دائـــرة الآثـار العامـــة
Department of Antiquities
JORDAN | الأردن

State Of Conservation Report

Um er-Rasas
(Kastrom Mefa'a)

Jordan

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Acronyms

ACL-UNIWA	The Architectural Conservation Laboratory of the University of Attica
CNR	National Research Council
DoA	Department of Antiquities
EKBMM	The European Centre for Byzantine and Post Byzantine Studies
ENEA	The Italian National Agency for New Technologies, Energy and Sustainable Economic Development
ISPRA	The Italian Institute for Environmental Protection and Research
MoTA	Ministry of Tourism and Antiquities
OUV	Outstanding Universal Value
PVC	Polymerizing Vinyl Chloride
SMAD	Shape Memory Alloy Devices
WHC	World Heritage Centre

General Information - Property Data

Um er-Rasas (Kastrom Mefa'a)

State Party

The Hashemite Kingdom of Jordan

Identification Number

1093

Year of inscription on the List of World Heritage

2004

Type of Property

Cultural

Geographic Information (lat/long)

N31 30 6.012 E35 55 14.016

Area

23.928 ha

Government Institutions Responsible for the Property

Ministry of Tourism (MoTA), Department of Antiquities (DoA)

Criteria

(i) (iv) (vi)

Previous Committee Decisions

2018, 2017, 2015, 2013, 2011, 2010, 2009, 2008, 2007, 2006, 2005

Executive Summary

The State of Conservation of Um er-Rasas (Kastrom Mefa'a) is among the most important priorities of the Department of Antiquities, therefore, this State of Conservation report responds to Decision: 42 COM 7B.55 of the World Heritage Committee and its requests. The report includes information on the following:

- A submission of comprehensive conservation plan
- A Public Use Plan
- Regulations for the Archaeological Projects in Jordan

In addition to the previous and current work being done on the Stylite Tower, the approved proposal of the intervention of the Stylite Tower, and the monitoring being conducted on the Castrum Fortification.

The report also address the boundaries of the site and the future plans of the Department of Antiquities in regards of the Buffer zone.

Lastly, the report mention in details the other conservation efforts carried out by the Department of Antiquities, such as:

- Adopting and implementing the management plan; including the immediate water treatment of the shelter of St. Stephan church and the monitoring of the mosaics
- Improving the visitors' experience; including installing new panels showing the locations of the main archaeological features, planning to install interpretation panels and the plan to cover the wells close to the visitors' trail
- International cooperations with various institutions regarding the documentation of the site and protection of the mosaic floors.

Response to the Decision of the World Heritage Committee

Decision 3

Commends the State Party for the submission of the Management Plan for the property; and invites it to submit the requested complementary documentation

- **A comprehensive conservation plan** is presented in the Site Management Plan that was submitted in February 2018, Chapter 7 covers all necessary policies and actions related to the conservation of the World Heritage Property, including the Legal and Institutional Framework, which will be a conducive to the conservation and presentation of the site's values, authenticity and integrity, and will ensure the enforcement of protection by-laws
In addition, chapter 7 covers in details the Conservation and Documentation, Research and Excavation, as well as Maintenance and Monitoring.
- **A Public Use Plan** was submitted within the State of Conservation report in 2015, (Kindly see Annex I) in addition, appropriate use is also explained in the Site Management Plan in chapter 7, section 7.2.2 Appropriate Use
- **"Regulations for the Archaeological Projects in Jordan"** issued pursuant to the provisions of the Jordanian Antiquities Law Number 21 for the year 1988 as amended" was issued in 2016 and it sets the legal framework for all archaeological works in Jordan. (Kindly see Annex II)

Decision 4

Expresses concern over the lack of completion of urgent conservation work across the property, with particular attention given to the Stylite Tower and the Castrum Fortification and urges the State Party to undertake all needed temporary and reversible consolidation interventions of the fragile attributes in the property and submit the final conservation projects to the World Heritage Centre for review by the Advisory Bodies, and encourages the State Party to invite a joint World Heritage Centre/ICOMOS Advisory mission to support the finalization of such projects if deemed necessary

All elements of the of the properties are monitored and reported twice a month in winter and every month in summer

Stylite Tower

The current strategy in use regarding the Stylite Tower is constant monitoring and preventive actions using glass panels fixated on the tower since 2006. Last monitoring mission to the site from the Department pf Antiquities (DoA) staff was in December 2018.

Figure 1: An example of the glass panels
Source: DoA

Recently, the DoA is cooperating with a team from the Italian Institute for Environmental Protection and Research (ISPRA) and the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) to conduct research on the tower and develop an intervention solution; the following was done to the Stylite tower in the recent years:

- A set of engineering geological investigations and modelling have been carried out since 2014 by ISPRA, in cooperation with ENEA with provision of different types of structural consolidation interventions;
- As a continuation to the previous works and studies on the Stylite Tower that were submitted within the 2015 SoC report of Um er-Rasas, a seismic vulnerability analysis was carried out on the Stylite Tower at Um er-Rasas, by Paolo Clemente, Giuseppe Delmonaco, Lucamaria Puzzilli, and Fernando Saitta in 2018. The study was based on preliminary investigations, which consisted in Schmidt- hammer tests executed on stone blocks and passive tromography tests on the ground. (Kindly see Annex III for more details).
- Taking into account several aspects, such as effectiveness, long-term sustainability, limited impact on the tower's key architectural features and reversibility of the intervention, four proposals were presented to the Department of Antiquities. It is worth mentioning that the four proposals were sent already to the World Heritage Centre (WHC) in 2015, and after evaluations

and studying the proposals with experts from ISPRA and ENEA and DoA, the DoA recommended that the following proposal was reputed and presented as the most promising and feasible for the tower. (Kindly see Annex IV for the full research and all the proposed interventions)

The Approved Proposal

Internal cables are substituted with special devices (SMAD – Shape Memory Alloy Devices) which will provide higher resistance to the tower's increasing tensional strength of materials and decreasing acceleration motion to the structure due to seismic events.

