Directorate General of Antiquities & Archaeology
Culture, Tourism, Antiquities & Archives Department
Government of Sindh (Pakistan)

STATE OF CONSERVATION REPORT
HISTORICAL MONUMENTS AT MAKLI, THATTA (PAKISTAN) (C 143)
DECISION: 45 COM 7B.170

Updated as of December, 2023

In compliance with Decisions adopted during the 45th Session of World Heritage Committee & Paragraph 169 of the Operational Guidelines
Following the format for the submission of SOC reports by the State Parties

Aerial view of one portion of site after 2022-Monsoon Flooding

DIRECTORATE GENERAL OF ANTIQUITIES & ARCHAEOLOGY
CULTURE, TOURISM, ANTIQUITIES AND ARCHIVES DEPARTMENT
GOVERNMENT OF SINDH, PAKISTAN

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Foreword Note

December, 2023

The catastrophic 2022-Monsoon flooding badly affected the tombs, platforms and canopies of the Historical Monuments at Makli, Thatta and left an indelible mark on the original features of significant monuments. This report presents a detailed sketch of damages that were caused and department's response in repairing the brick and stone structures in dilapidated condition.

The ceaseless heavy showers impacted the physical condition of most of the monuments. Some of the tombs and grave markers were severely affected, with some portions of the brick and stone structures collapsed, others only suffered surface damage. The physical survey of site after heavy rains it was observed that some of the decorative kashi tiles were chipped, cracks appeared on the top of tombs, walls deformed with stone bulging out in compound walls, some canopies were damaged, the stone rubble core was exposed in some tombs, cracks appeared on the ceilings and walls, the floors several tombs and enclosures damaged and lime plaster finish was lost from some of the walls.

Monumental tombs suffered from a wide variety of damage, including loss of bricks, loss of lime plaster, loss of decorative kashi tiles, and sub-structure have eroded away due to heavy rains. The tombs that did not receive conservation work before the monsoon were more badly damaged than those that received conservation work between 2015-2021.

After the heavy showers and floodwaters, some issues regarding drainage and maintenance appeared. Keeping in view the conservation practices and the Operational Guidelines to preserve the outstanding Universal Value of site, some strategies were devised and planned to immediately conserve and repair the damage.

The Directorate General Antiquities & Archaeology, Govt. of Sindh being the state party extends its heartfelt thanks to the World Heritage Centre of UNESCO and ICOMOS for their relentless and unyielding support and technical knowhow in the field of conservation in preserving and protecting the Historical Monuments of Makli, Thatta. This Directorate General has achieved the desired goals in carrying out recommendations and guidelines in preserving the site and have taken urgent measures to preserve, rehabilitate and prevent the deterioration of the values and their attributes at Makli. The World Heritage Centre of UNESCO approved **120,800 US Dollar** for both World Heritage Properties i-e Makli & Mohen Jo Daro in Sindh which was utilized in preserving the sites.

Thank you and we look forward to the continued cooperation, support and engagement with the WHC and ICOMOS for the protection of the Historical Monuments of Makli at Thatta.

With best regards,

16/01/2024.

(ABDUL FATAH SHAIKH)
Director (Archaeology & Museums)
Directorate General of Archaeology & Antiquities
Culture, Tourism, Antiquities & Archives Department
Government of Sindh

Executive Summary

This State of Conservation Report is intended to give an upfront evaluation of the condition of the World Heritage Site Historical Monuments at Makli, Thatta, Sindh, Pakistan. It also presents the response of the Directorate General of Antiquities & Archaeology, Culture, Tourism, Antiquities & Archives Department, Government of Sindh, Pakistan to the recommendations of Decision 45 COM 7B.170 of the World Heritage Committee (WHC) regarding the site in its 45th Session.

The state party is conscious of its responsibility of protecting this unique World Heritage property and highlights in this report the efforts it has undertaken on all fronts in conserving the site, in association with international partners and non-government stakeholders, to preserve the property's Outstanding Universal Value (OUV). Also highlighted are the efforts to prevent the deterioration of its physical fabric and implement an integrated conservation strategy for the site, following WHC's guidelines and specific development goals and needs of this department.

Response to the Decisions of the World Heritage Committee- This SOC report is an in-depth and a clear regarding the decisions and recommendations. The report not only comprises the actions and works that were successfully completed but also presents an overview of actions and works ongoing, including the critical response to the disastrous monsoon flooding.

Makli was well prepared for a regular monsoon. However, the intensity and duration of the 2022-Monsoon was exceptional and unprecedented with three times more than normal, and floodwaters covered up to 70% of Sindh. The first Mission of UNESCO resulted in a more comprehensive investigation and inspection of the damaged areas. A follow-up mission was also planned for February 2023; which was conducted between February 26th and March. An extensive Inspection of monuments was conducted and a report was prepared by the site In-Charge with assistance of experts.

The strategy for assessment, stabilization, repair and reconstruction was based on the operational guidelines clearly outlined in Article 110 of World Heritage Properties. All the conservation works were carried out ensuring the long-term safeguarding of the Outstanding Universal Value and the strengthening of heritage resilience to disasters and climate change. The mitigation measures were taken as per Disaster Risk Reduction Plan & Conservation Plan of the site. The Management Plan prepared by the Directorate General of Antiquities & Archaeology outlines the aims and objectives (what we are trying to achieve), the strategies used to meet the objectives (How will we achieve the set objectives/goals) and evaluation methods used to measure performance. The Management Plan includes short-, medium-, and long-term goals in order to improve management and protection of OUV.

There are mostly stone structures including tombs, platforms, graves, canopies etc where emergency stabilization works were carried out as per conservation manual and guidelines of UNESCO expert Mr. Rand Eppich. Numerous works were initiated soon after the 2022 Monsoon that were ongoing during the last mission, and other works started.

Emergency conservation works were carried out on family enclave of Mirza Issa Khan Tarkhan-I and Khanqah of Hamad Jamali that suffered huge loss. The sides of structures were destroyed. Only emergency works including fixation of detached bricks and masonry work because the detachment of bricks could cause collapse of entire structure. Most of the platforms were subject of same type of issue.

In view of the preparation of the detailed emergency plan to be implemented before next monsoon season. It has been discussed and approved that the walls that need conservation may be repaired, restored and conserved on top priority.

Risk preparedness Strategy has also been observed in wake of climate change to protect the site from disasters in unforeseen future. In this regard, the DRR Plan of site has been prepared and the staff of the site has been trained to minimize the loss in unforeseen future.

All the conservation activities carried out on the site represent an effort to safeguard the Outstanding Universal Values as well as the integrity and the authenticity of Makli. The Directorate General of Antiquities & Archaeology thrives on challenges and proactively responds to decisions and recommendations presented at every session, providing that a true partnership with World Heritage Committee exists.

Response to the Decision of the World Heritage Committee (45 COM 7B.170)

Draft Decision: 45 COM 7B.170

The World Heritage Committee,

1. ***Having examined*** Document WHC/23/45.COM/7B.Add,
2. ***Recalling*** Decision 44 COM 7B.35 adopted at its extended 44th session (Fuzhou/online, 2021),
3. ***Expresses its profound compassion*** to the State Party on the impacts of the August 2022 monsoons on the World Heritage property, as well as its loss in human lives and livelihoods, ***welcomes*** the response and recovery efforts undertaken, and ***calls on the international community*** to support the State Party as it responds to the immediate threats, undertakes longer-term conservation programmes and further addresses risk preparedness and emergency response planning;
4. ***Expresses its appreciation*** for UNESCO's two emergency missions funded through Emergency International Assistance under the World Heritage Fund to the property in November 2022 and February - March 2023, as well as the support through Heritage Emergency Fund (HEF) to integrate evaluation on culture and heritage into the Post Disaster Need Assessment (PDNA) of Pakistan after the August 2022 monsoons;
5. ***Suggests*** that the State Party……

Decisions/ Concerns of WHC	Response from Culture, Tourism, Antiquities& Archives Department, Government of Sindh
4 (a to g)	
Consider the recommendations of the two abovementioned UNESCO emergency missions in preparing a report assessing the damage from the August 2022 monsoon, and presenting short-, medium- and long-term action plans and related financial and technical requirements in preserving monuments and areas, which should be treated as priority, conducting monitoring and documentation, studying on the drainage plan, rules to be observed by the visitors, and the update of the Management Plan, including the progress on the disaster risk mitigation plan already under way;	After 2022-Monsoon flooding, two UNESCO-led emergency missions conducted the damage assessment of site and presented a damage assessment report containing several recommendations which were strictly followed during immediate stabilizations works that were carried out at Makli in order to help save its outstanding Universal value. In the wake of climate change and other natural disasters including floods, torrential monsoon rains, it became vitally important for Historical Monuments and stone graves to plan for emergency response. Whether it is a natural disaster, new regulatory compliance standards, equipment failure or human error, we made serious and t efforts to respond and adopt short, medium- and long-term action plans in preserving the monuments and areas that were badly affected. In this regard a thorough physical survey of site was conducted, the documentation process was initiated and drainage plan was minutely studied and visitor management framework was prepared hence the Management Plan of site was updated so that mitigation measures are taken accordingly in unforeseen future. There are more than 21 active shrines at Makli, which are visited by hundreds of pilgrimages, even after heavy rains

	the visitors to those active shrines did not diminish. Pilgrimages continued immediately after the monsoon, so the active shrines on the main portion of the site are relatively kept clean. We have become more effective, efficient and relevant in providing the services for tourists. In last monsoon rains, the physical condition of most of the monuments/tombs was severely affected; some portions of the brick and stone structures collapsed and fell down. The Director General (Antiquities & Archaeology) being a state party took a serious note of the damages and carried out some emergency conservation works to avoid more destruction. Drainage canals were created under the supervision of the UNESCO expert, to drain off the puddles and standing water next to the tombs. ***(Monument wise pictures of damages along with damage description are attached at – Annexure-I)*** Considering the recommendations of UNESCO Emergency Missions, a workshop was organized at Historical Monuments of Makli, Thatta which helped plan response programs to address emergency response plan after an incident occurs in order to safeguard the site. On 28th of February, 2023 following two sessions of Training Workshop were conducted by Dr. Rand Eppich. **SESSION-1: CLIMATE CHANGE EFFECT ON THE MONUMENTS** In this session Mr. Rand Eppich highlighted several factors which are directly or indirectly responsible for the deterioration of Heritage Monuments in context to Monuments of Makli Necropolis, Thatta and also discussed how climate change cause deterioration of stone and ceramic artifacts. He also highlighted the **Climate Emergency** which calls for urgent collective action to safeguard Heritage from Climate Change. **SESSION-2: EMERGENCY PREPAREDNESS** In this session, the effect of Natural Disasters like heavy rains, flooding, earthquakes etc. h on historic monuments throughout the world including Makli Necropolis, Thatta was discussed along with the importance of preparedness to avert the effects of such disaster to the maximum extent. The importance of five measures **i.e Prevention, Protection, Mitigation, Response & Recovery** for Historical Monuments at Makli, Thatta and their possible interventions were also analyzed. All the participants were trained to demonstrate the commitment to protect the monuments in case of emergency. The workshop helped to simplify the out-dated processes, standardize response methods and in improving asset utilization. The workshop proved to be

	beneficial in reducing risks through risk assessment. As when potential threats and risks are identified, measures can be taken to mitigate or even eliminate the potential for an emergency. Mitigation efforts included the training of the staff the site, updating the safety procedure and obtaining updated equipment. The staff received emergency preparedness training to learn the protective protocol for security and life safety and to handle the unexpected situations effectively. Apart from it, a two-day workshop was held in two parts; the first part was with the management of the site, and the second part was with the staff, workers, and participants from community. ***(Workshop pictures are attached at – Annexure-II)*** Keeping in view the guidelines of expert, we have improved the documentation system and have enabled systematic recording of important detached architectural elements. Measures have been taken to keep up-to-date inventories of monuments. The regular monitoring of site is also emphasized. This documentation center at the site has also been improved by providing a new image scanner and a computer with full accessories for documentation of detached architectural elements.

6. ***Welcomes*** the completion of the Management Plan for the property, including the requested Mission Statement and ***requests*** that……

The Management Plan be revised with regard to the comments and findings of the recent technical review, particularly to address engagement of the local managers, and then re-submitted to the World Heritage Centre;	The Management Plan of Historical Monuments of Makli Thatta has proved to be an effective and efficient tool in preserving the outstanding Universal Value of property after catastrophic situation of unprecedented torrential Monsoon rains in 2022. If it had not been enforced timely, the site would have suffered an unprecedented damage. As the Management Plan is a living document, requisite changes can be made in it, from time to time. Moreover, it is pertinent to mention that several preservation and conservation issues have been addressed as per Management Plan. The accountability and efficiency has multiplied after implementation of Management Plan. The Plan includes short, medium and long term goals in order to improve management and protection of OUV. We are also engaged on evaluating the consequences of alternative strategies and tactics and we are discovering new competitive advantages to meet the needs. Potential Problems and associated risks in managing the property have also been identified and ways of mitigating the risks have also been devised and applied on the site. The Management plan of site have been updated as per damage assessment report of UNESCO expert Mr. Rand Eppich and will be submitted to World Heritage Centre shortly. We ensure to review and amend it regularly so that the Plan remains a dynamic working tool to help protect and preserve the property at its best and to be relevant.

7. ***Welcomes*** the progress made with implementation of the recommendations of the 2019 Reactive Monitoring mission, the protection and visitor management initiatives and conservation works undertaken at the property, the staff workshops, stakeholder engagement and community education programmes and ***urges*** the State Party……

To continue with its action programme and to complete the proposed risk preparedness strategy and emergency response plan, and the visitor management framework and to submit these documents and the proposed report on the	The state party continuing its action programme has taken several measures in order to complete the proposed risk preparedness strategy and emergency response plan and the visitor management framework. The report on the effects of the recent monsoons on the historical monuments prepared by UNESCO expert and site manager is attached herein for review

effects of the recent monsoons, to the World Heritage Centre, for review by the Advisory Bodies;	by the Advisory Bodies. (Please find attached the Report on effects of the recent monsoons for review by the Advisory Bodies) It is equally important to share that 2022-Monsoon flooding was a blow to historical monuments, the site was seriously affected and an alarming loss was caused. The expert of UNESCO along with site staff assessed the impacts of the heavy rain on site, prepared an assessment report, and devised a detailed strategy and action plan to undertake immediate conservation works. The measures were put into action and site was saved from further damage. In this regard; Disaster Risk Reduction Strategy has been devised **(Copy attached)**, a strategy for assessment, stabilization, repair and reconstruction has been formed and a conservation plan has been prepared, **(Copy attached)** Risk preparedness Strategy has been observed in wake of climate change to protect the site from disasters in unforeseen future. In this regard, the DRR Plan of site has been prepared and the staff of the site has been trained to minimize the losses in the unforeseen future. The training workshop also ensured that what to do and when to act to avoid further damage. The staff received emergency preparedness training to learn the protective protocol for security and life safety and to handle the unexpected situations effectively. Due to climate change the potential hazards of future monsoons have increased. These hazards can be mitigated by taking some extra care between and during monsoon seasons. In this regard, all the facilities will be provided at the site office for scheduled inspections to vulnerable areas as part of preparedness. An emergency response team has been designated for emergency maintenance of site during rains / flooding or any other emergency. In view of the preparation of a long-term plan for the restoration and preservation of site and its preparedness to Climate Change, and the warning provided by the last heavy rains in 2022, the **following measures have been taken to protect the site** from damage in future.

	1. Repair & Maintenance Work including cleanliness: Before the onset of the next monsoon, it is necessary to repair and conduct maintenance work to keep site safe from potential hazards. The drain lines have been cleaned to avoid water clogging during heavy rains. It is ensured that the garbage and rubbish is disposed of properly. **2. Study of damages and proper treatment:** Many parts of the site are exposed to nature, several elements like humidity in air also damage the fabric of monuments, as it has considerable proximity with the Indian Ocean. Though those damages are not visible to naked eye but those damages appear with the passage of time, the damages that have appeared so far have been studied and repaired. **3. Restoration of Drainage System:** The drainage system of the site has been improved to face the next monsoon. **4. Filling of foundations of monuments:** The foundations of the monuments have been filled with salt free soil and slopes have been created to avoid penetration of rainwater into the base of monuments. **5. Removal of unwanted grass and shrubs:** The removal of vegetation / unwanted wild growth is the suitable action undertaken for preparedness of next monsoon. The growth of unwanted grass/ shrubs near the stone structures is very detrimental for monuments, as their roots can damage the foundation of structures. **6. First Aid:** All the monuments that were in vulnerable condition have been provided with first aid i.e lime plaster, underpinning, earth filling, *chiroli* etc. **7. Provision of Security Guards:** Improving the Visitor Management framework, the station security system has been evaluated and guards have been provided on services rendered A literate guard is provided at main gate of site who counts the number of visitors, records their names and collect information from them and provides them with basic information on the history of site.

	8. Lighting on Visitor Paths: Appropriate lighting has also been provided along the main pedestrian walkways to guide visitors to shrines and deter them from visiting the other parts of the property during night time. It has been ensured that all the areas are lit with visitor paths. **9. Tourist Facilities:** (i) Sign board, signage and direction boards (ii) Availability of the Electric Buses. (iii) Reconstruction of a spacious Guest (iv) Establishment of Information Desk. (v) Conference Room, Dining Hall & Multimedia System ***(Pictures of Sign boards, Information Desk, signage, Information Boards, Guest House, conference Hall, Dining Hall, Multimedia System are attached at-Annexure-III)***

8. ***Welcomes*** the 'We Connect Makli' project, the training programmes and capacity building initiatives that have been undertaken and ***encourages*** the State Party and collaborating agencies…….

To continue to identify opportunities for staff to benefit from national and international capacity-building programmes, in particular for risk preparedness and disaster response, management, stone conservation, and conservation of moveable heritage and detached architectural elements;	The importance of having trained site staff / labor available at Makli Necropolis, Thatta cannot be over emphasized. In the wake of heavy monsoon rains, a three-day workshop on Emergency response was conducted at site in order to enhance their sense of ownership. Several courses related to stone conservation and management has been investigated, trainings have been provided to staff for better management and conservation of stone. The conservation of moveable heritage and detached architectural elements, including their documentation has also been included in the course. There has been several capacity building efforts. UNESCO sponsored a five week (40 days) workshop under the supervision of UNESCO expert, Rand Eppich at Makli, Thatta recently, in which several participants from other provinces of Pakistan participated and shared experiences. Experts from all

	over the world participated either virtually or in person. The site manager and the staff of the site was highly benefitted from this long workshop. The site manager was provided different trainings and participated in China-Afghanistan-Pakistan Advanced Online workshops for Conservators of Stone Objects on 11th May, 2022, hosted by the Ministry of Foreign Affairs of the PRC and the National Cultural Heritage Administration of the PRC and organized by the Chinese Academy of Cultural Heritage. The workshops and trainings play a vital role in creating a space in which a group of people meet to discuss questions, brainstorm ideas, identify problems, make decisions and develop solutions to the problems faced on archaeological and heritage sites especially on Historical Monuments of Makli, Thatta. During the interactive meetings in trainings, different sets of activities were discussed to a good length and the issues related to monuments were solved. The ways of teaching were widened; different skills were inculcated among trainees. In the wake of Climate Change, state party has organized workshops with wide strategy to put into place. The document of strategy prepared for the protection of site defines the areas of focus and objectives for the years to come. The problems and issues are penned down, discussed and made visible on board. The team brainstorms strategic objectives that address the key challenges. All the affected areas of site have been conserved and preserved as per guidelines of experts by the learned staff. The experts / engineers examined and studied the development made on site and pointed places where major intervention could be harmful for the structures / monuments and suggested the remedial advices for the safety of Heritage. The original architectural features of the walls of monuments were maintained while doing the conservation work, keeping in mind the basic principle of conservation **"Minimum Intervention"**. The new work did not affect or alter the original look of the wall that existed before collapse. The sweet

	water was used for conservation, preservation and restoration wherever required. The surface was cleaned by using hard and soft brush. The debris was removed. The surplus stuff was removed from the site as per direction of the site manager. ***(Pictures of Capacity-building programmes are attached at – Annexure-IV)***

9. ***Takes note*** of the…….

Submission of the action plan for the stabilization and conservation of the mausoleum of Jam Nizamuddin II;	The mausoleum of Jam Nizamuddin-II is the monumental tomb of site. Given the significance of this tomb, specific measures have been taken and an action plan for the stabilization and conservation of the mausoleum is being prepared which will be communicated with expert for review and submitted with World Heritage Centre as soon as possible. It is important to bring in knowledge that the while preparing the action plan, a detailed inspection of the mausoleum was conducted. During 2022-Monsoon flooding, this significant monument suffered a little damage. Even though it appears that, the monsoon of 2022 did not affect Jam Nizamuddin-II mausoleum and the same was concluded after the study of the mausoleum by UNESCO Expert. ***(Pictures of present condition of mausoleum of Jam Nizamuddin-II are attached at – Annexure-V)***

10. ***Takes note*** of the…… and ***also requests*** the State Party……

i) plans to renovate the main gate at the property	The construction of main gate of the property was a laborious task, but it was conceived in order to protect the site, erection of main gate was an inevitable work. Visitor management is made effective after construction of main gate, which will be completed in near future. Keeping in view the sanctity of site, the Director General (Antiquities & Archaeology) erected a temporary fence to control the direct access of visitors to site. Now the visitors, instead of entering from the east of site near the shrine of Abdullah Shah Ashabi, enter the site from the main gate, thus the visitor management has become efficient.

	The construction of main gate at the property and installation of fence near the shrine of Abdullah shah Ashabi have proved to be very beneficial in maintaining the visitors, the entry of cars, bikes, cycles has been strictly prohibited in the vicinity of site, even the heavy traffic along the main road has also been stopped. ***(Pictures of Main Gate and fence near shrine of Abdullah Shah Ashabi are attached at – Annexure-VI)***
(ii) to submit documentation including architectural details, materials schedules and visualizations, to the Word Heritage Centre for review by the Advisory Bodies, prior to commencement of works in conformity with Paragraph 172 of the Operational Guidelines;	Numerous documentation efforts have been made. We are also documenting the tiles that fell in 2022-Monsoon rains. The inventory is ongoing on site; the inventory system has been developed and improved. Around 15 crack monitors have been installed at site; the data is collected from crack monitors in order to improve documentation work. As per data of crack monitors, no significant movement has been noticed. **(Copy enclosed)** Mr. Rand Eppich, International Expert assessed the rain damages and suggested to conduct Documentation and thorough Survey of site in order to collect the data before carrying out immediate stabilization works. In this regard, the survey team of Directorate General of Antiquities & Archaeology helped the site manager to collect the data; the team investigated the nature of damages and did documentation work. The overall aim of documentation was to record a resource so that the site may be authentically preserved and interpreted. (Copy of documentation is attached) The documentation including architectural details, materials, schedules and visualizations was carried out in the following manner. 1. Inventory of the tombs with photography and drawings & drone photography. 2. The accurate topographic survey. 3. The laser scanning of material. 4. The photography of tiles work.

11. ***Reiterates its previous request*** that the State Party……..

Submit additional information about the works carried out to provide waterproofing of the Mausoleum of Isa Khan Tarkhan II, including particularly the reasons for the installation of such extensive areas of new paving, whether the historic pavement was documented, the use of different size pavers and the functionality of the new system;	The factual position is that no work of conservation has been carried out on the main monument of Isa Khan Tarkhan-II. Only work on the floor of the Monument has been done as per internationally recognized Conservation charter/ Manual under the strict supervision of very senior and well trained conservationists having vast experience of working on all world heritage sites of Pakistan. However, the floor of the monument was not original because original floor was replaced by Archaeological survey of India before partition and repaired by Federal department of Archaeology from 1976 to 1979. The Mausoleum of Mirza Isa Khan was highly endangered due to the penetration of rainwater in floor/foundation. The measures were taken to prolong the life of monument as floor stones were not only settled / caved but also were crumbled badly. The replacement of decayed floor was essential to drain out the rainwater properly to stop further settlement and tilting of monument. If this pavement had not been provided, the mausoleum had suffered loss to an unimaginable extent from 2022-Monsoon flooding. We assure the World Heritage Committee that no such work will be carried out which is against the standards and principles of WHC. The state party is fully aware about the standards and principles of conservation of World Heritage Sites, all the immediate stabilization actions and conservation works have been carried out as per guidelines of expert and Conservation Manual. and all the works are being carried out accordingly. ***(Pictures of new paving in the area of mausoleum of Isa Khan Tarkhan-II are attached at – Annexure-VII)***

12. ***Notes*** the……..... but ***further requests*** that……

(i) Deferral of the proposal for a minor boundary modification to be prepared in line with Paragraphs 163-164 and Annex 11 of the Operational Guidelines and reflecting the boundaries identified in 2013, along with a	The state party is well aware of the postponement of the proposal for a Minor Boundary Modification to be prepared in line with Paragraphs 163-164 and Annex 11 of the Operational Guidelines and reflecting the boundaries identified in 2013 along with a regulatory plan for the proposed Buffer Zone. The boundary wall of the site has been completed and the state party have officially adopted the boundaries as identified in 2013.

regulatory plan for the proposed buffer zone	It is rightly said; "buffer zones are the aura that surrounds a special place" These intermediate areas are critical to protecting the values of a World Heritage property. Buffer zones are considered "important tools for conservation". The "protection of the surroundings of the inscribed properties is considered an essential component of the conservation strategy". Hence, for the effective protection of the nominated property, a buffer zone is inevitable.
(i) This proposal be prepared and submitted for review by the Advisory Bodies at the earliest opportunity;	The proposal for the Minor Boundary Modification has been prepared by the State Party in line with Paragraphs 163-164 and Annex 11 of the Operational Guidelines and the same has been shared with expert for necessary amendment; as it will be finalized, the same will be submitted for review by the Advisory Bodies.

