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Preservation of the Greater Kyz Kala at Ancient Merv

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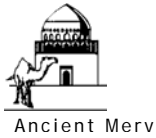
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Ancient Merv



Ancient Merv World Heritage Site, Turkmenistan

Preservation of the Greater Kyz Kala at Ancient Merv

22th January - 2nd February 2015

11th - 31th May 2015



Progress report 2015

David Gandreau and Chamsia Sadozai, CRAterre, France

Jointly organised by
The Ministry of Culture, Television and Radio broadcasting of the Government of Turkmenistan,
The State Historical and Cultural Reserve "Ancient Merv",
UCL-Institute of Archaeology and
CRAterre

Financed with the support of the
U.S. AMBASSADORS FUND FOR CULTURAL PRESERVATION: AFCP 2011 LARGE GRANTS PROGRAM

June 2015

TKM 019



UNESCO - World Heritage Centre
Ministry of Culture, Television and Radio broadcasting, Government of the Republic of Turkmenistan

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Organised in:

"Ancient Merv", World Heritage Site, Turkmenistan

Project financed with the support of:

**U.S. AMBASSADORS FUND FOR CULTURAL PRESERVATION
AFCP 2011 LARGE GRANTS PROGRAM**

Missions undertaken by:

David Gandreau, CRAterre
22th January - 2nd February 2015
11th - 23th May 2015

Chamsia Sadozaï, CRAterre
11th - 31th May 2015

Missions jointly conducted by:

**National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan (NAPSCCHMT),
The State Historical and Cultural Reserve "Ancient Merv",
UCL - Institute of Archaeology
Varsow University – Institute of Archaeology, department of Near East
CRAterre**

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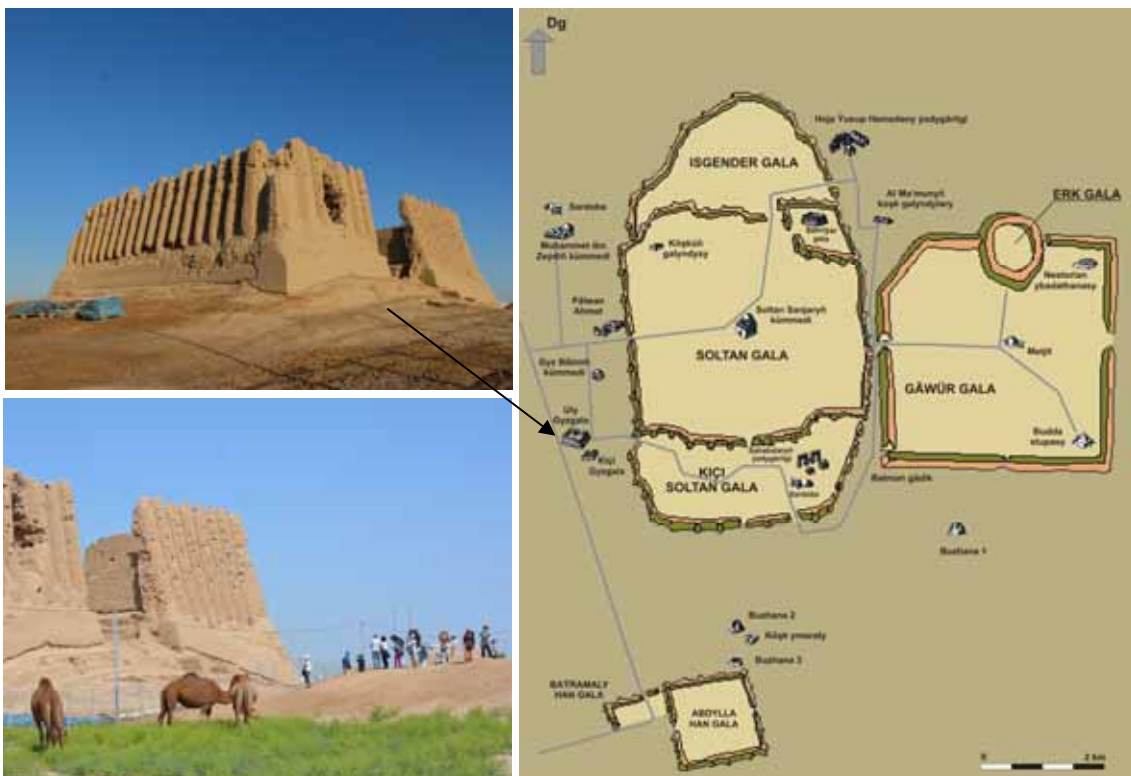
1- Introduction

1.1. Short description of the site

The Merv oasis occupies a vast area of 1200 hectares, on the flat landscape created by the alluvial delta fan of the Murghab River, in the centre east of actual Turkmenistan. A series of four adjacent walled cities of different periods testify of the importance of the oasis, founded in the 6th century BC, which became an imperial capital city during both the Abasid (8th century) and the Seljuk (11th -12th centuries) periods.

The Greater Kyz Kala, located outside the city walls, “is a monumental mudbrick *köshk* (a Khorasan word for castle or fortress), renowned for its massive scale and its tapering “corrugated” columnar walls rising from an earthen glacis. The massive walls of the Greater Kyz Kala still stand to a height of 15 meters. It measures 43 x 37 meters along the perimeter and the castle features 22 pentahedral half-columns on the long side and 18 on the short. The average thickness of the walls is more than (2 meters), with the walls narrowing as they rise;

(...) The Greater Kyz Kala is the largest and best preserved example of this unique building type to survive in the modern era, and one of the largest historic mudbrick buildings standing anywhere in the world. This monument is part of the State Historical and Cultural Park “Ancient Merv”, which has been designated a UNESCO World Heritage Site (inscribed in 1999)¹. (Ref. 2011 U.S. Ambassador’s Fund application).



(Left) Recent photos of the Greater Kyz Kala, CRAterre 2015.

(Right) Illustration from the Visitor’s guide (Djeparov 2011), showing the four adjacent walled cities and the Greater Kyz Kala located on the west of the cities.

¹ In 2000, Merv was inscribed on the World Monument Watch list of the world’s 100 most endangered sites. (<http://www.wmf.org/project/ancient-merv-archaeological-site>)

The values associated to the monument are described as follow in the 2011 U.S. Ambassador's Fund application:

“Archaeological & historical values: The structures are of outstanding universal value, being specifically mentioned in the inscription documentation for UNESCO World Heritage status. The Greater Kyz Kala is the best preserved earthen monument, outside the city walls. It is arguably the most significant mudbrick structure in the Central Asia, and internationally of significance given the scale comparable only to the Great Mosque at Djenne, Mali, and tower houses of Wadi Hadramawt in Yemen.

Architectural values: Appreciating the past architectural magnificence of Merv is difficult as, apart from kilometres of fortifications, very few walls stand above the ground. The Greater Kyz Kala testifies of the exceptional creativity and know-how of ancient craftsmen, in particular thanks to the remarkable level of conservation of its outer walls. No other mud brick structure of this scale, reflecting the rich architecture survives in the Merv oasis. In contrast to the scale the sophisticated interiors give detail and insight, through the staircases, windows and occasional surviving decorative elements.

Symbolic value: more than any other monument in Turkmenistan, with the possible exception of the Sanjar Mausoleum, the Greater Kyz Kala represents the cultural heritage of the Turkmen people. It has become an iconic monument, featuring on everything from banknotes to school books. Its conservation and preservation is a national and international issue.

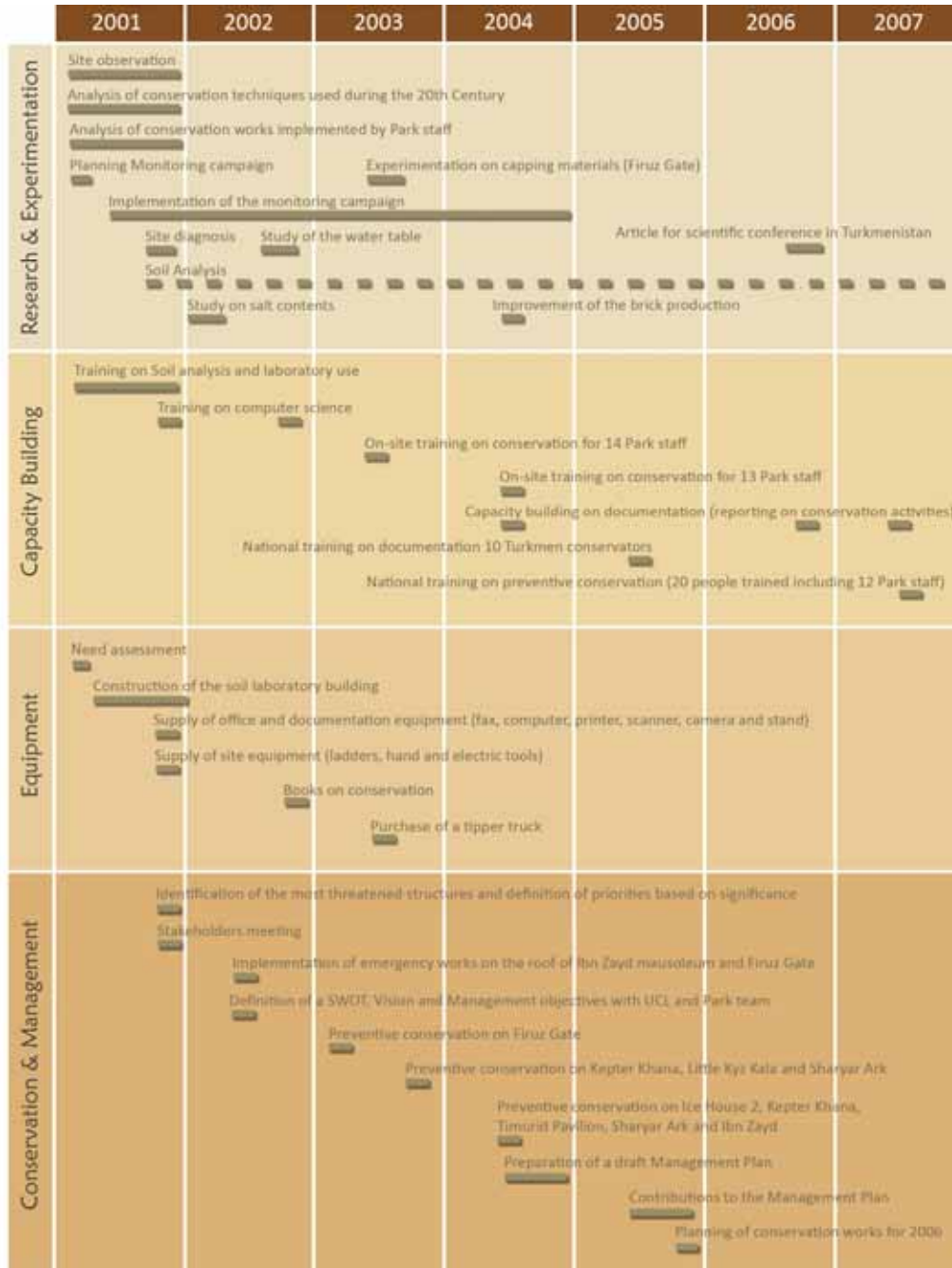
Interpretation value: these monuments are a key destination in any visitor's itinerary of Merv. They offer a unique opportunity to engage visitors in the history of Merv, and in particular they offer the visitor an opportunity to experience the above-ground splendour of Merv. This is important as despite the richness of the archaeological resources, it is hard for many visitors to imagine the scale of the cities in the past. They are also some of the few secular monuments still visible at Merv. As a result of their symbolic value to the Turkmen people (above), these monuments are the most important non-religious destination for Turkmen visitors, and offer rich interpretive possibilities.

