

Study project on the preservation of nine rock art carvings in Hong Kong

Consultancy Agreement Report



Valérie Magar

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I. Preliminary observations

A consultancy agreement was signed to inspect and study nine rock art sites in Hong Kong, from 25-31 May 2010. All visits and meetings took place in accordance with the planned schedule.

Preliminary information on the sites was timely provided to me, including brief descriptions of the sites and information on previous known interventions (Preliminary information). A recent geological report (Ho and Ho, 2010) was also supplied prior to the visit.

During the inspection visits, additional old images of the sites were also kindly made available to me, which were extremely useful for comparison purposes, and all my questions were always promptly answered.

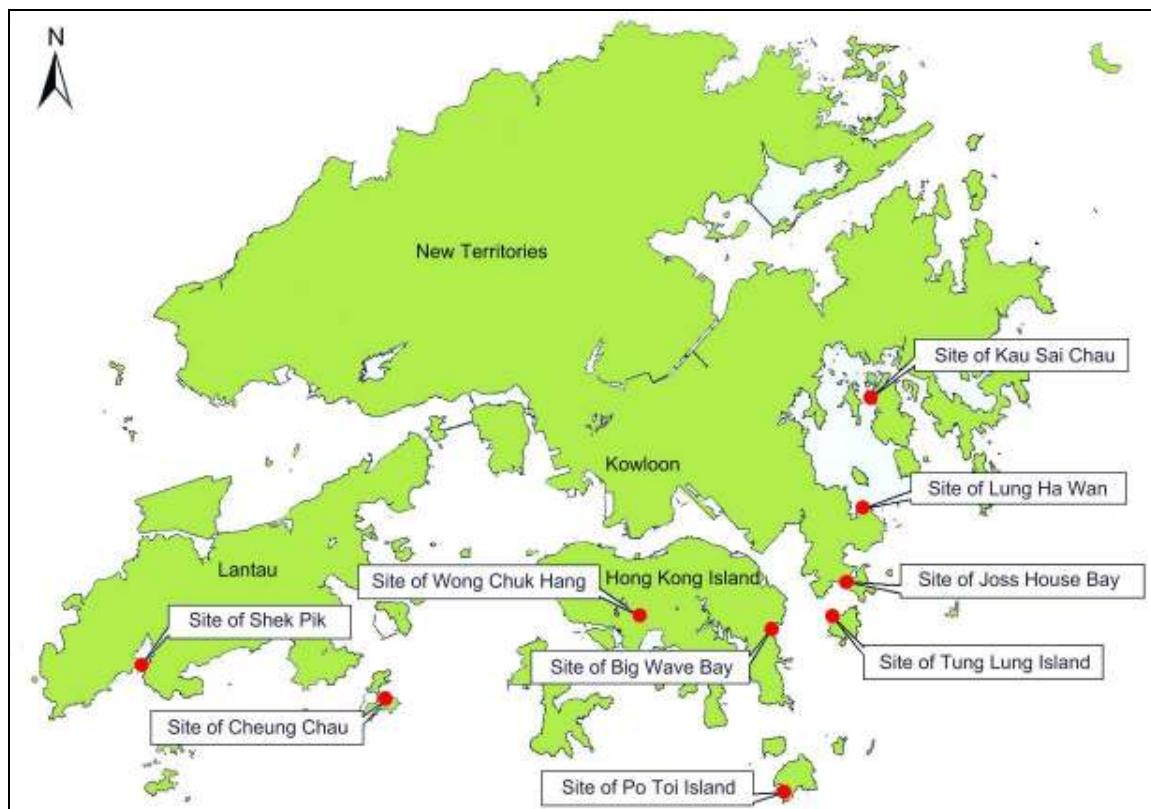


Figure 1. Location of the rock art sites in Hong Kong

II. Engravings at Shek Pik (25 May 2010)

1. Present situation

The site is on the Island of Lantau, in a valley under the Shek Pik Reservoir Dam. It is located in the close vicinity of a prison, and within a short walking distance of the sea shore.

Access to the site is clearly indicated with road signs pointing to its location, and there is also a bilingual sign at the site, with some explanations on the rock art, and clear indications that it is a protected monument.



Figure 2. Signage at Shek Pik

The engravings were incised on the vertical surface of a small rock outcrop, facing west. According to the geological report, the rock is an “eutaxitic coarse ash crystal bearing fine ash vitric tuff” (Ho and Ho, 2010:115). Rock samples were taken during the visit, in the vicinity of the site, for further analyses.



Figure 3. Engravings at Shek Pik

Two specific engraved areas can be found on the surface. They depict concentric squares and circles, believed to date from the Bronze Age, ca. 3,000 years ago (Preliminary information sheets). The engravings were not very easy to be fully perceived, although it is possible that visibility may vary during the day, according to the angle of incidence of light.

Earlier images of the site dating from 1977 revealed the presence of a third engraved area between the two visible ones, now no longer visible as it was reburied. The area where the outcrop is found was levelled and backfilled at some point between 1977 and 1986.



Figure 4. Ancient image of Shek Pik, dating from 1977 (courtesy Government of the Hong Kong Special Administrative Region)

The outcrop is currently protected by a shelter, and surrounded by a metal fence dating from 2005. Although the fence is quite massive, by using a traditional design it allows a clear visibility of the two engraved areas: there are window-like openings for adults, and a horizontal opening for children. There is sufficient distance to allow for photographs of both engraved areas to be taken by visitors.

The fence was designed with a gate to allow access into the sheltered area, and is protected by a lock.



Figure 5. View of the fence and shelter at Shek Pik

A long cement barrier was placed in 1985 above the outcrop, with the aim of channelling the water coming from the terrain above the site. The water is directed towards the northern side, taking advantage of the shape of the outcrop. However, the slope at the ground level seems to go towards the shelter, and the soil level is lower under the shelter. Possible water accumulation inside the shelter should be monitored in the future.



Figure 6. Cement channel on top of the shelter

Figure 7. View of the area north of the shelter, where water is channelled. Note the higher level of the ground in this area, in comparison to ground level inside of the shelter.



Figure 8. Accumulation of earth and leaves on the channel

Above the cement barrier, the channel is filled with large amounts of vegetation (leaves, branches, soil...). Some water may be overflowing towards the engraved areas, rendering the barrier ineffective.

A more problematic aspect of the cement barrier is its poor attachment to the underlying rock and soil: water is very likely seeping towards the outcrop. There seems to be a repair on the cement barrier where it joins with the soil, in which more cement was added to try to ensure a better sealing (see figure 9 below). This should be another element to consider for monitoring.

Figure 9. Detail of the lower part of the cement barrier. Note the space existing between the underlying soil and the cement. There are also visible cracks between the cement and the rock (upper right side)



The known past treatments at the site, undertaken in 2005, include:

- cleaning with soft bristle brush to remove dust and loose vegetation, and
- surface cleaning with biodegradable and non-ionic surfactant (Decon@90).

At the moment of the visit, the overall condition of the rock seemed stable. There is only a small area on the larger engraving, with little areas of possible flaking, which will need to be monitored in the future.



Figure 10. Detail of the large engraving at Shek Pik, with possible areas of flaking, to be monitored

There is some presence of microorganisms (especially lichen) on and in the close vicinity of the engravings, as well as presence of moss in other areas. They do not seem to pose any threats to the engravings. There are clear areas of water runoff along the sides of engravings, which are favouring the development of the microorganisms.

There is one root in the upper part of the engravings (visible in Figure 6), which should be monitored. If its diameter increased significantly with time, it may disrupt the balance of a rock above it. It should therefore be monitored.

There are also some mud insect nests in the vicinity of the engraving, but they do not seem to pose any harm.

In the area of the small engraving (on the left of the outcrop), there is a presence of a discontinuous black accretion (it could be manganese oxide), essentially found on the areas surrounding the engraved lines. The older images of the site do not offer enough detail to allow for a comparison and defining whether this black material was already present.



Although it does not seem to pose any threat to the site, it would be important to monitor the evolution of this material. If significant changes were detected over time, further chemical analyses would be recommended to understand the nature of the process, and its possible implications for the engravings.