13. ***Requests*** the State Party……

to submit to the World Heritage Centre, by 1 February 2024, an updated report on the state of conservation of the property and the implementation of the above, for examination by the World Heritage Committee at its 46th session.	The State Party (Culture, Tourism, Antiquities & Archives Department, Govt. of Sindh, Pakistan) is hereby submitting the report before the deadline, within stipulated time for examination by the World Heritage Committee at its 46th Session.

WAY FORWARD

- The heavy rainfall of 2022 was unprecedented, with three times more than normal, and floodwaters covered up to 70% of Sindh. Makli, recognized internationally for its Outstanding Universal Values as a World Heritage property and as a living memorial with 21 active shrines visited by thousands of people weekly. The site was well prepared for a regular monsoon. However, the intensity and duration of the 2022-Monsoon flooding was exceptional and not entirely expected. There is need to be cautious enough to cope with climate change.

- Historical Monuments at Makli, Thatta sit on an ancient bluff above an old bend of the Indus River. The geology below is inherently unstable as it is made of hard and soft layers. In addition; the water often ponds in shallow areas as there is inadequate drainage or compact soil.

- In this regard, keeping in view the geology of site, a well-planned Drainage System will be documented and provided to site so that the rainwater is not accumulated around the monuments, graves, platforms and canopies.

- Climate Change has increased the likelihood of extreme rainfall that led to flooding in Pakistan in 2022. In the wake of such natural disasters, the Directorate General of Antiquities & Archaeology, Sindh has trained a team at site to combat the natural disasters like heavy rains, flooding etc.

- The DRR & Conservation Plan of site has been prepared. Both present the current condition of the tombs, monuments canopies, platforms and graves. These plans will help outline a preservation / conservation strategy for the monuments and mainly focus on certain aspects of development that need to be implemented before onset of monsoon.

- All the existing issues in conservation and preservation of site will be addressed in the light of DRR and Conservation plan of the site; including the stabilization works of severely damaged tombs like Sheikh Jiyo.

Public Access

The State Party allows the World Heritage Centre to upload the full State of Conservation Report for public access on the World Heritage Centre's State of Conservation Information System database. *http://whc.unesco.org/en/soc*

We are eager to share our accomplishments to protect the World Heritage property Makli, this SoC Report will also be placed in our documentation centre at Makli as a resource for scholars and visitors on site. The information will also be made available on the new website of Department of Antiquities Government of Sindh,@ *https://antiquities.sindhculture.gov.pk/*

One can find information and update of works and initiatives taken by Directorate General (Antiquities & Archaeology) regarding all sites throughout Sindh Province on the website mentioned above. The activities at sites, maps, publications, photographs etc. available on the website project a sketch and overview of efforts of this Directorate General in preserving and conserving the sites.

We encourage you to visit the website.

Appendix

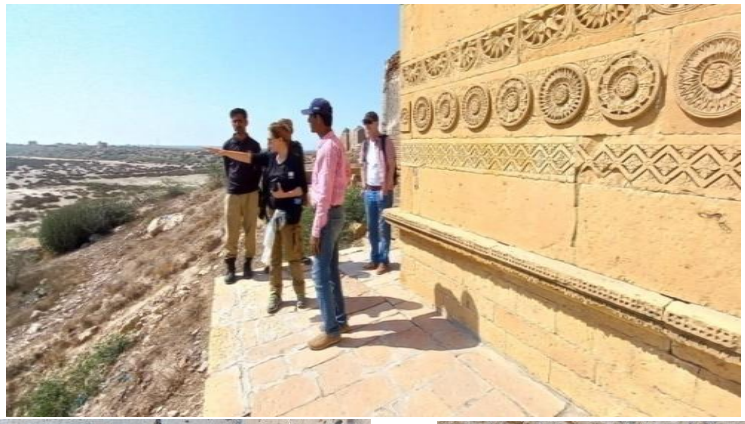
ANNEXURE-I

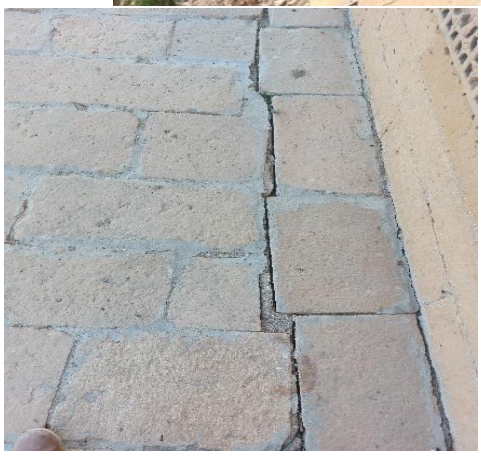
MONUMENT WISE PICTURES OF DAMAGES ALONG WITH DAMAGE DESCRIPTION

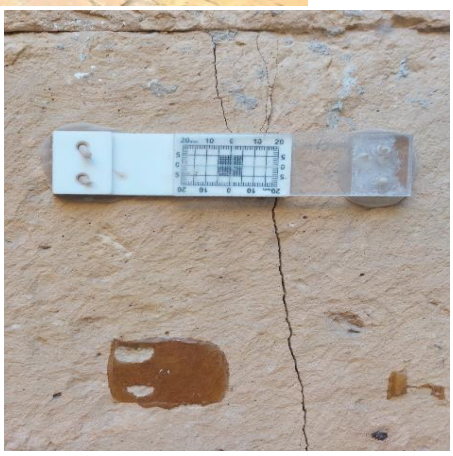
TOMB OF JAM NIZAMUDDIN-II

This monumental tomb is at particular risk because it is located at the head of the slope and has been moving due to differential settlement for approximately 100 years. The experts assessed the tomb immediately after the monsoon and determined that it has not suffered significantly during the rains. However, over time it has suffered from cracks and wall distortion caused by rough weathering and erosion of the slope on which it stands. Monsoon torrential rains affected the exterior portion of tomb including the foundation of the structure. During this monsoon, the rainwater penetrated into the foundation and eroded the platform, although this is difficult to measure.

Even though it appears that the monsoon of 2022 did not seriously affect Jam Nizamuddin, a long-term project must be made for the stabilization of the monument immediately, given its significance and contribution to the Outstanding Universal Values of Makli. However, some stabilization work is required on this Monument.







UNESCO assessing the impact of the monsoon on the Tomb of Jam Nizamuddin-II

LALI TOMB

The tomb is located at the head of the slope, there has been some erosion that has resulted in structural cracks throughout the remaining monument walls and squinches indicating a continuing differential settlement. The cracks appeared due to the loss of surface plaster as the continuous rains washed the material and entered the masonry. This is understandable as the interior of the main space is exposed to the extremes of weather; it is in an inevitable state of disintegration and total collapse. It is recommended to continue monitoring, inspection of the wall capping, repointing, and eventual re-plaster.

AMEER KHANI GRAVEYARD

This graveyard was not treated before the 2022 monsoon. This complex structure was badly damaged in the monsoon with a portion of the arch from southern side that collapsed and another annexure structure from east northern of the site has been partially damaged. Both structures needed emergency stabilization and restoration work. The emergency works must take place immediately.

COLLAPSED DOMES

Unfortunately, a dome of a tomb (unknown) in the middle of the Makli Necropolis collapsed due to the heavy rains. This structure was not worked on before the 2022 monsoon. The documentation of this tomb was done before the collapse. The significance of this tomb was its dome and contribution to the landscape of the necropolis. Because the documentation was conducted and the original materials are in place, it could be reconstructed.

Aerial view of Dome of Hazrat Peer Aasaat tomb before and after rains.

TOMB OF HAZRAT PEER AASAAT

The tomb of Hazrat Peer Aasaat was already in poor condition and unfortunately, the dome collapsed in the monsoon of 2022. The walls of the tomb were already heavily damaged, especially from southwestern side as some portions previously collapsed and heavy cracks appeared on the walls. Monday 12th of August 2020 during heavy rain two walls on the north and western side became unstable. This tomb needs emergency stabilization and conservation work. This demonstrates a pattern that continuing heavy monsoon rains first weaken a structure, leading to a later collapse.

Aerial view of an unknown tomb in 2019 on left side and in 2022 after rains on right side

AN UNKNOWN GRAVE DAMAGED

Dozens of rubble stone minor graves have been seriously affected and some of them destroyed during last torrential monsoon rains of 2022. The weathering from erosion and wind exposed the core of the loosely bonded earthen masonry and with the passage of time mortar between stones was eroded and bonding was broken.

AN UNKNOWN PLATFORM DAMAGED

Several (eight) known and unknown stone slab platform tombs were damaged in rains. Water entered the core of the rubble masonry walls eroding the mortar and this led to a detachment of the facing ashlar stone. This is concerning as it indicates structural deficiencies within the masonry wall, but it is easy to remedy if action is taken before the next monsoon. The masonry must be cleaned, the facing stone saved and replaced. Lime mortar grouting should be tested in the weak rubble core taking care not to have any visible from the outside.

FAMILY ENCLAVE OF MIRZA ISSA KHAN TARKHAN-I

The early 16th century family enclosure of Issa Khan Tarkhan I suffered a collapse of the tomb platform. Loss of mortar in the masonry vault led to the detachment of bricks and failure of the vault leading to a collapse. This contributed to the extreme degradation of the monument. This also led to loss of the surrounding masonry wall and massive loss of the finish stone. During the heavy monsoon of 2022 southern side of raised plate form was seriously damages which needed more attention and emergency stabilization to avoid additional damage.

Rainwater penetrated inside the foundation and weakened the brick subsurface structure

The experts while assessing the rain damages at this enclave highlighted that if immediate measures are not taken, the platform will suffer more damages because the foundation of structure has been badly damaged due to penetration of rainwater. The platform requires conservation work in order to help conserve the structure. Emergency works were undertaken and the brick vaults secured, but more work is needed. This is a similar case with all other platform tombs.

KHANQAH OF HAMAD JAMALI

The Khanqah of Hamad Jamali lies in the north of Jam Nizam's Tomb. Presently, only a portion of the Mehrab is left. Due to rains, the sides of structure have collapsed with only limited surviving portions.

MUGHAL CLUSTER & SAMMA CLUSTER

The monumental tombs at both of these clusters suffered minor damages while the minor graves in these clusters were badly affected during heavy rains. The rain water entered the core of the wall and detached the facing stone causing a partial collapse and detrioration of the graves. This was particularly evident in the tombs with an decorative enclosure wall constructed of rubble masonry with stone facing. It was impossible to know the status of the interior of the walls prior to the monsoon. These must be repaired as soon as possible to avoid further loss in the upcoming monsoon season.

Not only heavy rains and flooding affected the tombs, graves, platforms, and canopies of Makli Necropolis but also the subsequent wild growth of unwanted grass. This was because of two distinct impacts.

1) The growth of grass and small shrubs on platforms, graves and near canopies. The roots penetrated the stone structures and should be removed because the vegetation will harm the stone structures.

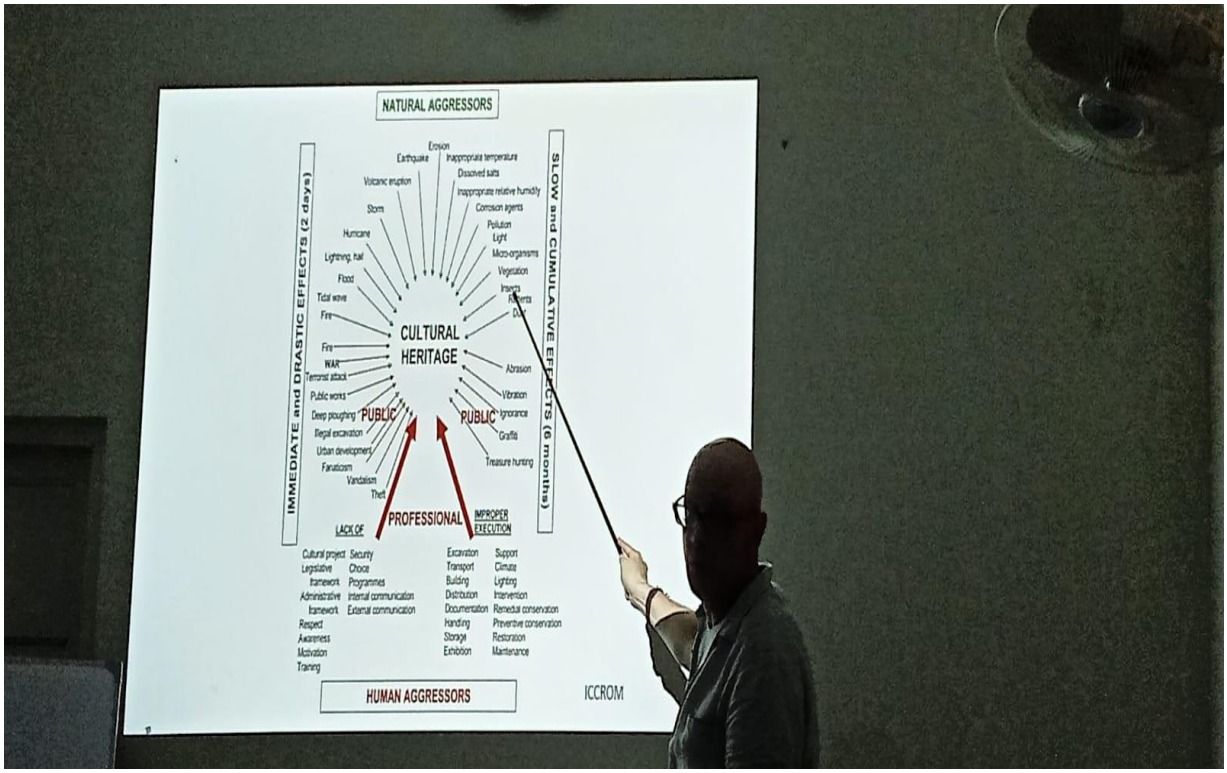
2) The fires of the grasses after the monsoon. This blackened several of the minor tomb markers.

IMAGE SHOWING WILD GROWTH OF GRASS AFTER RAINS

The experts suggested eradicating the unwanted grass in such a way that the tombs are not affected during removal of grass. The roots of grass badly affect the base and foundation of monuments, which is dangerous for monuments if not removed while the plants are young and roots have not penetrated deeply into the masonry.

ANNEXURE-II

WORKSHOP PICTURES



ANNEXURE-III

SIGN BOARDS, SIGNAGE & INFORMATION BOARDS FOR FACILITATING VISITORS


CULTURE, TOURISM & ANTIQUITIES DEPARTMENT
Government of Sindh
NOTICE
UNESCO
PROTECTED MONUMENT
Under the provision of the Antiquities Act.1975, Any person who damages or disfigures this monument will be liable to imprisonment which may extend to three years or to a fine which may extend to Rs. 500,000/- (Five Hundred Thousand Rupees only) or to both.
Director General Archaeology
Government of Sindh
قديم آثارن جو تحفظ
تحفظ آثار قديمه


WORLD HERITAGE SITE
MAKLI NECROPOLIS
unesco


BAQI BAIG
TUGRAL BAIG

FACILITIES FOR TOURISTS

GUEST HOUSE

GUEST HOUSE

Staff office

Site Manager Office

CONFERENCE HALL

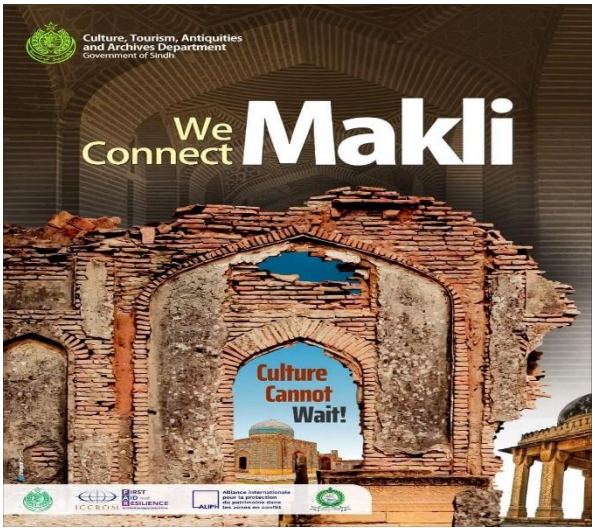
DINING HALL

MULTIMEDIA SYSTEM

INFORMATION DESK

ANNEXURE-IV

CAPACITY-BUILDING PROGRAMMES



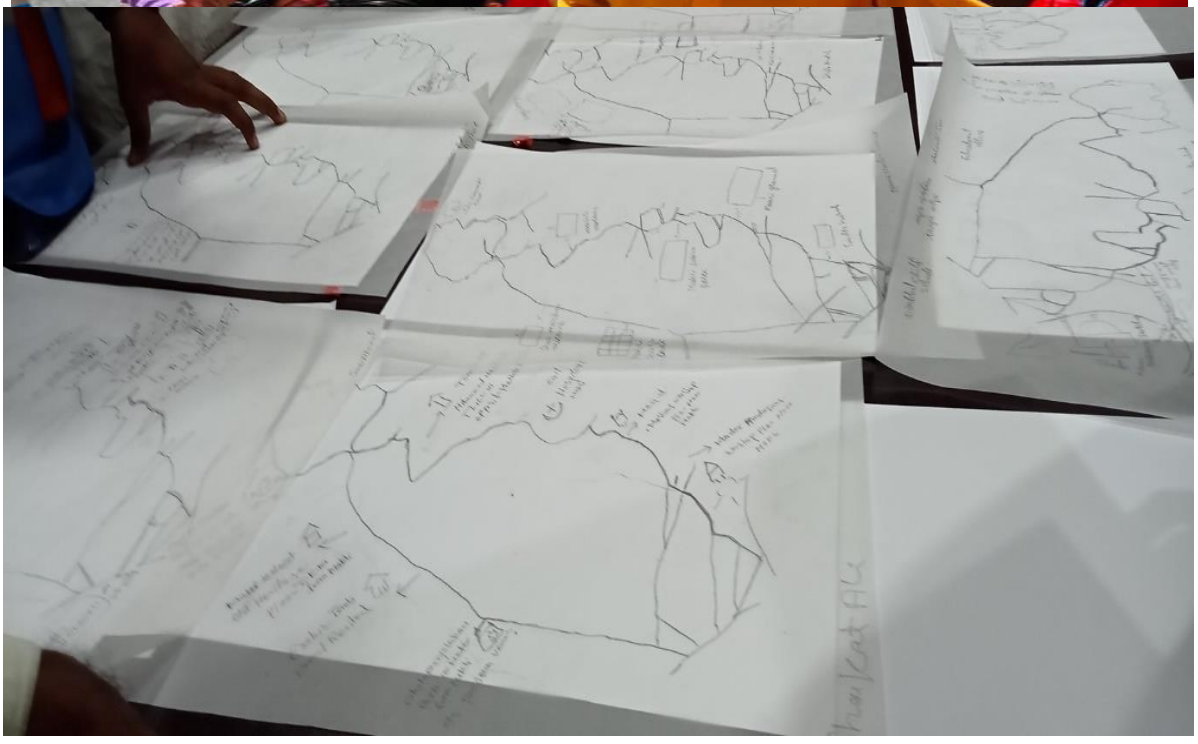

Makli


We Connect
Makli


We Connect
Makli

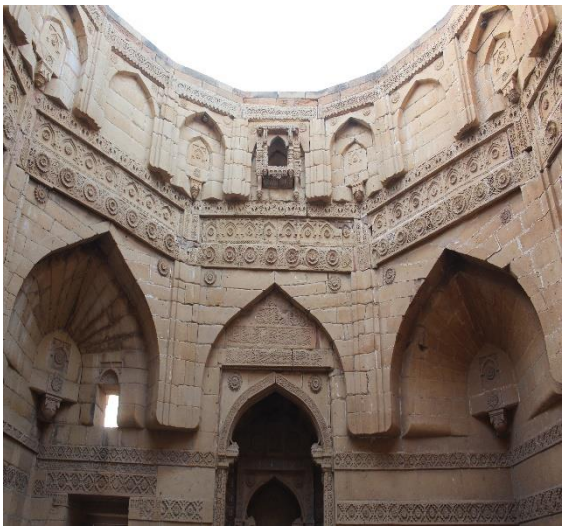
ON MANAGEMENT, STONE CONSERVATION, CONSERVATION OF MOVEABLE HERITAGE AND DETACHED ARCHITECTURAL ELEMENTS INCLUDING DOCUMENTATION (OPPORTUNITIES FOR STAFF)



ANNEXURE-V

PICTURES OF PRESENT CONDITION OF MAUSOLEUM OF JAM NIZAMUDDIN-II



ANNEXURE-VI

(A) PICTURES OF MAIN GATE

(B) PICTURES OF FENCE NEAR SHRINE OF ABDULLAH SHAH ASHABI

Near the tomb of Hazrat Abdullah Shah Ashabi there was an open space from where stray dogs, donkeys, goats etc used to enter into site. Therefore, we installed a net grill there to stop the entry of wild animals and to maintain the visitor management plan.

ANNEXURE-VII

PICTURES OF NEW PAVING IN THE AREA OF MAUSOLEUM OF ISA KHAN TARKHAN-II

If the new pavement had not been provided the rainwater would have penetrated into the foundation of mausoleum and resulted in more damage to this significant structure.

Field Mission Report 2022 Monsoon

World Heritage Property of Makli Hills

Figure 1 The tomb of Meerza Jan Baba at the edge of the site with flooded lowlands in the distance (Eppich)

United Nations Educational, Scientific and Cultural Organization

Historic Monuments at Makli, Thatta inscribed on the World Heritage List in 1981

Culture, Tourism, Antiquities & Archives Department

Government of Sindh (Pakistan)

March 4, 2023

Table of Contents

Acknowledgments

The team at Makli, who worked on this report, wishes to thank Dr. Christina Menegazzi and Jawad Aziz of the UNESCO Islamabad office for taking the time to understand the site and its challenges. Thanks must also go to Ms. Nao Hayashi, the World Heritage Centre of UNESCO and for the rapid response of UNESCO during and after the monsoon.

The team must also express gratitude to the leadership and management of the Directorate General of Antiquities for supplying materials and labor during and immediately after the monsoon and arranging the visit of national and international experts. Special thanks to the Minister of Culture, Tourism & Antiquities, the honorable Sardar Ali Shah; the Secretary of Culture, Tourism & Antiquities Department, Mr. Dr. Naseem ul Ghani Sahito and Director General Manzoor Ahmed Kanasro of the Directorate General Antiquities Department. Finally, the Director of Archaeology, Abdul Fatah, must be thanked for his deep and long-term dedication to Makli and the cultural heritage of Sindh.

This report was prepared in cooperation with the site managers and has been issued to the Department of Antiquities of Sind. If there are any questions or concerns, they can be contacted at:

021-99212126 dgantiquities@gmail.com www.antiquities.sindhculture.gov.pk

Sincerely,

Rand Eppich, Ph.D. Conservation Architect

Serfraz Nawaz, Archaeological Site Manager

Ghayoor Abbas Syed, Site Curator

Zahida Quadri

Executive summary

It is encouraging to see the dedication and commitment of the Department of Antiquities and the Site Managers. There were numerous interventions during the disastrous monsoon of 2020 and immediately afterward. These interventions and the gravity of the situation are discussed in the Makli Monsoon Report of November 2022. The purpose of this mission report is as follows:

- Assess the work since the monsoon last year
- Prioritize conservation measures in the coming months
- Develop a list of supplies and equipment
- Inspect other areas unrelated to the monsoon
- Recommend activities from conservation to governance

This report is divided into five sections

1) Assessment of the work since November 2022 and revisit of the damaged tombs from the monsoon. This also includes a detailed inspection along the eastern boundary of the site, given the unstable geology at the head of the bluff.
2) Inspection of other areas, including the administration zone, the projects by the Endowment Fund Trust, the western boundary walls, some active shrines, and new construction
3) Materials and equipment list to carry out conservation of tombs impacted by the monsoon
4) Workshop on Conservation and Disaster Risk Management that was attended by site staff and the nearby site of the Shah Jahan Mosque in Thatta and participation with a local N.G.O.,
5) Conclusions and recommendations are followed by an annex that includes a schedule of the project and mission and reference maps.

