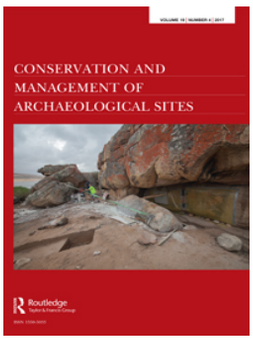

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Removal of Rock Art Affected by the Raising of the Clanwilliam Dam Wall, Western Cape Province, South Africa: Techniques and Procedures

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ABSTRACT

The commissioning by South Africa's Department of Water and Sanitation of a new and higher wall for the Clanwilliam Dam will increase dam storage and provide additional water for emerging and existing commercial farmers. But there is a cost to South African heritage. The raising of the wall will flood 27 rock art sites as well as other archaeological and historical resources. In partial mitigation of this impact on heritage the removal of particular pieces of rock art was approved by Heritage Western Cape, the provincial heritage agency. This report focuses on the removal process and techniques used to cut out three pieces of rock art under the management of PGS Heritage between 18 April 2016 and 7 May 2016 from the sites designated CDE02 and CDW10. Publication of the techniques used and the procedures followed will add to the sparse literature on rock art removal and increase the accessibility and availability of information about the removed stones.

KEYWORDS

Archaeological heritage resource management; cultural resources management; rock art conservation; rock art documentation; rock art removal; rock art restoration

Introduction

Rock art removal is a complex process with technical, social, economic, and ethical dimensions (e.g. Loubser 1994; Henry 2007; Hollmann and Msimanga 2008). Here we focus exclusively on the techniques used and the procedures followed to remove the rock art. Very little has been published on this subject in South Africa.

In their Heritage Impact Assessment of the raising of the Clanwilliam Dam wall (Figures 1 and 2) Orton and Hart (2005, 2) recommended that all the rock art 'be expertly recorded before the dam level is raised' and that 'at least 3' of the threatened rock art sites be removed and installed 'in an especially established local museum or alternative facility'.

The removal criteria are detailed in the HIA (Orton and Hart 2005). The panels selected for removal are rated as having 'Very high' significance (e.g. Orton and Hart 2005, 76). Significance is defined as 'The cost of losing a resource with respect to its heritage

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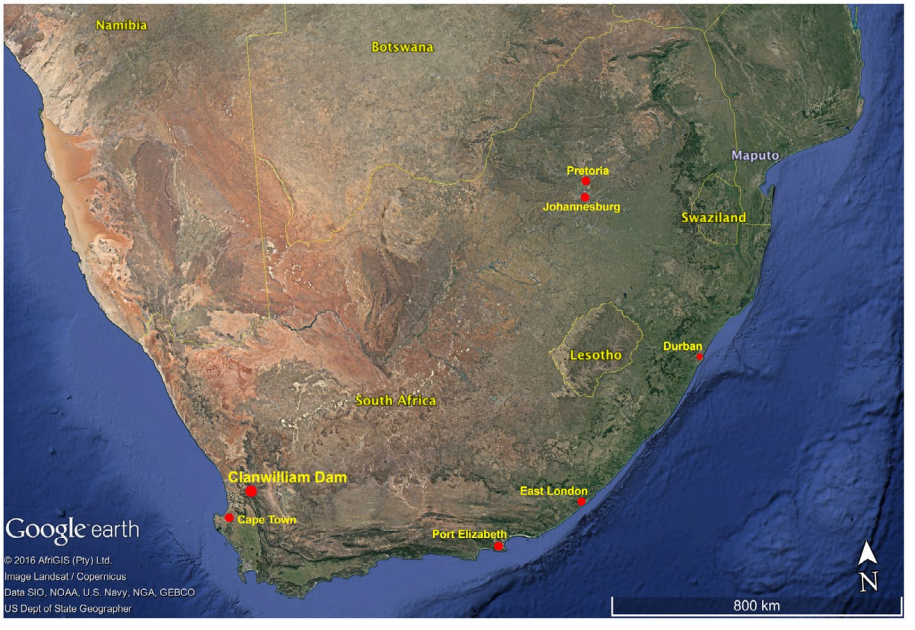

Figure 1. The large red dot indicates the location of the Clanwilliam Dam in Western Cape Province, South Africa, about 230 km north of Cape Town.