Figure 11. Detail of the black discontinuous accretion on the smaller engraved area

2. Recommendations

a. Visibility of the engravings – long term monitoring

The engravings seem to be stable, but from comments with colleagues – they seem to have been more visible in the past. A comparison with images from 1977 does show a significant difference, but this may not necessarily imply a decay of the engraving. Lightning conditions may significantly alter the visibility of a site. Raking light (i.e. light arriving almost parallel to the surface) is usually best to increase the visibility. Another important element to consider is the cleaning of the engravings undertaken in 2005. Through this process, potentially damaging agents may be eliminated, but the results tend to be a uniformity in the tone of the rock, and this reduced the sense of depth of the engravings, which thus seem less visible. By not having darker (in this case the engraved area where dust and other materials accumulate) and lighter areas (the surrounding areas), there is no longer a sense of three-dimensions on the surface.

In order to be certain that the visibility is due to a uniformity in the surface tones, and not to a loss of material, it would be recommendable to initiate a monitoring process, which will take some time to produce results.

Two compatible techniques may be used:

- A simpler one, using photography, which will need to be taken in identical conditions over time. In order to ensure similar lighting conditions at the site, the best results are obtained with night photographs, using artificial lightning. Photographs can be taken using two sources of light, placed at 45 degrees of the surface, at an equal distance. Artificial lights can also be used to take raking light photographs, which may be useful to make interpretive drawings of the engravings.
- A more complex technique could be done by using a precision 3D laser scanning, again over periods of time, to detect any alterations of the surface. Prior to using the equipment, it will be important to gently clean the surface with a soft brush, to eliminate dust, organic remains and insect remains, and loose deposits from the surface.

b. Direct monitoring

Reburied engravings

If there is no plan to re-expose the reburied engravings at the base of the boulder in the near future, it would be important to monitor these as soon as possible, in order to verify the stability of the rock in that sub-surface area. While reburial is considered a conservation measure, as it eliminates direct exposure to the environment, a shallow

backfilling can pose a threat to the buried elements. When there is little depth, there is still an active exchange with the outer environment (oxygen and temperature changes), and there can be fluctuations in the levels of humidity if water (in its many forms) has access to that area. This could lead to a differential decay of the engravings.

If there was a plan to excavate the entire engravings, it will be important to ensure a proper channelling of water, to avoid its accumulation in the lower excavated areas.

If there is no plan to excavate that area, a planned reburial could be devised. This would include removing the soil now covering the engraving, and protecting it with geotextile, clean sand, and compressed soil.

Monitoring of rain water accumulation

It would be important to monitor water movement and accumulation after rains inside the sheltered area. The current channelling of water and soil levels would seem to suggest that part of the water may be going towards the sheltered area, which would be detrimental for the conservation of the engravings. If this was proven, there would be a need to level the soil around the site in such a way as to take water away from the shelter.

Cement barrier and channel

During (or immediately after) a rain, it would also be important to monitor water seepage in the central area of the engravings, underneath the cement channel. If it was seeping through, it would prove the ineffectiveness of the cement channel. Water may be running on the surface of the rock, on the side of the engraved areas, which may not be posing an immediate threat to these, but there are still associated risks related to water, including water accumulation at the base of the outcrop, or the growth of microorganisms on the surface and larger plants on cracks and areas of soil accumulation.

A possible solution would be to change the channel for a new one. Cement is not an adequate material for a series of reasons. On one hand, it is a material which releases soluble or partially soluble salts (essentially sulphates) which can be harmful to the rock (causing whitish veils which can obscure a surface, or favouring exfoliation and disintegration of the rock through the wetting and drying of the soluble salts). Cement is also inadequate as it will never form a perfect bond with the rock: they have different physical reactions to changes in temperature and humidity, and there are therefore often hairline cracks (or larger visible ones) between cement and stones, allowing for water to penetrate and seep. A new channel could be built using smaller stones from the locality, with a lime-based mortar (using preferably a natural hydraulic lime). On the channel side, the barrier could be covered with a layer of clay (such as bentonite). The clay layer will swell in the presence of humidity, creating a water-proof barrier. This has been successfully used in various heritage sites, including for example the Domus Aurea in Rome (GIAVARINI, 2001: 217-228).

Monitoring of microorganisms and plants

The cleaning of the surface seems to have provided a good control in the growth of microorganisms in the area of the engravings. A periodic monitoring should be undertaken to evaluate their rate of growth, which may be reduced if less water had access to the sheltered area. The same photographs used for the monitoring of the engravings may be used.

A closer monitoring should be undertaken on the root crossing the upper part of the boulder, to verify its growth, and consider its removal if it proved to be a risk for the upper boulder on the right hand side.

c. Maintenance

A periodic maintenance cleaning of the channel, preferably prior to raining season, to make sure it is clear of organic debris, and will allow a proper elimination of water.

A broader and periodic cleaning and maintenance of the site should also be verified (it seems to be already in place), to make sure the site is kept clean and well kept.

d. Visitor presentation and management

While there is good signage along the road providing indications of the location of the engravings, it could be desirable to add one additional signage showing what the engravings represent. Given their difficult visibility, this would help visitors understand the motifs. These new signs/drawings should be preferably placed at the same angle from the view point where the visitor would be standing, to facilitate their reading and appreciation.

During the inspection visit and later meetings, I understood that there is an agreement with the jail authorities to change the location of the garbage bin collector from the immediate vicinity of the site. This will be very positive, as it disrupts the appreciation of the site. When this is done, it will be important to remove all bins as well as the old car tires which can be found around the bin collector area.

3. Risks

a. Water

The site exposed engravings seem to be in stable condition. The main risk is humidity (both as water runoff and from potential accumulation of water at the base of the rock outcrop), but this risk could be mitigated by improving the channelling of water coming from the hill side, and by ensuring no rain water enters the sheltered area.

b. Differential decay

Monitoring of both the exposed engravings and the buried ones is essential, to prevent any risk of differential decay, and the potential alteration of the buried engravings.

c. Visitors

The site is visible and accessible to visitors. Given that there is no security in situ, keeping it clean and providing clear evidence that the site is well care for will largely dictate the visitors behaviour.

The existing shelter and fence offer protection for the site, but there is no perfect design to completely eliminate danger of vandalism. The main risk for vandalism is due to the relative little visibility of the engravings: visitors may feel frustrated by not being able to see properly, and may attempt doing something to remedy this (for example pouring water on the engravings). Frustrated visitors may also feel more inclined not to respect the site. This risk could be mitigated by providing more information on the shape of the engravings, as suggested in the recommendations.

4. Conservation plan

As mentioned above, one of the most immediate threats to the site is water, both for the exposed engravings, and for those now buried under the soil. The suggested conservation plan would therefore be as follows:

a. Immediate actions

The most immediate treatments should deal with water-related issues, as soon as possible. This implies solving the problems of the barrier and channel.

b. Immediate to mid-term actions

The second step should focus on the reburied engravings and seeking possible information on whether there are to remain hidden, or if there is any plan to expose them. If they are to remain hidden, a proper reburial should be envisaged, as suggested above, and a regular monitoring plan set in place.

c. Mid to long-term actions

The overall monitoring of the surface of the engravings should also be planned. Given the apparent stability of the surface, it is not as urgent as the two other aspects above, but it should be done as soon as possible, in order to have a reference from which successive monitoring will be compared.

The other action with a mid to long term range should be the redesign of the signage plaques, possibly offering more visual information of the shapes of the engravings. This is true for all the sites, but especially important for those sites where the engravings are less visible.

II. Inscription at Joss House Bay (26 May 2010)

1. Present situation

The inscription is located on a pedestrian path leading to the nearby Tin Hao Temple. It was carved on a tuff boulder, using one of its vertical surfaces.

A landing platform with cement benches was built at the level of the boulder containing the inscription, allowing for visitors to take a rest.

Figure 12. Detail of the signage describing the site at Joss House Bay



There is signage along the path offering indications to locate the inscription, as well as a bilingual plate providing an explanation of its meaning.

The inscription represents the cyclical year of jiaxu of the Xianchin reign during the Southern Song Dynasty, equivalent to 1274. It is the oldest dated inscription in Hong Kong, and makes reference to the salt trade in this region, of high relevance for the history of Hong Kong.

