 dam provides an additional clay borrow area option and has the least environmental impact of the three dam options proposed.

An options exercise was conducted to determine what the most cost effective configuration of the scheme would be. This exercise considered a number of different dam capacities, abstraction locations, abstraction methods (pumping vs gravity) and distribution networks. The two different abstraction locations had the main influence on the total yield that this scheme would be able to provide whereas the different dams and the provision of pump stations had the largest influence on the cost of the scheme.

The resultant Unit Reference Values, which represent a unit cost of the water being provided, exhibited very little variance. This means that none of the configurations considered can be disregarded in further planning. It also implies that factors other than cost and deliverable yield should play a large role in the final selection process. These factors include the minimization of energy cost, which could be provided by the pure gravity supply options.

In response to the Aurecon report, HVWUA indicated the following¹:

"Although the URV of the different options seems very close to each other, the Association is not in favour of a scheme that comprises the usage of electricity. One of the goals of the project actually is to minimise or eliminate groundwater usage in the Sandhills furrow area of the Drie Riviere Sub District, because of the unpredictable electricity cost associated with groundwater usage.

A gravity scheme is also seen as much more environmental friendly, especially in the South African context. Storage in Boskloof is also very important as this will allow for better security of supply of almost a third of the yield of the scheme to higher lying irrigators under gravity. It will also open up the option to supply water into the Sandrift Scheme under gravity which in turn will enlarge the potential water users dramatically.

Our preferred options will then be:

First – Option 8

Second – Option 2

Third – Option 6

If a large dam at Boskloof is not authorised, then the smaller Boskloof Dam Option is preferred, ie Option 3 instead of Option 2, and Option 7 instead of Option 6. Equally a further option would be a smaller Boskloof Dam in Option 8 with a corresponding Larger Kleinberg Dam." The various options are shown below in Figures 3-10.

¹ Letter: Optimisation Analysis of Kleinberg Off-Channel Dam (7509_403111) v09 dated 28th March 2013