Figure 2. The Clanwilliam Dam, the location of dam wall to the north, and the two sites from which rock art was removed to rescue it from flooding. The town of Clanwilliam lies just to the north-east of the dam.

significance in terms of its typicality, rarity, aesthetic, tourism and educational value and research potential' (Orton and Hart 2005, 14). These authors describe the significance criteria applicable to rock art in specific detail (Orton and Hart 2005, 14):

> Paintings that are either poorly preserved or very simple or common in terms of their content are usually considered to be of low significance. Those that are either well preserved but have common subject matter or poorly preserved with relatively distinctive subjects are rated more highly. Well preserved rock art panels with complex of unique subject matter are given very high significance. Such paintings can serve as important records of the content and styles of rock art in the region and can also be used in tourism and education, either as part of a guided trail or in a museum if they have to be removed from their original outdoor context.

According to these criteria, three sites (CDE01, CDE02 and CDW10) were identified for removal (Orton and Hart 2005). CDE01 was selected on the basis of 'unique and significant' paintings of fat-tailed sheep (Orton and Hart 2005, 76), but ten years later when the documentation process began, these images could not be located on the rock face. The site, which initially had only a small amount of graffiti, had in the interim of ten years been extensively vandalised (Figure 3). Cleaning of the surface still revealed no traces of the sheep paintings. Project Advisor John Parkington, and Project Director Wouter Fourie, therefore decided that there would be no removals at this site; the number of sites from which rock art was to be removed was thus reduced to two (CDE02 and CDW10). CDE02 (Figure 4) was targeted for removal because of its 'excellent, well preserved paintings' (Orton and Hart 2005, 76) and the subject of the paintings – a 'large group scene'. CDW10 (Figures 5 and 6) was selected because of 'the very high quality' of images of 'male and female humans, several bags and various other marks' (Orton and Hart 2005, 97).

These measures were part of a broader social and cultural heritage programme approved by Heritage Western Cape, the provincial heritage agency. The client commissioning the project was the South African Department of Water and Sanitation (DWS). PGS Heritage was appointed to implement the measures, including the rock art documentation and removal.

Figure 3. Site CDE01, on the edge of the Clanwilliam Dam, had paintings of several fat-tailed sheep that were earmarked for removal but these images could not be located after the site was severely vandalised.

Figure 4. Well-preserved rock art at Site CDE02 (Area A) including dancing and clapping figures was successfully removed. Enhanced image with DSTretch and Photoshop.

Figure 5. Rock paintings at Site CDW10 (Area B), of a large female dancing figure and a bag. This painted surface was successfully removed. Enhanced image with DSTretch and Photoshop.

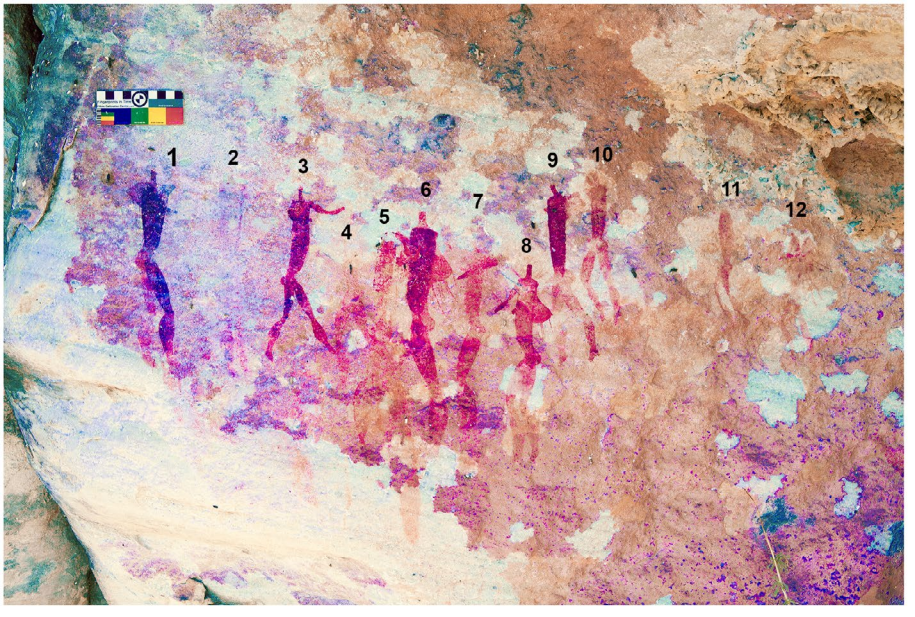

Figure 6. Rock paintings at Site CDW10 (Area C) of several male dancing figures. This painted surface was successfully removed. Enhanced image with DSTretch and Photoshop.

The removed pieces of rock art will be accessioned by Iziko Museums and housed in their premises in Cape Town.