There are red paint remains on some of the characters, a practice which was used at some point in time to enhance the inscribed characters.

Figure 13. Detail of the inscription, seen from the side

The boulder is composed of a "lithic block and lapilli crystal bearing coarse ash crystal tuff" (Ho and Ho, 2010: 34). Rock samples were taken during this inspection visit for further analyses by the Government of the Hong Kong Special Administrative Region.

The boulder is located on a shaded area, under the cover of trees and bamboos.

The inscription placed behind a Perspex panel in 1989, placed in the close vicinity of the carved surface, which makes the analysis of the surface a little difficult to appreciate. The Perspex panel has collected dirt and materials, mostly on the side closer to the inscription, and makes visibility very hard. Visibility is also greatly reduced by the reflections on the panel.

Waste bins have been placed on the path, including one that is currently located in front of inscription.

Figure 14. View of the inscription at Joss House Bay. Note the waste bin located in front of the inscription.



There are records of recent treatments on the inscription. It was initially cleaned in 2003 or 2004 with a soft bristle brush to remove dust and loose organic materials.

Further treatments were carried out in 2006. These treatments included:

- Cleaning with a soft bristle brush to remove dust and loose vegetation.
- Cleaning of the surface with a biodegradable and non-ionic surfactant (Decon@90) and then rinsing thoroughly with water.
- Application of an aqueous solution of isothiazolinon (Remmer BFA) to prevent further vegetation growth.
- Application of a siloxane-based hydrophobic agent (Remmer SNL) to act as water-repelling layer to avoid air pollutants deposition and pest infestation. (Preliminary information)

Only the engraved area and its immediate surrounding area were cleaned and treated, creating a very different visual impression of the boulder: while the inscription is relatively light in colour, the surrounding areas are covered by layers of different colonies of microorganisms (algae, moss and lichen).

On the inscription, there are visible remains of the water proofing treatment with a grey-beige in colour, with a relatively thick layer in some areas.

A cement barrier was built on top of the boulder to divert water from the engraved area (no date provided, but it is present on images dating from 1982). As in the case of Shek Pik, a poor bond is clearly visible between the rock surface and the cement, and the barrier is likely to allow water seepage at its base.



Figure 15. Detail of the cement barrier in the upper part of the boulder, with a visible separation.

In spite of the limited visibility and access for a close inspection, the surface of the stone seems stable, and there was no apparent decay in the engravings or in their close vicinity. The engraved characters are easily readable, and seem well preserved.

There is however new bio-growth on the inscription area, creating green vertical lines.

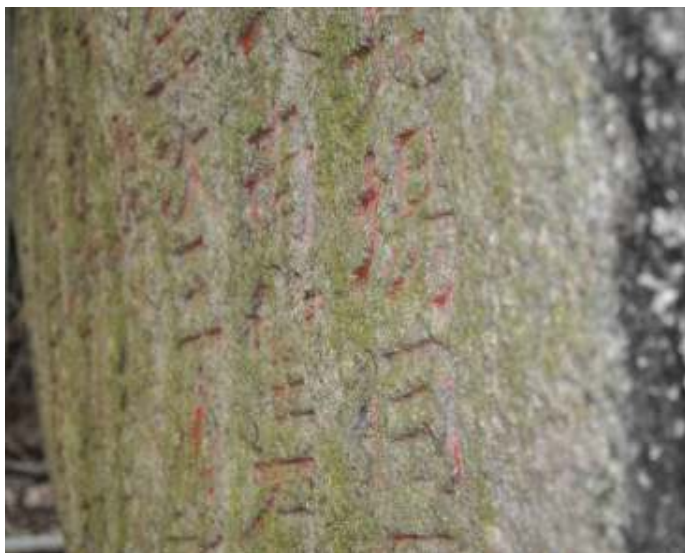


Figure 16. Detail of the growth of microorganism in vertical lines, according to water run-off patterns on the rock surface.



Figure 17. Detail of organic matter accumulation in the vicinity of the inscription area.

2. Recommendations and proposals

a. Monitoring

The condition of the rock surface seems stable, although there are areas of potential with may be at future risk of spalling. These are clearly visible on Figure 17. A close monitoring of the surface would be desirable to identify any evolution of the surface and, if required, proceed to a conservation treatment to stabilize it.

There is a very good image dating from 1977, which should allow a good comparison with the current state of all the engravings. For monitoring purposes, access to the close view to the inscription without the Perspex panel will be essential.



Figure 18. Detail of the inscription dating from 1977 (courtesy Government of the Hong Kong Special Administrative Region)

b. Presentation and protection

The Perspex panel creates a physical barrier between visitors and the inscription, but it also impedes a clear visibility of it, both because of the reflections on the panel, and because of dirt accumulated on its surface.



Figure 19. Overall view of the site

At this site, one could think of other types of protection, including the so-called 'psychological barriers', i.e. some sort of restriction, placed at a low level, that would indicate the adequate distance for visitors to stand, without causing any physical disturbance to the inscription. This would allow removing the Perspex panel. Such an initiative could be coupled with positive signals to the visitors, for example by placing signage along the path, or on the landing next to the inscription, explaining the value and importance of the inscription for the history of Hong Kong, and encouraging its conservation. Examples in various parts of the world have shown the importance of offering a positive message (which encourages good behaviour), rather than using a negative or restrictive message (which can cause frustration in visitors).



Figures 20 and 21. Replacement of a cage-like fence for a low rail acting as psychological barrier in Brandberg (Namibia). The site can now be easily seen and photographed by visitors.

c. Cleaning and control of microorganisms

At the moment, there has been a concern for cleaning and eliminating microorganisms from in the area of the inscription. During the visit, a cleaning test was made, using alcohol as well as a mixture of alcohol and water (1:1), applied with a brush over a thick layer of moss and algae. The main idea is to see if the microorganisms are dried by this product, and can then be easily removed from the surface. If this treatment is effective, it could be used periodically to control biological growth on the surface.

I would however recommend extending the cleaning to the entire face of the boulder where the inscription is located. The fact of cleaning only the inscription gives the impression of a sort of “window” on the boulder, with a light area occupied by the inscription, and a dark area surrounding it, covered by microorganisms. The appreciation of the site would be enhanced with a less abrupt change in colours.

There may also be a conservation reason to extend the cleaning beyond the engraving: by having one area clean and exposed, and another one covered by relatively thick layers of microorganisms, there could be a preferential evaporation in the cleaner area, which could weaken the tuff in this area.

Cleaning of an area above the boulder would also ensure that less organic matter is deposited on the engravings, which would therefore limit biological growth.

d. Graffiti

There is a graffiti painted on the side of the boulder containing the engraving. It is always good policy to remove graffiti as soon as possible when they are detected in the vicinity of rock art sites, as there is always a risk for other persons to copy the idea. Although there are not many graffiti visible along the path, I would still recommend cleaning this one in the near future.

When doing the cleaning, it will be important to also clean a slightly larger area, in order to avoid having a ‘clean’ window that would attract attention.

For the cleaning of the graffiti, as it is standard in all cleaning processes, it will be important to test various materials and techniques, starting from the less aggressive ones.



Figure 22. Graffiti on the side of the boulder

3. Risks

There are no apparent immediate and large risks for the site. However attention should be paid to monitor the surface stability of the rock boulder, and to verify the growth of microorganisms, which alter the readability of the site.

4. Conservation plan

a. Immediate actions

The most immediate action at the site should involve the removal of the lateral graffiti.

A second action would involve setting in motion the monitoring plan for the surface condition of the site, in particular to verify the small detached areas are as stable as they appear to be.

b. Immediate to mid-term actions

In a second time, a surface cleaning could take place, involving the entire facade of the boulder where the inscription is located, as well as the upper part. Although this is likely more for aesthetic reasons, there could also be conservation concerns by keeping the surrounding area covered with moss and algae (and therefore wetter), whereas the inscription is cleaner and may therefore offer an evaporation front for any surface migrating from the stone.