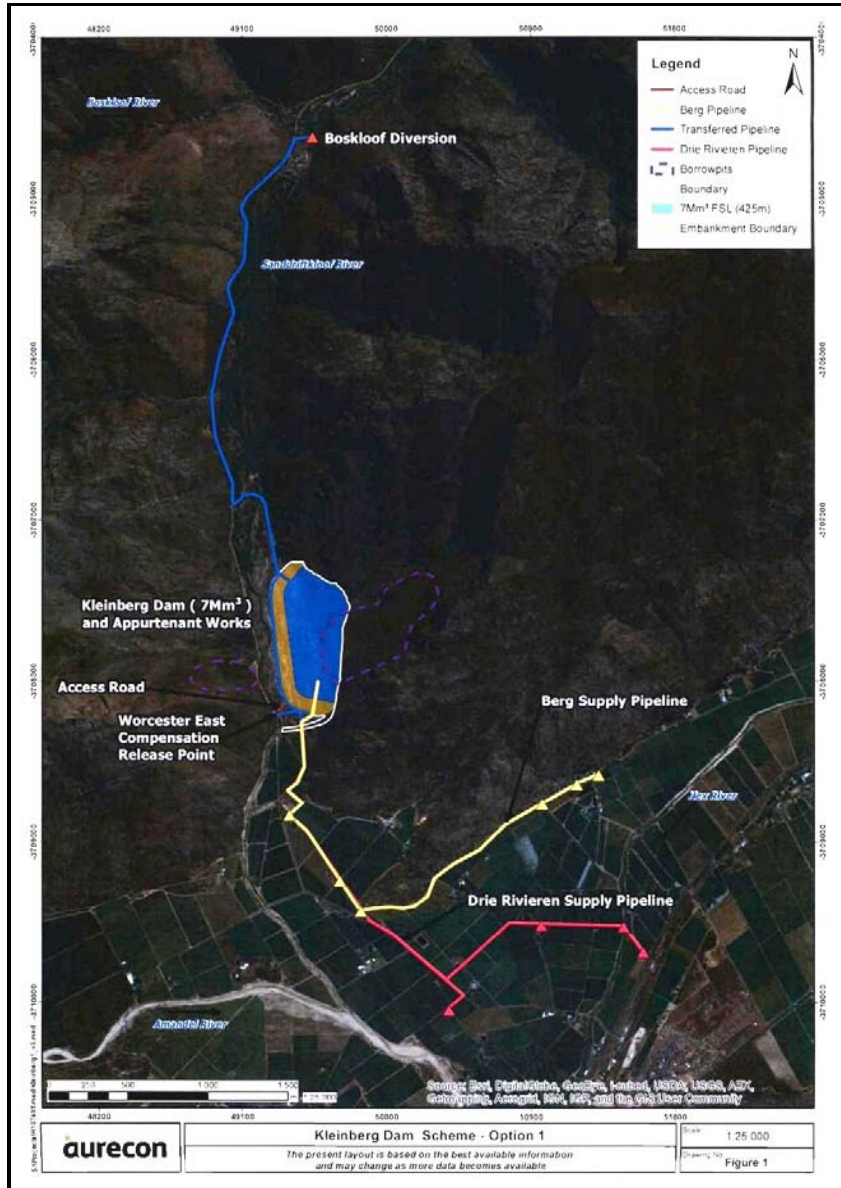


Figure 3: Option 1

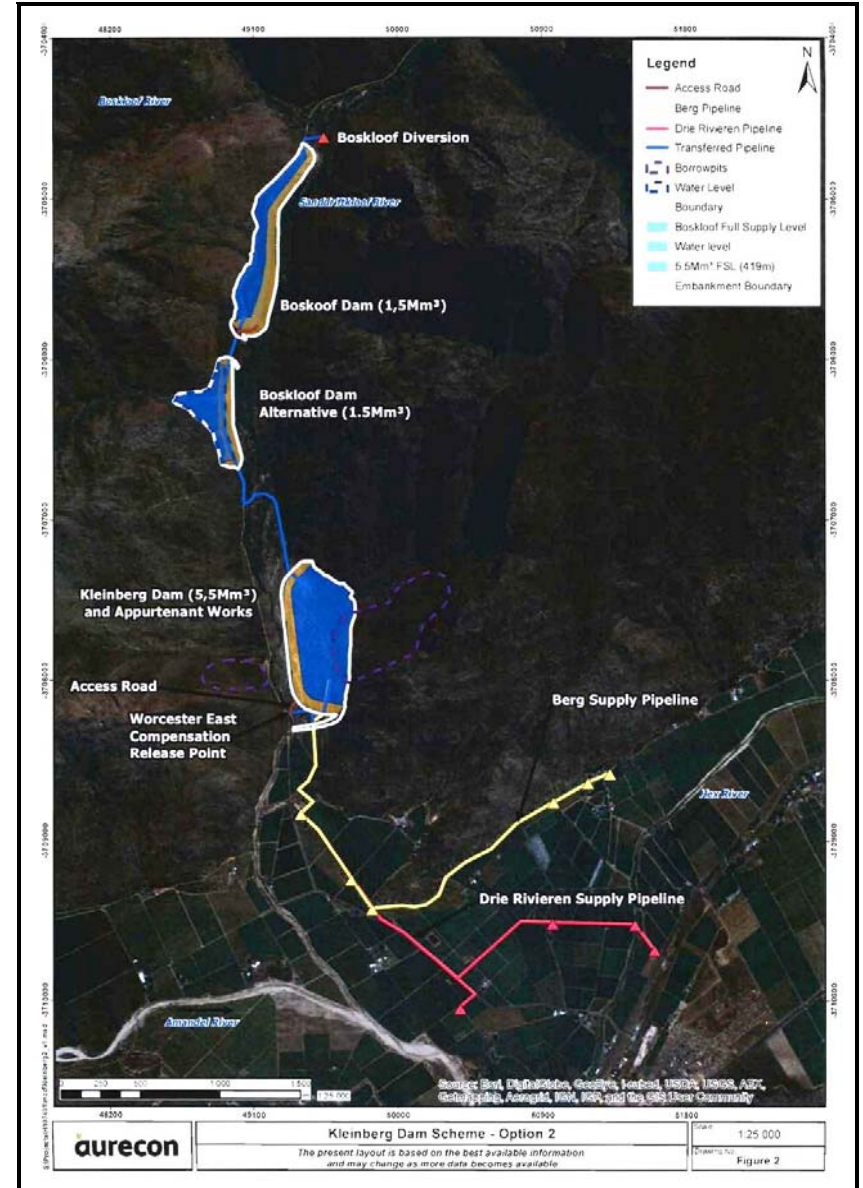


Figure 4: Option 2

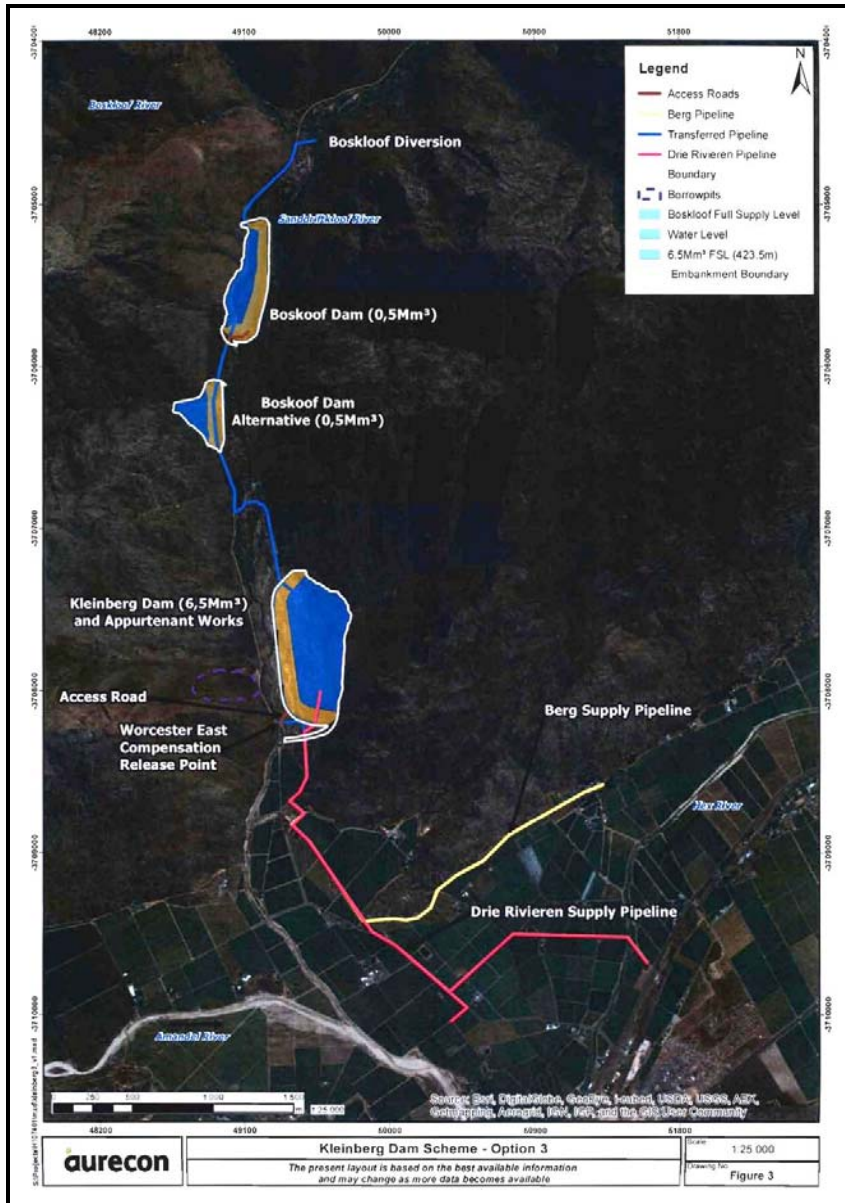


Figure 5: Option3



Figure 6: Option 4

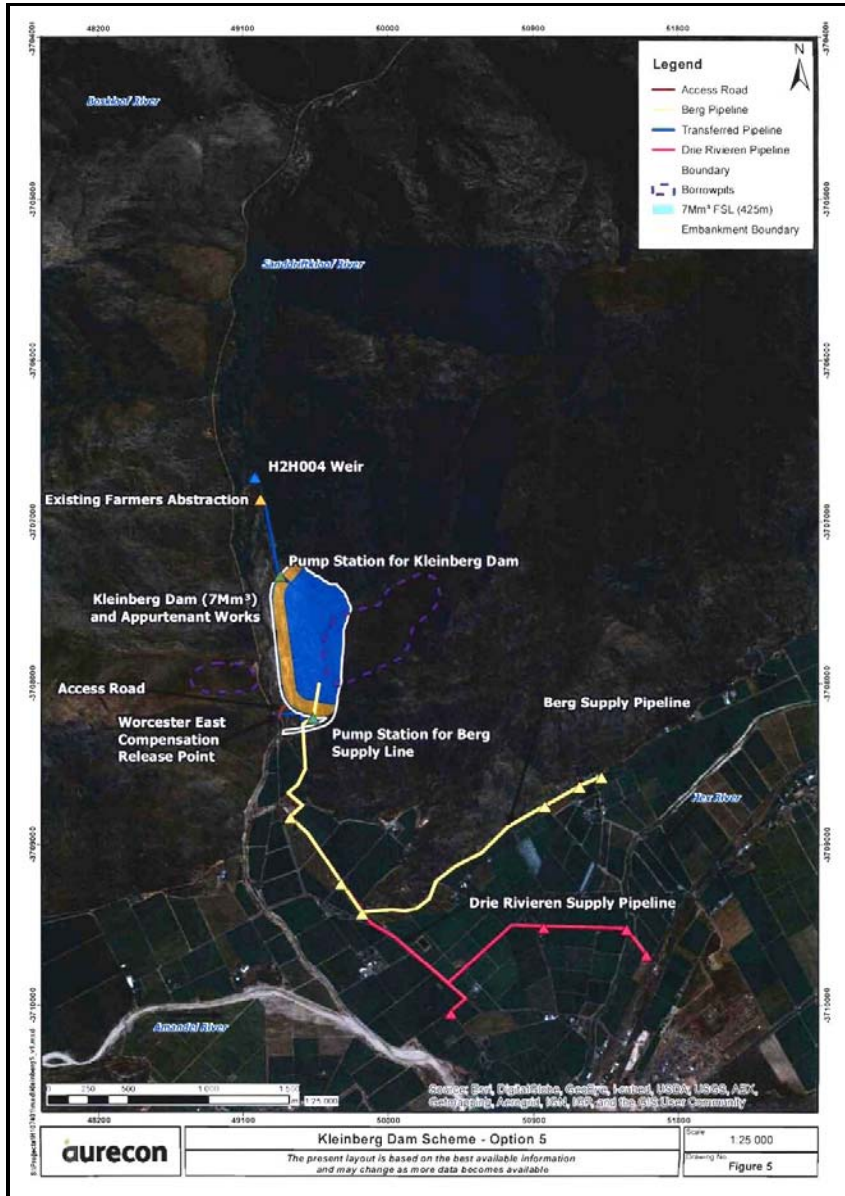


Figure 7: Option 5

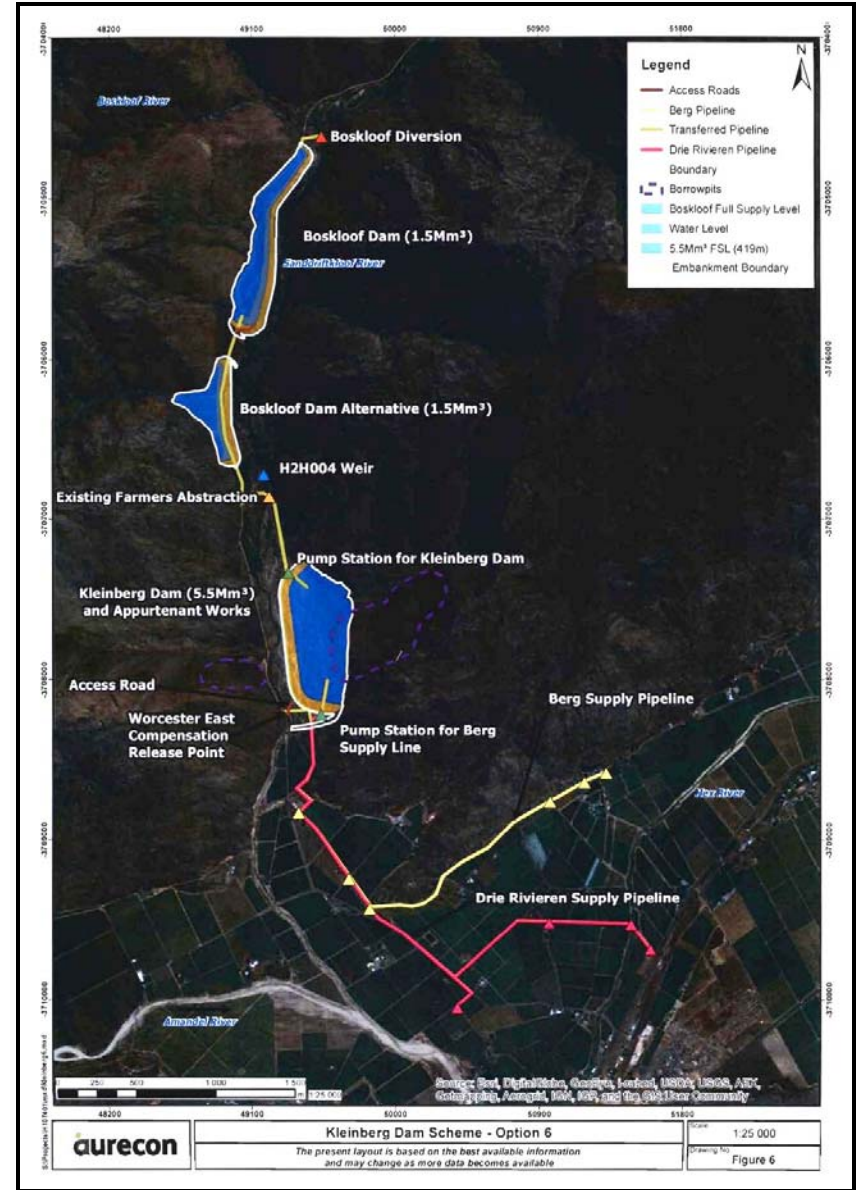


Figure 8: Option 6

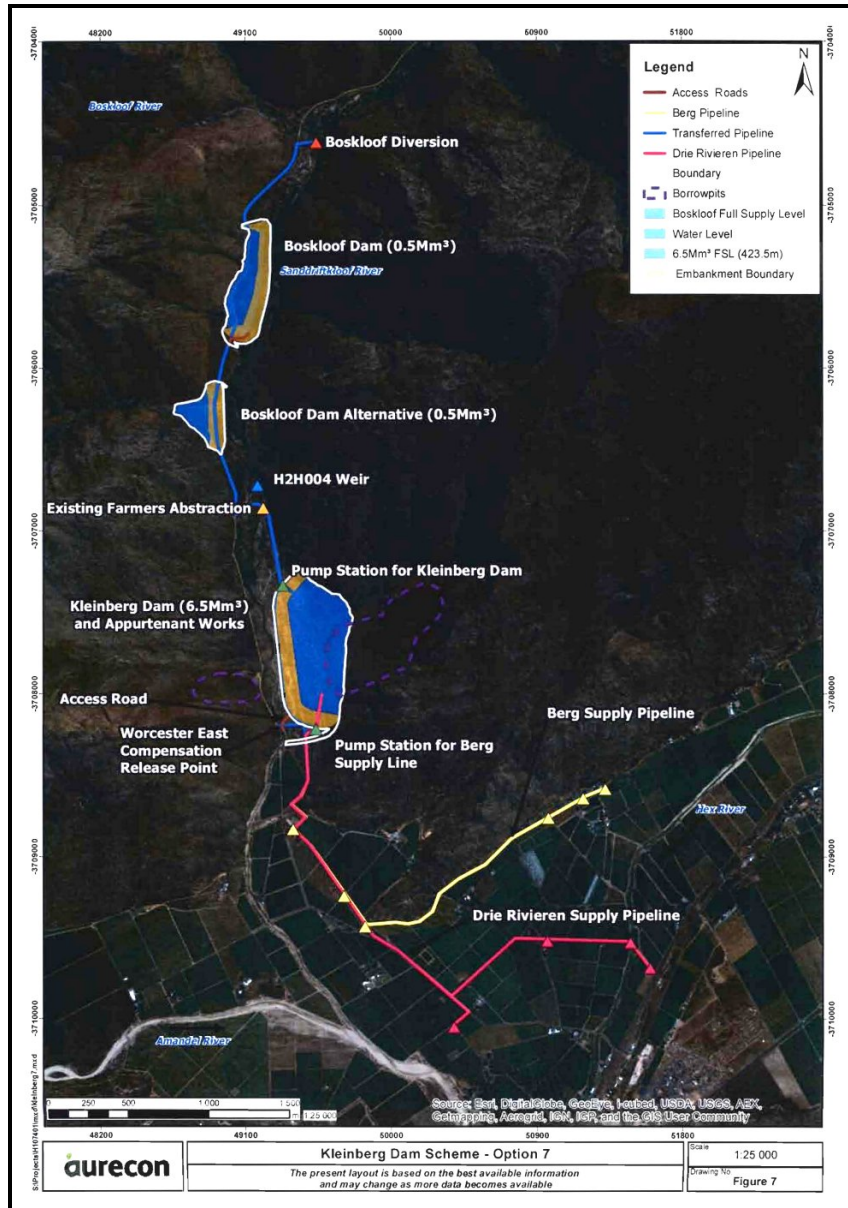


Figure 9: Option 7

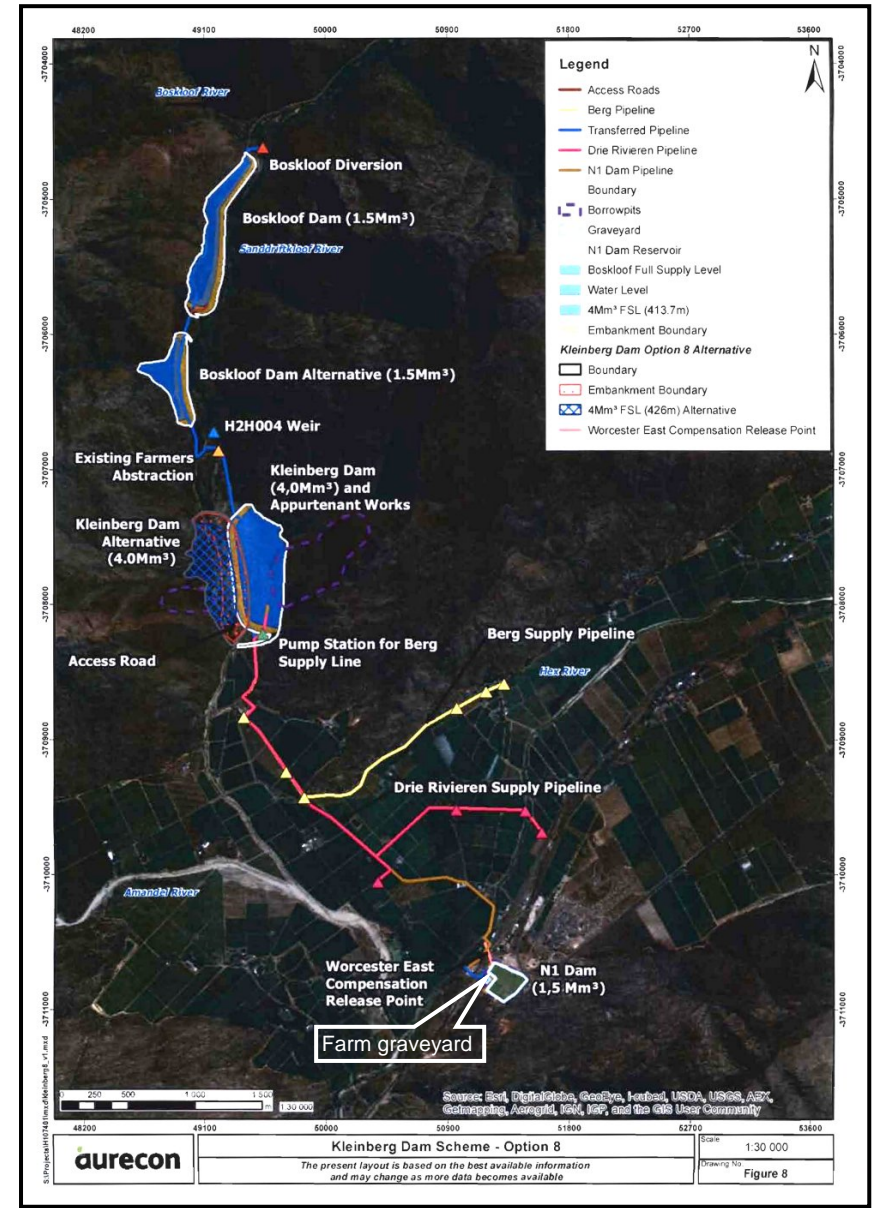


Figure 10: Option 8 (the preferred option)

3.3 Other project components

The dam would be an embankment type dam possibly lined with clay to make it impervious, as the alluvial foundations are expected to be permeable. The new dam will be lined with clay. Clay borrow areas will be established on both sides of the proposed dam, one partially within the proposed dam basin and extending into the eastern slope shale band, and one on the western slope shale band, at an existing borrow pit. Alternatively it could be lined with a commercial liner (HDPE, PVC, bentonite/cement sandwich, etc) if the clay is not locally accessible.