Most, if not all of the threatened rock paintings are associated with San or Bushman hunter-gatherers who inhabited the Cederberg during the Later Stone Age and Historical period (Parkington 1977, 2003a). Issues concerning consultation and communication about the rock art with the local communities, including possible Khoe-San descendants, were also part of the social and cultural heritage programme and so are not addressed here. The Cederberg area has many archaeological sites from this period and is well known for its rock paintings. The rock art in the Cederberg area has been documented and studied over many years (Johnson, Rabinowitz, and Sieff 1959; Maggs 1967a, 1967b, 1971; Johnson 1979; Maggs and Sealy 1983; Rijssen 1984; Manhire, Parkington, and Yates 1985; Yates, Golson, and Hall 1985; Parkington et al. 1986; Parkington 1989, 1996, 2002, 2003a, 2003b; Yates and Manhire 1991; Slingsby 1995, 1998; Parkington and Manhire 1997; Smuts 1999; Yates 2001; Bassett 2001; Paterson 2007; Mguni 2013).

The results and discussion of the documentation of 27 rock art sites located below the proposed full supply level of the proposed new dam wall for the Clanwilliam Dam are to be published separately. Here we provide a detailed account of the removal of three blocks of painted stone. Such an account is not only informative. Publication ensures that the information is widely available and easily accessible and thus helps to preserve the identity of the objects (i.e. the removed painted blocks) in wider memory. Missing or inaccessible documentation and accession data for removed rock art in museum and university collections can be a problem. This report describes the recording process and the techniques used to record and to remove the rock art. It concludes with a few particular and other more general remarks on rock art removal.

Methods

Orton and Hart recommend that the rock art sites that will be affected by the increased water level of the dam should have 'a full photographic record followed by careful tracing of the images' (Orton and Hart 2005, 30). To this end Jeremy Hollmann carried out fieldwork between 16 April and 15 May 2015. Documentation comprised the creation of spherical panoramas of each site, photography of the images and traces of images at the site using lenses of three different focal lengths as well as notes and measurements made while at the site and on computer (Hollmann 2016).

Lawrence Msimanga has produced a documentary of this part of the rock art documentation process. All sites listed in the HIA were visited and documented. Later in 2015 the Zamani Heritage Documentation Team from the University of Cape Town produced 3D digital models of the two sites from which the rock art was removed (https://lidarnews.com/articles/the-zamani-project-preserving-rock-art-virtually).

Stephen Bassett carried out conservation on CDE01 and CDE02 in 2015. Many of the paintings at CDE01 were covered with permanent marker and spray-painted graffiti. At CDE02 Bassett removed a white deposit that was obscuring part of the painted surface and in the process he revealed several paintings.

Rock Art Removal

As Orton and Hart remark, rock art removal is 'costly and difficult to achieve' (Loubser 1994; Orton and Hart 2005, 30). In their report they stress the need for 'suitably experienced people' and suggest that such personnel might need to be sought internationally (Orton and Hart 2005, 30). Ultimately, however, all the expertise required was found in South Africa. The removal of rock art is a multidisciplinary process that requires engineering, logistical, rock art conservation and rock art recording skills and experience. The site engineer, Frans Prinsloo, has extensive experience with rock art removal, having successfully carried out removal operations in the Free State (Anderson 2008), Lesotho in 2012, and KwaZulu-Natal (Hollmann 2012). In all these cases the rock art was successfully removed with no damage to the paintings. Jeremy Hollmann, the rock art specialist appointed by PGS Heritage, has carried out rock art documentation and removal projects at threatened sites in South Africa (Hollmann 2005, 2006, 2012; Hollmann and Namono 2005). The removal project and its personnel were part of a larger team of archaeologists engaged by PGS Heritage and managed by Marko Hutton. The people involved in the rock art removals were:

(1) Frans Prinsloo (Site Engineer, Amfra Maintenance)
(2) Sarel Smith (Operator, Amfra Maintenance)
(3) Ntandoyenkosi Busane (Assistant, Amfra Maintenance)
(4) Mandla Buthelezi (Assistant, Amfra Maintenance)
(5) Jeremy Hollmann (Rock Art Specialist)
(6) Lawrence Msimanga (Documentary Film Maker)

Rock Art Removal at CDE02

The removal of the paintings at CDE02 (Figures 7 and 8) took nine days, from 20 to 29 April 2016. The process began with a site inspection and preparations. Access to the site was along

the eastern shore of the Clanwilliam Dam through the grounds of the Clanwilliam Dam Resort (Figure 9). The level of the dam was extremely low at this time and so it was possible for vehicles to be driven along the hard sand on the exposed shore. A track about 10 m long was constructed from the shore of the dam uphill over a low rock terrace in order to get close to the site.