At this cleaning stage, the cement barrier could also be removed.

c. Mid to long-term actions

In a third moment, rethinking of the strategy to present the sites to the public could lead to the use of psychological barriers at some of the sites, including the inscription at Joss House Bay. This would involve removing the current Perspex panel, and placing low level barriers, which would indicate a respectable distance to see the inscription, but ensuring a good visibility for visitors. Such a strategy would need to be accompanied by signage panels on the paths leading to the sites, in which positive reinforcement on the importance of taking care of heritage, and the value of this specific inscription.

III. Rock engravings at Lung Ha Wan (26 May 2010)

1. Present situation

The engraving is located on the vertical face of a rocky area, in very close proximity with the sea. The site is facing east, from form where the wind was blowing during our visit.

A path and fence were built in 1990 to facilitate access to the site, with clear signage indicating the presence of the engravings. There is also signage at the site explaining the engravings, composed of geometric patterns. Some may resemble stylized animals or birds. There has always been a debate whether it is an engraving or shapes created by natural erosion of the rock surface. Notwithstanding this debate, it is a protected monument and the same protection measures have taken place as in other sites.



Figure 23. View of the engravings at Lung Ha Wan



Figure 24. Signage at the site

According to the geological report, the rock is an “eutaxitic lapilli and coarse ash crystal bearing fine ash vitric tuff” (Ho and Ho, 2010: 59). This very porous tuff has visible layers of natural weathering in horizontal bands, but some other shapes suggesting possibility of man-made engraving.

An image of the site, dating from 1980, seems to show better evidence for the site being created through man-made engravings rather than natural erosion. The contrast in this black and white image shows a series of patterns which do not seem to be natural. But it is true that given the high level of weathering in this rock, deciding one way or the other is difficult.



Figure 25. View of the site dating from 1980 (courtesy Government of the Hong Kong Special Administrative Region)

The engraving has been protected behind a glass panel since 1984 (the panels have been changed over time, the latest dating from 1990). The glass is clean and visible, but there is still a problem of reflection which does not facilitate observing the engravings.

At the moment of the inspection, the condition of the rock surface seems stable. There is however record of treatments undertaken at the site in 2006, which included a consolidation treatment, which indicates that there was a problem with the cohesion of the rock. The treatments at that time included:

- Cleaning with a soft bristle brush for removing dust and loose vegetation.
- Application of a silicic acid ethyl ester based stone strengthener (Remmer 300) to consolidate the rock carving.
- Application of a siloxane based hydrophobic agent (Remmer SNL) to act as water-repelling layer to avoid air pollutants deposition and pest infestation. (Preliminary information)

The water repellent treatment remains are still visible on the rock surface: they form a greyish layer, now peeling off in various areas. There is an undergrowth of microorganisms (moss or green algae) under peeled areas.

The consolidation treatment was extremely effective, as there is no sign of stone disgregation at the moment. It would be however interesting to understand better the mechanisms of decay at the site, and to monitor the condition of the surface in the future. If the site was indeed man-made, it has been severely weathered over time.

The aspect of the surface, with some smooth and hard surfaces next to badly weathered ones could suggest a phenomenon that can be found in tuffs exposed to humidity, called case-hardening. The mechanism essentially implies a migration of silica towards the surface of rock, where water evaporates), forming a hard layer at the surface. This process, over time, weakens the inner part of the rock by progressively reducing the silica content. When the inner part becomes too weak, the outer silica crust falls.

During the visit, rock samples from the vicinity of the engravings were taken, in order to undertake further analyses by the Government of the Hong Kong Special Administrative Region, and testing of conservation treatments. These samples should provide a good insight into decay mechanisms.



Figure 26. Detail of the surface of the rock in the vicinity of the engravings

On left side of the engraved areas, the rock has a dark brown colour. The area has remains of microorganisms (most likely algae, with a few lichen). During the visit, a trial test was undertaken using alcohol applied with a brush, to evaluate the possibility of using it periodically in order to control biological growth on the surface.



Figure 27. General view of the engravings at Lung Ha Wan (courtesy Government of the Hong Kong Special Administrative Region)

2. Recommendations

a. Monitoring

A monitoring system should be established for the site, possibly using the two same techniques as in Shek Pik, i.e. with photographs and, if considered necessary, with the 3D laser scanner.

b. Visitor management

Given the difficulty to appreciate the engravings at this site, due to the extremely weathered aspect of the surface, it could be useful to find if an interpretation drawing of the engravings exists (from previous archaeological studies). If so, it would be useful to provide such a drawing on the signage at the site.

c. Maintenance

While the site is very clean, there are a few areas where improvements could be made. There are various areas with paint drops under the fences and railing at the site. Although the engraved panel is not damaged by this, it is important to remove those stains (and prevent new ones from happening in the future), to ensure the site looks perfectly looked after. This has proved to be an encouragement for respect to the site from visitors.



Figure 28. Detail of paint drippings from the structure for the panel

3. Risks

The main risk at the site seems the advanced weathering of the rock surface, which has led to confusion over the nature of the shapes found on the rock surface, on whether these were made naturally, or through a combination of man-made actions and natural factors.

4. Conservation plan

a. Immediate actions

The most immediate action should involve setting a monitoring plan in action, to verify the apparent stability of the rock surface.

The monitoring should encompass an area outside the engravings, but with a similar texture, and which has not been changed by conservation treatments. This would allow evaluating the usefulness of the conservation treatments.

b. Immediate to mid-term actions

As for Shek Pik, a mid to long term range actions should be the redesign of the signage plaques, possibly offering more visual information of the shapes of the engravings. Given the difficulty of seeing and understanding the shape of the designs, if interpretive drawings from past archaeological research exist, it may be useful to present these to the public.

IV. Rock engravings at Po Toi Island (27 May 2010)

1. Present situation

The site is composed of two engraved panels, located on the southern side of Po Toi Island, in the close vicinity of the sea. Both engravings were made on flat vertical surfaces, facing south. The engravings are made on smooth vertical surfaces of a fine-grained granite (porphyritic microgranite) (Ho and Ho, 2010: 102)

The first group as one reaches the site (group 1) depicts lines which have been interpreted as a stylized animal and fish patterns. The second group (group 2) is essentially composed of spirals.

A cement path with a metal handrail and stairs, built in 2002, allow access to the site, from a walking/trekking path. The island is often used for nature walks in Hong Kong. Along the path, there is signage indicating the presence of the engravings.



Figure 29. General view of the engraved areas in Po Toi Island

Group 1

The engraved panel is currently protected by glass panels and a metal structure. There are three front panels, one more on the left lateral side, and half a panel on the right lateral side. The upper panels are either broken or entirely missing, and they may have been broken when a strong typhoon hit Hong Kong in 2008. The lower right side only has metal bars and an access door, which closes with a chain and lock.



Figures 30 and 31. General view of the protective structure for group 1



Figure 32. Detail of the upper broken glass

The protective structure is not in contact with the rock surface. The small gap very likely allows rainwater to wash the engraved surface, and this would happen even if the upper glass panels were present. This gap seems positive to allow for salts to be washed and removed from the surface of the rock.

The engravings are quite faint, and may not always be easy to see, unless lighting conditions are correct.

The stone is composed of prophyritic microgranite (Ho and Ho, 2010: 102). The surface is quite smooth, essentially composed of the fine grained granite with some large grey inclusions. There are a series of vertical cracks along the panel, with one larger diagonal one as well.



Figure 33. Detail of the engravings in Group 1



Figure 34. Detail of infills

Evidence of some of these treatments is still visible at the site. There is also evidence of infills, which were placed on the edges of a large spalling area (the infills could have been done with a mortar mixed with a coarse sand) (see Figure 34). The infills were not done along all the edge, but rather only on the horizontal ones. Where the edge becomes vertical, no infills were detected.



There are plant roots (apparently dead) on some of the crack in the central part of the panel, as well as in the lower area, which should be monitored.

Figure 35. Detail of an apparently dry root inside a crack

Alveolar decay patterns are visible in various parts of the panel, but they seem to be stable at the moment. There is only one unstable fragment in lower right side, next to the metal structure (see Figure 36).