Key findings

The consolidation work, cleanup, and drainage near the main gate are acceptable and commendable but should expand to selected monumental tombs including in the priority list

There has not been any noticeable degradation since November

The smaller grave markers and platform tombs along the eastern edge of the site are at serious risk of erosion

Equipment on site is sufficient for small platform tombs or grave markers but not for larger monumental tombs

New burials are an ongoing concern, with some new graves with inappropriate materials noted

A new fence at Shrine Darbar Syed Abdullah Shah Ashabi Alaihrehma has been erected to control the heavy influx of pilgrims

New constructions have been created, including a new memorial canopy and ongoing construction of a new main gate

Recommendations

Given this second mission and inspection, the following recommendations have been suggested in three categories, immediate emergency conservation, longer-term conservation measures, and management and guidance:

Emergency conservation

1) Emergency works on two key monumental tombs and four platform tombs
    a. Shikh Jiyo
    b. Unknown tomb northeast of Sheikh Jio
    c. Platform tombs north of Sheikh Jio
    d. Caulking, cleanup, inspection, and monitoring of Jam Nizamuddin
    e. Anastylosis of all small grave markers along the entire eastern edge of Makli
2) Extensive drainage plan study and excavation with more detailed documentation

Near future conservation

3) Ameer Khani enclosure
4) Issa Khan II
5) Unknown tombs and platforms (10)
6) Juman Jatti
7) Dewan Shurfa Khan
8) Jamia Masjid Mai Makli
9) Sunjo Qubo
10) Renewal of historical paths
11) Archaeological investigations into the historic drainage of the site and renewal and reuse of this drainage system to the step well that was cleaned

Management and guidance

12) Reinvigorate the Steering Committee – International Members must be included in the decision-making process, especially regarding any proposed new construction and prioritization of conservation for the protection of OUV or any works on the monumental tombs
13) Incorporate Heritage Impact Assessment (HIA) as per the Operational Guidelines to the World Heritage Convention
14) Renew and endorse the Site Management Plan
    a. Update and improve the Disaster Risk Reduction chapter
    b. Include a section on HIA
    c. Improve the governance chapter, including the Steering Committee
    d. Reevaluate the living heritage aspects of Makli
15) Monitor Heritage Foundation Pakistan's work and that of the Endowment Fund Trust
16) Execute extensive documentation
    a. Reinstall polycarbonate crack monitors at Jam N and other locations
    b. Orthophoto of the entire site to high resolution 4cm GSD for a topographic map for drainage and an update to the survey
17) Ban smoking on site, raise awareness of the dangers, erect no-smoking signs
18) Improve the water supply on site

Assessment of work since November 2022 mission

Introduction

The monsoon of 2022 was unprecedented. Rainfall with three times more than normal, and floodwaters covered up to 70% of Sindh. In addition, over 2 million homes were damaged or destroyed, 1.2 million hectares of agricultural land were damaged, and 13,000 km of roads have also reportedly been damaged (Reliefweb)[1].

The Department of Antiquities of Sindh acted during and after the monsoon to protect not only the two World Heritage properties but also over 300 other monuments. But it was an overwhelming situation. An urgent request went out to the World Heritage Fund, and the World Heritage Centre of UNESCO reacted. Funds were immediately dispatched to the regional Government of Sindh. This resulted in a series of actions, including an in-depth inspection immediately after the flooding by the Site Manager Serfraz, which resulted in the first field report, and this was supplemented by online meetings and, as soon as possible, a two-week field mission in November 2022. This mission resulted in a more comprehensive investigation and inspection of the damaged areas. A follow-up mission was also planned for February 2023, and this mission report relates the findings. The mission was conducted during a one-week field mission in February 2023 between February 26th and March 2nd.

Goals and objectives of the 2nd mission:

- **Follow-up on ongoing work started soon after the monsoon**
- **Inspect a second time the tombs most seriously impacted and finalize the priority list**
- **Introduce the new UNESCO cultural heritage expert from Islamabad to Makli and its challenges, recent work, and the impacts of the monsoon**
- **Conduct a workshop for the staff on conservation and disaster risk preparedness**
- **Create a list of materials, supplies, and equipment to continue conservation efforts**

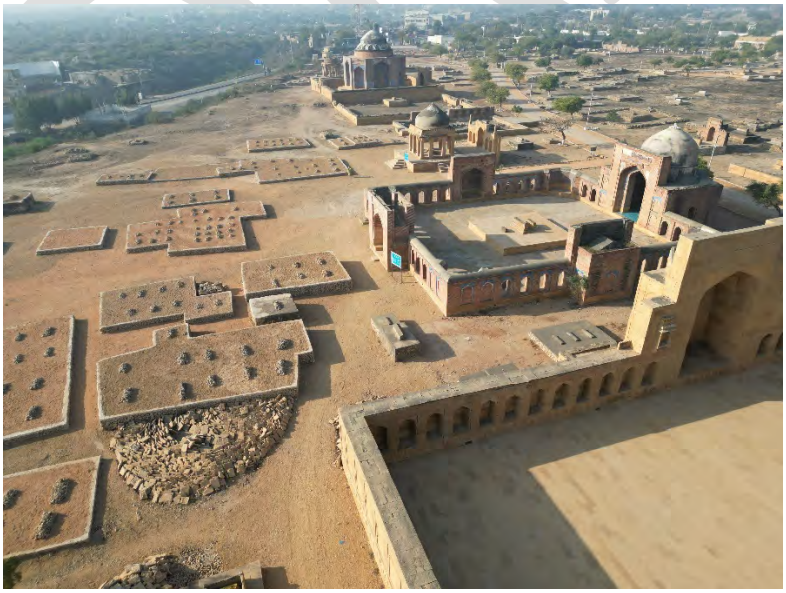


Figure 2 Overview of the Mungal period cluster near the main entry after improvements in drainage, cleaning of burned areas, and consolidation of the platform tooms (Eppich)

[1] https://reliefweb.int/report/pakistan/pakistan-2022-monsoon-floods-situation-report-no-7-23-september-2022

Recent consolidation work

There were numerous works initiated soon after the 2022 monsoon that was ongoing during the last mission, and other works started. The scope of this work is principally around the Mungul Cluster near the main gate and includes the following:

- Addressing the poor drainage near the monumental tomb of Isa Khan II by raising the level of the ground through infilling to create positive drainage
- Removal of vegetation growth near this same area and cleaning of the burned areas
- Consolidation of numerous platforms near the monumental tombs around Isa Khan II
- Compaction of the soil topping and creation of a slope to disperse rainwater
- Continued cleaning of scuppers within the enclosed tombs in all three groups and the creation of drainage channels at the southernmost cluster
- Cleaning of the historic stepwell and preliminary investigation of the historic drainage
- Removal of the building conservation materials away from the wall of Isa Khan II
- Prevention of trucks delivering materials to the east of Isa Khan II

Overall, the work executed is acceptable and used appropriate materials in lime manufactured on site with the replacement of the rubble stones in the masonry or securing the decorative ashlar stones. The materials are salt-free, are in most cases, the original brick detached from A lime mortar topping and repointing at the top of the platform walls was included, and this could be improved with more careful application and through the addition of colored mortar. Although over time, the mortar will gain a patina, as this is only an aesthetic issue. The area around Isa Khan II receives the largest number of visitors as it is the closest tomb cluster to the main gate and highway. Thus, the soil becomes compacted and prevents percolation into the naturally porous stone underneath the site. Visitors also use the nearby platform tombs as places to sit or stand, thus disturbing the small retaining walls or ashlar-facing stones. V.I.P. visitors also park at the northern space just off the main road, also compacting the soil.

Figure 3 Restoration of a rubble masonry platform tomb near the monumental tomb of Isa Khan II that was damaged in the monsoon. Above, before, blow after (Serfraz Nawaz)

Figure 4 Restoration of an octagonal rubble masonry platform tomb just off the main road that was damaged in the monsoon. Above, before, blow after (Serfraz Nawaz)

Figure 5 Restoration of a cut stone platform tomb near the monumental tomb of Isa Khan II that was damaged in the monsoon. Above, before, blow after (Serfraz Nawaz)

Figure 6 Aerial foto, above, before, blow after of the areas of cleaning and improved drainage in between the tombs of Isa Khan II and Jan Baba (Daud Jatoi)

Figure 7 Aerial foto, above, before, blow after of the areas of cleaning and improved drainage in between the tombs of Isa Khan II and Jan Baba (Daud Jatoi)

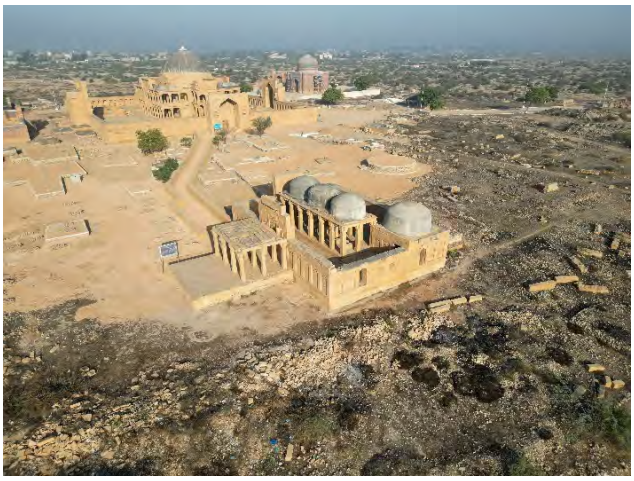


Figure 8 Another view of the tomb of Meerza Jan Baba. The recent interventions can easily be seen in and around this tomb which extends around the tomb of Isa Kahn II (Eppich).

Figure 9 The historic stepwell was cleaned, and preliminary investigations into the drainage channels that lead to this well were conducted. However, more in-depth archaeological research must be undertaken to determine if these can be reutilized for drainage

Figure 10 The work is generally well executed, with the correct materials, lime mortar created on site and the original bricks, or replacement bricks of the same dimensions and composition. However, the mortar could be colored to better blend in with the age-value patina of the lower masonry courses. This is a small detail, as time will add to the patina.

Figure 11 The impressive step well at the south of the site has been cleaned and can be used as a natural drainage. However, the historic channels leading into the well must be carefully investigated (Eppich)

Inspection of monumental, enclosed, and platform tombs

An inspection was made of the tombs most damaged during the 2022 monsoon, as work has not yet started. These tombs are extensively discussed in the November 2022 report. This was done to reassess the priorities from the last report, determine if any changes have been made since November 2022, and introduce the site and issues to the new UNESCO expert from Islamabad. A map has been included in the Annex.

Shiek Jeo

The inspection began at the monumental tomb of Shiek Jeo, which is an active shrine. This tomb was severely impacted by the monsoon, but it is easy to dismiss the impacts given its large size and durability. The effects of the monsoon were exacerbated by numerous modern interventions, including the concrete slap to the south, impermeable materials in the interior (tile and concrete), and the application of portland cement mortar at its base. The impacts of the heavy rains and flooding also increased due to the archaeological ruin of the enclosure wall and the popularity of the shrine that has compacted the soil around the tomb. Finally, its sheer mass prevents easy access to the upper levels of masonry, and the masonry can capping are in poor condition. Shiek Jeo has never been worked on before by the Directorate.

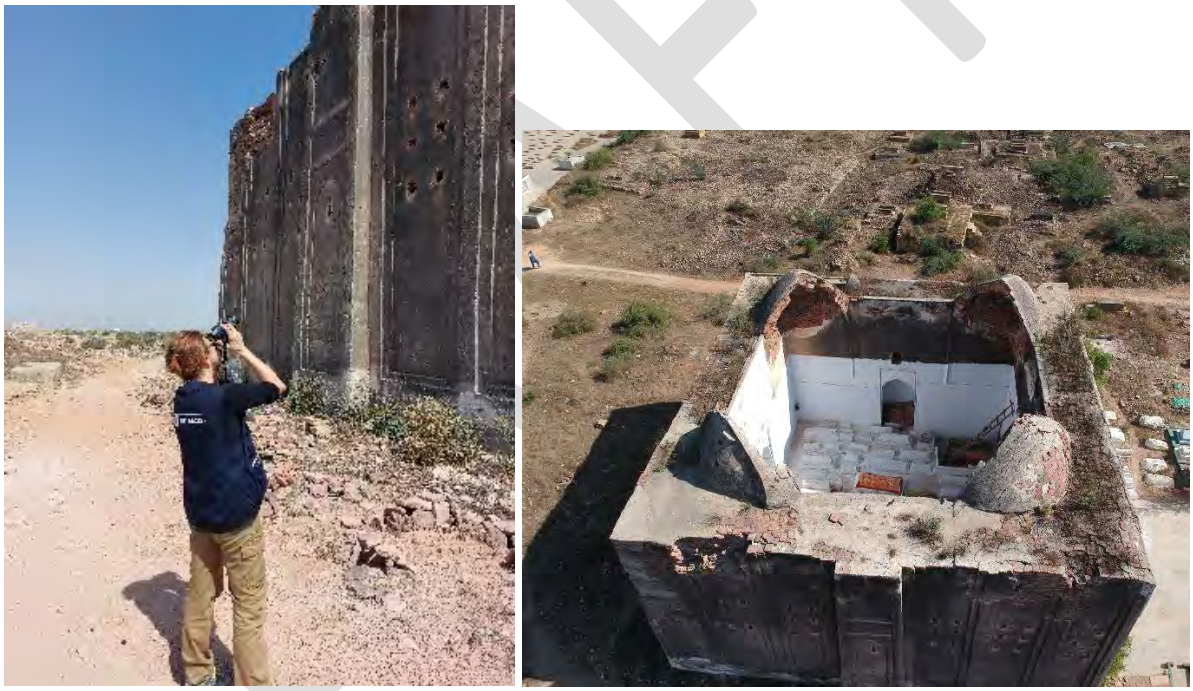


Figure 12 Inspection of Shiek Jeo. This significant tomb was damaged in the monsoon and is of a sensitive nature as it has a permanent caretaker and is an active shrine that is heavily used several times per year. Left, UNESCO expert Christina Menegazzi inspects the loss at the top of the wall. This is evident from the drone photo in the right image. There is also damage at the base from inappropriate portland cement patches in the plaster and the retention of water at the base of the wall due to the remains of the boundary wall.

Unknown tomb

To the northeast of Shiek Jeo, there is an unknown tomb that suffered significant damage from the monsoon. Unlike Shiek Jeo, it is not as massive and is at serious risk of collapse. Water had penetrated the masonry interior, the large facing ashlars had detached, and three of the four arches were in danger of imminent collapse. This is a unique tomb because it is a hybrid of the existing typologies; it is not an enclosure tomb as its boundary walls are significantly higher, yet it is also not a monumental tomb and was not originally designed to hold a dome. While not massive or monumental as other tombs, it contributes to the overall site and must be addressed. During this project, more research must be conducted. All of the ashlars and rubble masonry are still on site, so this is mainly a process of anastylosis and consolidation. Finally, a new trail should be constructed that would bring visitors to this tomb and raise awareness of its unique typology. This tomb has never been worked on before by the Directorate but was identified in 2017 as vulnerable.

Figure 13 small unknown tomb northeast of Shiek Jeo. This is a high priority given its poor condition and uniqueness (Eppich).

Enclosure tombs

To the north of Shiek Jeo, along the main road, there are three enclosed tombs, and the enclosed tomb of Hazrat Peer Mirran Mohammad Shah suffered from a loss of facing ashlars. These are not monumental tombs, and the damage is not severe, but if the problems are unaddressed, it will lead to continued loss of the facing ashlars. The work is not intensive, and the tombs are close to the road; thus, the consolidation work could proceed easily and quickly. One element that must be addressed is the wall capping on these enclosure tombs and an assessment of any possible underground vaulted tombs.

Figure 14 Small unknown enclosure tomb (Eppich)

Figure 15 Unknown enclosure tombs that have suffered from a loss of facing ashlars (Eppich)

Figure 16 Unknown enclosure tomb inspection. While the damages are not major, without addressing these smaller losses, the enclosure wall will eventually collapse. In addition, the tombs must be investigated for underground vaults (Eppich).

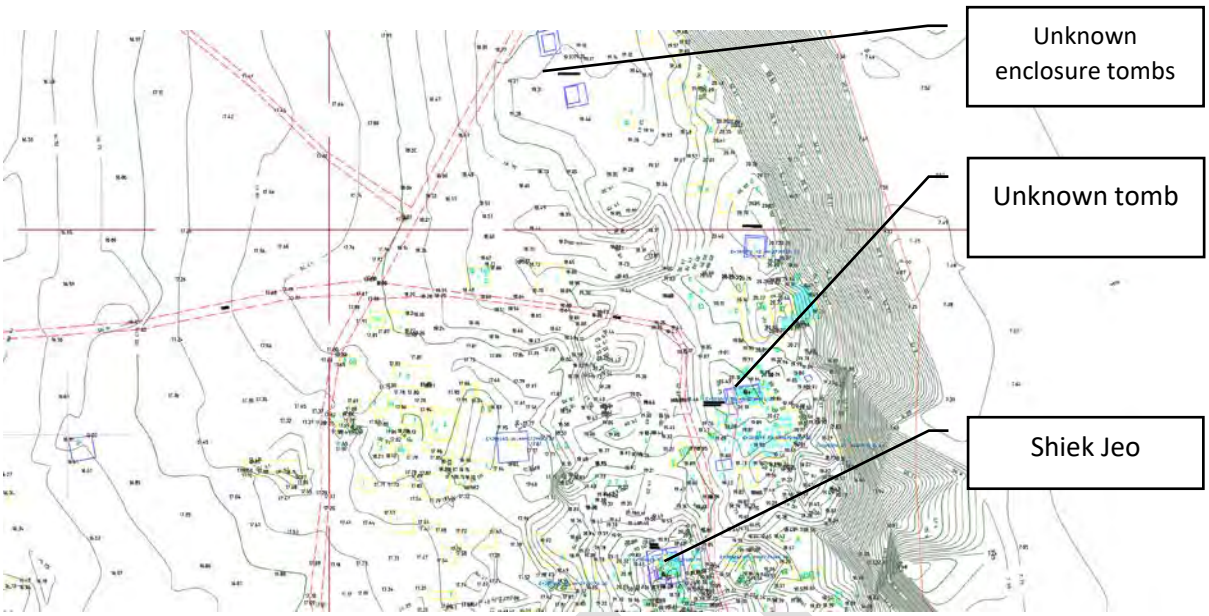


Figure 17 Survey showing the location of the unknown enclosure tombs north of Shiek Jeo, north is up, N.T.S.

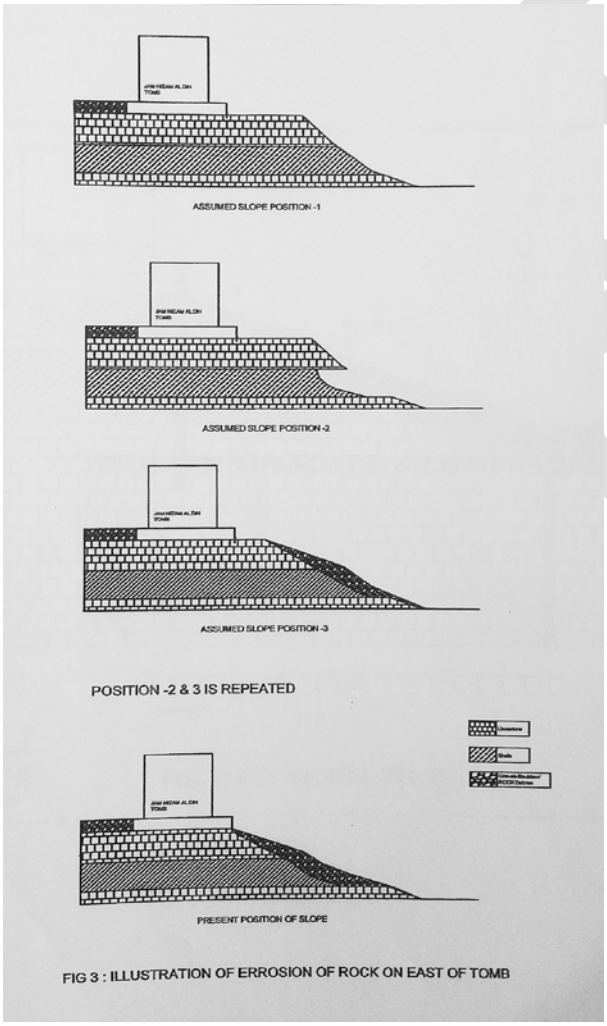


Figure 18 Slope erosion to the east of Jam Nizamuddin (Consolidated Engineering Services PVT Lt.) The legend reads from top to bottom, limestone, shale, rock debris

Jam Nizamuddin

Of particular importance is the monumental tomb of Jam Nizamuddin. Every visit to Makli must include an inspection of this tomb, given its significance and the precarious location at the head of the bluff, which is subjected to continual erosion. Fortunately, the previous inspection in November 2022 revealed that the tomb had not been damaged and suffered from little or no movement. Nevertheless, constant vigilance must be maintained. In addition, there should be some work on the tomb, including reinstallation of the polycarbonate crack monitors, downloading of the data from the RissFox Mini Data logger, and infilling of the crack at the base with lime putty to prevent additional water infiltration and possible erosion between the monument and base that was added in the 20th century. Even though it appears that the monsoon of 2022 did not seriously impact Jam Nizamuddin, a long-term project must be made for the stabilization of the monument immediately, given its significance and contribution to the Outstanding Universal Values of Makli.

Figure 19 Inspection of Jam Nizzamadin (Department of Archaeology photographer)

Figure 20 Left, the crack monitor, center the crack at the exterior base at the head of the slope, and a sketch of how water will enter this crack and erode the underlying soil. Figure 21 Right, polycarbonate crack monitors installed by Engineer Beckh were observed and showed a 1mm movement, but this was after the 2018 monsoon. Unfortunately, many crack monitors were lost (see below and right) and must be reinstalled for continued monitoring (Eppich).

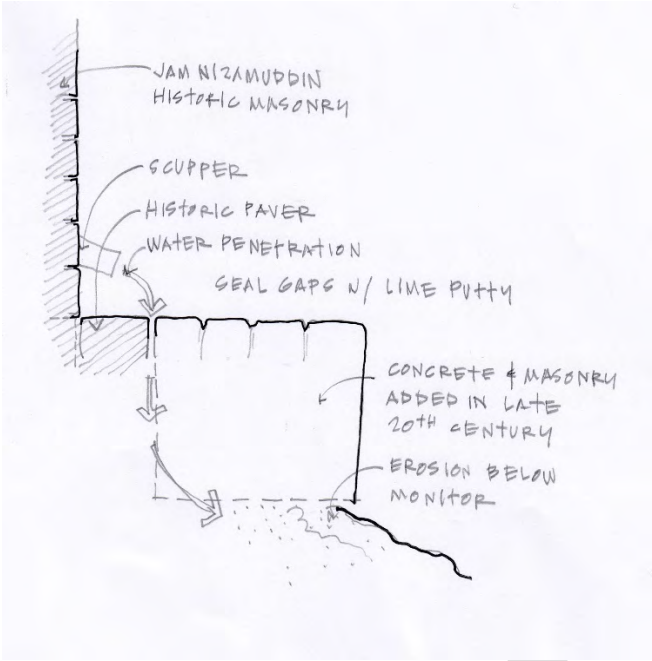


Figure 22 Sketch of the works necessary to seal the crack between the historic structure and the addition of the 20th century. This is ONLY a temporary measure and a long-term project for the stabilization of the monument must be started (Eppich).