John Parkington, project advisor, expressed concern about the overhang of the shelter collapsing while the removal was in progress. Frans Breytenbach, a geotechnical engineer who was called in, advised that it was safe to proceed, provided props were placed under the overhang. The site engineer had planned to put in steel props but decided on Breytenbach's advice instead to put in wooden packs (Figure 10). Prinsloo also glued two glass devices into angled corners of the overhang. These served as early warning devices – should they crack they would warn of the impending collapse of the overhang.

CDE02 comprises rock paintings that are spread out over about 5.8 m. Two wash zones (areas covered with a white salt-like deposit) have divided the painted surface into three areas (A, B and C). Area A has the best-preserved art (Figure 4), followed by Area B (Figure 11). Area C (1.2 m wide and 0.93 m high) is covered with a similar white salt-like deposit and comprises a few weathered images (Figure 12). Restoration work by Rock Art Conservator Steven Bassett in late 2015 removed most of the white deposits between Area A and B. The HIA recommended that, if possible, the 'entire painted surface should be kept intact' (Orton and Hart 2005, 76). The cost and difficulty of a removal of this size was assessed against the heritage value of the rock art in Area C. The project director and rock art specialist finally

Figure 7. An overview of the rock art to be removed from Site CDE02.

Figure 8. The entire painted surface at Site CDE02 is over 5 m long. Only the rectangular area at left (Areas A and B) was cut out. Area C was excluded so as to remove a block of rock that was manageable and less likely to fracture.

Figure 9. View from Site CDE02 down to the Clanwilliam Dam. Access to the site was along the sandy shore of the dam. A transect has been excavated down the slope.

decided to exclude Area C because of the great size and weight of the block of rock to be removed –5 m in length and 0.30 m wide. A block this size is not easy to work with and the risks of breaking increase as the size of the rock increases (see Loubser 1994, 445).

Figure 10. The overhang at Site CDE02 was reinforced with wooden packs to support the rock mass above the paintings.

The dimensions of the block to be removed were much more manageable, at about 2.3 m long, 1.3 m tall and 0.3 m wide at the base of the block, and estimated by the site engineer to weigh about 2.5 tonnes.

A block of rock protruding from the ceiling of the overhang about 0.2 m thick, 0.76 m long and 0.7 m wide impeded access to the rock art and so it was removed. Thereafter, a large rock in front of the rock art about 8.65 m long and 1.2 m high and weighing approximately 9 to12 tonnes needed to be shifted to gain free access to the rock art (Figure 13). With these operations completed the team could start to remove the rock art.

The plan was to construct two wheeled cradles and insert these underneath the block of rock so that once cut loose from the parent rock, the block would come to rest on the cradles. The cradles would in turn rest on sets of rails constructed from angle iron and so enable the block to be wheeled out from below the overhang and then loaded.

The block was to be removed by cutting along the top, bottom and sides of the painted surface; finally, a cut would be made about 250 mm deep behind the painted surface using a diamond wire saw.

Owing to the depth and the extent of the cuts required to remove the painted block of rock it was necessary to use water-cooled cutting equipment. A double-bladed rotary cutter and a diamond wire cutter were used to make the cuts. The use of water and the presence of dust made it necessary to seal the rock art to keep out the slurry produced while making the bottom cut (Figure 14). A sheet of plastic covered the rock art. The sheet was stuck onto the rock, initially with duct tape. Clear marine silicone sealant was used to seal the edge between the tape and rock surface.

Removal began with making a cut along the bottom of the block in order to create the necessary space for the cradles. Cutting was done with the double-bladed rotary cutter and

Figure 11. Rock paintings at the right hand end of the block that was removed at Site CDE02. Enhanced image with DSTretch and Photoshop.

water was used to cool the blade. The bottom cut was successfully completed and attention was then focused on making the right hand cut.

The cut on the right hand side of the rock art was large and deep (350 mm wide and 300 mm deep) because it had to accommodate the pulley wheels for the diamond wire saw, which was used to make the back cut, behind the paintings.

When making the right hand side cut with the double-bladed rotary cutter some moisture and thin slurry got in at the top right of the painted surface. It covered an area about 10 cm by 10 cm. The slurry was immediately rinsed with water but some traces were left on the rock art. These traces were removed with cotton wool poultices.

To achieve an even tighter seal for the plastic covering the rock art an aluminium sealing tape was substituted for duct tape. The aluminium sealing tape sticks onto the rock very tightly. The plastic covering the rock art was placed on top of the aluminium tape. Then the

Figure 12. Faded images of large antelope at Site CDE02 (Area C). These paintings were not removed. Enhanced image with DSTretch and Photoshop.

tape was sealed by making a silicone beading along the top edge of the first layer of aluminium tape to thoroughly waterproof the rock art. This was done along the top and the two sides, leaving the bottom edge undone but with the plastic draped and secured at the bottom by stones and planks.