In addition to this main reservoir, a second much smaller off-channel embankment dam is also under consideration further up the valley, namely the Boskloof Dam. A third potential dam, of similar size to the Boskloof Dam, located just below the N1 in the main part of the Hex River Valley was also included as this site has plentiful supplies of clay whereas the others do not (see Figure 10). The two dams in the Sanddriftkloof would provide water to meet the irrigation demands whereas the N1 dam in the main Hex Valley would mostly supply the required compensation releases. Distribution pipelines from the dam to the water users (500mm to 150mm diameter), which will follow the route of existing pipelines and canals where possible.

4. SUMMARY OF THE HERITAGE ENVIRONMENT OF THE PROJECT AREA

There is no obvious built environment within the proposed development footprint apart from the existing weirs, and a road leading to the fairly substantial existing Roode Elsberg Dam upstream on the Sanddrif River. Another dam, namely Zanddriftskloof, can be found even further upstream. Although the the Roode Elsberg dam is known to have been built before 1960, the actual date remains elusive. Similarly, the dates of construction of the weirs is also unknown.

Some structures (cottages) exist on the proposed N1 dam site and would be impacted by its construction. From the limited views available on Google Streetview, they do not appear to be of any heritage significance.

4.1 Palaeontology

The Cederberg Formation, known for its rich post-glacial fossil assemblages of Late Ordovician age are present in the kloof and the proposed clay borrow pits are located in deposits of that formation. However, the fact that the fossil bearing mudrocks are normally mantled by soil, scree and vegetation, means that a borrow pit would actually provide a useful additional window into the formation. A desktop study will be required and palaeontological monitoring