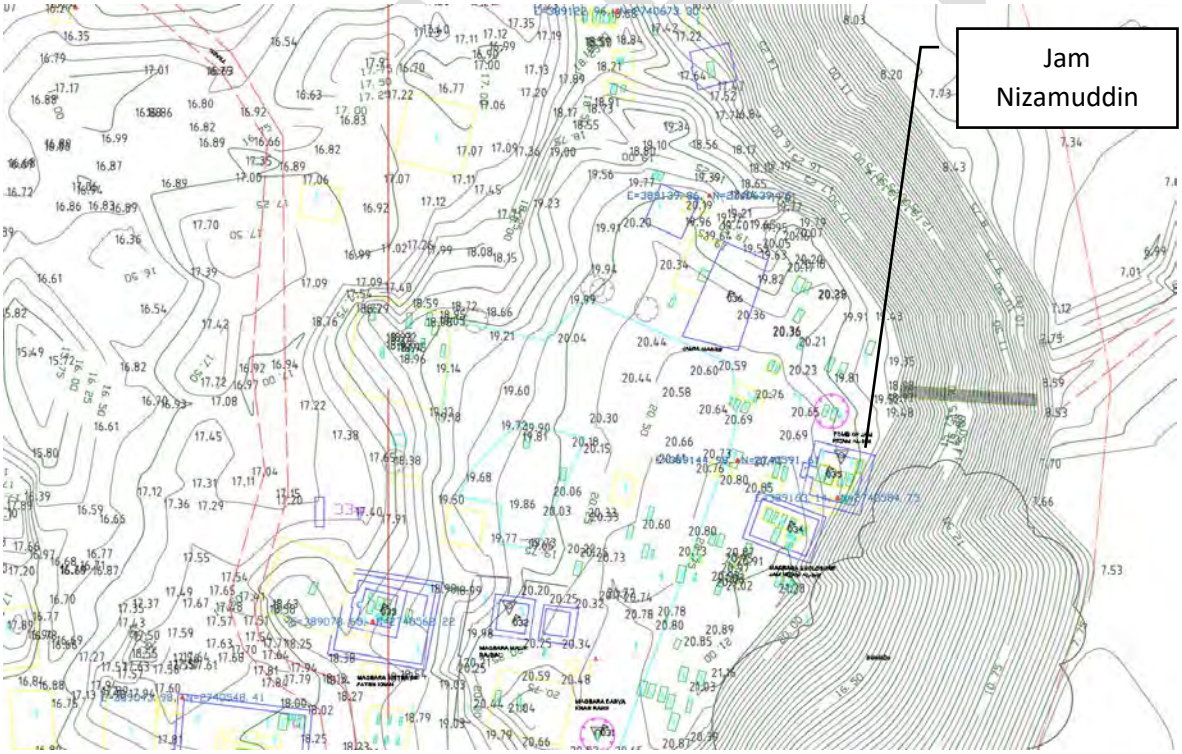


Figure 23 A detail from the topographical survey of 2016 near Jam Nizamuddin shows the relationship of the tombs to the head of the slope, north is up, N.T.S.

Inspection of the eastern boundary of the site

One of the most vulnerable aspects of Makli is the tombs along the head of the bluff that outline the eastern edge of the site. This is for three reasons: 1) Erosion from the monsoon and subsequent movement or collapse of large and small tombs, 2) the small community at the eastern edge of the site and their continued growth, and 3) pilgrim traffic to the most significant and popular shrine of Darbar Syed Abdullah Shah Ashabi Alaihrehma. Therefore, a detailed inspection all along this eastern boundary of the site was conducted from the main gate to Jam Nizamuddin. The underlying geology is described in detail in the geological report for Jam Nizamuddin, which is included in the Annex to this report. Although this report is concentrated on Jam Nizamuddin, it is similar geology all along the bluff and can be observed in all typologies of the tombs.

Smaller grave markers

Figure 24 Small unknown grave markers at the easter edge of the site. Many of these smaller grave markers were displaced during the 2022 monsoon due to unstable geology and heavy rains. These are some of the most vulnerable elements at Makli as they are small, not monumental, and often go unnoticed (Eppich).

Figure 25 Other small unknown tombs that have been displaced by the monsoon. Most are constructed without mortar on rubble masonry platforms. Fortunately, the masonry platforms can be restored, and the markers reassembled anastylosis. Right, there are other damages, such as the erosion of the platforms that expose the graves below (Eppich).

Figure 26 Other damages include the erosion of the platforms that expose the vaults of the tombs below.

Figure 27 An aerial image of displaced elements near the Mongul Cluster after the fire burned the vegetation that was nourished by the monsoon. Now it is especially important to address these smaller elements as there is less vegetation, and easier to work on (Daud Jatoi).

Enclosure tombs and shrines

Enclosure tombs and shrines along the eastern boundary were also inspected, as these are also vulnerable. These tombs are concentrated in the Tarkhan period and are often below the head of the slope and integrated into the small settlement to the east of the site. The inspection included Issa Khan I, Amir Habshad Bai, and Badi Uz Zamman Tarkhan. The tomb of Mir Mateen Baig was also inspected, and this is described in the section on projects by the Pakistan Heritage Foundation. The active shrine of Bagdadi was also briefly inspected.

Figure 28 Continued erosion of the access steps and eastern boundary wall of the enclosure tomb of Badi Uz Zamman Tarkhan, left. Right, a 3D model was created of the enclosure tomb of Amir Habshad Bai to document the erosion.

Figure 29 Advertisements and graffiti appeared in only one place on the enclosure tomb of Amir Habshad Bai. Although this only appeared in one location, diligence is necessary to prevent the placement of more placards. Right, the same tomb was inspected for erosion on the downhill side. While this is not a monumental tomb, nevertheless, it is a contributing tomb to Makli (Eppich).

Shrine of Darbar Syed Abdullah Shah Ashabi Alaihrehma

This important shrine at the eastern edge of the site was also inspected, and this is detailed later in the report.

Inspection of other areas

The final inspection was intended to cover a wide range of areas, including the Administration Area, which contains the conservation office, guest house, and western gate, which is used for access by dignitaries and delivery of materials. Other inspections include the projects by the Pakistan Heritage Foundation, the western boundary wall, the new fence at the Shrine of Darbar Syed Abdullah Shah Ashabi, the new main gate to the south, and the new memorial. In addition, another important issue was brought to the attention of the team members of the mission. This included a formal request for new burials by prominent families of Thatta. This request prompted an inspection of new burials along the eastern boundary of Makli.

Administration Area

There have been numerous improvements in and around the administrative area. This includes the installation and activation of a comprehensive weather monitoring system provided by the Japanese Government. A data report will be sent to the Directorate General and the site manager, but this transfer of data must be formalized. The first report has not yet been received. This will allow the deactivation of the three weather stations that the Reactive Monitoring Mission of UNESCO and ICOMOS recommended in 2017. The unfortunate weak link with the previous weather stations was that the site manager did not have time to download and analyze the data, and the stations required continuous maintenance. These stations are still functioning and could be moved to other sites, such as Mohenjo Daro. CCTV security cameras have also been installed at the gate and will supply a live and recorded video feed to the administrative offices, but it is not active yet.

Figure 30 Installation of CCTV cameras at the Administrative Area, installation of a new weather station by Japan, and the new storage building with important elements of decorated stone (Eppich).

Figure 31 Storage warehouse continues to operate, as well as the onsite conservation lab. These will come into more use following conservation efforts after the monsoon.

Figure 32 The workshop, offices, and demonstration space of the Pakistan Heritage Foundation, constructed of bamboo and earth, collapsed during the monsoon and created an unsightly entry for V.I.P.s. The debris should be cleaned, the remaining structures removed, and the site made presentable.

Heritage Foundation of Pakistan

The past work of the Heritage Foundation of Pakistan (HFP) on various monuments at Makli is commendable. Works include the conservation of the monumental tomb of Sultan Ibrahim and Mirza Jan Baba Khan Turkhan and detailed assessment and geological investigations at Jam Nizammudin.

The Heritage Foundation of Pakistan was co-founded by the first woman architect of Pakistan, Yasmeen Lari, with her husband, the historian Suhail Zaheer Lari. More information can be found on their website: https://www.heritagefoundationpak.org/Hf. Before the global Covid-19 pandemic, the foundation began work on the tomb of Merhoomi Wa Meghfoori Mir Mateen Baig[2] (not named in the foundation's materials as Muneer Maghfoori). This important tomb is located at the eastern edge of the site, almost within the small settlement, and contains important remains of Kashi or decorated tile and unique details. The pandemic halted all work on the tomb, and the site was abandoned. Fortunately, the bamboo scaffolding erected over the tomb did not collapse in the monsoon, but there were some issues with the masonry stairway and remains of the boundary wall, detachment and loss of Kashi tile, and collapse of the bamboo huts erected behind the tomb.

This tomb was inspected immediately after the monsoon and was described in the 2022 report. The tomb was again inspected in February 2023, and some vegetation has been cleaned, the collapsed bamboo huts removed, and the precarious scaffolding over the tomb removed. However, this is insufficient, and the conservation work should proceed immediately. There is significant erosion of the entry steps, and the gateway is in a precarious state. The bamboo huts were removed, but the site was left in disarray with debris with the remaining elements of the huts. Consolidation of the decorative kashi tile and supporting masonry should be carried out immediately. Critically, the underground (possibly vaulted) tomb must be investigated, documented, and structurally consolidated. The boundary walls and pavement of the platforms must also be conserved. Fortunately, Naheem Shah contacted the site in late March 2023 and notified the site manager that work would start again soon. The site must be inspected again in June 2023 before the next monsoon season.

[2] The complete name as mentioned in the book by Dr. K. Lashari, the Epigraphy of Makli

Figure 33 Left, the site has been cleaned and the bamboo scaffolding removed since the 2022 report, but Kashi tile and historic masonry consolidation must be immediately begun.

Figure 34 The bamboo huts have been dismantled and removed, but the site still requires significant cleanup. Right, the masonry entry steps and wall tops require consolidation.

Figure 35 Of particular concern is the subsidence of the surface masonry that makes up the main platform. By all indications, there exists an underground vault that requires structural stabilization. During the monsoon, many other tombs with platforms suffered from near collapse as these vaults were unknown. This situation should be investigated immediately.

Endowment Fund Trust

The Endowment Fund Trust (EFT) for Preservation of the Heritage of Sindh has conducted several projects at Makli. The Trust is a non-profit that receives government support and holds conferences, publishes books and articles on cultural heritage, and also executes conservation works. More information can be found here: https://www.facebook.com/eftsindh/.

Before the monsoon, they had several projects underway before the monsoon, and these continued after. These projects included Juma Jatti, Dewan Shurfa Khan, Jamia Masjid Mai Makli, and Sunjo Qubo. These two tombs were visited and described in the December 2022 report and did not suffer from the monsoon. This Trust was given permission from the Directorate of Antiquities to proceed with these projects following the monsoon and inspection. These are monumental tombs but not at the level of Jam Nizmaddun. Fortunately, the archaeological site manager from the Directorate now has direct involvement and will frequently visit all these projects.

Makli is a large and complex site with insufficient resources to address all the issues. Therefore there is ample room for the involvement of non-profit entities such as the Endowment Fund Trust and the Heritage Foundation of Pakistan. These entities should be welcomed for their efforts. However, all projects must be closely coordinated with the Directorate of Antiquities with the direct involvement of the archaeological site manager. The site manager must remain independent and be notified of the project in advance, the scope of the conservation, the professionals and workmen involved, and what materials will be used and how they will be applied. There should be frequent visits, preferably weekly, by the site manager, with reports submitted monthly to the DG in Karachi. All planned work should undergo a Heritage Impact Assessment and abide by international conservation standards with the World Heritage Centre of UNESCO notified. Although on a smaller scale, this same policy must also apply to all the individual shrine keepers. This policy was outlined in the management plan, but this requires an update.

Figure 36 Left, Jamia Masjid Mai Makli before work by the EFT and right after (EFT)

Shrine Darbar Syed Abdullah Shah Ashabi Alaihrehma

One major issue at Makli, not related to the monsoon, is the number of visitors to the very popular shrine of Darbar Syed Abdullah Shah Ashabi Alaihrehma. Many of these visitors wish to enter from the main gate or the gate at the administrative complex to the south and cross the entire site as it is more convenient. This has created unreasonable demands for cars to enter the site, especially during important festivals. The reaction of the Department of Antiquities was to erect a temporary fence to control access and direct it through the small village to the east of the site. This has reduced the number of pilgrims requesting to enter the administrative gate to the southwest of the site.

However, the shrine is still part of Makli, with historic structures and tombs within the complex. There are also tombs such as Issa Khan I, Amir Habshad Bai, and Badi Uz Zamman Tarkhan that will be somewhat isolated by this action. This action will also give the encroaching merchants free access to part of the site. Although temporary, a more permanent solution should be devised.

Figure 37 The situation at the eastern edge of the site at the Darbar Syed Abdullah Shah Ashabi Alaihrehma Shrine

Figure 38 Darbar Syed Abdullah Shah Ashabi Alaihrehma Shrine with the location of the fence and image from the ground

Western boundary wall

The western boundary wall was of particular concern to past Reactive Monitoring Missions. Therefore, a brief inspection was made of this wall and the small settlement encroaching to the west of the site. The boundary wall does not seem to have been impacted by the monsoon. The wall also has no blocked drainage that would impact the monuments to the east. It does, however, seem to have significantly reduced vehicular traffic onto the site, even though there are small gaps in the wall for the settlement. Resettlement of these families is taking significant time and has progressed somewhat. There are numerous issues related to relocation, yet it will take time. The small settlement does not seem to have been impacted by the monsoons as it is on higher ground. The two small cemeteries that hold new grave markers were also visited given the visit by local families requesting permission to bury their relatives at Makli. This is addressed in the next section.

It is not within the scope of this mission or report to comment on the relocation or new cemeteries, but it was important to assess the western portions of Makli for any monsoon-related issues or any impact of the newly constructed boundary wall on drainage.

Figure 39 Left, opening in the boundary wall for the small settlement within the site.

Figure 40 Right, new burials are just inside the boundary wall to the west of the site.

New burials

New burials have been an issue in the past. Reactive Monitoring Missions have insisted on a ban on new burials for obvious reasons. The new graves use modern materials that are incompatible with the settings, their placement is not carefully considered, and trucks and other vehicles drive across the site with little regard for the surroundings or historical environment. New burials, for the most part, have been stopped by the Directorate General of Antiquities upon the insistence of these past R.M.M.s.

During the mission, a group of prominent local leaders met with the UNESCO representative and the site management to request a moratorium on this ban. The leaders stated they had had family graves for two centuries in Makli, and they see the site as a living heritage and not as a necropolis. They also stated that they would respect traditional materials and comply with any directives or guidelines for new burials. This meeting was a surprise and not included on the agenda.

The response from the local UNESCO representative was to listen carefully and patiently and state the reasons for the mission – to assess the impact of the 2022 monsoon. The UNESCO representative suggested that the community put their concerns into a letter and request that one member be nominated to the Steering Committee. It was also mentioned that there are two sites to the west of Makli that could serve as possible locations. This idea was rejected as a few of the families have enclosures within the western portions of the site. A detailed inventory of these areas and delineation with orthophotos of the whole site can help in identifying these areas. These areas that the community mentioned are unknown, and the spacing within any enclosures. Finally, the suggestion was made that this issue must be considered at the Ministerial level and cannot be decided in the short term.

This visit prompted an inspection of the eastern portions of the site and a recording of the new burials using new inappropriate materials. Numerous grave markers dating from 2019 were noted. It is unknown if these are the areas of those who requested the meeting, but it highlights an important issue that unpermitted burials, although significantly reduced, continue along the porous easter border of Makli.

Figure 41 New burials are abundant near the eastern edge of the site and use modern materials, many near historic monumental tombs. Some dates on the graves are from the past 2-5 years.

New gate

Another issue not related to the scope of this mission or the impact of the monsoon is the construction of a new entrance gate. The decision to construct this gate should have proceeded with a Heritage Impact Assessment (HIA) in line with the Operational Guidelines of the World Heritage Convention. It will be a monumental gate constructed of modern materials and will most likely block key views of the southernmost cluster of monuments.

Figure 42 The foundation of the new gate and view from the entry

New memorial

There is also a new memorial canopy tomb located midway between the southern entry gate and Jam Nizamuddin. This is to celebrate an important historian of Sindh, Mir Ali Sher Qana Ji Akher Aramgah. As with the new entry gate, the new memorial should have been proceeded by a Historic Impact Assessment (HIA) in line with the Operational Guidelines. This is an effort of the Endowment Fund Trust (EFT), mentioned earlier in this report. The new monument is appropriately constructed of local stone, of which most of the historical monuments are constructed, but the execution, construction, form, and workmanship could have been improved. Construction could have served as a capacity-building opportunity for the use of traditional techniques, tools, and materials, but this new canopy was constructed with machine tools such as grinders and resin epoxy. This new memorial has proven to be popular as its inauguration was well attended by the community and continues the living aspects of Makli in celebrating a noted Sindh historian.

Figure 43 Overview of the new canopy and detail of the workmanship, right inaugural celebration (EFT).

Figure 44 Endowment Fund Trust announcement for the inauguration of the new canopy (EFT)

New construction and conservation

Makli is recognized as a living memorial with 21 active shrines visited by thousands of people weekly. The site has been recognized internationally for its Outstanding Universal Values as a World Heritage property. It is not within the spirit of the World Heritage Convention to prevent the community from using the site or from the authorities from enhancing its use or visitation. It is the exact opposite, with the World Heritage Centre of UNESCO encouraging engagement with World Heritage properties. The Strategic Objectives of the "Five Cs" (Credibility, Conservation, Capacity-building, Communication, and Communities) critically seek to enhance the role of communities. "The Convention recognizes the way in which people interact with nature and the fundamental need to preserve the balance between the two" (UNESCO).[3]

The World Heritage Convention also stresses community. VI.A. Objectives 211. C) "to enhance the function of World Heritage in the life of the community;" In addition, the Operational Guidelines stress: "It is important to underline a fundamental principle of UNESCO, to the effect that the cultural heritage of each is the cultural heritage of all. Responsibility for cultural heritage and the management of it World Heritage belongs, in the first place, to the cultural community that has generated it and subsequently to that which cares for it. However, in addition to these responsibilities, adherence to the international charters and conventions developed for the conservation of cultural heritage also obliges consideration of the principles and responsibilities flowing from them. Balancing their own requirements with those of other cultural communities is, for each community, highly desirable, provided achieving this balance does not undermine their fundamental cultural values. However, new construction should be carefully considered with the guidelines of the Operational Guidelines clearly outlined. Article 110: "Impact assessments for proposed interventions are essential for all World Heritage properties." And article 118bis[4]:

> Notwithstanding Paragraphs 179 and 180 of the *Operational Guidelines*, States Parties shall ensure that Environmental Impact Assessments, Heritage Impact Assessments, and/or Strategic Environmental Assessments be carried out as a pre-requisite for development projects and activities that are planned for implementation within or around a World Heritage property. These assessments should serve to identify development alternatives, as well as both potential positive and negative impacts on the Outstanding Universal Value of the property, and to recommend mitigation measures against degradation or other negative impacts on the cultural or natural heritage within the property or its wider setting. This will ensure the long-term safeguarding of the Outstanding Universal Value and the strengthening of heritage resilience to disasters and climate change.

Information on Historic Impact Assessments and how they can be helpful for such situations can be found within the ICOMOS Guidelines at:

https://www.icomos.org/en/home-wh/108301-new-guidance-set-to-help-reduce-impacts-from-development-on-world-heritage-sites

[3] https://whc.unesco.org/en/convention/
[4] https://whc.unesco.org/en/guidelines/

Figure 45 Makli is used daily by young people for cricket matches in a field without tombs near the administrative center. This compatible use demonstrates that the community does use the site and sees it as not only a place of burials and monuments but also for recreational purposes.

Materials and Equipment

The following list of equipment and tools has been developed with the site managers at Makli to address the damages caused by the 2022 monsoon. A short description is provided with brief specifications and a number of items. A supplemental budget is provided in an Excel spreadsheet. This equipment is provided in order of priority. The images are provided only for reference.

1) **Scaffolding** – There is insufficient scaffolding on the site, and this hampers the conservation work but, more importantly, the safety of the workers. The existing scaffolding is also not adequate to work on taller monuments over 1 meter. Scaffolding is specifically needed for the damages to the monumental tombs, i.e., Sheikh Jeo, given the height of the monument and damages near the top and lack of wall capping. http://supremescaffolding.com/
Single-width aluminum tower, Length: 1.80 Mtr, Width: 0.90 Mtr, Height: 2.00 Mtr to 15.00 Mtr, Frames Heights: 2.00 Mtr, 1.5 Mtr & 1.00 Mtr. (1 or better 2 towers needed).

2) **Mechanical jack propping** – this is needed for the stabilization of the arches and vaults during conservation. This is especially important for the four unknown arch tomb northeast of Sheikh Jeo. The arches are unstable and require immediate propping. Tube size 38 mm, Weight varies as per size, Length as per requirement, Packing 5 pcs, Finish zinc electroplated, painted & self, Nut malleable casting & drop forged. (25-30 of these are required).

3) **Single extension straight aluminum ladders** – this is needed for inspection and work at higher places, especially the capping of brick walls to prevent the entry of water. C.S.L./23 20(ft) 6.10m, 14.9kg (2 of these are needed) OR Telescopic Aluminum Ladder 2.6-6.2m

4) **Traditional mason kits**, trowels, buckets, water level, plumb bobs, line (3 kits needed)

5) **Portable generator 5kv** - there are frequent power cuts at Makli, and many of the monuments away from the main road or clusters do not have access to electricity. Electricity is needed for mixing mortars mechanically, and lights extend the working hours in the early mornings, given the high temperatures during the summer. A generator will also be useful for grinding or cutting bricks and stones. Honda Generator EZ6500cxs 5.5kVA (1 needed).

6) **Small rickshaw loader –** to move equipment and supplies around the site, especially to reach the graves and tombs off the main road (1 needed).

7) **Lime mixing machine** – currently, lime is mixed by hand and takes considerable time. The workers are dangerously exposed in the lime mixing tank as they mix with their feet in rubber boots. Electrical motor with wheels and stand (1 needed).

8) **Safety harnesses**, hard hats, and construction vests (3 needed)

9) **Tripod to lift and move heavy stone** 3 meters, steel with pully and safety chain. This is required for the movement of single heavy pieces of stone to load onto trucks or position on site.

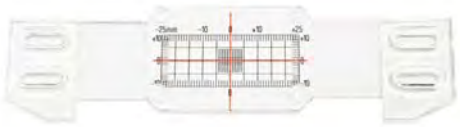
10) **Grass cutting machine**, backpack gasoline powered, with blade for trimming grass and small shrubs (2 needed).

11) **Lime injection equipment** for cavities inside of walls

12) **Stone grinding mill small** – this is for grinding brick and stone to color the mortar and plastering. The color of the mortar and plaster is an important part of the conservation works, and recently many plasters have been applied without coloring and have come under criticism.

13) Brick-cutting saw or grinder

14) **Polycarbonate crack monitors** – to monitor the movement across cracks in several monuments (20 pieces needed). Crack monitors were placed some years ago, but some have been lost due to vandalism, others to U.V. on silicon placement. Some monuments have not been monitored.



15) Laptop computer / Lenovo IdeaPAd G 3. AMD Ryzen 5 5600H 32gb ram 2 tb ssd, Nvidia Geforce GTX 1650 (1 needed). This is to generate the overall orthophoto of the entire site.

16) **Compact loader** – to move building supplies, brick, mortar between sites. Min Young MCL-590 Skid Steer Mini Wheel Loader (1 needed).

17) **Emergency water pump** - INGCO Submersible Pump 1" - 750watts electric (1hp) - copper wire motor. Voltage:220-240V~50Hz Output power: 750W(1.0HP) Max.head:32M Max.flow:120L/mim Stainless steel base Stainless steel screws Stainless steel shaft. Pipe diameter:1" (1 needed).

18) **Electrical gang wire rope hoist** for lifting supplies, tools, and materials to the top of scaffolding. Lifting Capacity: 0.5-16t, Lifting Height: 6-30m, Lifting Speed: 0.35-8m/min, Traveling Speed: 20m/min, WorkDuty: M3, M4 (1 is needed)

Budget

Tools and equipment and materials for Makli World Heritage property					
Equipment					
no.	item	number	price Rs	total PR	
1	Scaffolding	2	80,000	160,000	
2	Jack propping	140	3,500	490,000	
3	Ladders	2	24,000	48,000	
4	Masons´ kits	4	5,000	20,000	
5	Generator	1	333,000	333,000	
6	Rickshaw loader	1	300,000	300,000	
7	Mixing machine	1	180,000	180,000	
8	Safety equipment	4	7,000	28,000	
9	Tripod lift	1	9,000	9,000	
10	Grass cutting	1	25,500	25,500	
11	lime injection	3	8,000	24,000	
12	Stone mill	1	26,000	26,000	
13	Saw	1	14,000	14,000	
14	Crack monitors	15	10,000	150,000	
15	Laptop computer	1	257,000	257,000	
16	Loader	1	4,000,000	4,000,000	
17	water pump	1	47,000	47,000	
18	Hoist	1	180,000	180,000	
subtotal equipment				6,111,500	22,001
					USD
Materials					
no.	item	number	price PR	total PR	
A	bricks	20000	50	1,000,000	
B	quarried stone	500	500	250,000	
C	lime	100	500	50,000	40kg bags
D	hill sand	5	30,000	150,000	trucks
E	water	30	1000	30,000	trips in truc
subtotal materials				1,480,000	5,328
					USD
TOTAL				7,591,500	27,329
				PR	USD
				PR to USD conversion	
				12 03 2023	0.0036

Workshop Conservation and Disaster Risk Management

One of the goals of the mission was to conduct a workshop to build capacity in conservation, management, and, importantly, disaster risk preparedness and management. A two-day workshop was held in two parts; the first part was with the management of the site, and the second part was with the staff, workers, and participants from nearby sites, specifically the Shah Jahan Mosque Thatta and the nearby Thatta Museum.