The right hand side cut took 5 h and 45 min to complete, but cutting was interrupted during this period. The left hand side cut did not have to be as wide or deep as the right hand side and was completed in 40 min.

The top cut was next (Figure 15). After 40 min of work the double-bladed cutter cut into the silicone beading and some of the slurry ran over the paintings in a streak about 5 mm wide and 200 mm long. Cutting was stopped immediately and the plastic sheeting that covered the rock art was lifted at the bottom (it had intentionally not been sealed). The slurry was cleaned off with cotton wool poultices. Further cutting was postponed until the following day. The bottom edge of the plastic was drawn away from the rock and weighted with bricks to let air in at the bottom and to dry the rock. Then the damaged beading was repaired with fresh silicone.

The following day (26 April 2016) cutting proceeded for about an hour when it was noticed that the guide plank that was put up against the plastic to guide the double-bladed cutter

Figure 13. A 9 to12 tonne block of rock at Site CDE02 that was in front of the overhang was cut off at ground level and dragged out of the way using a block and tackle.

Figure 14. The rock art at Site CDE02 was waterproofed with plastic sheeting, aluminium tape and silicone. The pulleys at right are part of the diamond wire saw setup.

in making the top cut had punctured the plastic. In addition, it could be seen that slurry had leaked through onto the paintings in certain areas along the top edge of the block where the sealed edge had parted. There were now several streaks of slurry over the painted surface

Figure 15. The top cut along the top of the block at Site CDE02 varied in depth between 150 and 350 mm and was made with a double-bladed rotary cutter that was cooled with water.

(Figure 16). In order to prevent staining of the rock surface these streaks were cleaned off immediately using cotton wool poultices. The cleaning process took 3 h and 45 min. Then all the plastic and the top tape was removed and replaced with fresh, new plastic and aluminium tape.

In the meantime four dowels made of stainless steel rods were inserted into the bottom right hand corner of the rock to reinforce a small natural crack. Drilling was done with a diamond-tipped drill that feeds water through a hole (6 mm diameter) while it cuts and is vibration free. The hole was dried out using a blower and the dowel – a stainless steel rod cut 10 mm shorter than the depth of the hole – was inserted. The hole was sealed over with epoxy.

To make the final, back cut, the pulleys for the diamond wire saw were mounted in the 350 mm gap at the right of the paintings and the diamond wire itself was inserted, ready to cut.

Before commencing to cut, however, the safety of the paintings and the stability of the block had to be ensured. The sides and bottom of the block were sanded in readiness for sticking on carbon fibre strips. Strips were glued on the right hand side and along the bottom of the block.

The cradles were inserted taking care that they did not press on any visible faults in the rock but also so that they could bear the weight of the block evenly. The cradles were stabilised so that they could not twist under the weight of the block. Metal uprights were welded onto the sides of the cradles on which to attach the strapping that would be used to keep the block upright and in position. Then 2 mm thick rubber matting, folded double, was placed between the cradles and the block. The cradles were wedged into position on the rails so that they were tight against the block and would not budge.

Figure 16. Breaching of waterproofing caused by a defective silicone seal and the accidental breaching of the plastic. The slurry was immediately removed and there is no permanent damage to the rock art.

Wood packs were placed underneath the rails so that the rails would be supported in readiness for the weight of the block. Levelling the rails and the cradles was crucial to prevent the block from twisting. The rails were also extended so that the block could be moved out beyond the overhang and then loaded.

The large rock that was originally in front of the shelter art was moved further out of the way so that the TLB (tractor, loader, backhoe) could get easier access to the block.

High-density foam about 100 mm thick was wedged up against the plastic covering the art. The block was now firmly supported in the vertical dimension and would not move during the making of the back cut or during removal.

The back cut with the wire saw took 2 h and 50 min. The block was now free of the parent rock (Figure 17).

The block on its cradles was pulled out about 1.3 m and the back of the block inspected. At least five horizontal hairline cracks were visible. The back of the rock was cleaned of the slurry, then dried using a blower. Finally, the strengthening carbon fibre strips were glued onto the back of the block.

By the next morning (Thursday 28 April 2016) the block was ready to load with the help of an operator and TLB made available by DWS. The TLB would transport the block to the Time Machine building at the Living Landscape Project, a couple of kilometres away.

Metal stoppers were welded onto the rails to prevent the block from running off the rails. Then webbing slings were wrapped around the block using wooden blocks to prevent the slings from touching to pulling against the block.