of the borrow pit excavations (as they are indicated on the proposals) will be required. The remainder of the project components will only affect non-marine bedrocks of the Table Mountain Group as well as superficial deposits such as alluvium and scree, all of which are of low palaeontological sensitivity. (Dr J Almond - comment to D Halkett via e-mail 09.05.2012). An existing Cederberg formation fossil site can be found at Buffels Dome in the Hex River Mountains. The N1 borrow pit and dam site will require comment.

4.2 Archaeology

It is highly likely looking at the terrain that the Sanddrift River Valley with its ready supply of water, would have formed a natural thoroughfare for animals and people between the Hex River Valley and Ceres Karroo in the past.

With that in mind we would expect at least some form of Stone Age, and possibly colonial archaeological signature in the kloof. Early Stone Age artefacts will in all likelihood be found in secondary contexts, and a possibility exists that Middle Stone Age artefacts will also be found. The chances of finding either of these two categories of material in primary context is extremely low, but perhaps moderately more likely for the latter.

There is a strong possibility that Late Stone Age material will be found as there are documented observations of rock paintings in the vicinity of, and in Sanddriftkloof (Trew 1984). Over a 2 year survey of the Hex River, Trew found 46 painted sites some of which were associated with LSA artefactual material, including indigenous pottery. He indicates finding one painted site (WHx/RI) in

Sanddriftkloof but his co-ordinate places the site to the north of the Roode Elsberg Dam. He does not provide any maps but rather gives broad geographical co-ordinates (likely to have been obtained by referring to 1:50 000 topographic maps). While these may place sites broadly in the landscape, they are often inaccurate when it comes to actual site positions, dependant on the map reading skills of the user.