Educational value: both Kyz Kala's were strong elements of the Ancient Merv teachers' handbook, a resource designed to promote local access and use of the Merv Park monuments. They have become a key element of local teaching strategies, and offer important examples of historic architecture, architectural design, conservation issues and climate change strategies.

Economic value: because of the international reputation of these monuments, and their very visible nature, they are a major factor in drawing visitors to Ancient Merv. At present, tourism is not a major factor in the Turkmen economy; but this facet will grow and it will undoubtedly become a major strand in the long term sustainability of the Turkmen economy. As such, these monuments are an integral part of developing Merv's distinctive destination; a significant part of its competitive advantage.”

1.2. CRAterre cooperation (since 2001)

Between 2001 and 2007², CRAterre-ENSAG was regularly invited by UNESCO to work in close cooperation with the national and international partners³ on conservation and management issues, with the view to better tackle the problems affecting earthen structures and strengthen capacities within the Turkmen team. The working methodology integrated research and experimentation, capacity building, supply of equipment and improvement of conservation/management practices, as described in the following diagram:



² After 2007, CRAterre involvement in Turkmenistan has concentrated on Kunye Urgench, World Heritage site inscribed in 2005.

³ National partners: The National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan (NAPSCCHMT) / The State Historical and Cultural Reserve 'Ancient Merv'. International partner: University College of London, Institute of Archaeology.

1.3. The “Preservation of the Greater Kyz Kala” project (since 2011)

The long term cooperation engaged between the partners since 24 years for UCL and 15 years for CRAterre was a great opportunity to share experiences between various international and Turkmen teams, and allowed the gradual fine tuning of the conservation techniques, resulting in a range of technical solutions based on a preventive approach.

Considering this successful past cooperation, CRAterre agreed in 2011 to collaborate in an ambitious new project on the Kyz Kala, initiated by UCL and the National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan (NAPSCCHMT).

The main objectives of this project is to address simultaneously two issues:

- Archaeology: the construction date of Kyz Kala is currently a matter of some speculation. They are thought to have been constructed somewhere between the 6th and 8th century CE, in the late Sassanian or early Islamic period, and to have continued in use until the Mongol sack of Merv in 1221 CE.
- Conservation: despite its remarkable state of conservation, the Kyz Kala suffers from continuous erosion, due to natural and human factors. This includes erosion as a result of ground water fluctuations, wind erosion, the effects of aeolian sands, alongside erosion as a result of animals, plants, insect and human activities.

The grant application for the “Preservation of the Greater Kyz Kala” project, has been submitted to the U.S. Ambassador’s Fund for Cultural Preservation by NAPSCCHMT, in partnership with UCL-Institute of Archaeology of University College London, and CRAterre, Centre international de la construction en terre.

In 2012, the U.S. Ambassador’s Fund for Cultural Preservation awarded Turkmenistan’s NAPSCCHMT a \$595,000 grant.

The first activities have been implemented in 2012, 2013 and 2014, mainly by the Turkmen partners. The effective cooperation of CRAterre on this project has started in 2015.

In January 2015, UCL and CRAterre were invited by the NAPSCCHMT to take decisions for the work to be implemented in 2015. This mission has allowed the partners to assess the work completed on the site and to update the plan and scope of work for 2015, based on the initial project document submitted in 2011. Two priority areas have been identified by the three partners during this mission (cf. Maya Meredova report – Appendix 3):

- a. Immediate preventive conservation work on the south facade of the monument, which is most vulnerable and eroded.
- b. Systematic approach for documentation to apply both to the work completed, as well as for future work undertaken on the site

In May 2015, the NAPSCCHMT has invited experts from UCL, CRAterre and Varsow University to implement in simultaneity archaeological and conservation activities on the Kyz Kala:

- UCL has been able to create a 3D model (Photoscan software) of the monument and its surroundings. The experts have also worked on the documentation and inventory of the collections and have given advices on how to document and preserve the informations coming from the excavations of the site.

- Archaeologists from Varsow University have started excavating on the north facade (exterior of the monument) with the staff from 'Ancient Merv' Reserve.
- CRAterre has mainly implemented conservation work on the south facade with the staff from 'Ancient Merv' Reserve.



Slide presenting the scope of work for the year 2015 (extracted from a PPT presented by David Gandreau (CRAterre) after the second mission in May at NAPSCCHMT in Ashgabat.

1.4. Specific Terms of references for CRAterre

The specific terms of references defined for CRAterre are the followings (cf. Maya Meredova report – Appendix 3):

- Identify the # of experts that will come, develop the two-visit mission budgets and submit to NAPSCCHMT to prepare the contracts (one for each visit);
- Develop a strategy for preventive conservation of the monument, specifically the south facade this year;
- Provide experts to help implement the preventive conservation work on the south facade;
- Develop a draft manual of the best approaches/methods for preventive conservation of the earthen structures for use at the Kyz Kala project and future earthen monuments;
- Assistance with building awareness about the work of the international team on Kyz Kala (specifically through inviting two Turkmen specialists from the Turkmen team to present at Terra World Congress for around 800 specialists in earthen architecture in July 2016);
- Both UCL and CRAterre will also work on some options for possible and adequate restoration to present for the review/discussion at the meeting of the Scientific council in the fall of 2015 that will be the final meeting and the model for the restoration will be decided/agreed upon that will be presented to the Turkmen government as the final decision of the Scientific Council.

1.5. Main results of the missions

CRAterre as identified two experts, David Gandreau, and Chamsia Sadozaï specialized in earthen architecture conservation and already used to work in Turkmenistan. The missions have been implemented by the experts as follow:

David Gandreau (Two missions):

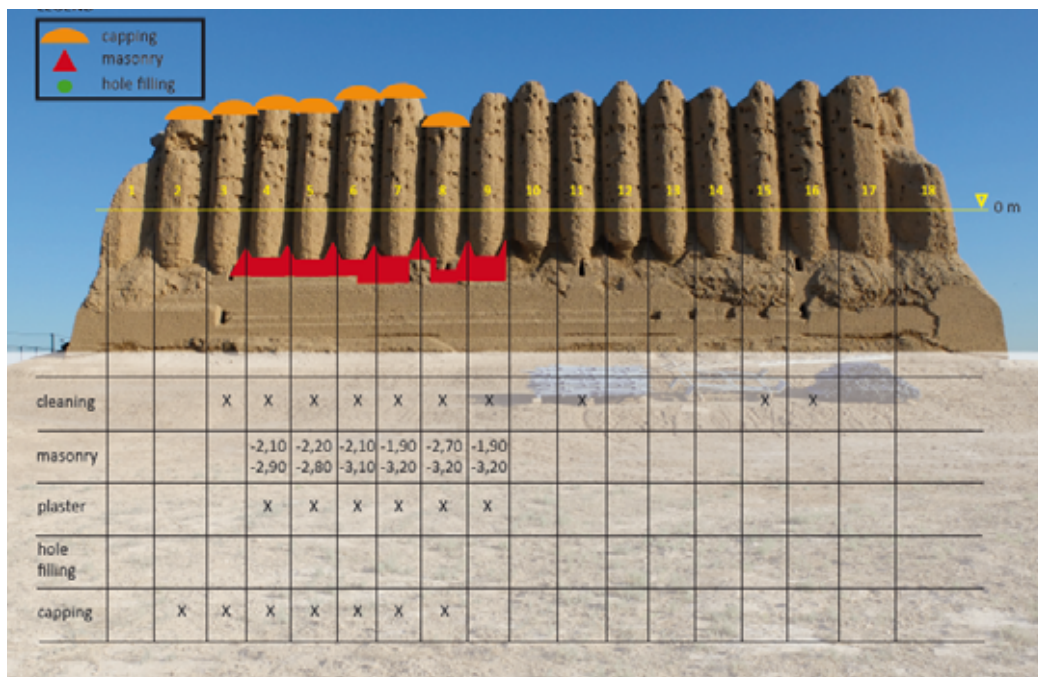
- 22th January - 2nd February 2015
- 11th - 23th May 2015

Chamsia Sadozaï (One mission):

- 11th - 31th May 2015

They have been able to:

- Collect and analyse all relevant informations on the site made available by the partners: 'Ancient Merv' Reserve, UCL and CRAterre;
- Discuss with the partners and in particular the site director, Mr. Redzhep Djeparov, a conservation strategy for the overall monument, including drainage, preventive conservation, restoration, site presentation (virtual / physical);
- Present and discuss the outcome of the two missions to the partners at the office of NAPSCCHMT (Asghabat) after each mission;
- Implement conservation work, mainly on the south facade;
- Give recommendation for further conservation/restoration that could be presented and discussed with the Scientific council in the fall of 2015;
- Propose an abstract with the partners, for a presentation of the project to the TERRA 2016 World Congress (Appendix 4);
- Compile and distribute the present report, which includes texts, illustrations and conservations forms useful for a conservation manual of the Kyz Kala.