Eighteen participants attended, and the workshop was divided into two parts, 1) lectures that contained theory, other case studies, and the impact of the monsoon on Makli and 2) a field exercise to identify values, O.U.V., and visits to see firsthand the impacts of the monsoon on Makli. The workshop was held in Sindi, Urdu, and English with translation. Fortunately, most participants speak and understand English facilitating the communications. Some of the participants repeated the previous workshop held after the monsoon in 2022. Ms. Zahida Quadri ensured that the material in this workshop did not repeat the previous material but built on that which was presented earlier.

Figure 46 Participants at the Workshop on Conservation and Disaster Risk Management (Eppich) and news release

Staff:

Sarfraz Nawaz

Zahida Quadri

Ghyoor Abbas shah

Ashraf Chandio

Kaneez Fatima

Ghulam sarwar panhwar

Yar Mohammed Khaskheli

Abdul Rehman (metrology department)

Community team members:

Sajid Shaikh

Sarfarz Ahmed

imtiaz Khaskheli

ismail Azaad

Asgahr Ali Senhro

Sannullah Khan

Saud Ghani

Hayyan Khalil

Shoaib Memon

Fayaz Khoso

Figure 47 Zahida Quadri delivers a presentation on past disasters and how they impacted Makli and ways of preparing for the next disaster.

Conclusions

Makli was well prepared for a regular monsoon. However, the intensity and duration of the monsoon of 2022 were exceptional and not entirely expected. Essentially, this year's monsoon was three regular monsoons, all at the same time. The tombs that the Directorate worked on from 2016 until 2022 weathered the monsoon exceptionally well with little loss of original materials or structural integrity. None of the fragile masonry canopies collapsed, and this was a welcome result. The current management plan included a brief Disaster Management Plan that anticipated flooding, high winds, and heavy rains. Key staff was in place, living on the site, during the monsoon to excavate trenches and drain standing water. They were also available immediately after the fires started. The rapid reaction was essential to identify partial collapses and initiate emergency responses. A key member of the Directorate's staff attended the ICCROM First Aid for Culture course in Jordan and was working on improving disaster response and the management plan at the time of the 2022 monsoon. Finally, the Directorate of Antiquities has experience following the disastrous monsoon of 2010 and a following conference on Disaster Risk Reduction sponsered by UNESCO in 2017 (included in the Annex).

Recommendations

Recommendations fit into three broad categories, management and guidance, Emergency conservation and prioritization of interventions after the monsoon, and near-future conservation project for late 2023 and 2024

Recommendations

Given this second mission and inspection, the following recommendations have been suggested in three categories, immediate emergency conservation, longer-term conservation measures, and management and guidance:

Emergency conservation

19) Emergency works on two key monumental tombs
    a. Shikh Jiyo
    b. Unknown tomb northeast of Sheikh Jio
    c. Caulking and cleanup around Jam Nizamuddin
    d. Anastylosis of all small grave markers along the eastern edge of the site
    e. Mir Mateen Baig
20) Extensive drainage plan study and excavation

Near future conservation

21) Ameer Khani enclosure
22) Issa Khan II
23) Unknown tombs and platforms (10)
24) Juman Jatti
25) Dewan Shurfa Khan
26) Jamia Masjid Mai Makli
27) Sunjo Qubo
28) Renewal of historical paths

29) Archaeological investigations into the historic drainage of the site and renewal and reuse of this drainage system to the step well that was cleaned

Management and guidance

30) Reinvigorate the Steering Committee – International Members must be included in the decision-making process, especially regarding any proposed new construction and prioritization of conservation
31) Incorporate Heritage Impact Assessment (HIA) as per the Operational Guidelines to the World Heritage Convention
32) Renew and endorse the Site Management Plan
    a. Update and improve the Disaster Risk Reduction chapter
    b. Include a section on HIA
    c. Improve the governance chapter, including the Steering Committee
    d. Reevaluate the living heritage aspects of Makli
33) Monitor Heritage Foundation Pakistan's work and that of the Endowment Fund Trust
34) Execute extensive documentation
    a. Reinstall polycarbonate crack monitors at Jam N and other locations
    b. Orthophoto of the entire site to high resolution 4cm GSD for a topographic map for drainage and an update to the survey
35) Ban smoking on site, raise awareness of the dangers, erect no-smoking signs
36) Water supply on site

Next steps

This is only an intermediate report from the mission in February. The project will continue to address the damage caused to Makli in the coming months. This report must be reviewed by the Director of Archaeology, and recommendations must be modified and finalized for the final report. The consolidation works were scheduled to be completed in June of 2023; however, given the extent of the damages, this will take considerably longer.

The next step will be to meet with the Director of Archaeology and finalize the priority list of major tombs to be addressed, complete the equipment and materials list, and set dates for conservation. This will be reflected in the final report in the summer of 2023.

Figure 48 a converence sponsered by the Endownment Fund Trust on Disaster Management that proceeded the capacity building. This demonstrates that there is concern following the impact of the 2022 monsoon (E.F.T.)

Figure 49 Previous capacity building workshop after the 2022 monsoon at Makli (Z. Quadri)

Annex

Schedule

Schedule - Makli visit Feb. 2023					
	Sun. Feb. 26	**Mon. Feb. 27**	**Tue. Feb. 28**	**Wed. Mar. 1**	**Thurs. Mar. 2**
time					
2:00	travel via Dubai	**SITUATION INSPECTION**	**DRR WORKSHOP**	**REPORTING**	
09:00		site inspection, recent works	DRR workshop - welcome tea	inspection east side, new graves	report writing
10:00		visit lower areas to the east, PHF works	Introduction Dr. Eppich DRR needs at cultural sites	update Nov. prelim. Report	
			Lecture by Ms. Quadri - DRR for Sindh, recent activities		
11:00		continued	Lecture by Mr. Serfraz Nawaz Impact of the Monsoon on Makli	write 2023 mission report Work on the long-term conservation plan	departure Karachi airport
12:00	travel	visit boundary wall	Lunch	last site inspection	
13:00		Lunch, review equipment material needs	Site Inspection Exercise in mapping DRR	Lunch, start reports	
14:00		visit Jam N. digital crack monitor, install crack monitors	continued	inspection damage, review documentation	
15:00	arrival Karachi airport 15:20 Discussions with UNESCO Islamabad repr.	site documentation contour drainage	Workshop exercise DRR, site documentation, photogrammetry Eppich conclusions	continued	
16:00	travel to Makli, tour of the site upon arrival	review digital documentation from Jam N. cluster	continued	travel to Karachi	
17:00	Meeting with site manager	continued	Site manager meeting	TBD summary meeting with Director Archaeology	
18:00	Visit the Shrine Darbar Syed Abdullah	continued	meeting with local representatives, new burials		
	site visits				
	coordination meetings				
	report writing				
	Workshop				
	travel				

Sunday, Feb. 26 - Arrival, travel directly to the site, hopefully with the Director of Archaeology, Abdul Fatah. If so, we can have a meeting along the way. An alternative is to travel with Ms. Zahida Quadri and discuss

Monday, Feb. 27 – Inspection of the recent works, areas with problem drainage, especially near Issa Khan II, Sheik Jio, etc. Of particular interest are the platform tombs and areas suspected to be at risk in the future. We will also review the last report. It was only a draft version given the time pressure, and we need to finalize it.

We must address:

- Additions and omissions of the report
- Review of proposed form for inspections
- Equipment and material lists,
- Priorities for conservation
- Discussion the situation with the shrines
- The proposed wall around Dargah Ashabi Baba

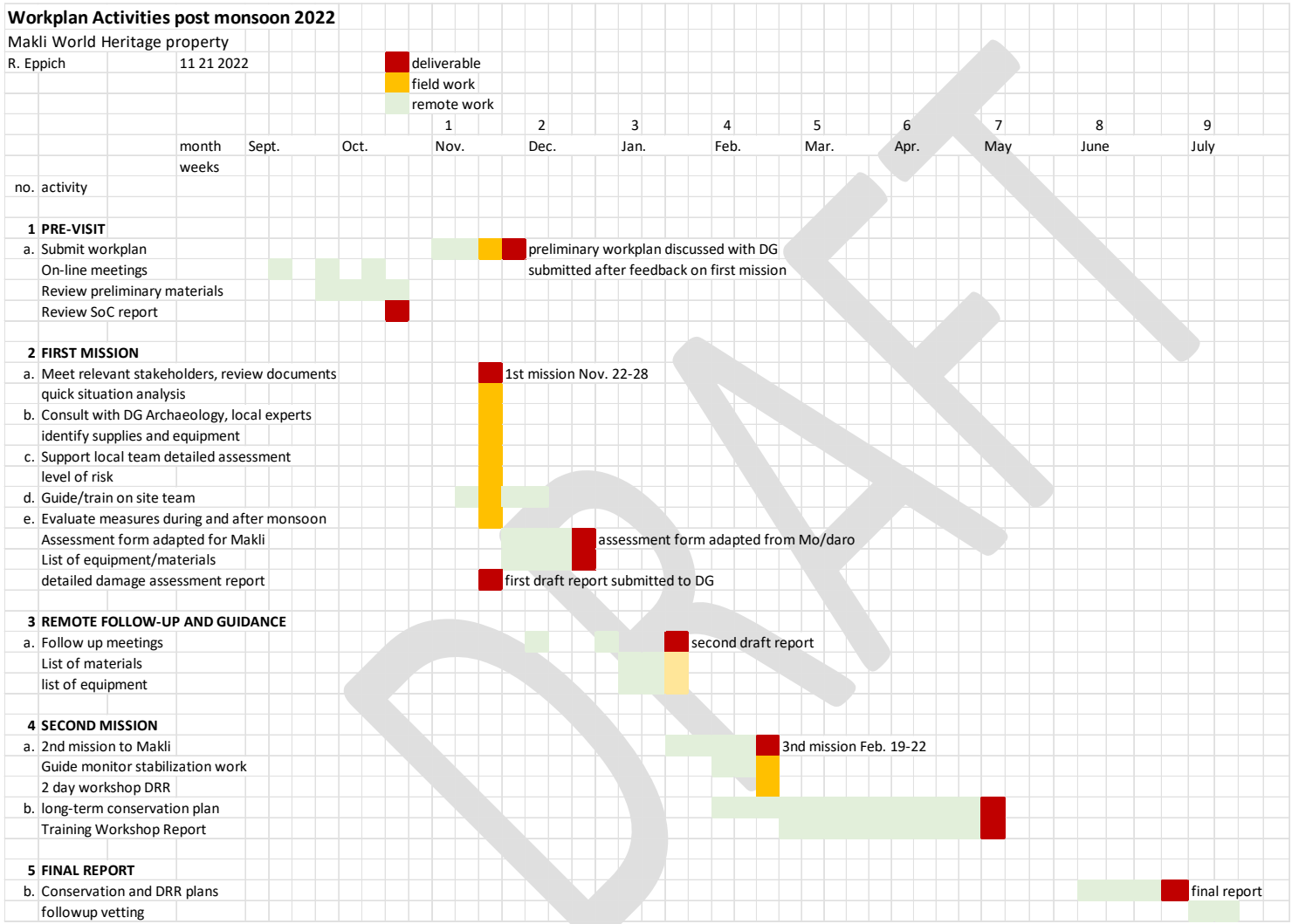
Work on the long-term conservation plan. Inspection of boundary wall and remaining openings. Inspection Heritage Foundation sites, and the area near Dargah Ashabi Baba. Documentation of key areas not visited in November and possible 3D model generation.

Tuesday, Feb. 28 – one-day workshop with staff in the mornings (in field for conservation with some lectures on conservation and DRR). If time permits, a short workshop in photogrammetry following up on work started in November.

Wednesday, Mar. 1 – continued workshop in the morning. Work on the long-term conservation plan and begin work, outline of the DRR plan. Start preparation of the final report. Documentation of key areas not visited in November in parallel with 3D model generation.

Departure 6-7 pm, meeting and dinner with DG in Karachi prior to departure.

Thursday, Mar. 2 – departure 2am.


Workplan Activities post monsoon 2022
Makli World Heritage property
R. Eppich
11 21 2022
deliverable
field work
remote work
1
2
3
4
5
6
7
8
9
month
Sept.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
weeks
no.
activity
1 PRE-VISIT
a. Submit workplan
On-line meetings
Review preliminary materials
Review SoC report
preliminary workplan discussed with DG
submitted after feedback on first mission
2 FIRST MISSION
a. Meet relevant stakeholders, review documents
quick situation analysis
b. Consult with DG Archaeology, local experts
identify supplies and equipment
c. Support local team detailed assessment
level of risk
d. Guide/train on site team
e. Evaluate measures during and after monsoon
Assessment form adapted for Makli
List of equipment/materials
detailed damage assessment report
1st mission Nov. 22-28
assessment form adapted from Mo/daro
first draft report submitted to DG
3 REMOTE FOLLOW-UP AND GUIDANCE
a. Follow up meetings
List of materials
list of equipment
second draft report
4 SECOND MISSION
a. 2nd mission to Makli
Guide monitor stabilization work
2 day workshop DRR
b. long-term conservation plan
Training Workshop Report
3nd mission Feb. 19-22
5 FINAL REPORT
b. Conservation and DRR plans
followup vetting
final report

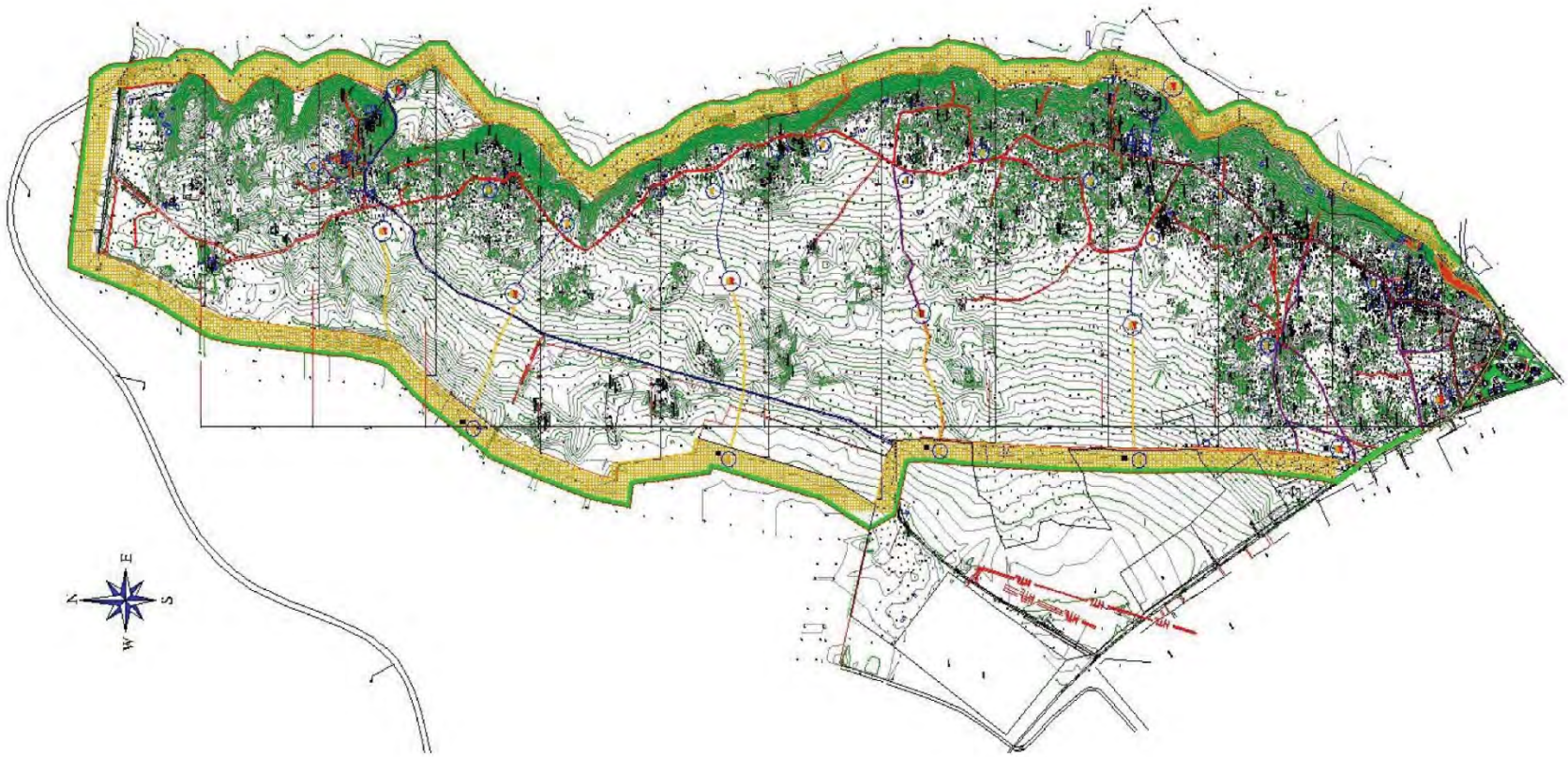


Figure 50 – Official boundaries and existing buffer zone as surveyed in 2014, not to scale (C.T.I., 2014)

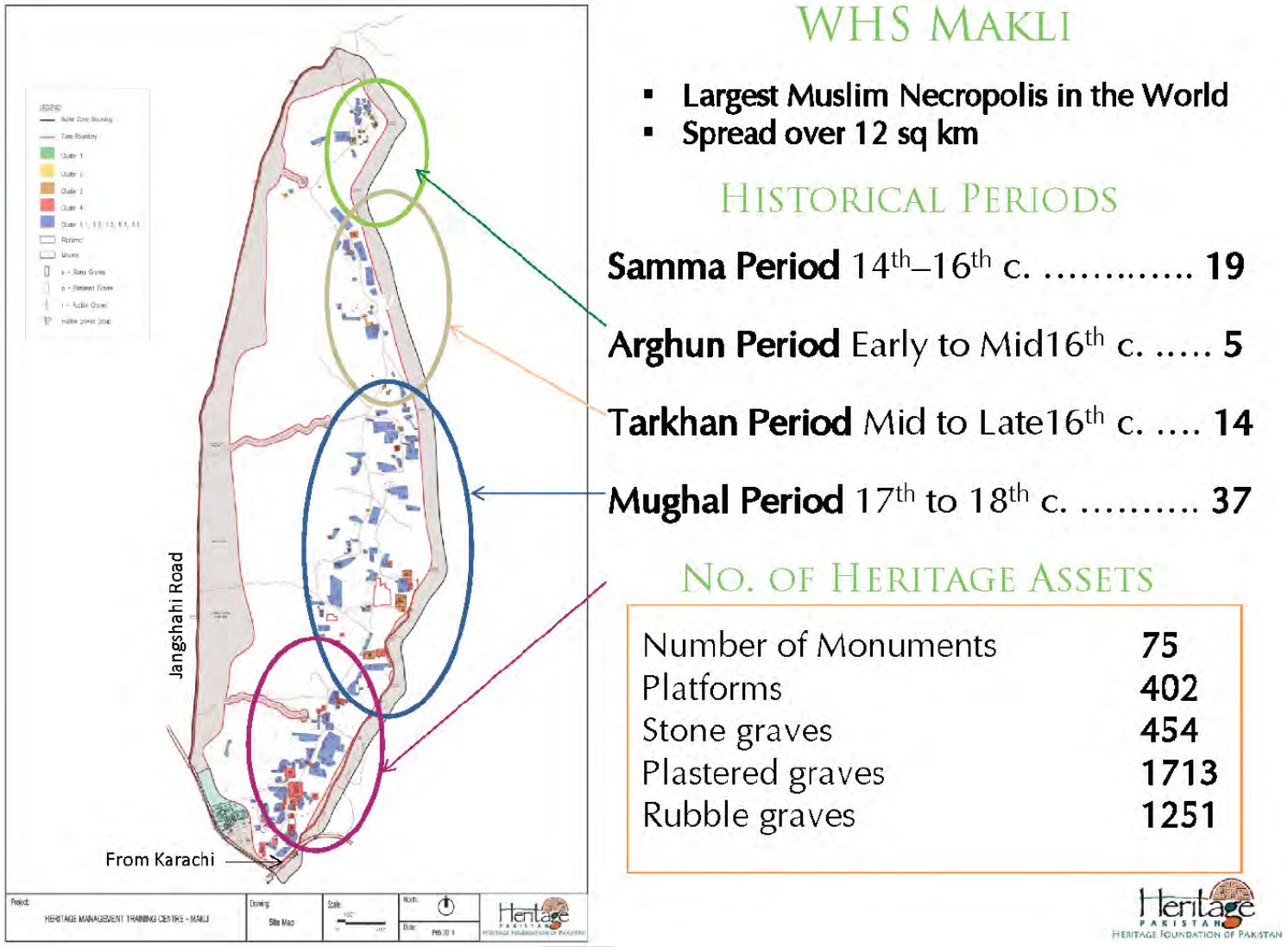


Figure 51 – Map and inventory of the burials by period (Heritage Foundation Pakistan, 2013) North is up

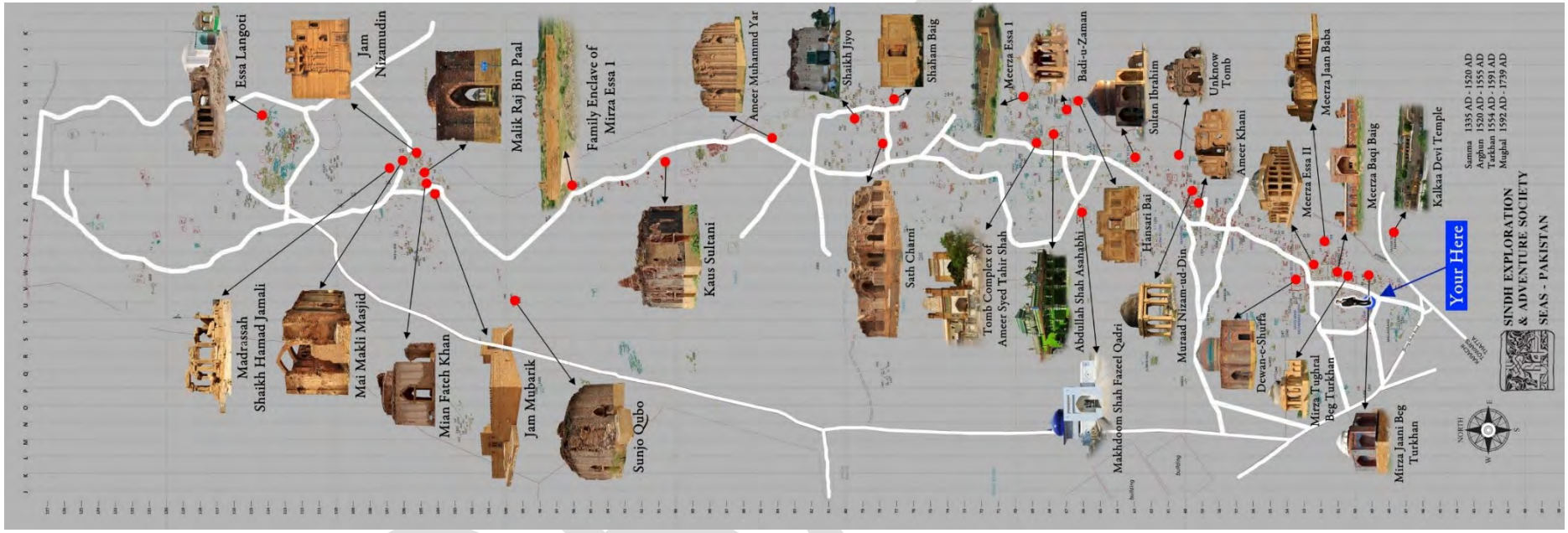


Figure 52 – Map of the major monuments at Makli (Directorate of Antiquities and Archaeology and SEAS Pakistan)

Workshop Presentations

The following are some sample slides from the presentations that took place during the workshop.