Looking at the satellite and aerial photographic images on Google Earth however, there do not appear to be any major rock outcrops in the kloof close to the proposed dam sites, although clay borrow areas do extend closer to rocky areas with possible rock shelter indicators. These observations need to be verified by field inspection. Pre-colonial graves will tend to be in proximity to or in occupation sites. This is particularly the case with sites inside caves and overhangs with sufficient depth of deposit. The presence of caves or rock shelters are therefore a primary indicator of pre-colonial heritage.

A Scoping report was previously prepared in July 2009 for the then proposed in-stream Kleinberg Dam, which noted that there were a number of rock art sites in the vicinity of the proposed dam site (located immediately to the west of the now proposed off-stream dam). No figures or localities of the sites were however provided in the reporting (noted by Holland and Associates in the Heritage ToR document). It is not clear who the author of that report was or where the information in the 2009 Scoping report was sourced and whether it was Trew's data that was referred to.

No obvious significant built environment is visible on aerial photos. This does not exclude the possibility of small vernacular structures (huts and kraals) being present on the landscape.

If graves dating to the historical period are to be found, they will most often be associated with settlements, and in sandy soils. River confluences with sand banks can often be sites of settlement and graves. A known farm graveyard exists in the vicinity of the proposed N1 dam (Figures 10 and 11) but will be excluded from the development area. An inspection of the area must be undertaken to determine the extent of the cemetery (if this is not clearly demarcated at present).

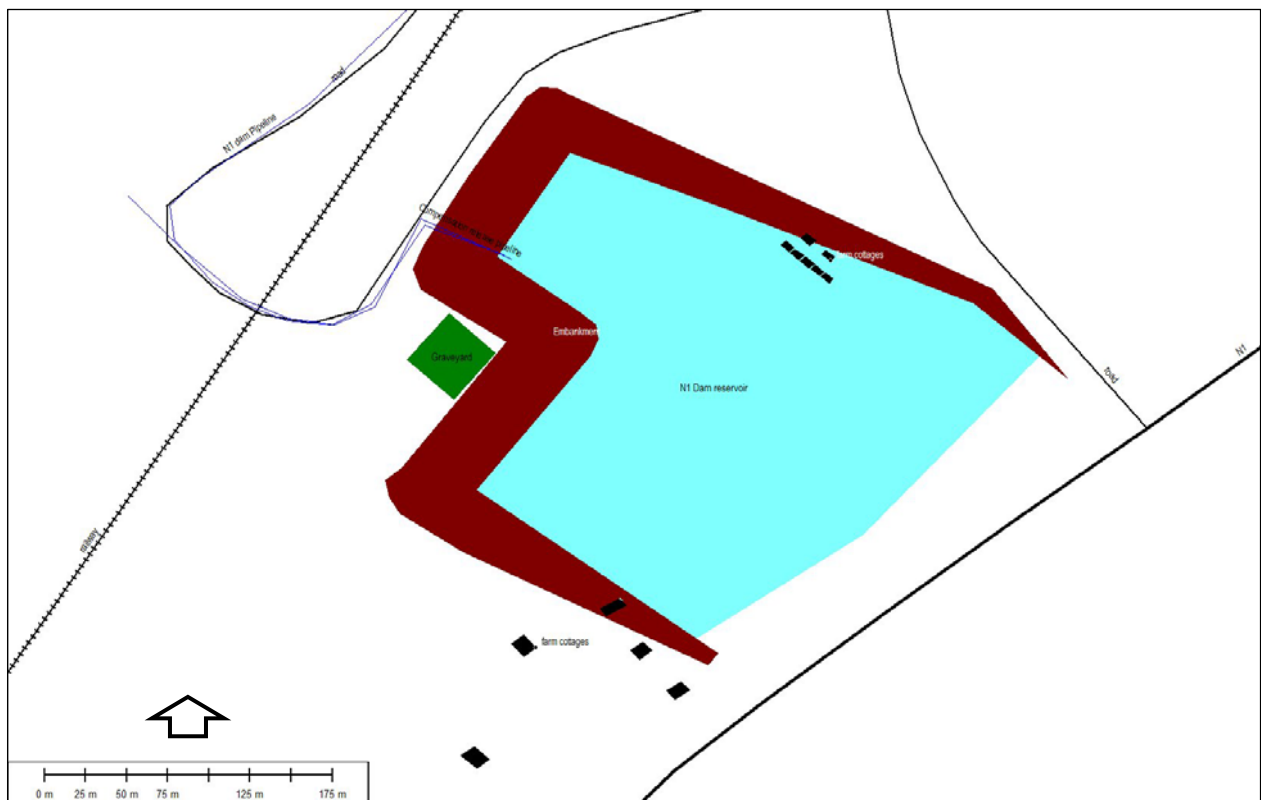


Figure 11: Schematic of the N1 dam design showing the position of the graveyard, farm structures, N1 road and railway line

5. ISSUES TO BE ADDRESSED IN THE EIA

Examine the footprints and vicinity of all proposed schemes (including roads and infrastructure) to determine if heritage resources such as those described above will be directly or indirectly impacted as a result of the construction or operation of the dams and infrastructure. Some comment of the visual impact of the N1 dam may be required (see below). The N1 dam site will impact some structures. These do not appear to be old but must nevertheless be inspected.