Figure 17. The block at Site CDE02 has been cut free and has been wheeled from underneath the overhang on a cradle on rails.

The block was rolled into the TLB's carrier bucket together with the tracks that it runs on (Figure 18). The block was wedged into the carrier bucket with planks and tied into place with rope. The rock art was protected with high-density foam for the 25 min journey (Figure 19).

The block was offloaded onto the front veranda of the Time Machine building. In order to get the block into the building it was necessary to rotate the cradles 90° so that the cradles were now arranged one behind the other instead of standing side by side. To do this the TLB lifted the block off the cradles, the cradles were rearranged and the block lowered back onto the rails. The block was rolled inside the Time Machine building where it stood on the cradles and railing. Wooden wedges were positioned to keep the block stable (Figure 20). The wooden wedges were a temporary solution, suitable for a few months (i.e. around the end of 2016). For longer-term storage and safety a metal stand needs to be provided to replace the wooden wedges.

In the aftermath of the removal the rock art specialist became concerned about 'stains' over certain paintings –two streaks each between 100 and150 mm wide, running down over the rock. What was this substance 'staining' the rock? Were these streaks caused by the leakage along the top edge of the waterproofing? The blower was used for about one and a half hours but this procedure made no visible difference to the streaks.

By comparing these 'stains' with photographs of the accidental slurry staining that occurred during removal it was established that there was no correspondence between the slurry streaks (now removed) and the darker, moist-looking zones. It was concluded that the 'stains' were indicative of moisture (water) within the rock. It had started raining, humidity levels were high and the temperature was low (<20° C) and thus evaporation was not happening very quickly. A lamp was therefore set up in front of the rock in order to facilitate the

Figure 18. The painted block from Site CDE02, still strapped to its cradle and with a short section of rails, is loaded into the carrier bucket of a TLB.

Figure 19. The block of rock from Site CDE02 on a TLB loaned by Department of Water and Sanitation on its way to temporary storage in the nearby town of Clanwilliam.

evaporation of the moisture-laden rock. The lamp was kept on for the following 21 days. The rock face was regularly monitored to make sure that it was not warm. Within two days the left hand most 'stain' had disappeared and the other streak had begun to slowly diminish,

Figure 20. The block from Site CDE02 rests on a platform of rails and planks and is wedged with wooden chocks. The dashed rectangles draw attention to areas of moisture within the block. The left hand area dried out within two days. The area at right continues to dry out.

and it continues to do so. These developments seemed to confirm the hypothesis that the block of rock was moisture laden in places.

The moisture inside the block probably originated from the use of water to cool the cutting equipment. More specifically, the use of water to cool the wire saw when making the back cut – which took almost three hours to complete – might have been the reason why the block absorbed moisture.

The dusty residue of the cutting water that ran over the rock face and over paintings in some areas was cleaned off with cotton wool poultices and distilled water. Small traces remain in certain small places and are only visible on very close inspection. As much as possible of the silicone sealant around the edge of the block was removed by rubbing it off. However, in some very small areas the rock has become slightly stained. A conservator could remove these blemishes.

Rock Art Removal at CDW10

Work at CDW10 began on 3 May 2016 and ended on 7 May 2016 (5 days). The site has paintings in three areas (Areas A, B, and C). The mandate was to remove CDW10 Areas B and C. Area A was not removed and remains *in situ*. It had already been decided that Areas B and C would be removed separately owing to the rock formation of the overhang. Areas B and C are each on convex shaped rocks and are separated by a gap of 5 to 8 mm.

Remains of a bird's mud nest above, but not covering, CDW10 Area C were removed with a penknife blade. The precise locations of the cuts were outlined in pencil. The double-bladed rotary cutter was used to make the cuts required (Figure 21). The cuts were made dry, i.e. without the use of water-cooling. Cutting dry produces a lot of fine dust but it was decided

that there was no risk of any dust settling permanently on the paintings. A blower was used while cutting to prevent any dust from settling on the art. The surface was regularly inspected during the cutting procedure.

The first cut, 100 mm deep, was made below the paintings in CDW10 Area B and took 35 min. The top cut above CDW10 Area B was next, still cutting dry. The left hand side (dry) cut followed. By 14:48 the cuts on the right hand side and the top of CDW10 Area C were completed.

The following day (4 May 2016) the art was sealed up with plastic, aluminium and duct tape and silicone. The rest of the team constructed cradles and scaffolding to accommodate the rock art as the same procedure as at CDE02 was to be followed here. Areas B and C would be removed separately, beginning with CDW10 Area C. It was estimated that CDW10 Area B weighed about 800 kg. CDW10 Area C weighed about the same.