Makli Disaster Risk Reduction Workshop

Organized with the Assistance of
UNESCO Pakistan
unesco
&
Directorate General of Antiquities & Archaeology

Presentation By *Zahida Quadri*

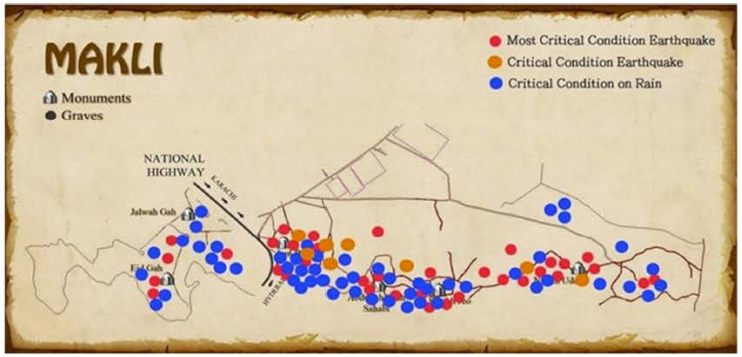
REVIEW OF PAST WORKSHOP

Understanding Climate Disaster through Community Engagement

1- Witnessing Climate Disaster → Reliable and quality information , secure authicity, Focus on developing solution not to create panic
2- Careful Reporting → "Senor", Investigate and then forward, Distinguish facts from fiction
3- Information → Inform to concern authorities, Fire Dept, Culture Dept, Police, Disaster unit in-charge of the area, Concerned District officer

Developing Management Mapping through Community Participation Method

1- Introduction Developing Team Network → Why team work important? Divided into groups which according to tasks,
2- Participatory Mapping Methodology → Nearest police station, Who you think will help you immediately Your contact person in community, your mean of communication
3- Community Practice to develop Base Emergency Plan of Makli → What are sensitive places? What should be your route? What was the aftermath of Covid and floods?



Culture, Tourism, Antiquities & Archives Department
Government of Sindh

Terminologies of Disaster

Risk Identification or Risk Assessment : Approach to determine the nature and extent of Risk

Risk Reduction or Mitigation : Aimed at Preventing new and reduce existing disaster

Emergency Preparedness and Response: Preparation to act in case of Emergency

Resilient Recovery : Restoring by improving the previous situation

THINK WHAT KIND OF HAZARDS AFFECT MAKLI ?

HOW THEY THREAT CULTURAL HERITAGE?

THINK! HAS YOUR REGION SUFFERED SOME DISASTER?

Did it impact Cultural Heritage?

HOW?

WHAT WE CAN DO? ---------- WHAT YOU CAN DO?

1- Evaluation of information from Past Disaster

2- Monitoring

3- History of Maintenance of the Site

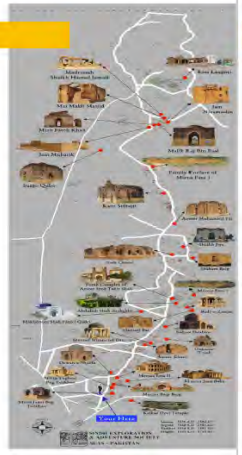
4- Existing Financial Resources

5- Stay in touch with Existing Disaster Management Departments, Authorities, and concerned person.

6- Awareness

7- Mark Evacuation Routes, safe paths

8- Help in building relationships between Different Stakeholders



WHAT WE CAN DO? ---------- WHAT YOU CAN DO?

Hazard profile

Do not forget to study the hazard profile of this region thoroughly, as well as the record of past events, to identify the hazard(s) that are most likely to affect our region.

Please note that some of these hazards might be less likely to occur but might have a larger impact and therefore the hazard profile will help you identify such hazards which might sometimes be overlooked.

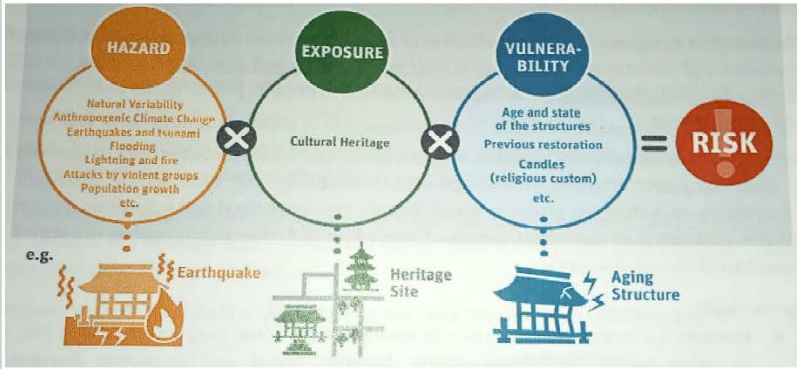
Consider the possibility of multiple hazard events (compound and cascading hazards) affecting your site/collection. For example, it is crucial to consider the effect of a sudden storm, during the ongoing COVID-19 crisis.

Expected outcomes:

- Hazard map of your area where you must geo-locate selected heritage
- Summarize the possible hazards that can occur in your selected heritage (which may or may not be directly related to the hazard profile of your region) and can lead to a disaster.
- List of hazards and categorize them based on likelihood and impacts.

Phases of Disaster

UNDERSTAND SITUATIONS



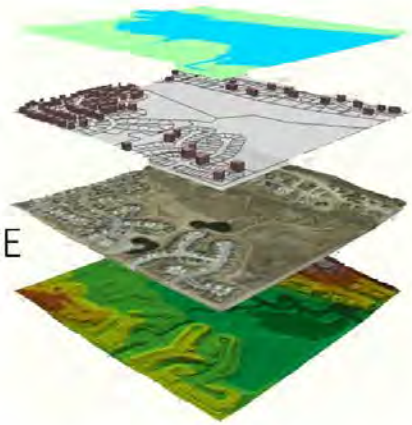
IDENTIFY VALUES
documentation

IDENTIFY RISKS

MITIGATION & RESPONSE

damage assessment

plan for disasters

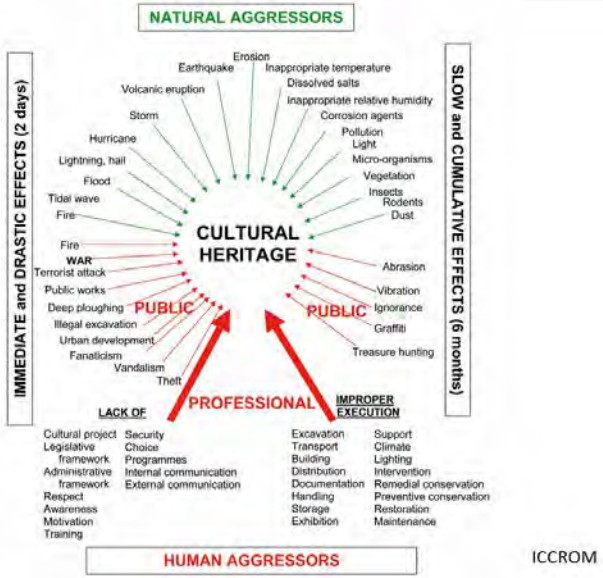


IDENTIFY RISKS Immediate and drastic

LACK OF — **PROFESSIONAL** — **IMPROPER EXECUTION**

Cultural project	Security	Excavation	Support
Legislative framework	Choice	Transport	Climate
Administrative framework	Programmes	Building	Lighting
Respect	Internal communication	Distribution	Intervention
Awareness	External communication	Documentation	Remedial conservation
Motivation		Handling	Preventive conservation
Training		Storage	Restoration
		Exhibition	Maintenance

HUMAN AGGRESSORS



ICCROM

Geological Report

THE TOMB OF
JAM NIZAM AL DIN
FINAL REPORT AUGUST
2011

PART IV

4.1 SOIL AND STRUCUTRAL STATUS

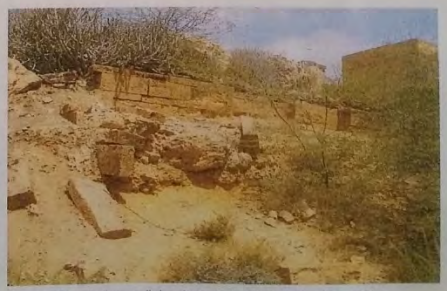
4.1.1 Past Interventions and Available Data

Coupled with the cracks, is the closeness of the tomb structure to the sudden drop where soil continues to erode. This has been considered as one of the causes for the settlement of the structure. Other structures in the vicinity, particularly the pavilion tomb of Nuri and Jam Tamachi is also endangered, being close to the edge of the ridge and its structure also suffering from settlement.

Although several interventions appear to have been made by the Federal Department of Archaeology; however, in the absence of recorded information, it has been difficult to compile the information. According to the officials of the present Directorate of Archaeology, who have earlier served in the Federal Department, an attempt was made during the mid-1990s to erect a retaining wall, which was taken to a depth of 15'0". However, when drilling was carried out to investigate the soil conditions for the present assignment, it was found that excavating the soil up to 15'0" depth would be impossible, since rock was encountered just a few inches below the ground surface. Some form of retaining wall seem to have been built, however, how effective it was, cannot be determined with certainty.

Glass tell-tale shows movement in the structure. Date of Placement not confirmed.

Cracks in Level 3 point to the same movement



Remnants of an embankment wall along the South side of the Tomb of Jam Nizam al Din.

We are informed that glass tell-tales were placed during the 1990s, however, there is no recorded information and as such it is difficult to base any assumptions regarding the state of structure on the tell tales.

At various times, some filling of the joints has also been carried out. Once again the dates of this work are not available.

Other interventions consist of filling the doorways with stone masonry that is likely to have been carried out before Independence. In the absence of records, it is uncertain when the plain flooring and plastering of the graves was carried out.

So far the data that is readily available is the one that is in Heritage Foundation Archives. This is due to the book that was written on the Samma Period by Suhail Lari and Yasmeen Lari, at which time extensive photography was carried out by Suhail Lari. Those photographs appear to be the only systematic record of the tomb of Jam Nizam al-Din during the late 1980s. These archival photographs can be used at the time when conservation and stabilization of the structure is undertaken.

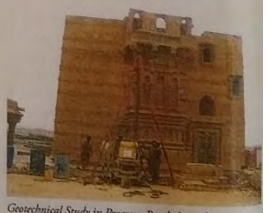
4.1.2 Geotechnical & Structural Studies

It is due to lack of sufficient information regarding interventions carried out by the Federal Department of Archaeology in the past, that it was considered essential to carry out investigation of the soil conditions in the area. A geotechnical study was carried out which would lead to an assessment of the causes that have lead to the settlement of the structure.

The findings, based on boreholes in the vicinity of the monument , have been fully recorded in the geotechnical report. Similarly, the results of laboratory tests have also been appended to the Geotechnical report.

Geotechnical Study in Progress. Borehole made at the bottom of the cliff at the east end.

Geotechnical Study in Progress. Borehole made along the Southern Facade



Geotechnical Study in Progress. Borehole made along the Western Facade

Sample Box of excavated material from Borehole 1

CONSOLIDATED ENGINEERING SERVICES (PVT) LTD.

REPORT ON
GEOTECHNICAL INVESTIGATION AT
JAM NIZAM AL-DIN TOMB
MAKLI, SINDH

Client	:	Heritage Foundations
Consultant	:	Mushtaq & Bilal, Consulting Engineers
Project No.	:	CES - 11453
Date	:	August 19, 2011

2nd Floor, Nabika Square, G-5 Central Commercial Area, Off. Shaheed-e-Millat Road, Karachi-8.
Phone : 34539701 - 34538837 Fax : 34524976, E-mail: ces@cyber.net.pk

REPORT ON
GEOTECHNICAL INVESTIGATION AT
JAM NIZAM AL-DIN TOMB
MAKLI, SINDH

TABLE OF CONTENTS

REPORT ON
GEOTECHNICAL INVESTIGATION AT
JAM NIZAM AL-DIN TOMB
MAKLI, SINDH

1. INTRODUCTION:

The Tomb of Jam Nizam Al-Din is situated in Historical Graveyard of Makli, Sind. The Tomb was constructed about 500 years ago. The tomb has shown tilting towards East which in result developed several sets of cracks & opening in the Tomb wall. These cracks are considered to be related to movements/distortion and settlement in foundations of the Tomb.

A program of Subsoil Investigation was undertaken to determine subsoil conditions to evaluate the reasons for the settlement of foundation. Consolidated Engineering Services (Pvt) Ltd. Karachi carried out this program of soil investigation.

The program of investigation included drilling of 4 boreholes upto 15m depth, at selected locations, collection of representative subsoil samples and conducting laboratory tests. The scope of work also included preparation of soil investigation report giving details of the investigation, identifying the causes of distortion in Tomb wall and recommend measures for stabilizing the Tomb.

The fieldwork was carried out from August 03, 2011 August 10, 2011. The soil samples collected during field investigations were tested in the laboratory, the results were compiled and analysis was made for the foundations design.

The subsoil stratigraphy is presented as shown in Borehole Logs while laboratory test results are also included herewith.

This report presents the results of the investigations, identifies the causes of distortion in Tomb wall and recommendations for stabilizing the Tomb.

PROGRAM OF INVESTIGATIONS:

A total of four boreholes were drilled to the depth of 15m at specified locations, as shown in Fig-1 and EXHIBITS 1, 2, 3 & 4. Three boreholes were drilled at the level of Tomb pedestal (top of hill) while one borehole was drilled at the foot of the hill.

Rotary drilling method was used to advance the borehole to the required depths. Standard Penetration Tests (SPT) were conducted as per ASTM Designation D-1586. Core samples were collected form cemented formations Representative samples of subsoil materials were preserved for further testing.

A program of laboratory tests was conducted and selected representative samples were tested to determine physical and engineering characteristics of various subsoil materials encountered at the site.

The tests were conducted in accordance with Standard Procedures as given in relevant ASTM/BS standards.

GEOLOGY OF THE AREA

The Geological formations in this area mainly belong to Laki formation Eocene Rocks.

The Laki formation includes fossiliferous Limestone and Shale. The Surfacial Deposits generally consist of flood plain deposits of Clay, Silt, Sand and Gravels of surrounding Rocks.

RESULTS OF INVESTIGATION:

Stratigraphy:

The subsoil materials as encountered at the site have been described in detail in Borehole Logs included in the report, which is summarized hereunder:

BH# 1, 2 & 4 (at top of hill)

Layer – I: 1st layer consists of Sand/ Clay with GRAVELS/ COBBLES (of LIMESTONE origin) which encountered from existing ground level and extended upto 1.0 to 1.95m (3.30 to 6.40 ft) depth.

Layer – II: 2nd layer consists of highly fractured, jointed, Nodular LIMESTONE & Sandy LIMESTONE which extended upto 4.5m (14.75ft) depth in BH-4 and upto 6.0m (19.7ft) depth in BH 1& 2.

Layer – III: 3rd layer consists of Silty SHALE which extended upto 9.9m (32.50 ft) depth in BH 1, 9.0m (29.50 ft) depth in BH 2 and upto 7.5m (24.60 ft)depth in BH 4.

Layer – II: 4th layer consists of highly fractured, jointed, Nodular LIMESTONE & Calcareous SANDSTONE interlayer with seams of SHALE which extended upto maximum investigated depth of 15.0m (49.20 ft).

BH# 3 (at foot of hill)

Layer – I: 1st layer consists of GRAVELS/ COBBLES (of LIMESTONE origin) with Sand & Clay which encountered from existing ground level and extended upto 3.0m (9.80 ft) depth.

Layer – II: 2nd layer consists of highly fractured, jointed, Nodular LIMESTONE which extended upto maximum investigated depth of 15.0m (49.20 ft).

EXHIBITS 5, 6, 7, 8, & 9 show Core Samples from Boreholes.

Ground Water Level:

Ground water was encountered at a depth of 1.35m (4.40ft) only in BH 3, at the time of investigation, while it was not encountered in other boreholes.

oratory Test Results:

boratory test results are included in the relevant section of this report. These results have been ered while preparing Borehole Logs and giving recommendations for foundations.

LYSIS OF CAUSES OF DISTORTION IN TOMB WALL:

he Tomb is considered to be founded on Rock formation. Though, Rock exhibits high degree of eathering in near surface zone, it is competent to support the load of present structure from Bearing Capacity consideration.

The Tomb is located just at the edge of the Rock slope (Eastern Side). The inspection of slope shows very clear signs of continued weathering and erosion which has destabilized the slope over period of time.

EXHIBITS-10 & 11 show such weathering and erosion of near surface formation. Strewn loose debris are evident in these EXHIBITS. The loose material is assessed to extend to about 2-3ft from existing surface level in top horizon while it stands deeper in low horizon.

3. Fig-2 presents Sectional Profile, developed on the basis of borehole logs included in this report as well as physical observations at site. The thickness of top loose debris is an estimate only. The profile shows a layer of SHALE (Psudo-Rock) sandwiched between LIMESTONE layer at top & bottom. The physical characteristics, as determined from laboratory tests, show that the SHALE is essentially of Silty in nature and lacks cementation/cohesion. Such formations, when exposed to atmosphere, are prone to degradation and slake to *soil like* formations. It is our opinion that originally the Tomb was placed at a distance well clear of the edge of slope (on East side of Tomb). The Rock on the east side eroded over period of time with the result that Tomb is just at the edge of slope. We believe that the exposure of SHALE to atmosphere resulted in its slaking into *soil like* formation which eroded away over period of time, leaving top LIMESTONE overhanging. The cantilevered LIMESTONE collapsed and drifted away along the slope. The repetition of this process has produced the present slope on east of Tomb. The process of erosion of Rock on east of Tomb and development of present slope is illustrated in Fig-3.

4. The depth of foundation could not be determined physically since any excavation close to the foundation was considered detrimental to the safety of structure.

   We have considered the depth of foundation to be as shallow as 5 ft to as deep as 15ft from surface level. This suggests that the foundation of Tomb is resting in LIMESTONE which is competent from consideration of *Bearing Capacity*.

5. The position of foundation is undesirably close to the present slope, thus building structure is prone to distortions. We are of the opinion that the foundation edge should be at least 30 ft clear of the slope line unless a properly designed retaining wall is provided to stabilize the slope. The close proximity of foundation to the slope renders East wall to tilt (East ward) when failure of slope is considered.

6. To our assessment the building structure is sensitive to "differential settlement" because of Brick/Stone wall construction. The tolerable angular distortion of Brick/Stone building is taken on the order of 1/200. The angular distortion exceeding this value will result in cracks in the wall. Considering the wall footing of the order of 40ft in length, the limiting differential settlement (between extreme ends of wall footing) will be 2.4 inch. We have reviewed the survey data which shows that the differential settlement upto 8 inches has taken place. The survey data also suggests that the Tomb has tilled essentially towards East while East wall showing rotation of East wall (Axis 7.1) (which indicates unstable slope on East side). The rotation of NE corner with respect to SE corner is reported to be 5.5 inches. The East wall show distortions upto 8 inches as per survey data.

   The pattern of differential settlement and angular distortion as given here above suggests cracking in North, South and East wall which has also been observed at site.

CONCLUSIONS & RECOMMENDATIONS:

Based on investigation data and its analysis the conclusions and recommendation on procedure for mitigating of distress in Tomb building is presented hereunder:

1. As discussed in earlier Section on Analysis of Causes of Distortion, the distress in the Tomb building has been caused mainly due to weathering and erosion of Rock formation on East side of the Tomb. It has been assessed that originally the Tomb building was placed quite clear off the edge of escarpment on East of Tomb. The erosion continued over period of time reducing the extent of the escarpment resulting in present day position that Tomb is sitting just at the edge of the slope. The slope, covered with debris, is unstable in its present position. Therefore, a must mitigation requirement is to stabilize the slope.

2. We have noticed signs of crude "tell-tales" (of glass sheets) installed at cracks for their monitoring. It is our opinion that not only such instrumentation shall be proper but its record shall be maintained properly. We recommend to install tell-tales at existing cracks to monitor pattern of further movement of the building structure. "Crack Mon" or similar devices may be used for this purpose. The monitoring and crack recoding shall be carried out on at least monthly basis for at least one year and data be analyzed. The monitoring and crack recording may then continue for long term.

3. Some effort to stabilize the slope has been made in 1990 by constructing a retraining wall on East side of Tomb. However, we are of the opinion that this is not adequate and prevailing conditions necessitate a proper technical solution of the problem.

We recommend to consider following two options and adopt one on its merits and site conditions:

a) Extend the pedestal of Tomb on East side by filling "Selected Fill Materials" with a safe slope and protect slope surface with "grouted stone pitching". The selected Fill Material shall be placed and compacted in layers of 8 inches. The typical arrangement is shown in Fig- 4.

b) Construct a Retaining Structure, on East side, consisting of Contiguous Piles with Tie-back Anchors. The Retaining Structure may be placed at about 10-15ft from Eastern Wall. The space between Retaining Structure and wall shall be filled with "Selected Fill Material" placed and compacted in layers of 8 inches. The typical Arrangement is shown in Fig-4.

The detail design of the selected option shall be taken up on finalization.

4. The Analysis and recommendations as given here above are focused on implications of subsoil conditions. It is recommended that Structure Engineering aspects should also given due considerations prior to finalizing the mitigation as recommended here above. The Structure Engineering aspects include Analysis of Structure Type (Brick-wall), influence of aging on cementation of mortar used in construction, stability against Earthquake etc.

CHEMICAL AGGRESSIVENESS:

The values of Sulphate content, Chloride content and pH on soil and water samples are included in the report. The Sulphate and Chloride Content was found to be moderate to high.