Figure 36. Alveolar decay



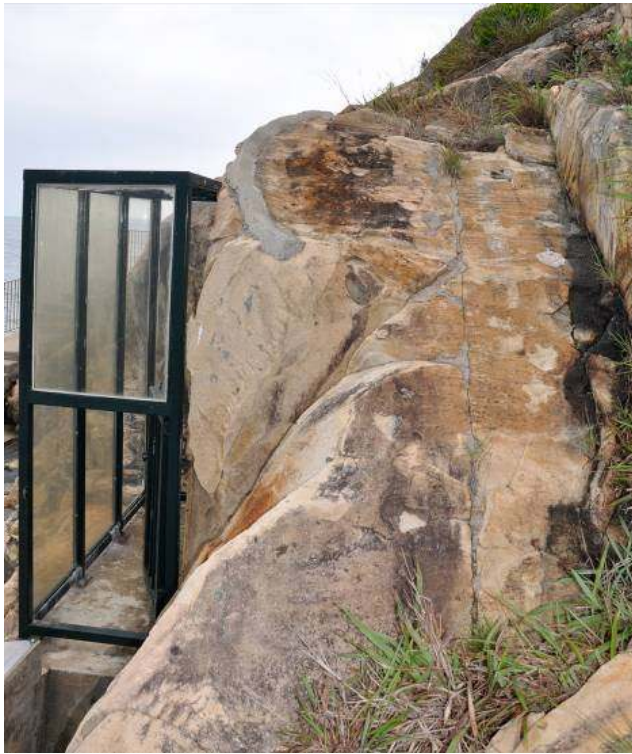
Figure 37. Unstable and partially detached fragment



There is a visible scratch in the central part of the panel, which may have been caused when the protective cages were damaged by a recent typhoon.

Figure 38. Presence of a scratch in the central part of the panel

In various areas, there are paint drops on the rock surface, which come from the paint in the metal structure of the fence (green and yellow paint drops). Preventive measures should be devised when maintenance of the structure is undertaken, in order to avoid either paint drops to fall on the surface, or any other potential damage while workers are present in the vicinity of the engravings.



On top of the engraved area, a cement barrier was applied in the past. The same situation as at other sites, this is not really useful, as there is a poor connection between the cement and the granite surface. Water could seep under the cement barrier, however in this case it may not be so because of the angle of the surface in that area, which would tend to take water away from the vertical surface. On this horizontal landing (where the cement barrier was placed, the area has a series of cracks, which were infilled in the past with a coarse grained mortar (likely cement-based). The infill is not preventing water infiltration along those cracks, as there is again a poor bonding between the mortar and the granite, and there are still visible gaps. Furthermore, the infills were only applied on the larger openings, but not along the entire cracks.

Figure 39. View of the cement barrier placed above group 1. Note also the grey coloured infills placed on some of the cracks.

Group 2

A few meters further away to the right, and roughly at the same level on the rock escarpment, a second group of engravings can be found. These are only protected by a cement platform on which small posts and iron chains were recently placed. A metal structure, similar to the one present on group 1 used to protect this area as well, but it was damaged by a typhoon in 2008. The posts and chains act as a psychological barrier, but they were placed too high, and make it difficult to photograph the engravings and see part of them: on the right side, some of the engravings are located behind one of the posts.

As in group 1, the engravings are quite faint, located on a fine grained granite.



Figure 40. General view of the posts and chains protecting group 2, seen from the side.



Figure 41. Detail of the engravings



Figure 42. Detail of the engravings

The central part of the panel has a broad spalling area, which likely led to the loss of a large part of the engravings.



Figure 43. General view of group 2



The surface of the granite is stable, but there are some areas which could tend to delamination, and should therefore be monitored.

Figure 44. Detail of areas that should be monitored, to detect any possible risk of delamination

In 2004, conservation treatments were undertaken (Preliminary information). These included:

- Cleaning with a soft bristle brush to remove dust and loose vegetation.
- Cleaning of the surface with a biodegradable and non-ionic surfactant (Decon@90), which was then thoroughly rinsed with water.

Further treatments were carried out in 2007, including:

- Cleaning with a soft bristle brush to remove dust and loose vegetation.
- Cleaning of the surface with a biodegradable and non-ionic surfactant (Decon@90), which was then thoroughly rinsed with water.
- Application of an aqueous solution of isothiazolinon (Remmer BFA) to prevent further vegetation growth;
- Application of a siloxane-based hydrophobic agent (Remmer SNL) to act as water-repelling layer to avoid air pollutants deposition and pest infestation.

A new treatment was undertaken in 2008, including:

- Application of a dilute acetic acid to dissolve cement stains.
- Cleaning with a soft bristle brush to remove dissolved cement staining.
- Cleaning of the surface with a biodegradable and non-ionic surfactant (Decon@90) which was then thoroughly rinsed with water.
- In view of the consultancy study ahead, the siloxane-based coating was not applied, although it might have been washed away by the cleaning.

A close observation of the surface showed that the waterproofing treatment no longer visible on all the surface, but it is still present inside the cracks.

There are vertical lines of black microorganisms. There however pose an aesthetic problem much more than a physical one.

Above the engraved areas, two cement barriers were built in the past, with the aim of deviating water. One (located closer to the engraved area) was recently removed due to the constant leaching and pollution of soluble salts.

The other one, higher up is not useful: as in other sites, there is a poor contact between the cement and the granite, with clearly visible cracks between them. Water seepage was confirmed by pouring water above the channel during our visit, and within a short time, water was easily passing under the barrier.



Figure 45. View of the upper cement barrier



Figure 46. Detail of the cement barrier



Figure 47. Detail of the poor contact between the cement and the granite



Figure 48. Detail of water seeping under the barrier

The area located between the two groups of engravings seems to have a different structure in the granite. There are visible marks and evidence of water seeping from cracks and joints of the rock.

In the past (no date provided), a series of large drill holes were made on that area of the rock escarpment, clearly in an attempt to channel water away from the engraved areas. A channel was built on the cement platform, and seeping water is then directed towards the sea.

In that same area, some of the larger cracks were partially sealed with a mortar, which seems to be composed of a cement-course sand mixture.



Figure 49. Detail of water seeping in the area between the two engraved groups



Figure 50. Detail of the drilled holes and the infills on the cracks

2. Recommendation

a. Conservation measures

There are no visible immediate threats to the site's stability. However, there are a few actions which would be desirable. The first one is to remove the cement barriers, as they are not providing any help in the conservation, and may on the other hand still be leaching soluble salts onto the surface.

As mentioned above, the barrier above group 1 plays no real role, as the inclination of the upper ledge would tend to move water to the right side. Once the barrier is removed, there would be need to monitor rain water behaviour, but it is very likely that no new barrier will be necessary.

For group 2, given the number of areas of water seepage above and around the engraved panel, it would be desirable to remove the cement barrier, and replace it with a new one, built with small granite stones and a lime-sand mortar. This new barrier could, as suggested for the site of Shek Pik, be "sealed" above with clay (e.g. bentonite). Its behaviour should be monitored, and periodic maintenance of the barrier would need to be devised.

An additional action that could be devised would be the sealing of the cracks in the immediate vicinity of both engraved areas. This could either be done with an ethyl silicate – sand mortar (which is more durable, but also more expensive – and taking into consideration that the behaviour of ethyl silicate may be affected by soluble salts), or with clay (which needs periodic maintenance).



Another desired action would be the removal of all remains of cement from ancient protective structures at the site, to make sure the site offer a well cared for image to visitors.

Figure 51. Detail of remains of cement from an older protective structure

b. Visitor management

Given the damage of the protective cages at the site following a typhoon in 2008, it may be desirable to think of smaller structures, which would pose less resistance to the strong winds. The temporary measure currently in place for group 2 seems like a feasible idea, but may need to be reinstated with lower barriers allowing full visibility of the site. Given that the island is essentially used as a hiking place, visitors tend to appreciate the environment and the same would be true for the engravings. There seems less need at this site for a full protective cage.

At the moment, the temporary protection is composed of posts with chains between them. These may still pose a threat to the site in case of another typhoon (the chain could break and scratch the surface of the engraving). The system could either be change to use smaller sections of chains, or to use an alternative to the chain, for example a thin metal wire, or even a rope.