Synthetic presentation of the conservation work implemented on the south facade of the Greater Kyz Kala in, May 2015



Selection of pictures (1/2). Work in progress on the Greater Kyz Kala in May 2015



Selection of pictures (2/2). Work in progress on the Great Kyz Kala in May 2015

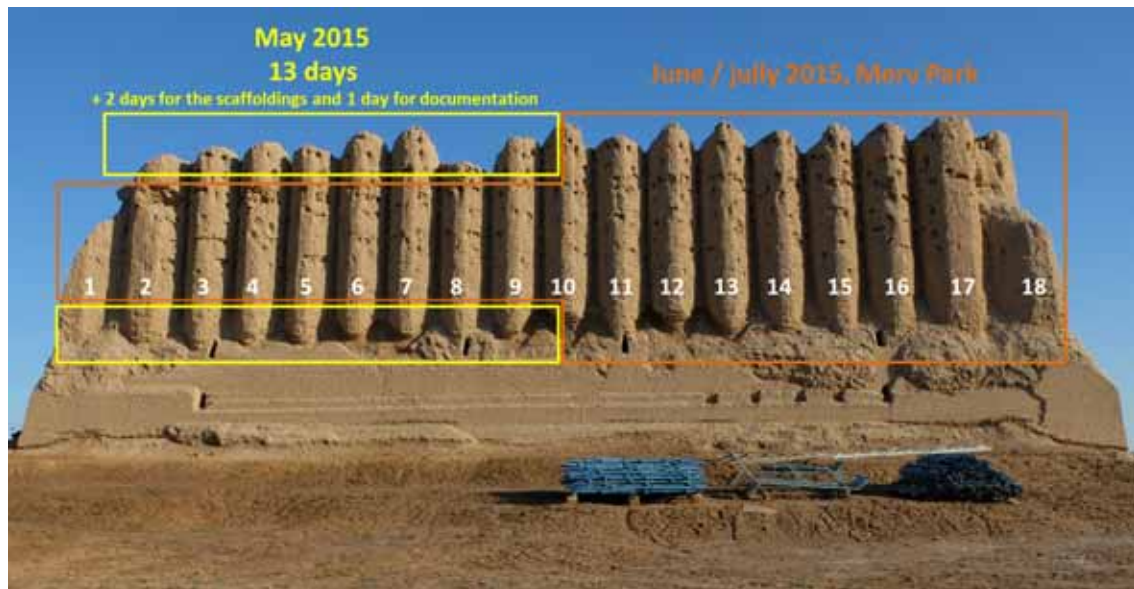
1.6. Recommendations and perspectives

Key principles:

- Respect the requirements of the UNESCO Operational Guidelines. (Ancient Merv is a World Heritage site since 1999);
- Keep working in multidisciplinary team, with shared roles and responsibilities;
- Develop innovative collaborative methods which balance the archaeological, conservation and development objectives in a sound management strategy;
- Ensure an appropriate balance between preventive conservation, restoration and virtual presentation, taking into consideration the high values of the site (local, national and international level) and the technical feasibility of each option;
- Document the excavation and conservation works according to the international standards;
- Ensure sustainability (economic, cultural and social local development).

South facade:

- Continue to restore with mud bricks the eroded parts of the wall, according to the method developed in May (see chapter 2.3 and 3);
- Apply this method to the holes created by the bird nests after the breeding season;
- Ensure preventive conservation by finishing the capping on the top of the wall and improving the drainage at the base;
- Document all step of the works;
- Assess the restoration/preventive conservation work in fall and adjust if necessary;
- Assess the technical and aesthetical (patina) results after two rainy seasons.

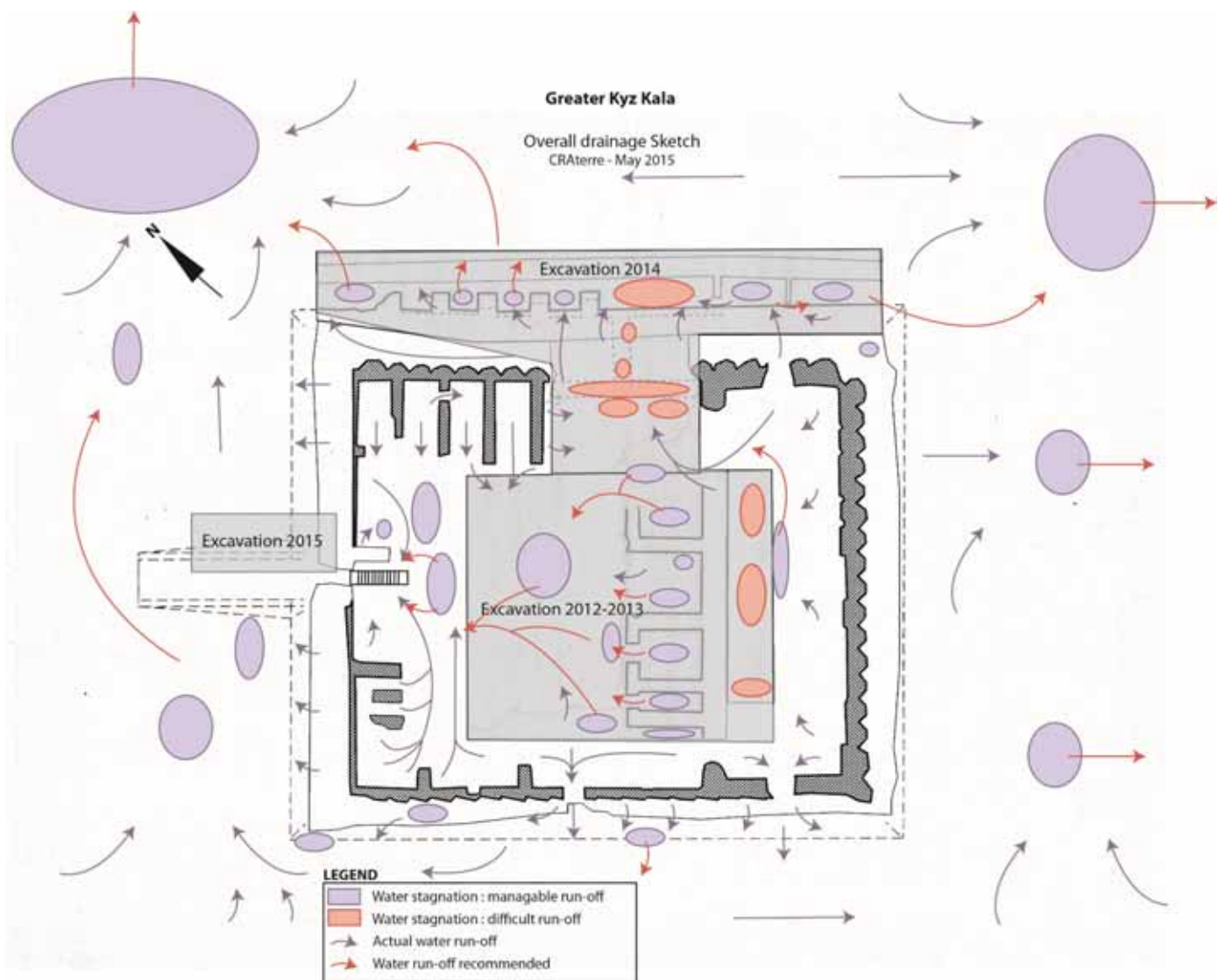


Recommended work plan for the south facade, from May to September 2015

Excavated areas:

- Improve the drainage of the building and its surroundings (see drainage plan)
- Set up a monitoring protocol to assess the speed of erosion of the remains;
- Gradually develop specific conservation approaches and techniques adapted to the different phases of excavation : before / during / after ;

- At this stage, leave a perimeter of minimum 4 meters along the wall (interior) without excavation to ensure structural stability of the corrugated walls. Focus on the central area;
- Ensure simultaneity of excavation and conservation;
- Be cautious and take justified decision step by step.



2- Condition assessment

2.1. Resources and capacities

2.1.1. Partners involved in 2015

One crucial aspect of this project is the number of institutions (6) and persons involved (25), which allow a wide range of professional profiles to work together and share capacities. In particular, the national and foreign experts in the fields of archaeology and conservation are developing innovative collaborative methods which balance the archaeological, conservation and development objectives and reveal the complementary approaches of the two disciplines.



Image extracted from a PPT presented after the second mission in May at NAPSCCHMT. This slide raises the importance of the partnership established and the range of capacities gathered.