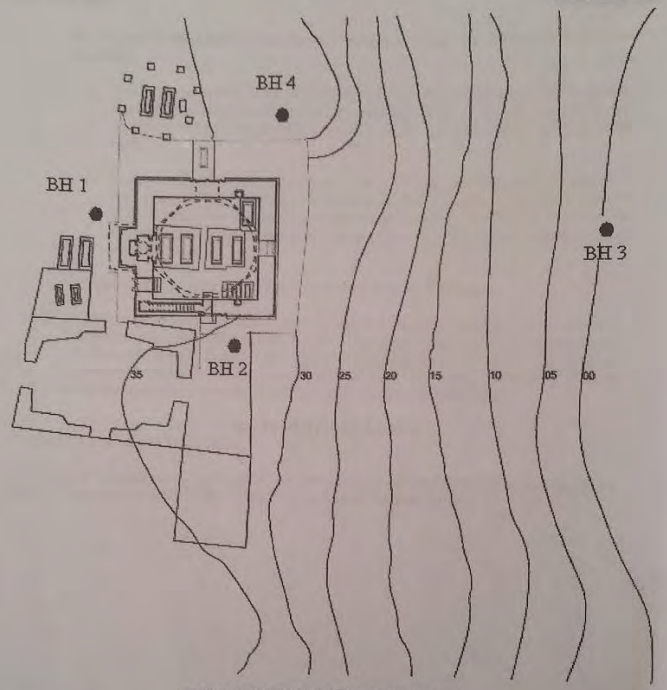


FIG 1; BORE HOLE LOCATION
GEOTECHNICAL INVESTIGATION AT JAM NIZAM AL DIN TOMB,

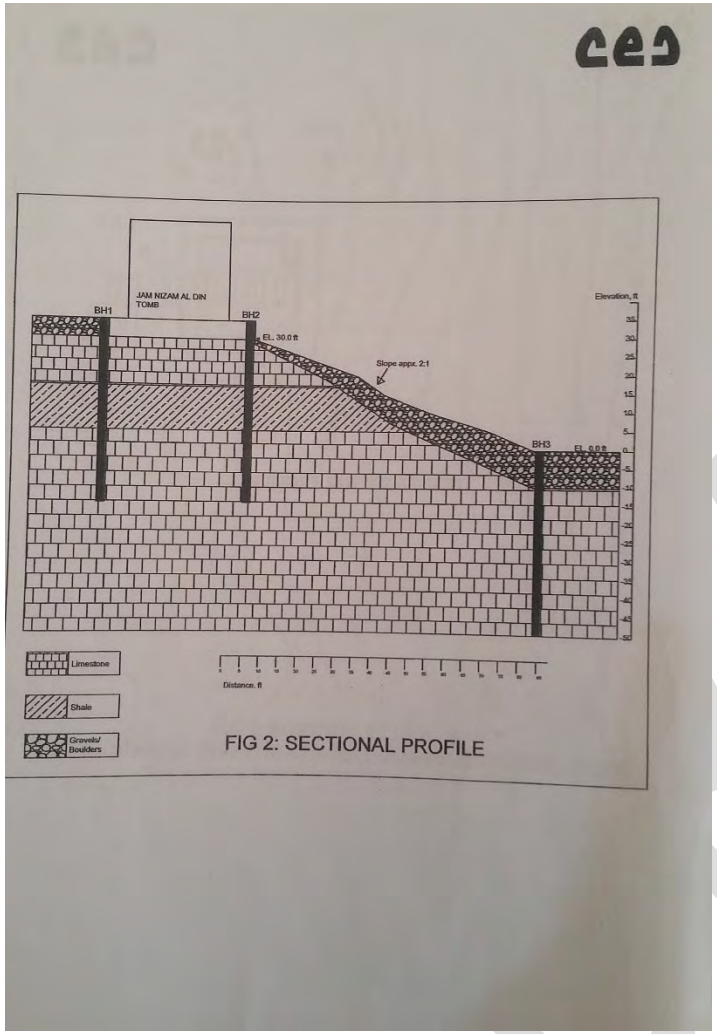


FIG 2: SECTIONAL PROFILE

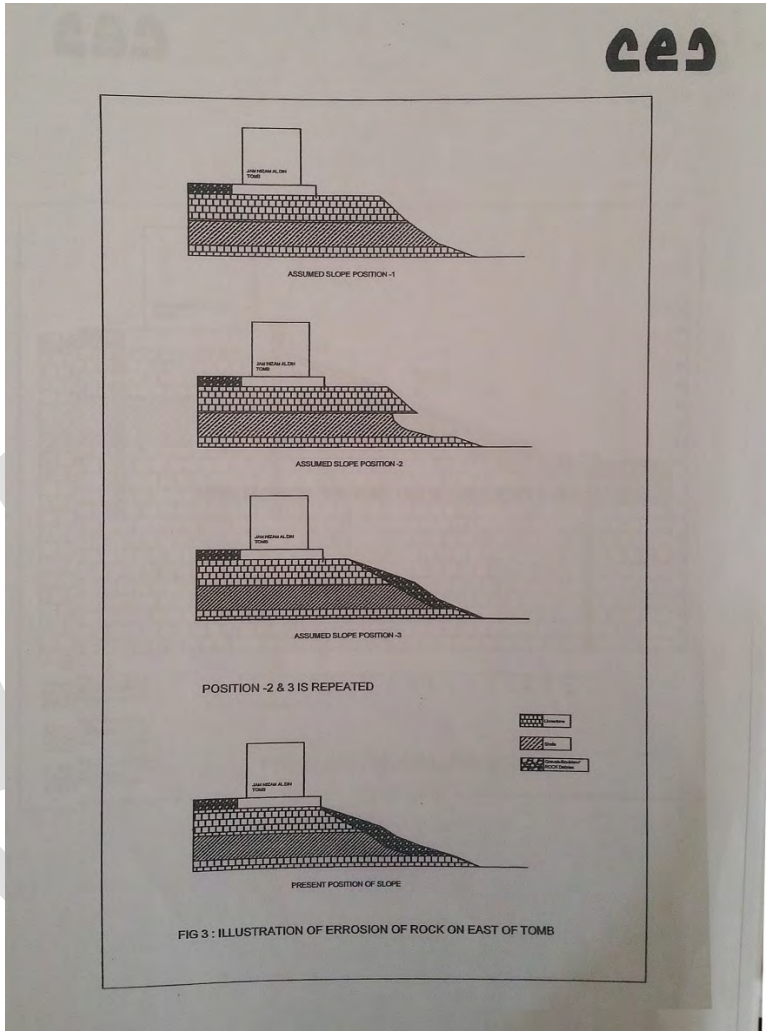


FIG 3 : ILLUSTRATION OF ERROSION OF ROCK ON EAST OF TOMB

EXHIBIT-1
LOCATION OF BH-1

EXHIBIT-2
LOCATION OF BH-2

EXHIBIT-3
LOCATION OF BH-3

EXHIBIT-4
LOCATION OF BH-4

EXHIBIT-5
CORES FROM BH-1

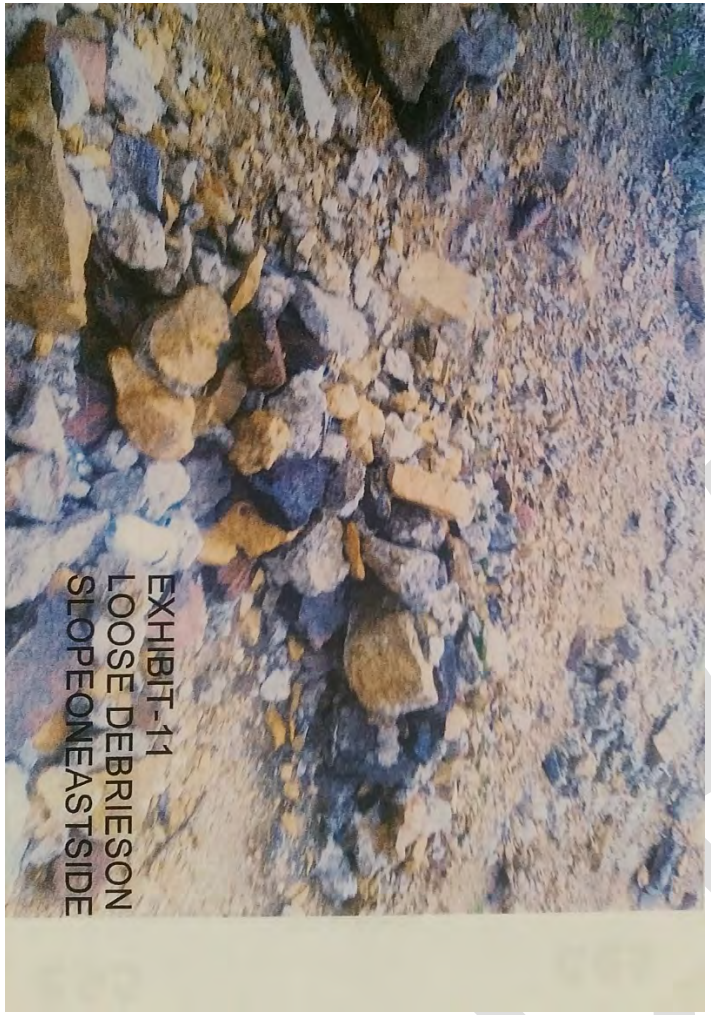
EXHIBIT-6
CORES FROM BH-1

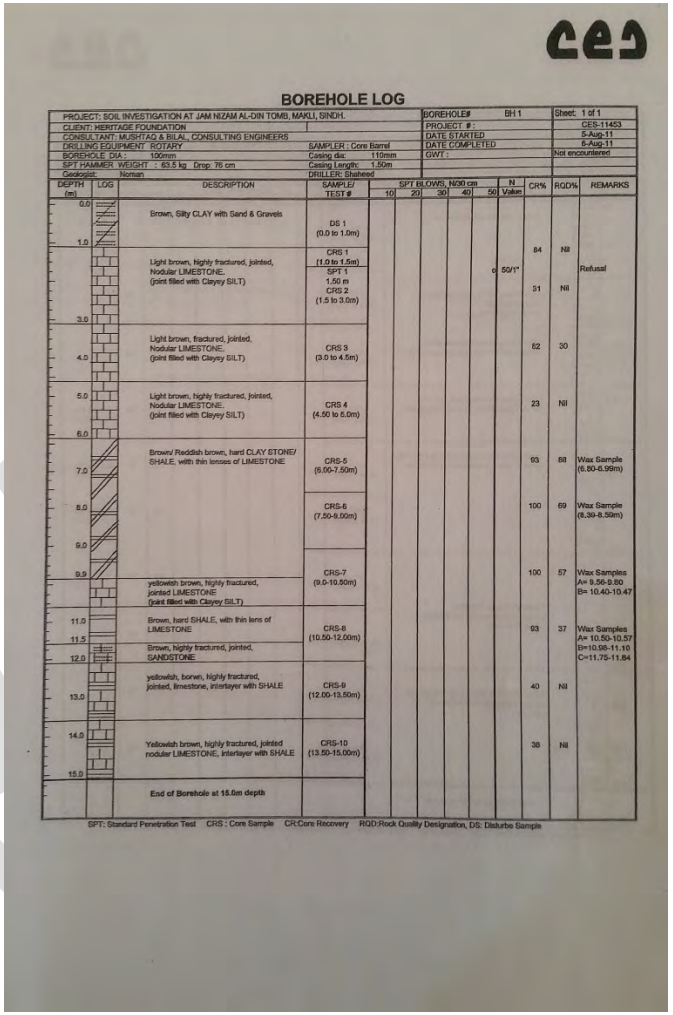
PROJECT: JAM NIZAM-AL-DIN
TOMB, MAKLI
BH #: 3
CORE BOX #: 1/1
EXHIBIT-7
CORES FROM BH-3

PROJECT: JAM NIZAM-AL-DIN
TOMB, MAKLI
BH #: 4
CORE BOX #: 1/2
EXHIBIT-8
CORES FROM BH-4

PROJECT JAM NIZAM-AL-DIN
TOMB. MAKLI
BH #: 4
CORE BOX #: 2/2
7.50m
10.50m
13.50m
9.00m
12.00m
R-8
R-7
R-6
R-5
R-9
EXHIBIT-9
CORES FROM BH-4

EXHIBIT-10
WALL & SLOP ON
EAST SIDE





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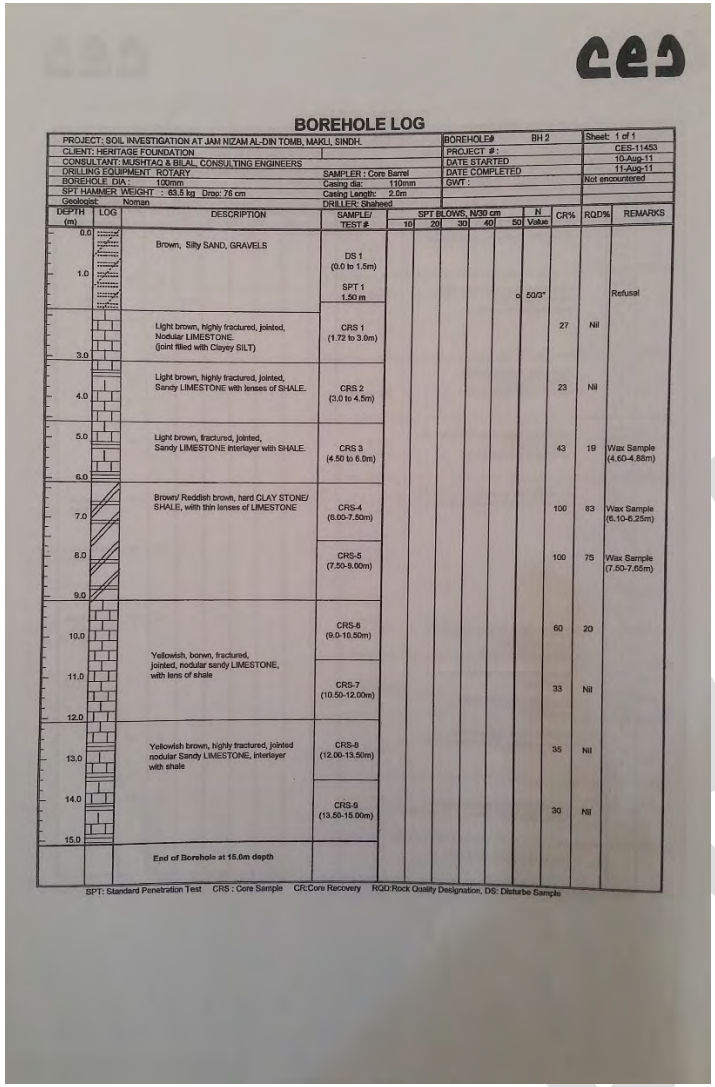
BOREHOLE LOG

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.		BOREHOLE# BH 1	Sheet: 1 of 1
CLIENT: HERITAGE FOUNDATION		PROJECT # :	CES-11453
CONSULTANT: MUSHTAQ & BILAL, CONSULTING ENGINEERS		DATE STARTED	5-Aug-11
DRILLING EQUIPMENT: ROTARY	SAMPLER : Core Barrel	DATE COMPLETED	6-Aug-11
BOREHOLE DIA : 100mm	Casing dia: 110mm	GWT :	Not encountered
SPT HAMMER WEIGHT : 63.5 kg Drop: 76 cm	Casing Length: 1.50m		
Geologist: Noman	DRILLER: Shaheed		

DEPTH (m)	LOG	DESCRIPTION	SAMPLE/ TEST #	SPT BLOWS, N/30 cm 10 20 30 40 50	N Value	CR%	RQD%	REMARKS
0.0		Brown, Silty CLAY with Sand & Gravels	DS 1 (0.0 to 1.0m)					
1.0		Light brown, highly fractured, jointed, Nodular LIMESTONE, (joint filled with Clayey SILT)	CRS 1 (1.0 to 1.5m)			84	Nil	
			SPT 1 1.50 m		50/1"			Refusal
			CRS 2 (1.5 to 3.0m)			31	Nil	
3.0		Light brown, fractured, jointed, Nodular LIMESTONE, (joint filled with Clayey SILT)	CRS 3 (3.0 to 4.5m)			82	30	
4.5								
5.0		Light brown, highly fractured, jointed, Nodular LIMESTONE, (joint filled with Clayey SILT)	CRS 4 (4.50 to 6.0m)			23	Nil	
6.0		Brown/ Reddish brown, hard CLAY STONE/ SHALE, with thin lenses of LIMESTONE	CRS-5 (6.50-7.50m)			93	88	Wax Sample (6.50-6.99m)
7.0								
8.0			CRS-6 (7.50-9.00m)			100	69	Wax Sample (8.39-8.59m)
9.0								
9.9		yellowish brown, highly fractured, jointed LIMESTONE (joint filled with Clayey SILT)	CRS-7 (9.0-10.50m)			100	57	Wax Samples A= 9.56-9.80 B= 10.40-10.47
11.0		Brown, hard SHALE, with thin lens of LIMESTONE	CRS-8 (10.50-12.00m)			93	37	Wax Samples A= 10.50-10.57 B=10.98-11.10 C=11.75-11.84
11.5								
12.0		Brown, highly fractured, jointed, SANDSTONE						
13.0		yellowish, borwn, highly fractured, jointed, limestone, interlayer with SHALE	CRS-9 (12.00-13.50m)			40	Nil	
14.0		Yellowish brown, highly fractured, jointed nodular LIMESTONE, interlayer with SHALE	CRS-10 (13.50-15.00m)			38	Nil	
15.0		End of Borehole at 15.0m depth						

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample



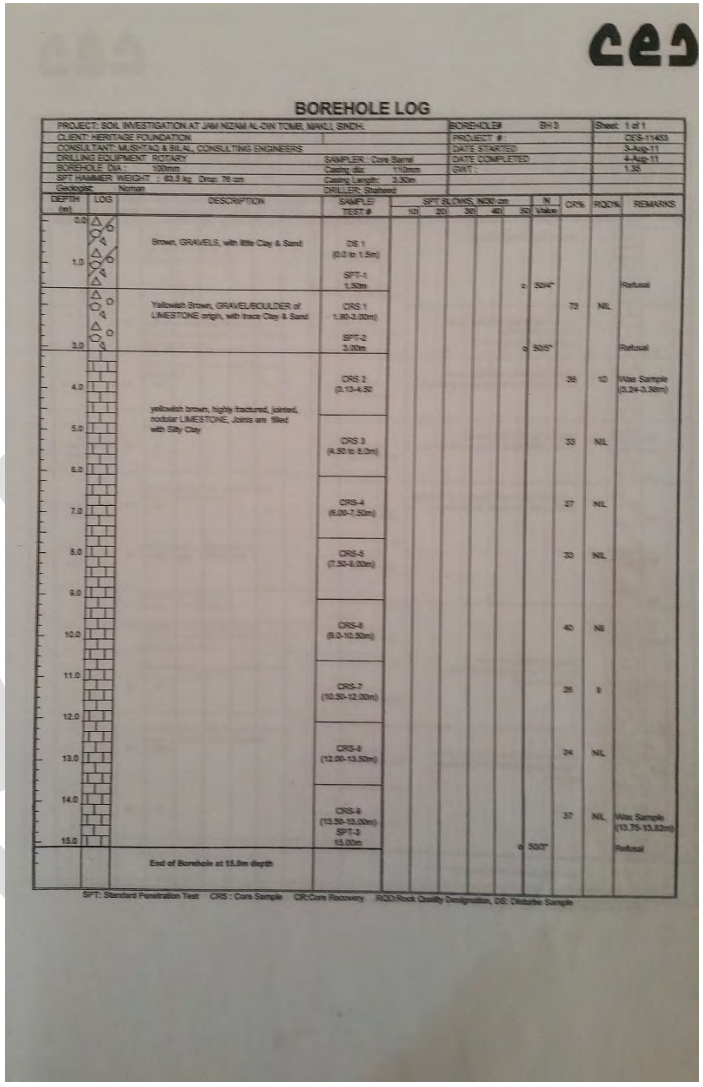
BOREHOLE LOG

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.		BOREHOLE#	BH 2
CLIENT: HERITAGE FOUNDATION		PROJECT # :	
CONSULTANT: MUSHTAQ & BILAL, CONSULTING ENGINEERS		DATE STARTED	
DRILLING EQUIPMENT: ROTARY	SAMPLER : Core Barrel	DATE COMPLETED	
BOREHOLE DIA : 100mm	Casing dia: 110mm	GWT :	
SPT HAMMER WEIGHT : 63.5 kg Drop: 76 cm	Casing Length: 2.0m		
Geologist: Noman	DRILLER: Shaheed		

Sheet: 1 of 1
CES-11453
10-Aug-11
11-Aug-11
Not encountered

DEPTH (m)	LOG	DESCRIPTION	SAMPLE/ TEST #	SPT BLOWS, N/30 cm (10 / 20 / 30 / 40 / 50)	N Value	CR%	RQD%	REMARKS
0.0 – 1.0		Brown, Silty SAND, GRAVELS	DS 1 (0.0 to 1.5m)					
			SPT 1 1.50 m		50/3"			Refusal
1.0 – 3.0		Light brown, highly fractured, jointed, Nodular LIMESTONE. (joint filled with Clayey SILT)	CRS 1 (1.72 to 3.0m)			27	Nil	
3.0 – 4.0		Light brown, highly fractured, jointed, Sandy LIMESTONE with lenses of SHALE.	CRS 2 (3.0 to 4.5m)			23	Nil	
4.0 – 6.0		Light brown, fractured, jointed, Sandy LIMESTONE interlayer with SHALE.	CRS 3 (4.50 to 6.0m)			43	19	Wax Sample (4.60-4.88m)
6.0 – 7.0		Brown/ Reddish brown, hard CLAY STONE/ SHALE, with thin lenses of LIMESTONE	CRS-4 (6.00-7.50m)			100	83	Wax Sample (6.10-6.25m)
7.0 – 9.0			CRS-5 (7.50-9.00m)			100	75	Wax Sample (7.50-7.65m)
9.0 – 11.0		Yellowish, borwn, fractured, jointed, nodular sandy LIMESTONE, with lens of shale	CRS-6 (9.0-10.50m)			60	20	
			CRS-7 (10.50-12.00m)			33	Nil	
12.0 – 14.0		Yellowish brown, highly fractured, jointed nodular Sandy LIMESTONE, interlayer with shale	CRS-8 (12.00-13.50m)			35	Nil	
			CRS-9 (13.50-15.00m)			30	Nil	
15.0		End of Borehole at 15.0m depth						

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample



BOREHOLE LOG

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.		BOREHOLE#	BH 3
CLIENT: HERITAGE FOUNDATION		PROJECT # :	
CONSULTANT: MUSHTAQ & BILAL, CONSULTING ENGINEERS		DATE STARTED	
DRILLING EQUIPMENT: ROTARY	SAMPLER : Core Barrel	DATE COMPLETED	
BOREHOLE DIA : 100mm	Casing dia: 110mm	GWT :	
SPT HAMMER WEIGHT : 63.5 kg Drop: 76 cm	Casing Length: 3.30m		
Geologist: Noman	DRILLER: Shaheed		

Sheet: 1 of 1
CES-11453
3-Aug-11
4-Aug-11
1.35

DEPTH (m)	LOG	DESCRIPTION	SAMPLE/ TEST #	SPT BLOWS, N/30 cm (10 / 20 / 30 / 40 / 50)	N Value	CR%	RQD%	REMARKS
0.0 – 1.0		Brown, GRAVELS, with little Clay & Sand	DS 1 (0.0 to 1.5m)					
			SPT-1 1.50m		50/4"			Refusal
1.0 – 3.0		Yellowish Brown, GRAVEL/BOULDER of LIMESTONE origin, with trace Clay & Sand	CRS 1 1.80-3.00m)			73	NIL	
			SPT-2 3.30m		50/5"			Refusal
4.0 – 6.0		yellowish brown, highly fractured, jointed, nodular LIMESTONE, Joints are filled with Silty Clay	CRS 2 (3.13-4.50			38	10	Wax Sample (3.24-3.38m)
			CRS 3 (4.50 to 6.0m)			33	NIL	
6.0 – 7.0			CRS-4 (6.00-7.50m)			27	NIL	
7.0 – 9.0			CRS-5 (7.50-9.00m)			33	NIL	
9.0 – 11.0			CRS-6 (9.0-10.50m)			40	Nil	
			CRS-7 (10.50-12.00m)			26	8	
12.0 – 14.0			CRS-8 (12.00-13.50m)			24	NIL	
			CRS-9 (13.50-15.00m)			37	NIL	Wax Sample (13.75-13.82m)
15.0			SPT-3 15.00m		50/3"			Refusal
		End of Borehole at 15.0m depth						

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample

BOREHOLE LOG

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.		BOREHOLE#	BH 2
CLIENT: HERITAGE FOUNDATION		PROJECT # :	
CONSULTANT: MUSHTAQ & BILAL, CONSULTING ENGINEERS		DATE STARTED	
DRILLING EQUIPMENT : ROTARY	SAMPLER : Core Barrel	DATE COMPLETED	
BOREHOLE DIA : 100mm	Casing dia: 110mm	GWT :	
SPT HAMMER WEIGHT : 63.5 kg Drop: 76 cm	Casing Length: 2.0m		
Geologist: Noman	DRILLER: Shaheed		

Sheet: 1 of 1
CES-11453
10-Aug-11
11-Aug-11
Not encountered

DEPTH (m)	LOG	DESCRIPTION	SAMPLE/ TEST #	SPT BLOWS, N/30 cm 10 20 30 40 50	N Value	CR%	ROD%	REMARKS
0.0		Brown, Silty SAND, GRAVELS	DS 1 (0.0 to 1.5m)					
1.0			SPT 1 1.50 m		50/0"			Refusal
3.0		Light brown, highly fractured, jointed, Nodular LIMESTONE. (Joint filled with Clayey SILT)	CRS 1 (1.72 to 3.0m)			27	Nil	
4.0		Light brown, highly fractured, jointed, Sandy LIMESTONE with lenses of SHALE.	CRS 2 (3.0 to 4.5m)			23	Nil	
5.0		Light brown, fractured, jointed, Sandy LIMESTONE interlayer with SHALE.	CRS 3 (4.50 to 6.0m)			43	19	Wax Sample (4.60-4.88m)
7.0		Brown/ Raddish brown, hard CLAY STONE/ SHALE, with thin lenses of LIMESTONE	CRS-4 (6.00-7.50m)			100	83	Wax Sample (6.10-6.25m)
8.0			CRS-5 (7.50-9.00m)			100	75	Wax Sample (7.50-7.65m)
10.0		Yellowish, borwn, fractured, jointed, nodular sandy LIMESTONE, with lens of shale	CRS-6 (9.0-10.50m)			60	20	
11.0			CRS-7 (10.50-12.00m)			33	Nil	
13.0		Yellowish brown, highly fractured, jointed nodular Sandy LIMESTONE, interlayer with shale	CRS-8 (12.00-13.50m)			35	Nil	
14.0			CRS-9 (13.50-15.00m)			30	Nil	
15.0		End of Borehole at 15.0m depth						

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample

BOREHOLE LOG

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.		BOREHOLE#	BH 4
CLIENT: HERITAGE FOUNDATION		PROJECT # :	
CONSULTANT: MUSHTAQ & BILAL, CONSULTING ENGINEERS		DATE STARTED	
DRILLING EQUIPMENT ROTARY	SAMPLER : Core Barrel	DATE COMPLETED	
BOREHOLE DIA : 100mm	Casing dia: 110mm	GWT :	
SPT HAMMER WEIGHT : 63.5 kg Drop: 76 cm	Casing Length: 3.50m		
Geologist: Noman	DRILLER: Shaheed		

Sheet: 1 of 1
CES-11453
7-Aug-11
8-Aug-11

DEPTH (m)	LOG	DESCRIPTION	SAMPLE/ TEST #	SPT BLOWS, N/30 cm 10 20 30 40 50	N Value	CR%	ROD%	REMARKS
0.0		Raddish brown, medium dense, Silty Sand/ Sandy SILT with GRAVEL/COBBLES	DS 1 (0.0 to 1.5m)					
1.0			SPT-1 1.50m	o	31			
3.0		Yellowish brown, highly fractursd, jointed, nodular LIMESTONE, Joints are filled with Silty clay	CRS 1 1.95-3.00m)			37	NIL	
4.0		Greyish brown, LIMESTONE interlayer with SHALE	CRS 2 (3.13-4.50)			50	22	Wax Sample (3.29-3.52m)
5.0		Brown, hard SHALE	CRS 3 (4.50 to 6.0m)			100	80	Wax Sample (4.66-4.87m)
7.0		Brown, hard, SHALE/ CLAYSTONE, with thin lens of limestone	CRS-4 (6.00-7.50m)			100	87	
8.0		yellowish brown, higly fractured, jointed, Clayey SANDSTONE	CRS-5 (7.50-9.00m)			84	46	Wax Sample (8.17-8.30m)
10.0		Yellowish Brown, hard SHALE/ CLAYSTONE	CRS-6 (9.0-10.50m)			93	44	Wax Samples A=9.29-9.43 B=9.76-9.84
		yellowish borwn, higly fractured, jointed, nodular LIMESTONE interlayer with lense of SHALE						
11.0		Yellowish brown, highly fractured, jointed Sandy LIMESTONE	CRS-7 (10.50-12.00m)			39	80	Wax Sample (10.65-10.77m)
13.0		Yellowish brown, highly fractured, jointed Calcarious SANDSTONE, Interlayer with SHALE	CRS-8 (12.00-13.50m)			31	NIL	Wax Sample (12.27-12.34m)
14.0			CRS-9 (13.50-15.00m)			30	NIL	
15.0		End of Borehole at 15.0m depth						

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.
CLIENT: HERITAGE FOUNDATION.