These psychological barriers would allow a full visibility of the engraving, something visitors will very likely appreciate. It would be important however to enforce the idea of the importance of protecting the site, and enhancing its importance and values in the signage. Positive encouragements have proven to be much more effective at rock art sites, than negative or restrictive signage.

3. Risks

The major continuous risk at the site is composed by water and weathering, which has caused damages on the engravings, both through major losses of rock fragments (spalling), and possibly also through the slow erosion of the surface.

A more violent, but less frequent, risk is composed by typhoons, which have damaged the protective structures in the past.

4. Conservation plan

a. Immediate actions

The most immediate actions should involve the removal of the cement barriers (and other cement remains can also be removed at this point, even if they are not too urgent).

New barriers built with cement and a lime-based mortar (which is then sealed with clays to ensure water is diverted and to avoid leaching of the lime).

The monitoring of the condition of the surface should be planned and started at this stage.

b. Immediate to mid-term actions

In a second time, and once the pattern of water runoff and water seepage is understood, smaller cracks may be infilled, to ensure as little water as possible reaches the surface.

c. Mid to long-term actions

In the mid- to long-term, the plan for visitor management could be devised. If the suggestion for the use of psychological barriers is accepted, then the existing structures should be carefully removed, and the new small barriers placed. As mentioned for the other sites, this would have to be coupled with signage encouraging visitors to care for cultural heritage, and emphasising the importance of each particular site.

V. Rock engravings at Tung Lung (28 May 2010)

1. Present situation

This site can be accessed by land, through a long path, or by boat, which is how we went there. There is a viewing platform with a metal handrail and fence, which was erected in 2005. As in other sides, there is a metal plate providing information on the site.



Figure 52. View of the site of Tung Lung from the sea



Figures 53 and 54. Views of the platform to access the site



The site is the earliest recorded in-situ rock carving in Hong Kong. An entry Xinan Gazetteer from 1819, compiled by Wang Chong Xi, described the existence of a depiction of a dragon.

A large protective structure was erected in 1983 on a cement base. The metallic structure supports three large Perspex panels in the front part of the site, as well as on top of it. The sides of the structure were left open, only with bars, which allows a constant air flow.

Figure 55. Detail of the engraving



Figure 56. View of the protective structure



Figure 57. View of the side opening



Figure 58. View of the lateral side



Figure 59. View of the roof cover of the protective shelter

The engraving was made on a large block, in one of its vertical surfaces, facing northwest to the sea. The large rock fragment is loose and overhangs under the engraving. The engraving is relatively deep (3-4 mm) on an irregular and weathered surface. The rock is composed by an “euxtatic lapillic lithic and coarse ash crystal bearing fine ash vitric tuff” (Ho and Ho, 2010: 72).



Figure 60. Detail of the engraving and the rock support

The rock seems stable, but there is a large missing fragment (spalled) in the central part of the panel, corresponding to a fracture in the material (see Figure 55).

The lower part of the panel has a series of cracked blocks.

There is record of past treatments undertaken in 2006.

- Cleaned with soft bristle brush for removing dust and loose vegetation.
- The surface was cleaned with biodegradable and non-ionic surfactant (Decon@90) and then rinsed thoroughly with water."

There are visible remains of a greyish material on the engraved areas, on top of which microorganisms have grown. While discussing with the colleagues present during the visit, they mentioned that a cast was made in the past, and this greyish material are remains from the materials used on that occasion. Older photographs also show evidence of enhancement of the engravings with a light materials (possibly chalk) (see Figure 61).



Figure 61. Ancient image of Tung Lung, dating from 1977 (courtesy Government of the Hong Kong Special Administrative Region)

There are also microorganism colonies (moss and lichen) which seem to be dormant on the surface of the rock.

Sometime in the past, a cement base was built underneath the site, to support the overhanging block. This was an excellent measure to ensure the stability of the large block.



Figure 62. View of the block from the lateral side. Note the large overhang underneath it.



Figure 63. Detail of the cement pillars placed under the overhang

A cement barrier was also placed in the rock overhang, above the engraved areas. Although no close inspection was made of it, it is likely to expect that this barrier does not offer a real protection for the site, as poor bonding between the rock surface and the cement allows leaching. However, given that the channel does not visibly disturb the site, and no leaching of the cement is visible on the engraved surface, it may be left where it is.

2. Recommendations

a. Monitoring

A thorough monitoring system should be devised, to control both the condition of the surface of the rock where the engravings are located, as well as the cracks present at the base of the rock overhang, visible both on the front facade and on the left-hand side.

For the surface, the same techniques already proposed for previous sites could be devised. For the cracks on the lateral side, movement sensors could be applied, to verify any movement or widening of the crack.



Figure 64. Detail of a crack at the base of the rock, on the left hand side.

b. Conservation treatments



More direct conservation treatments could include cleaning to tests to see the feasibility of removing the material present on the engravings (which could be the remains of a material using during cases made to the engravings, or it could be chalk or gypsum remains, from an ancient enhancement of the shapes.

More importantly, the graffiti present on the right-hand side of the boulder should be promptly removed, to avoid other graffiti.

Figure 65. Detail of the graffiti at the site

c. Visitor management

The protective structure at the site does offer a relative good visibility of the engravings. The Perspex panels are clean, but there is always a problem of reflections on it, and both visibility and photography are somewhat limited.

In terms of overall appreciation, this is one of the sites which has been changed the most by the visitor facilities (including both the platform and the protective enclosure). This could be another place where psychological barriers may be considered. Anyone reaching this site by land, was not simply passing by, but must have clearly wished to visit it. A small and low physical barrier would indicate the limits to approaching the site, while at the same time permitting a full visibility of the site.



The door on the protective structure currently closes with a lock, but there is still a chain from a previous closing system. This loose chain should be removed as soon as possible, as it is long enough to scratch the rock surface, especially in case of high winds.

Figure 66. Chain to be removed as soon as possible

3. Risks

The site seems to be stable. The main risks to be considered are the long-term weathering of the rock, and possibly seismic movements that could destabilize the entire overhang.

4. Conservation plan

a. Immediate actions

The most immediate actions should include the monitoring plan for the site, both for the surface (as at other sites), and for the surveillance of the cracks at the base of the overhang.

Additional immediate actions should include the removal of the graffiti on one of the sides of the overhang, and the removal of the chain from the door at the gate.

b. Immediate to mid-term actions

Mid-term actions could include the cleaning tests to remove the material residues on the engravings, and if the tests are positive, to undertake the entire cleaning.

c. Mid to long-term actions

Finally, a longer term action could consider the removal of the protective cage, and its replacement by psychological barriers, as always, coupled with additional signage along the path leading to the engravings to emphasise the importance and value of preserving such heritage.

VI. Rock engravings at Kau Sai Chau (28 May 2010)

1. Present situation

The site of Kau Sai Chau is located at the north-western coast of Kau Sai Island. Given that accessibility by land is poor, we also arrived by sea. The engraving is located on a back wall of a rocky beach, facing south, in close vicinity to the sea.



Figure 67. View of the site of Kau Sai Chau from the sea

The site has a plaque describing the engravings, and is protected by a metal cage, with two Perspex panels as a roof. The metal cage was built on a cement base, which had been dissimulated with local rocks, but many of these have detached, leaving the cement exposed, as well as large gaps in the lower part of the cage. There is enough space for a person to go inside the cage.



Figure 68. Signage at the site of Kau Sai Chau



Figure 69 and 70. Views of the protective cage at the site. Note the large gap on the right image

The engraving is not very easily visible, and the lower part seems to have been more weathered. According to the descriptions, it represents a zoomorphic motif. There is a striking difference when comparing the visibility of the engraving nowadays with an image dating from 1977. Is it decay or just less visibility due to a more homogeneous surface colour?



Figures 71 and 72. View of the engraving nowadays (left) and view from a different angle in an ancient image dating from 1977 (courtesy Government of the Hong Kong Special Administrative Region)



The rock is composed by a “coarse ash crystal bearing fine ash vitric tuff” (Ho and Ho, 2010: 46). The surface is slightly inclined.

Although the rock seems stable at the moment, there are small vertical scales along some of the vertical and diagonal cracks, which should be monitored. And given the difference between the images shown above, a thorough monitoring of the entire panel would be desirable.