The partners met during the two field missions or contacted by email include:

- The National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan (NAPSCCHMT):
 - Dr. Mukhammed A. Mamedov, architect, Head of the DPM,
 - Mr. Ruslan Muradov, architect,
- The State Historical and Cultural Park 'Ancient Merv' (created in 1999):
 - Mr. Redzhep Djeparov, architect, director,
 - Mr. Serdar Rejepow, specialised mason (earthen architecture)
 - Mr. Bayram Rejepow, specialised mason (earthen architecture)
 - Mr. Penji Jorayew, specialised mason (earthen architecture)
 - Mr. Guwanch Mämmedow, skilled worker (mud-bricks)
 - Mr. Myrat Shukurow, worker
 - Mr. Mergen Sylapow, worker
 - Mr. Gurbanmyrat Rejepow, worker
 - Mr. Kerwen Durdyew, worker
 - Mr. Guwanch Jumayew, worker
 - Mr. Babageldi Jepbarow, worker
 - Mr. Atajan Hudayberdiyew, worker

- Mr. Gurbanmyrat Babayew, worker
- The United States Embassy to Turkmenistan:
 - Mr. Brian Stimmler, Public Affairs Officer,
 - Mr. Michael Cavey, Cultural Affairs Officer,
 - Ms. Maya Meredova, Cultural Affairs Specialist,
- University College London (UCL)- Institute of archaeology (partner since 1991):
 - Pr. Tim Williams, archaeologist,
 - Dr. Paul Wordsworth, archaeologist,
 - Ms. Katherine Campbell, archaeologist,
 - Mr. Daniel Wheeler, archaeologist,
 - Dr. Leslee Michelsen, art historian and curator,
- Varsow University – Institute of Archaeology, department of Near East:
 - Pr. Barbara Kaim, archaeologist,
 - Dr. Maja Kornacka, archaeologist,

2.1.2. List of equipment and materials provided by ‘Ancient Merv’ Reserve:



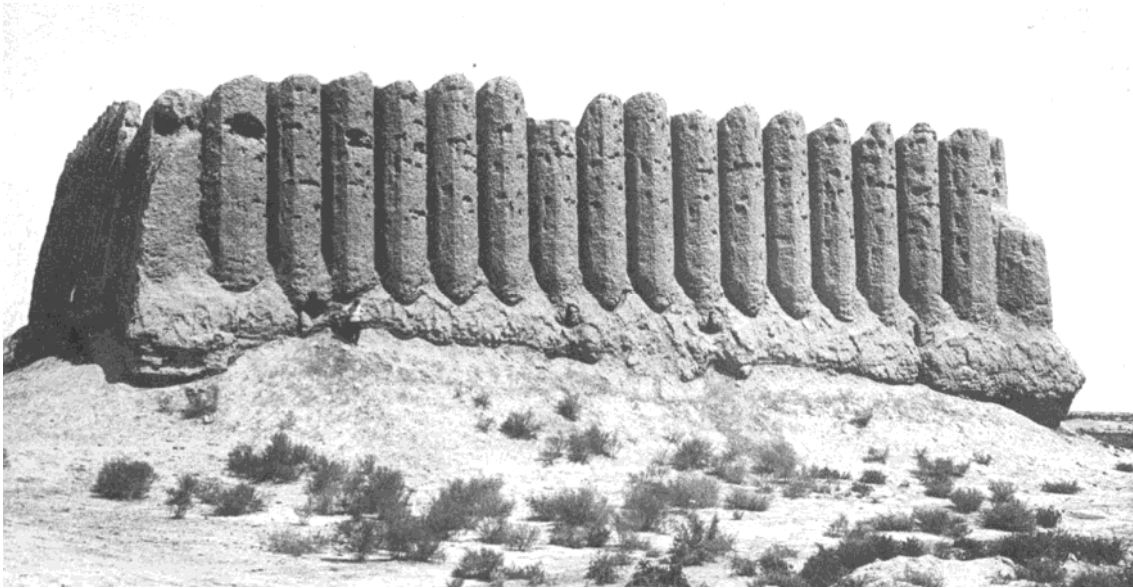
Equipment and materials

- Mud bricks produced under sheds nearby the offices. 15 000 bricks available, prepared between April and November 2014 by 2 to 3 workers. Size 34x34x8cm as the original mud bricks of the Greater Kyz Kala. Soil coming from various quarries and from the rubbles of excavations (sieved). Rotten straw coming from a wheat mil nearby.
- One truck of soil delivered close to the site to prepare the mortars and plasters. Quarry located at the North of Erk Kala. Bags of rotten straw to add to the mixture.
- Scaffoldings. 37 m long by 6 m high.
- All necessary tools for the 12 workers (shovel, trowel, wheelbarrow, helmets etc...)

A comfortable prefabricated office (portakabin) was installed in front of the south facade. The accommodation of all the experts was also organised by Redzhep Djeparov, ‘Ancient Merv’ reserve director, in the “archaeological base”, close to the offices for three weeks.

2.2. Analyses of the documentation provided by the Merv Park and UCL

2.2.1. Archive pictures of the greater Kyz Kala, south facade



1890. Ref. ZHUKOVSKY

- No conservation undertaken
- Corners are the most eroded (bases and tops)
- Many holes on the corrugations
- Massive debris deposit along the wall bases



1971. Ref: PILYAVSKY

- Same situation of the south facade (view from the S/E angle)



1999. Ref: J. ROCK

- Huge collapse of the East Facade (6 columns in the middle have collapsed since 1971)
- East facade is restored at the base (see S/E corner)



1999. Ref : J. ROCK

- View from the S/W angle.
- Only the S/E corner is restored
- Traces of the trench excavated by Khodjaniasov (1989 - report available in Russian, YuTAKE)



2001. Ref: CRAterre, Sébastien MORISET

- The bases of the West facade have been restored
- Beginning of CRAterre cooperation to the project



November 2012. Ref: Merv Park, Redjep DJEPAROV

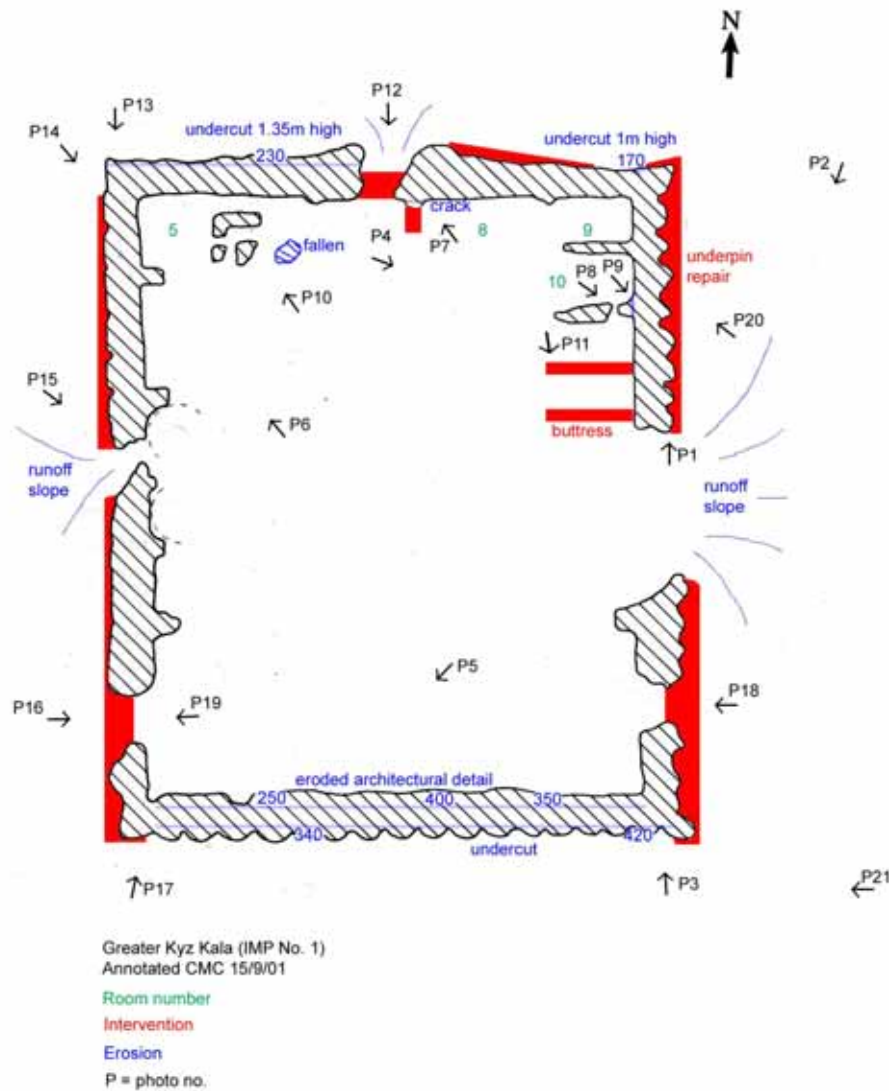
- Several conservation phases between 1999 and 2012
- A preventive conservation approach rather than restoration
- Preventive conservation of the wall bases masonries by “steps” to permit access without scaffolding
- Original parts are left visible in “first plan”.
- The only facade without render covering the conserved areas

2.2.2. UCL standing structure assessments (2001 / 2013)

Three documents were made available by UCL, documenting the condition assessment of the Kyz Kala:

Ancient Merv Project - Standing structure assessment 2001 (UCL, 2001)

This survey conducted in 2001, point out that the condition of the building was not alarmous but the decay process speed was increasing, mainly because of water pathologies (moisture). A brief history of the conservation actions is done with a plan and an analysis of their visual impact.



“Plan of monument indicating existing interventions, erosional problems and position of photographs”
(UCL, 2001, p.5)

The ‘Ancient Merv’ management 2010-2015 (Mamedov, M., Williams, T., 2010?)

The document includes a 2 pages chapter on assesement of condition for the whole site of the Ancient Merv (chapter 5.9) considering excavated trenches and standing monuments, as well as a summary of the approaches of conservation in the archaeological park (chapter 5.10).

Ancient Merv Project - The Great Kyz Kala standing structure record sheet, 2013
 (UCL, Alshisani, F., Katrakazis, T., 2013)

This document is describing in details all the pathologies of the monument. Two photos are systematically included for each wall (internal / external) with pathologies underlined on it. Recommendations are outlined on priority rank. Previous conservation works have been identified and assessed.