6. CONCLUSIONS

An HIA will be required as indicated in the response to the NID by Heritage Western Cape. They have requested an AIA and PIA. However, the N1 dam option was not included in the original NID submission and given its prominent position next to the N1, some visual comment should probably be forthcoming. The identification of a cemetery at the N1 site may also have elicited a broader comment. Visual impact is expected to be limited given that the dam fits within the prevailing farming landscape. If a visual study is undertaken as part of the requirements of the EIA, its comments could be included in the HIA.

6.1 Palaeontology

The fact that the fossil bearing mudrocks are normally mantled by soil, scree and vegetation, means that borrow pits and other invasive activities would actually provide a useful additional window into the formations. A desktop study of the scheme will be required and some palaeontological monitoring of the borrow pit excavations (as indicated on the proposal) and any other invasive excavations during the construction phase will be required, and will be identified during the desktop EIA/HIA study.

6.2 Archaeology

In terms of the archaeology, we do not anticipate any fatal flaws to arise from the more detailed field study. We will need to keep in mind archaeological observations/conclusions made in the area by Mr Trew (and that some of his site locations are inaccurate).

There are unlikely to be significant built environment issues arising out of the proposals.

While we reserve judgement until after the fieldwork is completed, we do not believe that there will be substantial impediments to the scheme.

6.2.1 Cemeteries and graves

During the HIA/EIA, the known cemetery at the site of the N1 dam must be inspected and its extent determined and surveyed. It must be determined in the cemetery is still in use and if under the jurisdiction of a local authority, or not. No disturbance of the graveyard will be tolerated, unless a formal process is followed in this regard (exhumation). This is a lengthy process and probably best avoided if possible. If not under local authority jurisdiction, SAHRA will be the responsible statutory body, and they should be asked for a comment on the development of the dam as it is proposed at the scoping stage. Some public comment will be required with regard to the placement of the dam close to the cemetery if it has not been done so already.

Individual or small groups of Informally marked or unmarked graves may be present within the development footprint. Attempts will be made to identify these during fieldwork, but often they may be well camouflaged. If any were to be identified during the construction phase, they would be assessed and dealt with as necessary, either through design, or exhumation.

6.3 Built environment

Some structures are identified at the N1 dam site. These do not appear to have heritage significance as far as can be ascertained from Google. This observation must be field verified however.

6.4 Options rating

At this time, no option is favoured over another from a heritage point of view, although some issues are noted with regard to the clay borrow pits for the Kleinberg off stream dam (archaeology) and for the N1 dam option (graveyard, possible visual impact). The few structures at the N1 dam site are unlikely to be of heritage significance and dam design has acknowledged and excluded the cemetery. SAHRA and public comment will be required on this option specifically with regard to the cemetery.

7. REFERENCES

Trew W. I. 1984. Rock Paintings at Sandhills in the Hex River Valley, South-Western Cape. South African Archaeological Bulletin, Vol. 39, No. 140 pp. 130-137.

APPENDIX 1

Our Ref: G:\CASE FILES\CASES\CAPE WINELANDS\BREEDE VALLEY\HEX RIVER VALLEY\ZANDDRIFTKLOOF 78



Enquiries Troy Smuts Date: 15/08/2012
Tel: 021 483 9543 Case No: 120730TS24
Email: justin.bradfield@pgwc.gov.za Auto IDs: 1931 - 2042

RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP
In terms of section 38(8) of the National Heritage Resources Act (Act 25 of 1999)
and the Western Cape Provincial Gazette 6061, Notice 298 of 2003

Attention: Ms Nicole Holland
Holland and Associates
PO Box 31108
Tokai
7966

CASE NUMBER: 120730TS24

NID: PROPOSED KLEINBERG AND BOSKLOOF OFF-STREAM DAMS AND ASSOCIATED DIVERSION WIER AND PIPELINES, HEX VALLEY, WESTERN CAPE

The matter above has reference.

Your NID dated 13 June 2012 was tabled and the following was discussed:

1. The proposal is for a dam w with a storage capacity of 7 million cubic meters and a 40m high wall.
2. An approximately 2.7km diversion pipeline will go from the weir to the dam.
3. There are two Schemes for the layout of the dam and associated infrastructure.
4. The size of the area flooded for the dam might disturb Early, Middle and Late stone age artefacts.
5. Site is located on the Cederberg Formation know to be rich in post glacial fossils.

Decision:

1. Since there is reason to believe that heritage resources will be impacted upon, HWC requires an HIA in terms of S. 38(3) of the NHRA (Act 25 of 1999) assessing the impacts on the following heritage resources which it has identified; a Heritage Impact Assessment consisting of an archaeological and palaeontological study is required.

Terms and Conditions:

Heritage Western Cape reserves the right to request additional information as required.

Should you have any further queries, please contact the official above and quote the case number above.

Yours faithfully

Andrew B Hall
Chief Executive Officer
Heritage Western Cape