Figure 73. Detail of small scales on a vertical crack

There are various plants growing around the site, notably to the left side, at the ground level, and above the engraving, which need periodic maintenance. Evidence of that maintenance is already taking place is visible in Figure 74, which shows an abundant vegetation growth around the site.

Figure 74. View of the site with overgrown vegetation (courtesy Government of the Hong Kong Special Administrative Region)



2. Recommendations

a. Monitoring

This is the site which seems to have suffered most from weathering and decay of the engravings, and although the surface seems stable, a thorough monitoring system should be devised. This will allow a better control and will help indicate whether any active decay is still taking place.

b. Visitor management

This site has no facilities to visit it, and access by land is extremely difficult. Given this, and the fact that the engravings are not easy to see and appreciate, it may be better not to encourage visits to this site (which are not frequent in any case).

At the moment, the site is clearly visible thanks to the protective cage. It may be better to remove this structure, and not advertise its location, to avoid frustration from potential visitors.

If the protective shelter is removed, special care will need to be placed to avoid any damage of falling rocks over the engravings. Special measures to protect the engravings should be considered, (for example using a soft, cushioning fabric, and placing a strong plywood sheet to protect the surface), prior to any works.

If the site is not to be advertised, the sign at the site should also be removed.

c. Maintenance

Even if the site is closed to the public, periodic maintenance to remove garbage and to control plant growth around the site will need to be maintained.

3. Risks

Although the site seems apparently stable, the main risk is the long-term weathering of the rock surface.

4. Conservation plan

a. Immediate actions

The most immediate action should include the setting of a monitoring system for the site (similar to the one at other sites).

b. Immediate to mid-term actions

In the mid-term, a decision should be reached on whether the site continues as it is, or if it closed to the public, as recommended. In that case, the actions should include the removal of the cage and of the signage.

c. Mid to long-term actions

The site will continue to have periodic maintenance, to make sure plants do not grow too close to the engravings, and to make sure the site is kept clean.

VII. Rock engravings at Big Wave Bay (29 May 2010)

1. Present situation

The site of Big Wave Bay is located on a ledge, close to the sea, within a small bay that is a favourite weekend destination in Hong Kong.



Figure 75. General view of the site, with the protective shelter



Figure 76. View of the panel, inside the protective cage



A cement path with a hand railing has been built to access the site, with clear indications to show its location. The path bifurcates at a point, and is often used by hikers.

The site is clearly visible from the beach.

Figure 77. View of the beach from the site

There are two plaques at the site, providing information on the site, as well as the location of the other engravings in Honk Kong.



Figures 78 and 79. Views of the two signage plaques at the site

The pattern of the engravings includes geometric and zoomorphic designs, which are very clearly visible.



Figure 80. General view of the engraved panel

The rock is composed by a “coarse ash bearing fine ash vitric tuff” (Ho and Ho, 2010: 9).

The site has been protected with wooden shelter (with three Perspex panels inserted to provide light), and supported by a metal structure. This is the only protective shelter with no door to access the engravings easily.



Figure 81. View of the cage and part of the cover

A cement barrier was built in the slope above the engraved area to deviate water, An additional cement barrier was built on a ledge above the engravings. There are numerous areas of water seepage in the immediate vicinity. The barrier around the site has accumulated soil and grass, and will need to be cleaned.



Figures 82 and 83. Details of the cement barrier above the engravings, and the vegetation growth on the channels removing water around the site.

The area in front of the cement barrier above the engraved area has a whitish veil on the surface, which may be composed of soluble salts leaching from the cement. Samples of this veil should be analyzed, and if leaching products from cement are verified to be present, the cement barrier should be immediately removed.



There are also various areas with cement patches from previous protective structures and signage, and these should also be removed as quickly as possible. On one hand, because of the bad impression they cause on the site, and on the other hand, because they may also be slowly leaching soluble salts which are damaging to the tuff.

Figure 84. Detail of cement remains at the site, which should be removed.

There are records of past treatments undertaken at the site in 2008 (Preliminary information). These included the following actions:

- Cleaning with soft bristle brush to remove dust and loose vegetation.
- Surface cleaning with a biodegradable and non-ionic surfactant (Decon@90) which was then thoroughly rinsed with water.



The overall aspect of the surface seems stable, even if there are various areas of water seepage, keeping the rock surface wet along some of the vertical and horizontal cracks.

There are cement remains at the base of the engravings, and tests should be undertaken to determine the feasibility of their possible removal.

Figure 85. Detail of the lower area of the engravings, with water seepage along the cracks, and cement in the lower area



There is also a zone of water seepage on the right-hand side of the engraving. Small plants are growing in this area, which should be removed periodically, to avoid the development of larger plants with roots which could be damaging for the site. There are also some roots on the cracks (possibly from plants which were removed in the past), and these should also be monitored (see Figure 86).

Figure 86. Detail of the right side of the site, with water seeping along a series of cracks

There are some areas with green microorganisms, especially in the upper area of the engravings (on the horizontal ledge), and relatively little on the engraved surface, where they do not seem to pose any major threat.



Figures 87 and 88. Detail of microorganisms of the surface of the engravings (left) and of roots on some of the cracks (right)

2. Recommendations and proposals

a. Maintenance and monitoring

Regular maintenance at this site is extremely important, given the larger human presence in the vicinity of the site. The site should have a well-kept aspect at all times, to ensure respect from visitors.

Maintenance should also include the periodic cleaning of the water channels around the site, particularly prior and during rainy seasons.

Figure 89. View of the path between the beach and picnic area, and the site of Big Wave Bay



A specific repair should also be undertaken as soon as possible, to replace a missing stone on corner of the platform (the could produce a weakness of the structure in case of typhoon).

Cement and any other evidence from previous protective structures or signage around the site should also be removed, to keep the site as clean as possible.

Figure 90. Detail of the corner of the viewing platform, with a missing stone.

b. Conservation treatments

The cement barrier located on top of the engravings should be removed.

3. Risks

The site is stable at the moment.

The main potential risks at this site could be derived from a stronger human presence.

The second risk would be water and weathering and decay associated with water.

4. Conservation plan

a. Immediate actions

The most immediate actions should include the removal of the cement barrier on top of the engravings, and enforcing a periodic maintenance and cleaning of the water channels.

Another important action is the repair of the missing stone in one of the corners of the viewing platform, to prevent possible further damages.

b. Immediate to mid-term actions

In the mid-term, a thorough removal of all cement and elements from previous structures and signage should be undertaken.

c. Mid to long-term actions

In the long-term, the overall maintenance strategy and plan for the site should be the main focus.

VIII. Rock engravings at Wong Chuk Hang (29 May 2010)

1. Present situation

The engravings at Wong Chuk Hang are located on the side wall of a stream course on Hong Kong Island. This is the only known rock art site not to be located in the close vicinity of the sea side.



Figure 91. General view of the site of Wong Chuk Wan, with the engravings located on the vertical wall on the left hand side of the image



Figure 92. Signage plate at the site

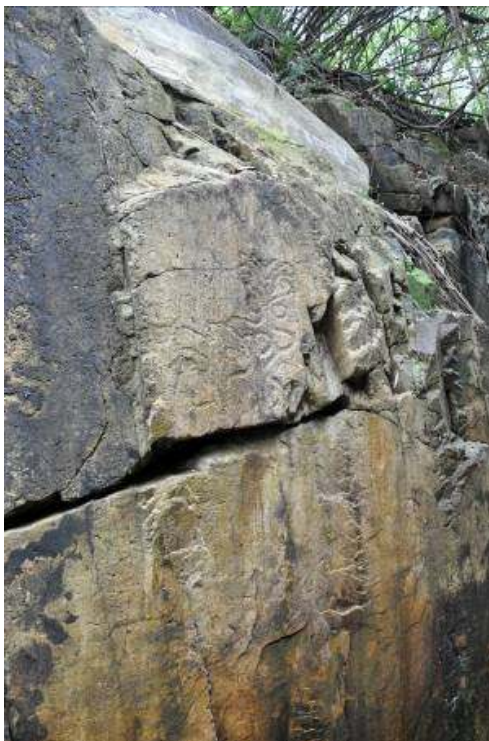
A cement walkway and observation platform was built in 1987 to access the site.