“Wall 4. South-east face (external)” (UCL, Alshisani, F., Katrakazis, T. 2013, p.6)



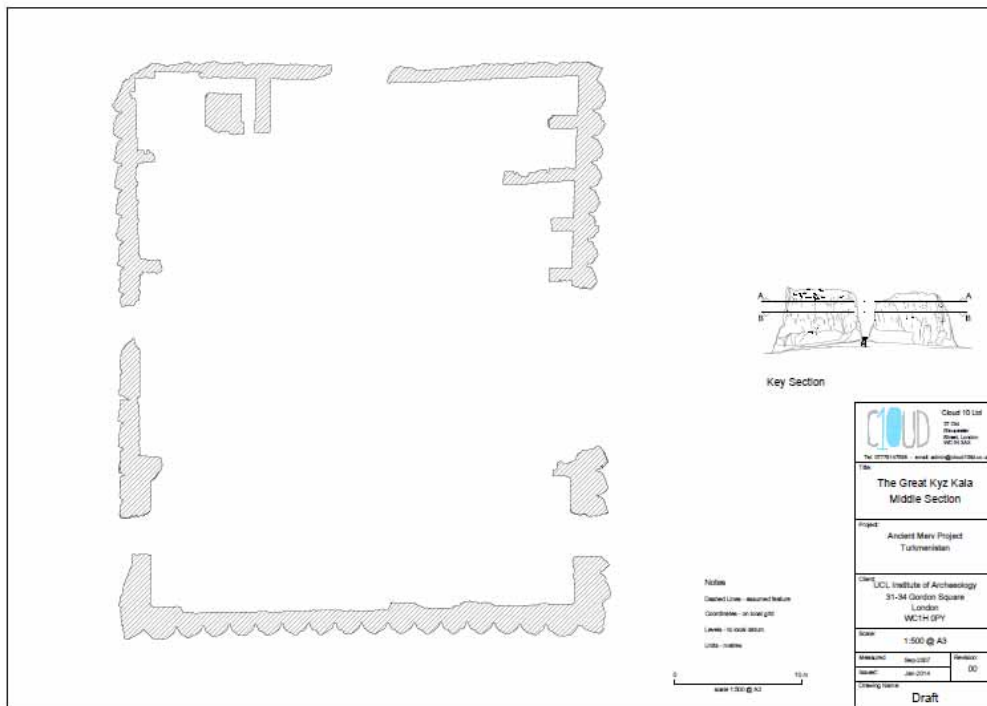
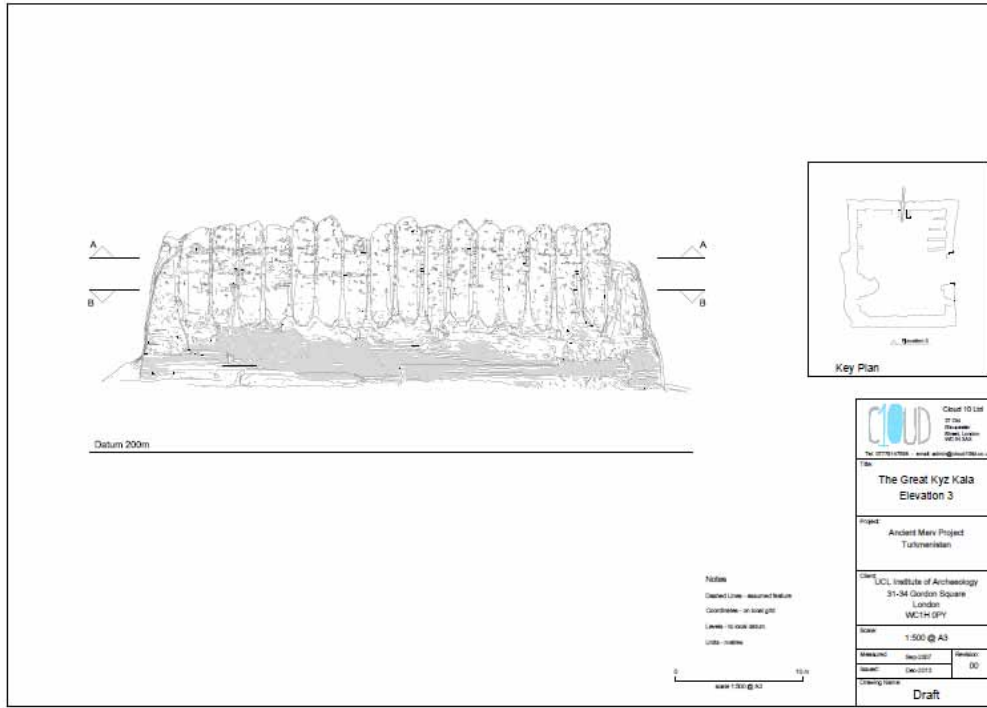
“Wall 4. North- west face (internal)” (UCL, Alshisani, F., Katrakazis, T. 2013, p.6)

Structural Defects		Surface Defects	
1. Cracks		9. Peeling	
2. Undercutting		10. Burrows	
3. Shearing		11. Droppings	
4. Sliding		12. Nests	
5. Structural Collapse (or detachment)		13. Salts	
6. Vegetation		Previous Interventions	
7. Damp		14. Wall Capping	
8. Rain gullies		15. Plugging	
		16. Mud-brick buttress	
		17. Fired brick buttress	

Appendix 2: Integrated legend for the documentation of standing structures
 (UCL, Alshisani, F., Katrakazis, T. 2013, p.8)

2.2.3. UCL Laser scan

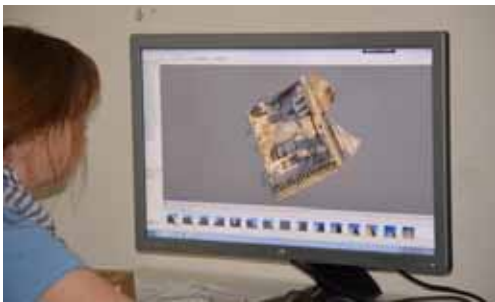
A laser scan dating from September 2007 is made available by UCL. 13 usefull plans, sections and elevations have been produced from the laser scan which give a complete documentation of the monument, with accurate data recorded in 2007.



Example of drawings (elevation / section) produced from the 2007 laser scan of the Greater Kyz Kala (UCL)

2.2.4. UCL 3D model

The UCL team is currently working on the modelisation of the buildings, to help record each step of excavation or conservation. During the May mission, 2 archaeologists, Katherine Campbell and Daniel Wheeler, have realised the 3D model from series of pictures. They have also trained the Turkmen staff to use the software (Agisoft PhotoScan©) installed on a computer provided by UCL to the 'Ancient Merv' Reserve.

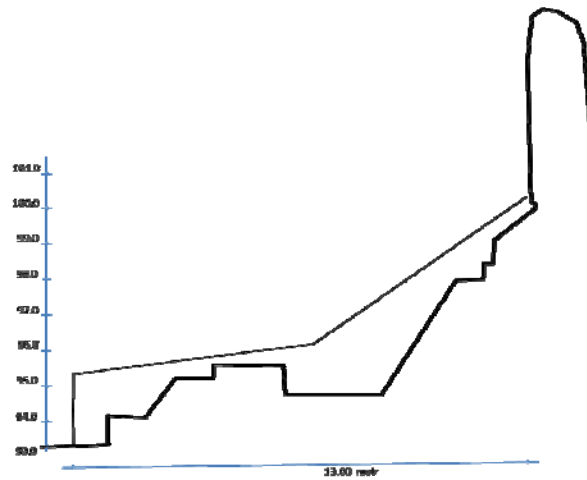


The advantages of this quite recent technic which is increasingly applicated to heritage projects have been discussed among the experts:

- It is rapid and rather cheap (as compared to the Laser scan);
- It can give a scaled model of the monuments (allow measurements);
- It can also easily be used for the surrendings of the monument;
- It is efficient for monitoring (volume which has eroded can be estimated)
- It is efficient to document the “before-after” conservation / excavation
- It allows hydrological modeling to show water runoff / stagnation of the monument
- It gives a base for potential elevation drawing to show hypothesis of restitutions
- It is a tool for conversation and decision taking.

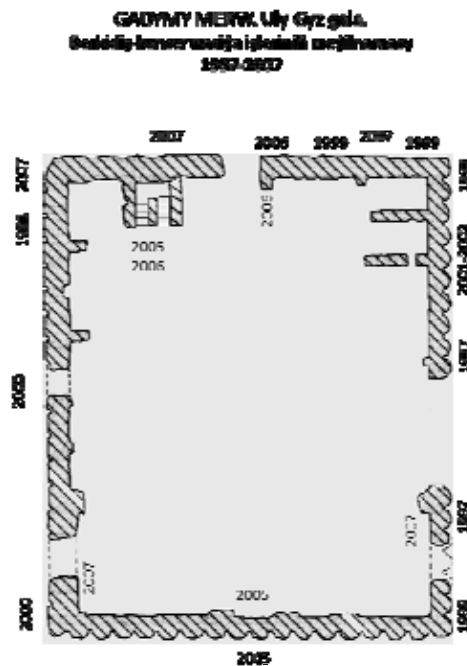
2.2.5. Merv Park, Excavation reports

The first excavation was conducted by Khodjaniyasov in 1989. A trench situated perpendicularly to the southern facade, near the corrugation #6. The archaeologist made a 4 pages report in Russian with one drawing of the trench section.

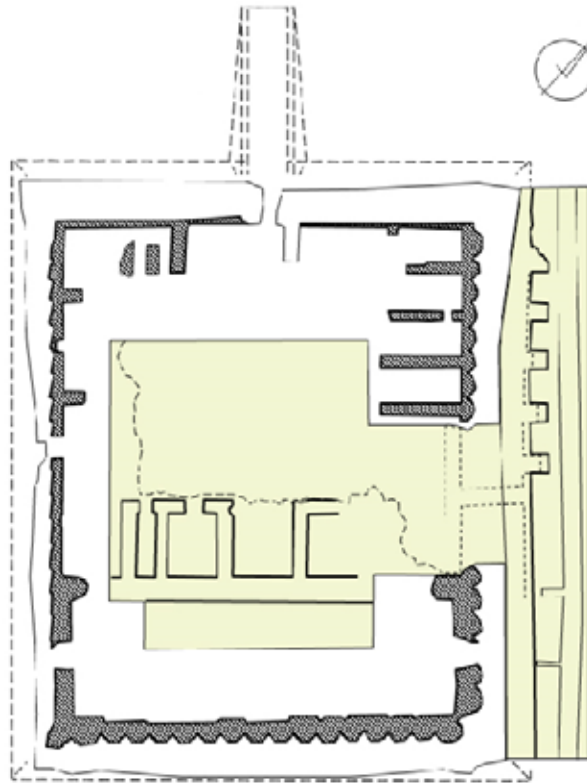


Section drawn from Khodjaniyasov report. Provided by Redzhep Djeparov

Since 1997 the director of the Park is doing yearly reports, about conservation and about the recent excavations (since 2012). These reports are recording the works undertaken with plans, pictures and comments in Turkmen. A local program of conservation was undertaken on the Greater Kyz Kala from 1997 to 2007. A plan is summarizing and locating these interventions. The lack of fundings stopped the works until this new project started in 2012.