By 10:15 the frame and cradle were in place under CDW10 Area C. The frame was equipped with jacks to raise the cradle closer to the base of the block when necessary; sandbags were used to cushion the art.

Attention was then focused on setting up the wire saw (Figure 22). The top cut had to be deepened and extended along the top of CDW10 Area B to the left to facilitate the wire cutting. The cut on the right hand side of CDW10 Area C was also deepened. Once the diamond wire saw was in position sand bags filled with sieved soil from the nearby archaeological excavation at CDW11 was packed onto the cradle.

The next day (5 May 2016) the wire saw and generator were set up on site. A stopper was welded onto one side of the frame to prevent the block from slipping down onto the ground

Figure 21. Site CDW10, the second site from which rock art was removed. Guide cuts for the diamond wire saw are being dry cut with the double-bladed rotary cutter. A blower is used while cutting in order to keep dust from settling on the rock art.

Figure 22. The diamond wire saw set up for cutting at Site CDW10. The wire saw is controlled from the console at left.

once it had been cut loose. The rails and the rail support scaffolding were stabilised with sandbags.

A second trolley on which to support CDW10 Area B was constructed on site. A chain block was anchored to a point on the top of the boulder that forms the overhang of the shelter.

'I' bolts were inserted on either side at the bottom of the block and then fastened to the supporting trolley; this was an additional precaution to eliminate the danger of the block slipping down once it had been cut loose. The bolts are to be removed afterwards and the holes filled in and disguised.

Wire cutting (water-cooled) commenced at 13:30 (Figure 23). The cutting speed was initially 6 m/s and then increased slightly to 7 m/s. The cradle was kept away from the art until the wire cut was firmly established. Then the cradle was pushed closer to the block. An additional anchor point was created. About halfway through the cut it was noticed that the bottom right hand corner waterproofing of CDW10 Area C had been breached by the wire saw. No art was affected, however, and the slurry was promptly removed. At the same time it was also observed that water was pooling on the top edge of the block.

By 15:50 the cut behind CDW10 Area C was complete and the block was detached from the parent rock (Figure 24). It was very gentle, with no slipping of the block, or any movement.

The block was slid out from beneath the overhang and the entire cradle rigged with webbing. After discussion about how to handle the block – the back is concave and there was a crack at the bottom – two dowels were drilled into the top edge of the rock using the core drill.

The rigging, loading and transportation of the block continued the following day, 6 May 2016. The process involved lifting the block using the block and tackle, turning the block

Figure 23. Water-cooling the diamond saw at Site CDW10. The red hose is feeding water into the cut that the diamond saw is making. A thin slurry of water and dust drains to the ground.

and then laying it flat on top of a platform of sandbags and planks on top of the second trolley. After positioning the rails the pickup truck reversed in, underneath the suspended block and cradle. By 11:45 the operation was complete.

Preparations for removing CDW10 Area B began immediately. The scaffolding was reconfigured to accommodate the second block (CDW10 Area B). A dowel was inserted at the bottom left of CDW10 Area B where a crack in the rock had been noticed. A rod was also inserted at bottom right – this was an anchor point to tie the block to the support scaffold cradle.

With the second block ready to be cut out the following day, the first block that was already loaded was taken to the Living Landscape Centre's Time Machine building. There a TLB was used to hoist the block off the back of the truck and to deposit it on the back veranda outside the Time Machine building. The rock art was in perfect condition.

Figure 24. Area C from Site CDW10 has been cut out and is resting on a padded cradle.

On the next day (7 May 2016) work on the removal of the second block (CDW10 Area B) continued. After final levelling and repacking the sandbags, water-cooled wire cutting commenced. The cut took 53 min and the block came loose from the parent rock with no damage. Dowels to rig the block were inserted 300 mm deep into the top edge of the block. Then the block was rigged and loaded onto the back of a truck and taken to the Time Machine building at the Living Landscape Centre where it was offloaded with a TLB. A set of rails into the Time Machine building was constructed on the opposite side of the building to the entrance used for CDE02. Both blocks from CDW10 – still on their supporting cradles – were deposited inside the building. With the transportation of the last block from CDW10 to the Time Machine, the removal phase was completed (Figure 25).

As of June 2016, the plan is that all the removed rock art will be transported to Cape Town and will be accessioned by Iziko South African Museum.

Work on cleaning off minor traces of slurry on the painted surfaces with distilled water and cotton wool poultices began immediately. This treatment was repeated where necessary over the next two days. The excess silicone beading was also rubbed off. A few small areas of silicone staining remain (especially on CDW10 Area B). A conservator could remove or disguise these stains.