As for other sites, a signage plaque offers indications on the discovery and protection of the site, and a brief description of the engravings.

Three main groups of carved patterns can be recognised. They consist of meandering and spiral designs suggesting stylised animal eyes.



Figure 93. General view of the engraved areas



Figures 94 and 95. Details of the engravings

The rock is composed of an “eutaxitic lapilli lithic and coarse ash crystal bearing fine ash vitric tuff” (Ho and Ho, 2010: 21).

The rock surface seems stable, and the engravings are clearly visible and apparently well preserved. This higher stability may be due in part to the much more stable conditions of the site, with constant humidity and shade, provided by dense foliage of the trees.

A cement barrier and mesh were placed above the engravings (no date provided) to avoid diminish water runoff on the engraved surface and also to avoid soil and debris getting onto the surface. Although the solution is not very aesthetically appealing, it does seem to be effective.

There is also a capping (possibly cement, but no close observation was done) on both sides of the upper parts of the stream. This capping may have been placed to stabilise the soil in these areas, where settlements used to exist in the past.



Figure 96. View of the cement barrier and mesh place above the engravings, and of the capping covering the upper parts of the stream walls.

The site is located in the close vicinity of school.

There are records of past conservation treatments, undertaken in 2006 (Preliminary information). The treatments included:

- Removal of the green moss on the rock carving using a soft bristle brush with water.
- Surface cleaning with biodegradable and non-ionic surfactant (Decon@90) which was then thoroughly rinsed with water.
- Application of an aqueous solution of isothiazolinon (Remmer BFA) to prevent

- further vegetation growth.
- Application of a siloxane-based hydrophobic agent (Remmer SNL) to act as water-repelling layer to avoid air pollutants deposition and pest infestation.

2. Recommendations and proposals

The site is in stable conditions, and looks well kept.

a. Periodic maintenance

Periodic maintenance should take place (as it already does), to make sure the site is clean and looked after.

b. Regular monitoring and inspection visits

There should be periodic visits to the site to monitor the condition of the surface (probably photographs would be enough), and to evaluate the need for cleaning if biological growth obscures the engravings.

c. Visitor management

The viewing platform is excellent to allow visitors a full appreciation of the site, from a safe distance. If signage is changed in other sites, one could also think of offering visitors a visual interpretation of the shapes of the figures, but given the good clarity of most of the engravings, this is not urgent.

3. Risks

The site is stable, and seems to have few risks. The most visible one would be the aesthetic appreciation of the site, in case of biological growth.

4. Conservation plan

a. Immediate to mid-term actions

Verify the regular maintenance plan for the site, to ensure the site is always clean and well kept, especially after the raining season when the stream may carry debris.

c. Mid to long-term actions

If new signage is devised for the other sites, with more visual information on the shapes represented, this may be useful for visitors at this site as well.

IX. Rock engravings at Cheung Chau (30 May 2010)

1. Present situation



The site is located at the south-eastern end of the island of Cheung Chau.

The engravings are located on a rock outcrop, immediately below the Warwick Hotel, facing northeast, at close vicinity with the seaside.



Figures 97 and 98. General overview of the site at the foot of the Warwick hotel, and of the viewing platform and the protective enclosure.

The site's property is divided in two, with one half belonging to the Warwick Hotel, and the other half to a local private owner, whose family no longer lives in the island. This complicates immensely any action at the site, which needs approval of both owners, or in their defect the Chief Executive of Hong Kong needs to authorize the planned actions.



Figure 99. Signage at the site

The engravings, located on a vertical surface, consist of two groups of similar design with several carved lines surrounding small depressions. They are clearly visible, and seem well preserved.

The rock is composed of “inequigranular to porphyritic microgranite” (Ho and Ho, 2010: 89).



Figure 100. Engravings from Cheung Chau

A pathway and stairs were built in 1983 to access the site, with a viewing platform. The site was protected by a large enclosure in 1986, composed of a metal structure with four large glass panels on the front, and Perspex panels on the cover. The sides are protected by means of metal bars, with an access door on the left hand side. There is an opening all around the shelter in the upper part, allowing constant air circulation.

The overall condition of the rock is stable, and the engravings seem to be quite well preserved. There is however one area of active damage of the rock, in the upper central part, on a fragment that does not have engravings.

The upper area of the site seems to be receiving important quantities of water (there is evidence of water seepage in various points in the near vicinity of the site). In this area, a cement and stone barrier was built to prevent water from accessing the engravings. This barrier is filled with soil and plants, and is extremely damp, and seems to be allowing some water to access the damaged stone. Although samples and analyses should be undertaken, it is very likely that this damage may be associated with soluble cements coming from the stone, and with rapid cycles of wetting and drying of this area.



Figure 101. Detail of the actively decaying area, above the engravings. Note the evident presence of humidity on both sides, and the presence of a barrier built with cement on top of it.



Figure 102. Detail of the area where water should be channelled away from the engravings, filled with soil and leaves, and visibly very damp



A close inspection of the roof of the shelter also gave evidence of some water going into the site along the large joints. The evidence is provided both by small debris visible on the inner part of the metal structure, and by very clear stripes of microorganisms growth exactly under each roof joint.

Figures 103 and 104. Detail of water seeping from the roof structure (left) and evidence of microorganisms growth under the roof railings



There are small remains of green paint on the stone surface, in the vicinity of the engravings, but it does not seem to be posing a problem, and will probably fall alone with time.



Figure 105. Detail of an area with remains of green paint (especially on the left-hand side)



There are some cement remains in the close vicinity of the engravings, which should be removed as soon as possible. This should be a relatively easy task, as the cement is already partially detached from the rock surface.

Figure 106. View of cement at the base of the engravings. A large block is already detached, and other areas sound loose when gently tapping over them.

2. Recommendations and proposals

a. Monitoring

A periodic monitoring of the surface of the stone should be planned, in a similar manner to what was proposed for Shek Pik. In this case, special focus should be placed on the lower left hand side, where some risk of spalling was detected.



Figure 107. Detail of area to be monitored, on the lower left-hand side of the engraved panel

b. Analyses

Samples from the damaged rock in the upper part should be collected, to identify the possible causes of decay.

c. Conservation treatments

The conservation treatments should initially concentrate in removing the cement present in close vicinity of the engravings.

There should also be works around the barrier to prevent water from accessing the site, and improving the waterproofing. A similar solution to the one proposed for Shek Pik could also be devised at Cheung Chau, i.e. removing the existing stone barrier that uses a cement-based mortar, and replacing it with a lime-based mortar and a layer of clay (bentonite).

The third action should focus on the roof of the shelter to make sure no more leaks occur. This could either be by sealing the existing joints (for example using a translucent silicone paste) or entirely replacing the Perspex panels. This will require periodic maintenance, to ensure the joints are always tightly sealed, and special inspections prior to, or at the beginning of the raining season.

Once the joints are sealed, a cleaning of the microorganisms on the surface of the rock should be undertaken (using a solution of alcohol and water).

d. visitor management

There are a few missing stones on the pavement of the viewing platform, which should be removed as soon as possible, to avoid the loss of other stones, and to ensure the site looks well looked after.

3. Risks

The main risk for the site is water, essentially the once coming from the upper part of the hill.

4. Conservation plan

a. Immediate actions

The most important action will be to focus on the water drainage of the site, making sure water is deviated from the engravings area.

The second action should set in motion the monitoring of the condition of the surface, especially the area where potential spalling has been detected.

Samples should be taken to analyse the decay mechanisms in the upper part of the shelter, and to define its potential causes, and take actions depending on the findings.

Solving the problem of water leaking from the roof of the shelter should also be an immediate concern, before the main raining season evolves.

b. Immediate to mid-term actions

Another important action will be to remove the cement in close vicinity with the site, and to undertake a cleaning of the microorganisms which developed on the surface under each of the roof railings.

c. Mid to long-term actions

In the long-term, the periodic maintenance of the site will be important.

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Preliminary information: 8 rock carvings and 1 rock inscription in Hong Kong (no author, no date)

Appendix 1. CD containing images by Valérie Magar