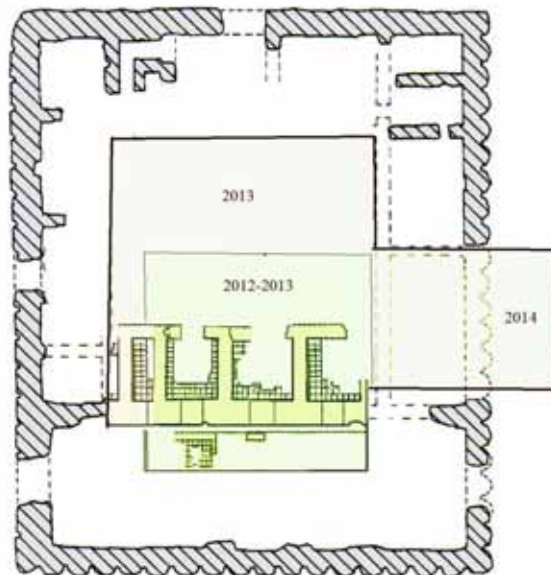


Location of the intervention zones by year, 1997-2007. Provided by Redzhep Djeparov.



10m

Gadymy Merw. Uly Gyz gala



10m

Plans provided by Redzhap Djeparov showing the location of excavations undertaken by the staff of 'Ancient Merv' Reserve since 2012

Excavation work in progress. Photographed by Redzhep Djeparov



October 2012



October 2012



October 2012



June 2013



June 2013



June 2013



June 2013



June 2013



June 2013



December 2013

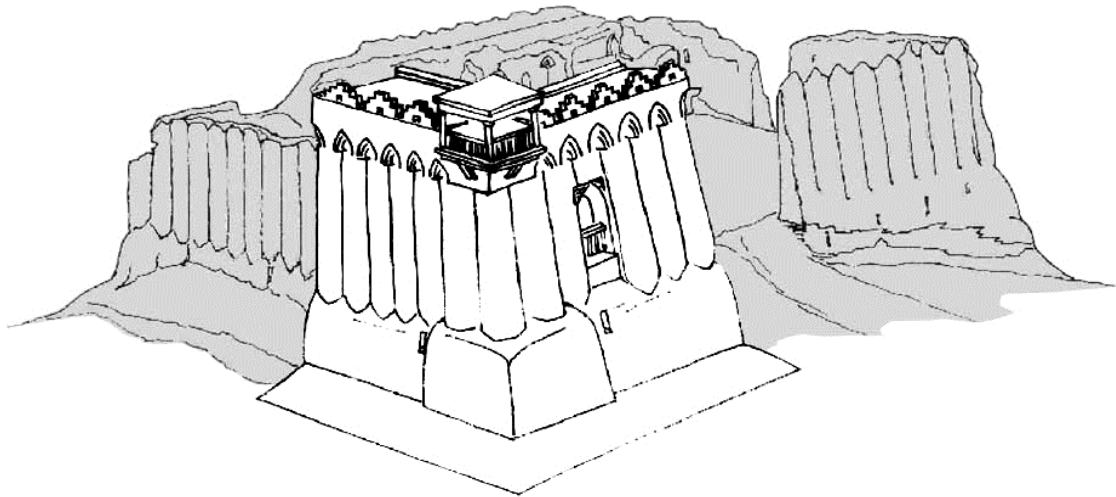


August 2014



August 2014

2.2.6. 'Ancient Merv' Park, Hypothesis for restitution



Sketch provided by Redzhep Djeparov showing a tentative of restitution of the North East corner of the Greater Kyz Kala

2.3. Update of the site assement

2.3.1. Overall drainage of the site

The January 2015 mission has allow to assess the situation of the site after a heavy rain and snowfall (about 10 hours at night), combined with frost. These extreme climatic conditions are not usual in Merv, but it happens more often, according to the Park Director.

Many zones of water stagnation have been observed, inside the monument and on its direct surroundings. The entire monument was soaked in depth, revealing the poor drainage of certain zones of the site. Due to the capillary nature of the earthen material and its weakness against wet conditions, it is necessary to improve the drainage of the overall site, with a particular attention regarding the excavation areas.

During the May mission, a drainage sketch has been produced, giving recommendation to create additional water run-off. (See chap. 1.6.)



The greater Kyz Kala under snow. 01/02/22015

2.3.2. South facade

The information collected (chap; 2.2.) help us drawing an update of the condition assessment. The archives pictures have shown that there was a stabilisation of the decay process until 1971. After that date, it was speed up especially on the eastern facade, with the collapse of 6 corrugations.

It is not so obvious on the southern facade, because its state of conservation seems to be better. This wall is the thickest one and best preserved. Conservation works conducted by the 'Ancient Merv' Reserve have been identified by UCL and CRAterre, and confirmed by the Park reports. They can be summarized as follow:

- The East angle was done in 1999, being part of the conservation of the eastern facade.
- The West angle was done in 2000, being part of the conservation of the western facade.
- The glacis (or platform, under the corrugation) was consolidated in 2005 without scaffolding. The circulation floor may have been levelled at that time.
- Nothing was done on the corrugations themselves or between them.

This documentation also allow to clearly distinguish the original and the restored parts of the south facade. The integrity of the building is respected. But the “stairs shaped” in the basis (probably to avoid the use of a scaffolding) may be confusing for the public.



Original / Restored parts of the south facade

Another observation was made specifically on the bases of the corrugations, at the junction between the platform and the columns. The erosion, particularly important in the middle of the wall (from #5 to #13), is probably due to the fact that the rainwater from all the upper parts of the facade are channeled on this building detail, making it relatively weak. Rainwater is leaking along the wall between the corrugations and creates a cone shaped hole, comparable to the alluvial fan at the mouth of a river.



Erosion process at the bases of the corrugatuions

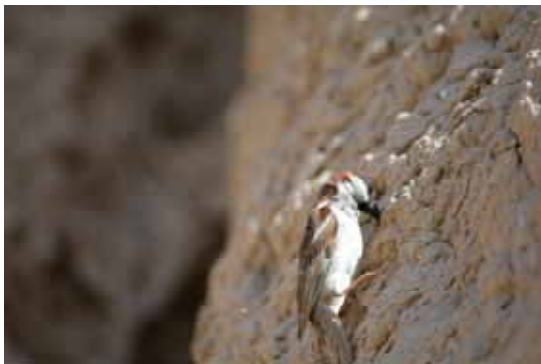
It is difficult to reconstitute with full certitude the original shape of the corrugated wall at its base, where it is too eroded. Therefore, our restoration work is based on the observation made on the columns 1 / 2 / 3 / 4 / 11 / 15 / 16 / 17 / 18, which are less eroded.



Detail of the erosion (column 10)

Columns 16;17;18, less eroded

Bird nests are also a real threat. Although the holes they make are visible since the first images known, the return of the colony every spring for breeding seems to enlarge the holes and weaken the bricks.



Bird nests

2.3.3. Excavated areas

In January 2015, the areas excavated were entirely covered with a thick textile laid by the staff of 'Ancient Merv' Reserve in November 2013. It was not possible to assess the situation of the structures underneath. Our observation mainly concerned the numerous "pools" on the textile, where water was trapped after the rain. In some places, the rainwater was frozen.



Observation of the protective textile laid on the excavated areas. January 2015

In May 2015, the textile was removed when we arrived on site and the assessment of the condition of the ruins was made possible. Based on a comparison with pictures taken after the 2013 excavation season, it seems that the erosion of the massive walls and structures discovered is rather low. In contrast, we can observe a more significant erosion of the building details such as the floors or niches. Our first conclusions are that the erosion processes are still occurring despite the protective textile, but probably at a rather slow pace. A monitoring system should be set up to record more in detail the speed of erosion of the excavated areas.



Excavated areas inside the Greater Kyz Kala. Photographed by Redzhep Djeparov, June 2013



Excavated areas inside the Greater Kyz Kala. Photographed by David Gandreau, May 2015

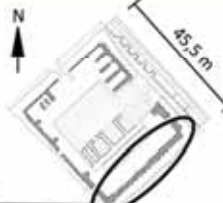
3. Conservation forms

3.1. Scaffolding

SCAFFOLDING

Country : TURKMENISTAN
 Site : GREATER KYZ KALA
 (ANCIENT MERV)
 Date : MAY 2015
 Implemented by :
 ANCIENT MERV RESERVE
 CRATERRE


Location on site :



Southern wall


Dimensions : 37m long by 6m high
 Time spent : 2,5 days
 Material used : fired bricks, metal poles,
 wooden boards, hammer, shovel
 Objectives :
 - Provide access to the upper part of the wall
 - Ensure security during documentation and
 conservation works

1




D1 - 7h30

2




D1 - 7h50

3




D1 - 9h20

4




D2 - 10h00

5




D2 - 12h00
D3 : finishing works (ladder,
boards)

A




Installation of metal poles on the floor : digging a flat surface and laying fired bricks under the poles.