Remarks

Henry (2007, 48) remarks 'Rock art is inevitably damaged during the process of removal'. It is certainly the case that the process of removal is fraught with difficulties and complications (Loubser 1994); the potential for damage or accidents is always present. Successful rock art removal is a multidisciplinary procedure. The engineering side of the removal enterprise focuses on the challenges involved in cutting loose the block on which the paintings were

Figure 25. Site CDW10 after the removal of the rock art.

made from the parent rock. At the same time the integrity of the paintings is paramount and must be vigilantly guarded against the threat of accidental damage caused by a momentary lapse of attention or careless mistake. After the removal of the rock art from CDE02 Author FP (the site engineer) joked that the removed block of rock belonged to him, and that the paintings on the surface of the block belonged to Author JCH (the rock art specialist). His humorous comment should not, of course, be misconstrued as lack of interest or concern for the rock art – the joke underlines the truth that the paintings cannot be separated from the rock on which they were made. In this way it affirms the necessity for the full cooperation of all members of the removal team.

Henry (2007) is right; however, that the process of rock art removal is destructive in nature (as is archaeological excavation) and that there is always some kind of damage, to the site itself and to the removed rocks. For instance, it was considered necessary to use water to cool the rotary cutter and the diamond wire saw when making deep cuts to remove the rock art. This decision had important consequences for the materials and techniques used to protect the rock paintings during the removal process. The most significant consequence was the need to waterproof the rock art using silicone. The use of silicone meant that areas of the rock from which the silicone could not be removed by rubbing by hand would be stained by the silicone. The stained areas are small and quite unobtrusive, however, and can be rehabilitated.

A second consequence of using water-cooled cutting techniques was the risk of the waterproofing being accidentally breached. This occurred at CDE02 and to a lesser extent at CDW10. The waterproofing problems at CDE02 were caused by two factors. One was that the silicone seal was not properly applied in certain areas along the top edge; the silicone was not smoothed out to cover the edge of the aluminium tape. The second cause of the breach of the waterproofing was the small holes made in the plastic covering the rock art

by the guide plank that was used to keep the top cut on track. The leakage could have been avoided by using another method to keep the cut straight. These accidental oversights caused no permanent damage to the rock art and may be avoided in any future rock art removal work.

Use of water-cooling for the double-bladed rotary cutter was not necessary at CDW10 because the cuts were not as deep as at CDE02 (about 100 mm deep compared with cuts 200 mm and deeper at CDE02). Dry cutting minimised the need to work with water and therefore decreased the risk of the waterproofing being breached to an extent.

Another important consequence of the decision to use water-cooling was that the block of rock on which the paintings were made absorbed some of the water, thus increasing the amount of moisture inside the block. The use of the diamond wire saw to make the back cuts, which took hours to make, meant that the blocks of rock were exposed to water for a long time. It seems likely that the use of water for cooling the cutting blades resulted in the damp stains on CDE02. Fortunately, however, the process is reversible – water that has entered the rock will slowly evaporate. It should also be noted that water did enter the rock at CDE02 in its natural state. The presence of accumulations of water inside the rock in the same locations as the stains was observed after rainfall on the evening of 22 April 2016.

Rock art conservator J. Claire Dean, who has worked on several rock art conservation projects in southern Africa, commented on 5 December 2016 the fact that we did not cover up the art at CDW10 while cutting She pointed out that:

> While a blower was used to keep the dust away, it still left the panel exposed to other possible damage from personnel accidentally bumping into the surface, tools slipping or breaking, etc. It is a general rule in conservation that you protect all exposed surfaces of an object, if possible, during any major, general intervention, even if the risk of damage appears to be negligible. There is always some surprise around the corner and it may be coming from the least obvious place.

Dean's advice is accepted and in any future rock art removals that we might carry out will include the covering of the paintings before commencing with any further activities.

Once removed, the painted block becomes an object that must be cared for in perpetuity (Loubser 1994; see Hollmann and Msimanga (2008) for a case study in the neglect of removed rock art). The identification of the original location and name of the sites from which the rock art was removed was stencilled on the back of the blocks. The temporary storage conditions must be replaced with a more durable and permanent arrangement. The current arrangement is that the rock art will be accessioned by Iziko Museums, but many stakeholders support the incorporation of the removed rock art into a local, Clanwilliam exhibit.

Removal of rock art is usually a last resort. The process is physically dangerous and the risk of damage to the rock art is always present. The Clanwilliam Dam removals were successful in that the rock art was removed with very minor damage that can be repaired and with no injuries to personnel.

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Disclosure Statement

No potential conflict of interest was reported by the authors.

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