LR # 49/ 11
Date: 12-08-2011

ATTERBERG LIMITS

S. NO.	BORING NO.	SAMPLE	DEPTH (m)	LIQUID LIMIT	PLASTICITY INDEX	Moisture (%)
1	BH-1	SPT-1	1.5	34	12	
2	BH-1	CRS-5	6.8 - 6.99	66	15	
3	BH-1	CRS-8	10.98 - 11.10	44	13	
4	BH-2	DS-1	0.0 - 1.5	Non-Plastic	Non-Plastic	
5	BH-2	CRS-3	4.6 - 4.88	66	17	
6	BH-2	CRS-5	7.5 - 7.65	66	16	
7	BH-3	DS-1	0.0 - 1.5	32	12	
8	BH-4	SPT-1	1.5	22	4	5.19
9	BH-4	CRS-3	4.66 - 4.87	60	9	29.84
10	BH-4	CRS-5	8.17 - 8.30	35	11	19.57
11	BH-4	CRS-8	12.27 - 12.37	25	8	8.12

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.
CLIENT: HERITAGE FOUNDATION.

LR # 49/ 11
Date: 12-08-2011

GRAIN SIZE ANALYSIS (PER CENT FINER BY WEIGHT)
SIEVE ANALYSIS

S.NO.	BORING NO.	SAMPLE	DEPTH (m)	3" 75 mm	1.5" 38 mm	3/4" 19 mm	3/8" 9.5 mm	#4 4.75 mm	#8 2.36 mm	#16 1.18 mm	#30 0.600 mm	#50 0.300 mm	#100 0.150 mm	#200 0.075 mm	0.05 mm	0.01 0.010 mm	0.002 0.002 mm	0.001 0.001 mm
1	BH-1	SPT-1	1.5			100	64	62	61	60	59	59	56	53				
2	BH-1	CRS-5	6.8 - 6.99									100	99	98				
3	BH-1	CRS-8	10.98 - 11.10					100	99	99	98	97	95	95				
4	BH-2	DS-1	0.0 - 1.5	100	39	30	29	26	24	23	21	20	14	12				
5	BH-2	CRS-3	4.6 - 4.88					100	98	93	87	84	74	72				
6	BH-2	CRS-5	7.5 - 7.65					100	99	93	86	83	77	75				
7	BH-3	DS-1	0.0 - 1.5	100	92	52	25	13	10	9	8	7	6	6				
8	BH-4	SPT-1	1.5		100	78	68	64	63	61	59	58	49	43				
9	BH-4	CRS-3	4.66 - 4.87					100	96	91	89	84	82	76	62	57	28	
10	BH-4	CRS-5	8.17 - 8.30				100	83	80	71	62	58	48	46				
11	BH-4	CRS-8	12.27 - 12.37			100	89	76	68	61	57	48	47					

HYDROMETER (Dia in mm)

L.R # 49/ 11
Date: 12-08-2011

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.
CLIENT: HERITAGE FOUNDATION.

CHEMICAL TESTS

S. NO.	BORING NO.	SAMPLE	DEPTH (m)	pH	SULPHATE CONTENT %	CHLORIDE CONTENT %
1	BH-1	SPT-1	1.5	6.5	0.287	0.296
2	BH-3	WATER	-	7.5	1465 (mg/ Liter)	7799.78(mg/ Liter)
3	BH-04	SPT-1	1.5	6.5	0.184	0.181

L.R # 49/ 11
Date: 12-08-2011

PROJECT: SOIL INVESTIGATION AT JAM NIZAM AL-DIN TOMB, MAKLI, SINDH.
CLIENT: HERITAGE FOUNDATION.

UNCONFINED COMPRESSION TEST

S. NO.	BORING NO.	SAMPLE	DEPTH (m)	UNCONFINED COMPRESSIVE STRENGTH		Bulk Density (gm/cc)	Moisture (%)
				q_u (Kg/ cm^2)	STRAIN (%)		
1	BH-1	CRS-5	6.8 - 6.99	2.301	4.06	1.845	34.17
2	BH-1	CRS-8	10.98 - 11.10	2.482	3.91	1.730	33.14
3	BH-2	CRS-3	4.6 - 4.88	2.019	5.29	1.763	39.59
4	BH-2	CRS-5	7.5 - 7.65	2.142	8.01	1.886	47.38
5	BH-3	CRS-2	3.24-3.38	16.875	1.94	2.316	7.6
6	BH-3	CRS-9	13.75 - 13.92	79.308	9.95	2.119	2.3
7	BH-4	CRS-3	4.66 - 4.87	2.873	4.09	1.839	29.64
8	BH-4	CRS-5	8.17 - 8.30	3.152	2.57	1.585	16.57

Aug 30th 2011

STRUCTURAL DEFORMATION IN THE TOMB OF JAM NIZAM, AT MAKLI NECROPOLIS

The Jam Nizam Tomb was built around 1509. It's located on in the Makli Necropolis (24°46'33.69"N, 67°54'13.39"E) at one of the highest level. On East as well as West, land slopes downwards. It's steeper towards East. The land profile on the East is in 2:1 slope. The eastern façade has settled and there are therefore cracks on Southern and Northern façades.

The area was jolted with massive earthquakes after the completion of the Tomb. Of these the major earthquakes were as follows:

2 May 1668 - Near Shahbundar (Lower Sindh), Pakistan, **M 7.6** (TS) 24.00 N, 68.00 E, The tomb is only 58 miles from the epicenter,

16 June 1819 - Allahbund, Indo-Pak Border region, **Mw 7.5** (Bilham, '99) 23.60 N, 69.60 E The tomb is 133 miles from epicenter.

27 November 1945 - Off the Makran coast (Balochistan), Pakistan, Mw **7.9**, 21:56: UTC, 24.50 N, 63.00 E, 16 miles (25 kms) depth. The tomb was 276 miles from the epicenter,

5 August 1947 - Off the Makran coast (Balochistan), Pakistan, Mw **7.2** 14:24: UTC, 25.10 N, 63.40 E the epicenter was 283 miles from the tomb.

First two earthquakes mentioned above, were very powerful and their epicenters were close by. These must have been very damaging to the tomb. However since it was *founded on solid rock*, the damage may possibly be limited to *extensive cracking of thick stone wall of the tomb*. In addition, these earthquakes could also have caused leaning of the tomb towards East since the terrain is slopping eastwards. Later two powerful but distant earthquakes, on Nov 1945 and Aug 1947, could also have *enlarged the deformity*. A keeper at the tomb who is in his late 80's remembers the earthquake of 1947 in particular and according to him damage in the tomb was also observed after this earthquake. In addition the slope on the East, where the tomb is leaning, could be attributed to presence of 15 feet thick layer of shale which is exposed to Elements at one eastern end.

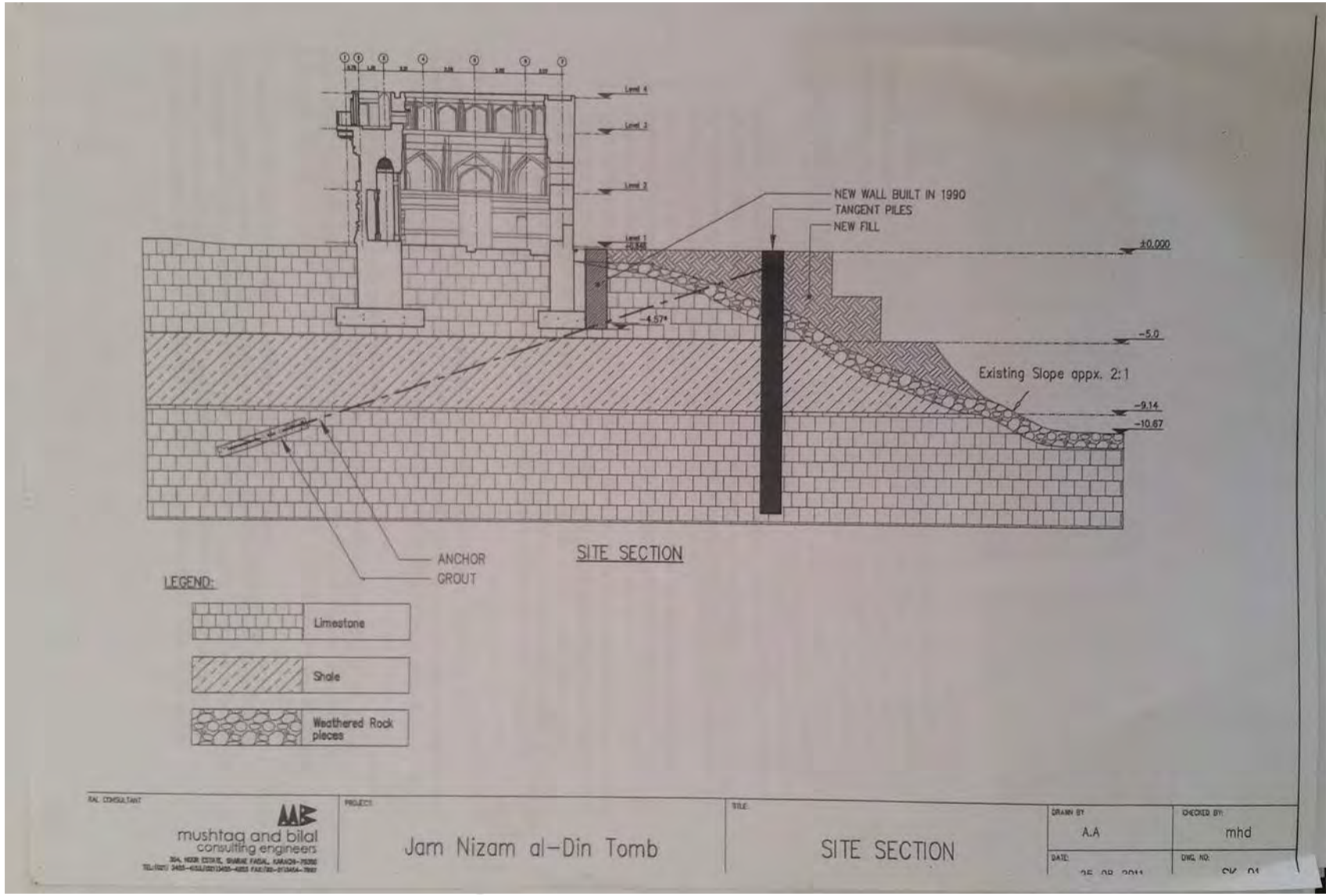
The subsoil investigation carried out recently (Aug 2011) indicated that top layer of earth was originally limestone. Due to exposure to Elements, it has disintegrated into smaller pieces. Immediately below the fragments of rock, is an approximately 4.5 M (15 feet) thick layer of lime stone and below this is a 4.5M (15 feet) layer of "Shale". Shale is identified as "dense silt" and its physical properties *may* change if inundated or exposed for long.

Reportedly the foundations of the Tomb are laid at about 15 deep from the present GL. In 1990 a 4 feet thick and 15 feet deep retaining wall was built close to the Tomb to prevent movement of the foundation. A quick review of the cross section of the tomb and the land reveals that this wall at this location cannot serve intended purpose.

A detailed study and exhaustive site visits are required by a team consisting of Architect, conservationist, Geotechnical and structural for detailed inspection. However after brief review of the available data and the site condition, following are my immediate observations and suggestions:

1) Land mass on the East side is slopping at approximately 2:1. (See SK-01)A 15 feet thick layer of Shale is therefore exposed as shown in the Sketch 01. It can undergo change in its physical properties. As a consequence East wall *may continue to settle*. (See SK-02). There is a potential of cracking over last 500 years. East wall is reported to have settled,
2) The mass of the tomb is not uniform but eccentric and its CG is at the top layers is towards East wall.
3) Accordingly South and North walls have wide cracks Repairs have been carried out.
4) It's vital to install "Tell Tale Crack Monitors" or similar gauge on each wall across three cracks to monitor movement/settlement for considerable period,
5) If some settlement of eastern wall is still observed, measures must be taken to minimize it. These measures are likely to include a long wall made of closely spaced (0 to 6") anchored piles and or stabilizing slope by new stone riprap.

Mushtaq H. Dawood,
mushtaq & bilal


NEW WALL BUILT IN 1990
TANGENT PILES
NEW FILL
±0.000
-5.0
Existing Slope appx. 2:1
-9.14
-10.67
ANCHOR
GROUT
SITE SECTION
LEGEND:
Limestone
Shale
Weathered Rock pieces
mushtaq and bilal
consulting engineers
Jam Nizam al-Din Tomb
SITE SECTION
A.A
mhd

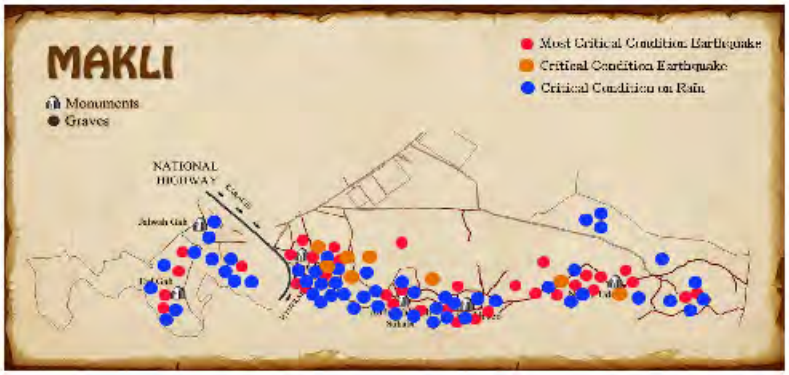
Final Report DRR 2017

A previous disastrous monsoon occurred in 2010. Makli and Sindh were less well prepared then as an influx of refugees from the surrounding low-lying areas inundated the site. In 2017, UNESCO and the Directorate of Antiquities and Archaeology, Government of Sindh began a workshop on raising awareness and importance of disaster risk reduction. Key pages of the final report is included here as it is not well known and this effort did contribute to reducting the impacts of the 2022 monsoon.

Directorate of Antiquities and Archaeology
Culture, Tourism and Antiquities Department
Government of Sindh

FINAL REPORT

Raising Awareness and Capacity of the Culture and Disaster Management Authorities to Manage Disaster Risk Reduction to the Cultural Properties in Pakistan



a) Contacting the Geology Department, University of Sindh for their involvement in the study. Professor of Geology and Pro-Vice Chancellor, Dr. Sarfraz Hussain Solangi took up the responsibility for his valued engagement and contributions to the study.

b) Secretary Irrigation was personally approached by the DG Antiquities and Archaeology and the flood data was received in time and shared with the experts for their study and analysis.

c) The Directorate of Antiquities and Archaeology plans to take a lead role in integrating the heritage sites in district DRR plans. Required capacity development, establishing linkages and developing the information/ advocacy material will be taken up.

1. Introduction

Directorate of Antiquities and Archaeology, Government of Sindh, is working with UNESCO Islamabad on raising awareness and capacity of the Culture and Disaster Management Authorities to manage disaster risk reduction to the cultural properties in Pakistan with a focus on Mohenjo-Daro and Makli, the World Heritage sites in Sindh. The project on carrying out the detailed disaster risk assessment at both the heritage properties was successfully carried out from the period between August to November, 2017.

As a common phenomenon at the majority of the heritage sites in Pakistan, the heritage sites in Sindh are facing the imminent natural and man-made disasters, including the vandalism and possible terrorist attacks. Famous shrines in Sindh have been attacked in the past and one most recently, i.e. the shrine of Hazrat Lal Shahbaz Qalander, as such; the likelihood of such attacks cannot be ruled out at the heritage sites. This calls for the additional security measures specifically at the World Heritage Sites in the province, apart from addressing and minimizing the natural and man-made disasters.

As far as the World Heritage Properties in Sindh are concerned, both have been and are continuously facing considerable deterioration and threats from floods, earthquakes, heavy rainfall, cyclones and the factors related to the man-made disasters including the vandalism, encroachments, ill-planned development schemes and the use of sites as safe haven for the internally displaced people during the emergencies.

The purpose of this initiative is to raise awareness and build the capacity of both the Culture Department and Disaster Management Authorities to better understand and manage the disaster risk reduction to the cultural properties in the province which may serve as a precursor for the similar studies at the other important cultural properties in Pakistan. The project included the detailed studies and assessments of the disaster risks, sites and museum appraisals involving the experts, MET and irrigation departments and Provincial and District Disaster Management Authorities. The project activities were carried out during the above specified period and culminated with the organizing of a Provincial Workshop wherein the findings of the study and recommendations were shared with the stakeholders, involving the lead departments; disaster management authorities, irrigation department, civil defense, fire-brigade, boys' scouts association and the district administration.

2. Background

The natural and man-made disasters have been detrimental to the cultural properties in Pakistan and in recent past have inflicted damages or raised vulnerability to the several archaeological sites and historical buildings. The massive floods of 2010 raised great concerns of the huge negative impact on the national and the world heritage sites in Pakistan. Located at the immediate vicinity of the Indus River, the archaeological remains at Mohenjo-Daro were at risk from unprecedented levels of flooding. Similarly, the necropolis of the Historical Monuments at Makli suffered a huge influx of the internally displaced people, wherein approximately 35,000 people took refuge among the monuments and tombs at the onset of a huge flood affecting the entire district of Thatta. The recent earthquake in 2015 caused a number of damages to the cultural sites and museums in Khyber Pakhtunkhwa.

Owing to such frequent disastrous events, it is very important to develop a better understanding of the disasters and assess the vulnerability of all the important heritage sites so that mitigating measures are taken well in time. Keeping in view the frequent occurrences of disasters in Sindh which have been considerably affecting its cultural heritage, it was proposed to carry out multi-hazard assessments of WH Mohenjo-Daro and Makli.

As the Directorate of Antiquities and Archaeology in Sindh is now functioning with a new set-up and is actively involved in the preservation and conservation of the province's heritage sites, this study would greatly benefit the Directorate in understanding the types, intensity and frequency of the disasters and would build its capacity in forming linkages with the MET, irrigation department and the Provincial and District Disaster Management Authorities for putting in place appropriate mechanisms, plans and actions to mitigate the disasters.

3. Objectives

The objectives of the project include carrying out a comprehensive mapping of the flood, earthquake, rainfall, cyclone and multi-hazard assessment of the selected World Heritage Sites against the natural and man-made disasters. The proposed study may lead to developing a wider understanding of the disaster threats in the World Heritage sites and the development of the effective disaster risk reduction plans and actions. The project have achieved the following outputs;

i) A comprehensive disaster mapping and assessment
ii) A comprehensive report on the study, data analysis and recommendations
iii) Computerized database
iv) Workshop presentations
v) Awareness and capacity building workshop
vi) Recommendations shared with the relevant government authorities

In the course of the project timeline, following deliverables have been achieved for the DRR study;

i) Mapping flood, earthquake, rainfall, cyclone disasters and multi-hazard assessment of the selected World Heritage Sites against the natural and man-made disasters.

ii) Organize an awareness and capacity building workshop to manage disaster risk at cultural properties. Engaging Culture and Disaster Risk Management Authorities.

4. Activities carried out

As per the contract agreed and signed between UNESCO Islamabad and the Directorate of Antiquities and Archaeology, Government of Sindh, following activities have been carried out during the project cycle.

4.1: Inception Meeting

In order to prepare the scope of the study and develop a proposal for submission with the UNESCO Islamabad office, an inception meeting was organized on 25th April, 2017 at the National Museum of Pakistan. The meeting was participated by the lead experts from the NED University and the Management Board of Antiquities, including Mr. Arif Hassan, renowned senior architect, the officials of the Directorate of Antiquities and Archaeology and the UNESCO representative in Sindh.

The meeting was helpful in setting up the scope of the DRR study, including the various components, processes and activities for the project. This in turn helped the Directorate in developing a detailed proposal and the identification of the relevant experts to be engaged in the process. Details of the meeting including the Inception Report are attached in annexures. Please refer *Annexure-I* and *Annexure-II*

7. Findings and Recommendations

Besides the technical findings and recommendations suggested by the experts in the light of their studies, following findings and recommendations were discussed during the workshop;

- Fire-brigade officials reported the presence of their active services in all district headquarters of the province. However, the response time may depend upon the distance to the affected area. While it was noted that the fire-brigade can quickly respond to the fire-emergency at Makli necropolis, however; given the 30 kilometers distance between Larkana and Mohenjo-Daro, the response time will not be quick.

- Boys Scouts Association presented the structure of their association and informed the participants of their presence in districts. The representative shared that the age-bracket of the scouts for dealing with the disaster and emergency situations is from 19 to 25 years. However, as this age-bracket is usually not available due to their higher education and jobs. But, the Association showed their commitment and suggested that as they are working under the district administration; their services can be readily requested from the deputy commissioner.

- Representative from the Civil Defense expressed their commitment for playing their role in any case of disaster at the heritage sites, however; given that the institution of Civil Defense is itself in a disaster situation due to lack of funding, their role could not be clearly identified. The Civil Defense offices in districts are mostly vacant due to lack of budget and other management issues.

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- Additional Deputy Commissioner, Thatta, shared that as the district administration is often exhausted of the various responsibilities, they have not been given an opportunity to explore the possibilities of working closely with the culture department. Realizing the importance of Makli as an important World Heritage site, he showed his commitment for integrating the cultural heritage in the district DRR plans. He emphasized on developing the relevant informational material/ pamphlets for the dissemination to the district line departments for their sensitization and awareness.

- Ms. Yasmeen Lari suggested involving local communities and training them in disaster risk reduction. As the local communities are living within the epicenters, they can play an effective role as first responders.

- Dr. Kaleemullah Lashari informed the participants of his proposed meeting with the Secretary Irrigation Department for expediting the reinforcement of the dykes along the right-bank of the Indus near Mohenjo-Daro.

- The DG Antiquities and Archaeology expressed his commitment for establishing Joint Working Group with the disaster management authorities in close collaboration with the district administration and the relevant district line departments and other stakeholders. He thanked UNESCO Islamabad for supporting the department for carrying out this important DRR study at the heritage sites in Sindh.

8. Challenges

- The project activities were delayed due to backing out of the experts from the NED University.
- Delay in the flood data from the Irrigation Department
- Lack of awareness and capacity of the disaster management authorities and district administration

9. Strategies/ Actions

In order to address the challenges, the Directorate worked out and took necessary actions by;

a) Contacting the Geology Department, University of Sindh for their involvement in the study. Professor of Geology and Pro-Vice Chancellor, Dr. Sarfraz Hussain Solangi took up the responsibility for his valued engagement and contributions to the study.

b) Secretary Irrigation was personally approached by the DG Antiquities and Archaeology and the flood data was received in time and shared with the experts for their study and analysis.

c) The Directorate of Antiquities and Archaeology plans to take a lead role in integrating the heritage sites in district DRR plans. Required capacity development, establishing linkages and developing the information/ advocacy material will be taken up.

Figures

Figure 53 detail of ornamentation from Jam Nizzamadin