B




Installation of metal poles on the wall : digging a flat surface within the conservation mudbricks and laying fired bricks under the poles

C




Installation of metal poles on the wall : re-using the original holes

D




Installation of metal poles on the wall : joining flat angle poles to avoid the anchorage against the original wall

E

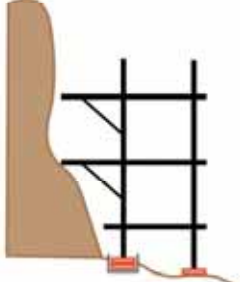


Installation of metal poles on the floor : ensuring a planned line

F




Installation of a ladder : ensuring security for the team



Profile sketch of the wall

Dig as less as possible into the original wall

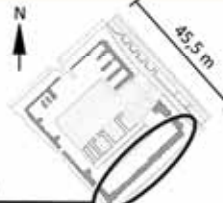


3.2. Surface preparation

SURFACE PREPARATION

Country : TURKMENISTAN
 Site : GREATER KYZ KALA
 (ANCIENT MERV)
 Date : MAY 2015
 Implemented by :
 ANCIENT MERV RESERVE
 CRATERRE

Location on site :



Southern wall

Dimensions : 8m long by 0,5m minimum and 2m maximum high
 Time spent : 4 days
 Material used : trowel, brush
 Objective :
 - Ensure a good adherence with the original surface

1



Take a picture before any intervention

2



Surface between corrugations : removing erosion remains

3



Surface of the corrugation : digging eroded bricks for keying-in the new courses

4



Surface after preparation : cleaning with soft tools

5



Surface after preparation : recording


6




Take pictures and dimensions when the surface is prepared




Profile sketch of a corrugation



Profile sketch of the platform (between two corrugations)



- During cleaning, do building construction analysis
- Remove previous conservation to have an homogeneous visual effect
- Dig as less as possible into the original wall

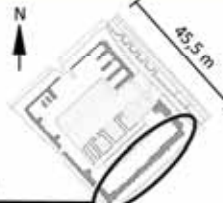


3.3. Masonry

MASONRY

Country : TURKMENISTAN
 Site : GREATER KYZ KALA
 (ANCIENT MERV)
 Date : MAY 2015
 Implemented by :
 ANCIENT MERV RESERVE
 CRATERRE

Location on site :



Southern wall

Dimensions : 8m long by 0,5m minimum and 2m maximum high
 Time spent : 5 days
 Material used : string, level, plumb-line, trowel, hammer, bucket, mudbricks, mud mortar, water
 Objectives :
 - Strengthen the original masonry
 - Slow down the erosion

1



Mudbrick masonry :
transporting materials

2




Mudbrick masonry :
putting guides on

3



Mudbrick masonry :
cutting brick

4



Mudbrick masonry :
verifying guides and bricks
before laying

5




Mudbrick masonry :
putting mortar

6




Mudbrick masonry :
laying course by course

7

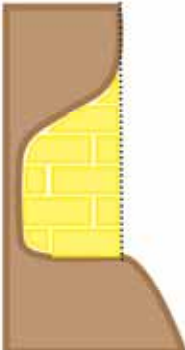


Mudbrick masonry :
Allow the masonry to set
before laying the last course

8



Mudbrick masonry :
recording

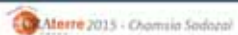


Profile sketch of
a corrugation



Profile sketch of the platform
[between two corrugations]

- Do a reversible action
- Assign the staff individual task (for one mason, two workers carrying, one worker cutting)
- Ensure a good adherence with the original surface
- Key-in courses to the original wall
- Ensure a good link between corrugation and platform

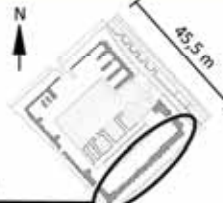


3.4. Plastering

PLASTERING

Country : TURKMENISTAN
 Site : GREATER KYZ KALA
 (ANCIENT MERV)
 Date : MAY 2015
 Implemented by :
 ANCIENT MERV RESERVE
 CRATERRE

Location on site :



Southern wall

Dimensions : 8m long by 0,5m minimum and 2m maximum high
 Time spent : 4 days
 Material used : shovel, bucket, bottle, fabric, mud mix, water
 Objectives :
 - Make a sacrificial layer that will be eroded
 - Produce an aesthetic effect






1

2

3

4

5













6

7

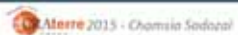
8

9

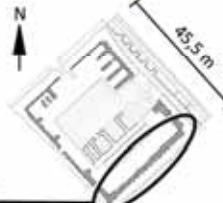






- Let the straw rot for a few days in the wet mix
- Ensure a good surface preparation (no dust)
- Ensure a good junction between old and new material
- Do a reversible action



3.5. Capping

CAPPING

<p>Country : TURKMENISTAN Site : GREATER KYZ KALA (ANCIENT MERV) Date : MAY 2015 Implemented by : ANCIENT MERV RESERVE CRATERRE</p>	<p>Location on site :</p>  <p style="text-align: center;">N</p> <p style="text-align: center;">Southern wall</p>	<p>Dimensions : 8m long by 0,5m minimum and 2m maximum high Time spent : 3 days Material used : shovel, bucket, bottle, fabric, mud mix, water Objectives : - Make a sacrificial layer that will be eroded - Produce an aesthetic effect</p>	
1	2	3	4
			
<p>Preparation of the surface : dampening widely with water</p>	<p>Capping : placing a first thick coat of mix</p>	<p>Capping : covering a wide surface on each side of the top of the wall</p>	<p>Capping : letting the first coat dry</p>
5	6	7	
			
<p>Capping : placing a second thick coat of mix on and along the wall</p>	<p>Capping : recording the final aspect in details</p>	<p>Capping : recording the final aspect in general</p>	<p>Profile sketch of the wall</p>
<div style="display: flex; align-items: center;">  <ul style="list-style-type: none"> - Let the straw rot for a few days in the wet mix - Ensure a good surface preparation (no dust) - Ensure a good junction between old and new material - Do a reversible action </div>			
			

Appendixes

1- Planning of the mission

10TH OF MAY

- Flight from Paris/Lyon to Istanbul

11TH OF MAY

- Flight from Istanbul to Ashghabad. Arrival 7:00 AM. Meeting with Ruslan Muradow at airport.
- Flight from Ashghabad to Mary at 11:40, arrival 13:00. Installation at the base behind the offices of Merv Archaeological Park.
- Meeting with the international team and Rejep Jeparow. Visit of the site all together.

12TH OF MAY

- Beginning of the field work, about archaeology and digital documentation.
- Meeting with Rejep Jeparow and Paul Wordsworth about planning of the mission
- Visit with Rejep Jeparow and Paul Wordsworth of icehouse 1

13TH OF MAY

- Beginning of the conservation field work: scaffolding installation.
- Visit of Ruslan Muradow, Michael Cavey and Maya Meredova on site and meetings

14TH OF MAY

- Architectural analysis, preparation of the report
- Visit with Rejep Jeparow and Serdar Rejepow of the mudbricks production
- Preparation of conservation works: scaffolding installation.

15TH OF MAY

- Departure of two members of the UCL team
- Visit of four quarries of soil with Serdar Rejepow
- Visit of Sultan Sanjar mausoleum and the turkish excavations around
- Daily meeting on site with Rejep Jeparow
- Preparation of conservation works: delivery of soil, straw and watertanks, end of scaffolding installation, dig of a pit for mortar mix under archaeological monitoring, preparation of mortar mix
- Architectural analysis by cleaning corrugation n°3 and 4 with Serdar Rejepow

16TH OF MAY

- Adjustment of the scaffolding
- Preparation of conservation works: water delivery, mudbricks delivery (around 300 units), preparation of mortar mix, cleaning of the erosion deposit on the wall, trials of masonry of the corrugation
- Overall drainage sketch

17TH OF MAY (Sunday off)

- Visit with the team of the Erk Kala and Gyaur Kala (trenches, buddhist complex, surrounding wall), Shahryar Ark, Sultan Sanjar shrine and the UCL excavations around, an icehouse and the timurid pavilion between Sultan Kala and Abdullah Khan Kala

18TH OF MAY

- Day-off in Turkmenistan
- Conservation works : new trial of masonry, corrugation n°4 and 5 under process
- Architectural analysis by cleaning corrugation n°11 and 15
- Preparation of the report

19TH OF MAY

- Decision taking with Rejep Jeparow: visit on-site, discussion at the office with layouts.
- Conservation works: applying the decision taken with the partner, cleaning and masonry of

20TH OF MAY

- Conservation works: preparation of mortar mix, masonry of the corrugation bases until corrugation n° 9 and between the corrugations
- Preparation of the report: defining conservation forms and a sketch on all conservation works done during this mission

21ST OF MAY

- Conservation works: masonry of the corrugation bases until corrugation n° 9 and between the corrugations

22ND OF MAY

- Flight of DG from Mary to Ashghabad
- Conservation works: preparation of mortar and plaster mix, mudbricks delivery (around 200), masonry of the corrugation bases until corrugation n° 9 and between the corrugations, scaffolding installation on the internal face of the southern facade

23RD OF MAY

- Flight of DG from Ashghabad to Lyon via Istanbul
- Conservation works: preparation of plaster mix, masonry of the corrugation bases until corrugation n° 9 and between the corrugations finished, application of a first coat of plaster on the new bricks between the corrugations, cleaning fieldwork, measurement of the conservation works implemented

24TH OF MAY (Sunday off)

25TH OF MAY

- Conservation works: application of a second coat of plaster on the new bricks between the corrugations, very thin and wet, application of the first coat of plaster for capping the corrugations n° 2 to 8.
- Meeting with Rejep Jeparow: informations about conservation works done since 1997, visit on site.

26TH OF MAY

- Conservation works: application of a third and a fourth coat of plaster on the new bricks between the corrugations (a clay barbotine), application of the second coat of plaster for capping the corrugations n° 2 to 8 and refilling some gullies on the internal face of the southern wall, removing partially the scaffolding on the external face.
- Departure of the members of the Polish team

27TH OF MAY

- Conservation works: application of a second coat of plaster in the gullies on the internal face of the southern wall, removing the scaffolding and cleaning. Pictures of the external face without scaffolding, implementing slopes of rammed earth near the north-eastern corner of the building to move stagnant water away (on the asphalt road), cleaning the building surroundings (avoiding vegetation).

28TH OF MAY

- Conservation works: scaffolding re-installation on the external side of the southern facade, implementing slopes of rammed earth near the north-eastern corner of the building to move stagnant water away (on the asphalt road), cleaning the building surroundings (avoiding vegetation).

29TH OF MAY

- Flight of CS from Mary to Ashghabad with the rest of the team

30TH OF MAY

- Flight of CS from Ashghabad to Paris via Istanbul during the night

2- Glossary (French/Russian)

animal	jivotnie
après	patom
argile/terre	glena
aujourd'hui	sievodnia
au revoir	dasvidania
autre	drugoy
balle de riz	miakine
beaucoup	ochin / monoga
bonjour	zdrastvuitsie/ dobre dien
bonjour (matin)	dobre outra
bonsoir	dobre vietcher
brique	kirpitch
brique cuite	jonenei kirpitch
bronze	bronz
brouette	tatchka
canal	canal
cendres	piepiel
céramique	keramika
c'est bien	paidiot
chantier de fouilles	razkopki
charbon	ougol
cher (coûteux)	daragaia
chercher	iskat
chose	tchota
clou	gvosd
comprendre	panimaiet
conservation	conservazie
creuser	kapat
cru (séché au soleil)	siriets
dangereux	apastnie
dedans	v noutri
demain	zaftra
dent	zubie
dessous	panije
dessus	pavoje
difficile	tiajoli
doucement	miedlina
droite	na prava
eau	vada
enduit	shukatulka
enfants	dieti
enlever	obrat
est (point cardinal)	vastok
facile	prosta
femme	genshina/gina (mariée)
fenêtre	akno
fer	jiliezni
feu	kastior
fille	dotchka

four	Pietchka
fourche	vilka
fumée	dim
garçon	sin
les gars	riviata
gauche	na lieva
grand/gros	balchoi
homme	moujchina
je	ya
jeune	mawadoi
loin	daliekou
maintenant	sitchias
marteau	malatok
mari	mouj
merci	spasiba
mort	oumierou
mouillé	mokri
moule (à brique)	forma
mur	stena
nettoyer	tchistit
nord	siever
os	koist
ouest	zapat
paille	saman
parler	gavariet
pas cher (peu coûteux)	dijevi
pelle	lapatka
Pierre	kamien
pioche	kirka
plat	rovno
pluie	dochts
plus tard	patom
porte	dvier
poussière	peow
qu'est-ce que c'est	chto eta?
rivière	rietshka
sable	piok
seau	vidro
s'il vous plait	pajaloutsa
sol	pow
sud	youg
terre (tout venant)	ziemla
toiture	krisha
travail	rabote
truelle	mastriok
un petit peu	tchout tchout
vent	vietr
vieux	stari
vite	bisra

3- Maya Meredova short report for AFCP program office in Washington. February 4th 2015.

Paul David Wordsworth (UCL-Institute of Archaeology of University College London) and David Gandreau (CRATERre-Centre International de la Construction en Terre - International Centre for Earth Construction) visited Turkmenistan on a five day mission from January 28-February 2, 2015 to assess the work completed on the site within the AFCP project, provide recommendations and develop a plan and scope of work for 2015 with the involvement of all the interested parties: a team of archaeologists from UCL, a team of conservators from CRATERre and a team of local experts and specialists working at Ancient Merv.

On January 29, both of the foreign experts, the U.S. Embassy representatives, as well as the director and deputy director of the National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan (NAPSCCHMT) convened for 2 hours to get the preliminary report on the project from the administrative point of view, and share ideas/concerns as necessary to provide a necessary background context for the two experts before their visit to Ancient Merv. Representatives of the NAPSCCHMT shared their vision and the pressure they face from their supervisors to ensure visible deliverable as the end result of the project. UCL and CRATERre experts emphasized the importance of documentation for both the archaeology and conservation work undertaken within this project, as well as compliance with the UNESCO standards for World Heritage Sites. U.S. Embassy shared the news that the project could focus only on one Gyz Gala, and specifically the larger Gyz Gala, with this amount of grant funding, and if extra funding is needed to finish the project, a second proposal could be submitted in a couple of years for the continuation stage.

On January 30-31 US. Embassy representative, NAPSCCHMT representative and a joint foreign expert mission traveled to the Ancient Merv to provide site monitoring, assessment of the work completed and developing the plan for the future work in 2015. Project manager Rejep Jepbarov provided full information and access to all artefacts, documentation, and work completed so far, as well as shared his team's vision and plan for future work. All interested parties spent a significant time on the site for site monitoring, assessment of the work completed. The rest of the time was spent on screening the available documentation, and long discussion on all project aspects: archaeology, conservation, documentation, management to come up with a strategy for 2015 that is agreed upon all three teams involved in the project implementation.

On February 1, 2015 all interested parties convened for the final de-brief meeting at NAPSCCHMT to present the findings of the mission on the work completed, as well as the strategy for 2015 agreed upon by all three teams.

The outcomes of this meetings are the following:

1. Two priority areas were identified and agreed upon to focus by the three teams in 2015:
 - a) Immediate preventive conservation work on the south facade of the monument, which is most vulnerable and eroded.
 - b) Develop the systematic approach for documentation to apply both to the work completed, as well as for future work undertaken on the site.
2. There will be two foreign expert missions to Ancient Merv this year in May and September/October. Both of the expert organizations will come at the same time to maximize the benefit of international and multidisciplinary collaboration.

3. The Turkmen team will work starting with April through November.
4. UCL and CRAterre will identify the # of experts that will come, develop the two-visit mission budgets and submit to NAPSCCHMT to prepare the contracts (one for each visit).
5. The Turkmen team will prepare their interim budget for 2015. Thus it will be clear how much of the funding will be used this year and how much funding will be remaining.
6. Based on this, in the end of the fall expert mission, the scope of work will be identified for 2016 for the remaining grant funds and a new proposal for the continuation phase will be submitted in November 2016 for the 2016-2017 AFCP cycle.
7. All documentation that is prepared or available in Turkmen will be translated into English for UCL and CRAterre use. All the documentation available or prepared in English will be translated into Russian to avoid misinterpretation, since Russian has a more straightforward archaeological terminology.
8. UCL proposed to provide expertise on the following:
 - a) Developing a systematic approach/method for documentation, especially visual documentation, that leaves no grounds for misinterpretation. This will be applied to all the work that was completed and will be completed in the future both for archaeology and conservation. They will also work with the Turkmen team to identify the missing factual documentation and help them fill the gaps.
 - b) Expert help with 3d modelling through a new software: photomap, that allows to build 3d models and be able to monitor the work through a systematic photography of the object, as well as the drawings. UCL will work with the Turkmen team to collect all available photography up-to-date to experiment, and this spring to develop systematic approach for photography necessary for the software and train the local specialist how to incorporate this approach into their documentation processes to use the data for this software for any work done on the site: archaeology, conservation etc.
 - c) Expert help with conservation, treatment, documentation, interpretation and storage of the artefacts/material found at the site.
 - d) Assistance with building awareness about the work of the international team on Gyz Gala
9. CRAterre proposed to provide expertise on the following:
 - a) Develop a strategy for preventive conservation of the monument, specifically the south facade this year.
 - b) Provide experts to help implement the preventive conservation work on the south facade.
 - c) Develop a draft manual of the best approaches/methods for preventative conservation of the earthen structures for use at the Gyz gala project and future earthen monuments
 - d) Assistance with building awareness about the work of the international team on Gyz Gala (Specifically through inviting two Turkmen specialist from the Turkmen team to present at Terra World Congress for around 800 specialist in earthen architecture in July 2016).

2. Turkmen team will work on the following prior to the arrival of the foreign expert teams:
 - a) Collect and translate into English/Turkmen all available documentation both from this project, as well as from the archives of the works of other expeditions and scholars.
 - b) Production of mud bricks necessary for the preventive conservation of the south facade, as well as the areas in the interior part of the monument that were excavated.
 - c) Prepare a team for this year and prepare scaffolding for the south facade exterior and interior
 - d) Ensure security for the international experts during their mission visits.
11. Both UCL and CRAterre will also work on some options for possible and adequate restoration to present for the review/discussion at the meeting of the Scientific council in the fall of 2015 that will be the final meeting and the model for the restoration will be decided/agreed upon that will be presented to the Turkmen government as the final decision of the Scientific Council.
12. Both UCL and CRAterre emphasized that they will need to go through all of the points raised with their teams and get their feedback as well.

5- Proposed abstract of communication for the TERRA 2016 World Congress

Title:

Archaeology and Conservation on the Greater Gyz Gala at Merv, World Heritage Site

Keywords:

Archaeology, Conservation, World Heritage Site, Management

Authors:

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- Ruslan Muradov, National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan
- Rejep Jeparov, State Historical and Cultural Park “Ancient Merv”, director
- Tim Williams, University College of London
- Paul Wordsworth, the University of Oxford, Oriental Institute
- David Gandreau, CRAterre-ENSAG

Abstract:

Context of the research or the activity

The Greater Gyz Gala is a monumental mudbrick *köshk* (a Khorasan word for castle or fortress) renowned for its massive scale and its tapering “corrugated” columnar walls rising from an earthen glacis. The Greater Kyz Kala is the largest and best preserved example of this unique building type to survive in the modern era, and one of the largest historic mudbrick buildings standing anywhere in the world. This monument is part of the State Historical and Cultural Park “Ancient Merv”, which has been designated a UNESCO World Heritage Site (inscribed in 1999).

Main issues or objectives

A project, in partnership with the National Administration for Protection, Study and Conservation of Cultural and Historical Monuments of Turkmenistan, UCL-Institute of Archaeology of University College London, and CRAterre, Centre international de la construction en terre, is currently supported by the U.S. ambassador’s fund for cultural preservation in order to address simultaneously two issues:

Archaeology: the construction date of Gyz Gala is currently a matter of some speculation. They are thought to have been constructed somewhere between the 6th and 8th century CE, in the late Sassanian or early Islamic period, and to have continued in use until the Mongol sack of Merv in 1221 CE.

Conservation: despite its remarkable state of conservation, the Gyz Gala suffers from continuous erosion, due to natural and human factors. This includes erosion as a result of ground water fluctuations, wind erosion, the effects of Aeolian sands, alongside erosion as a result of animals, plants, insect and human activities.

Results obtained

Conservation of the monument and its surrounding is undertaken while debris are partially removed (archaeologically) from the monuments’ ground floors, and around the monument, to enable a better understanding of its dating and function. The national and foreign experts in the fields of archaeology and conservation are developing innovative collaborative methods which balance the archaeological and conservation objectives in a sound management strategy.

Proposed content for the article or poster

The paper will describe the scientific and technical collaboration and present the activities of documentation, archaeology, conservation, interpretation and site presentation undertaken.

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