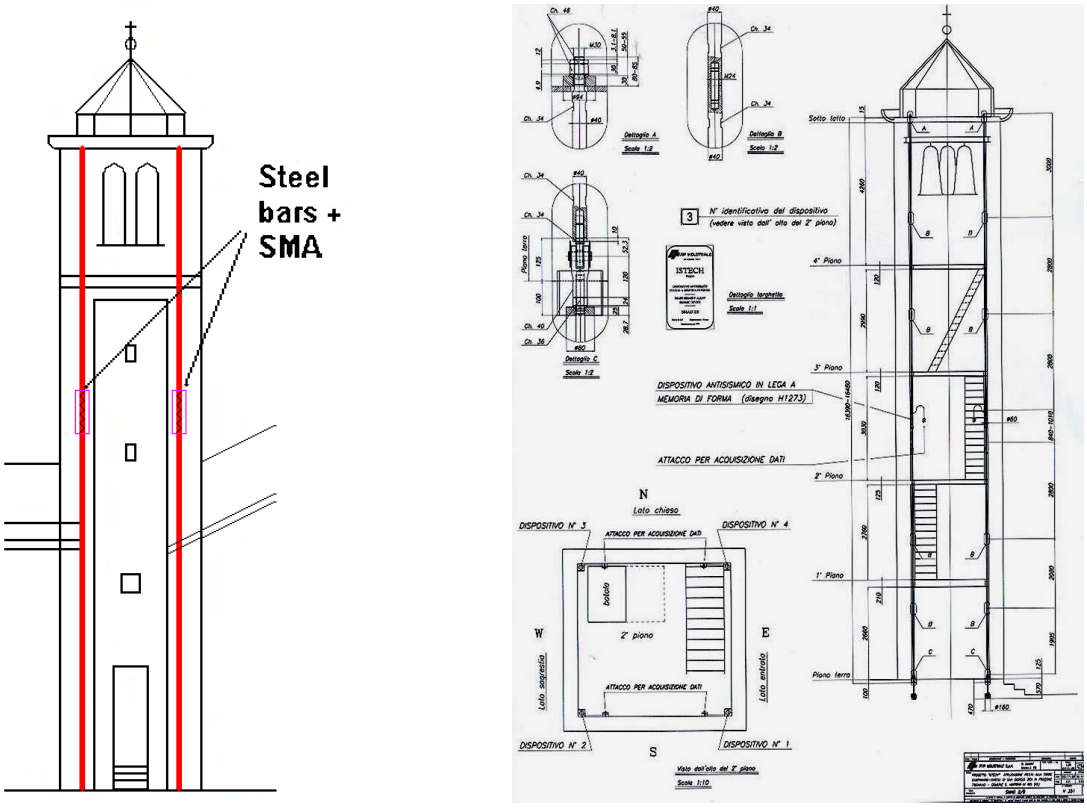

Figure 2: Proposal of reinforcement works , example of the Church of S: Giorgio a Trignano (Italy)
Source: Giuseppe Delmonaco

Application of SMADs has been implemented in some case studies in Italy as for the medieval Bell Tower of San Giorgio a Trignano (Emilia Romagna Region, Italy) and such methodology can be successfully applied to the Stylite Tower of Um er-Rasas. The main operations are the following:

- Excavation of the foundation (also for archaeological survey) until bedrock without dismantling the structure;
- Execution of micropiles from outside;
- Construction of reinforced concrete foundation of around 4.5mx4.5m;
- Installation of stainless steel bars connected with SMADs anchored to the top of the tower and foundation
- Restoration/replacement of damaged stone block (cuci-scuci technique).

Moreover, ISPRA in cooperation with ENEA and the National Research Council (CNR) are currently working on the refinement of the structural model in order to present a final feasible design on structural conservation of the tower. Certainly, in accordance with Paragraph 172 of the Operational Guidelines, the final version of the proposal will be shared with the World Heritage Centre and the Advisory Bodies before any implementation.

Castrum Fortification

The state of conservation of the Castrum Fortification is also monitored on a constant bases, with restoration, maintenance and consolidation of the Twins Churches led by the European Centre for Byzantine and Post Byzantine Studies (EKBMM).

Figure 3 : The Twins Churches
Source: DoA

Decision 5

Requests the State Party to update the definition of the property's boundaries and its buffer zone; and to submit it as a formal Minor Boundary Modification, in accordance with Paragraphs 163 and 164 of the Operational Guidelines, to the World Heritage Centre for evaluation by the Advisory Bodies and adoption by the World Heritage Committee at its 44th session in 2020;

The designated boundaries of the World Heritage property of Um er-Rasas have been the same since its inscription in 2004. The two core zones of the site (Castrum and ecclesiastical northern complex, and Stylite tower and associated structures) are owned by the DoA. As for the buffer zone, the majority of land parcels are owned by Ministry of Tourism ad Antiquities (MoTA). DoA and MoTA are planning to impose a larger buffer zone to protect the site through land acquisition around the archaeological area and the area extending from the Stylite Tower to the Castrum. Some parcels within the boundaries of the current buffer zone of the World Heritage site are privately owned and in the process of being acquired by MoTA, in case the parcels remained privately owned, they will be planned under special regulations with the coordination of Um er-Rasas municipality, in order to maintain the Outstanding Universal Value (OUV), authenticity and integrity of the site.

It is worth mentioning that the above mentioned parcels are not developed, and utilised minimally during summer times for agricultural and grazing purposes.

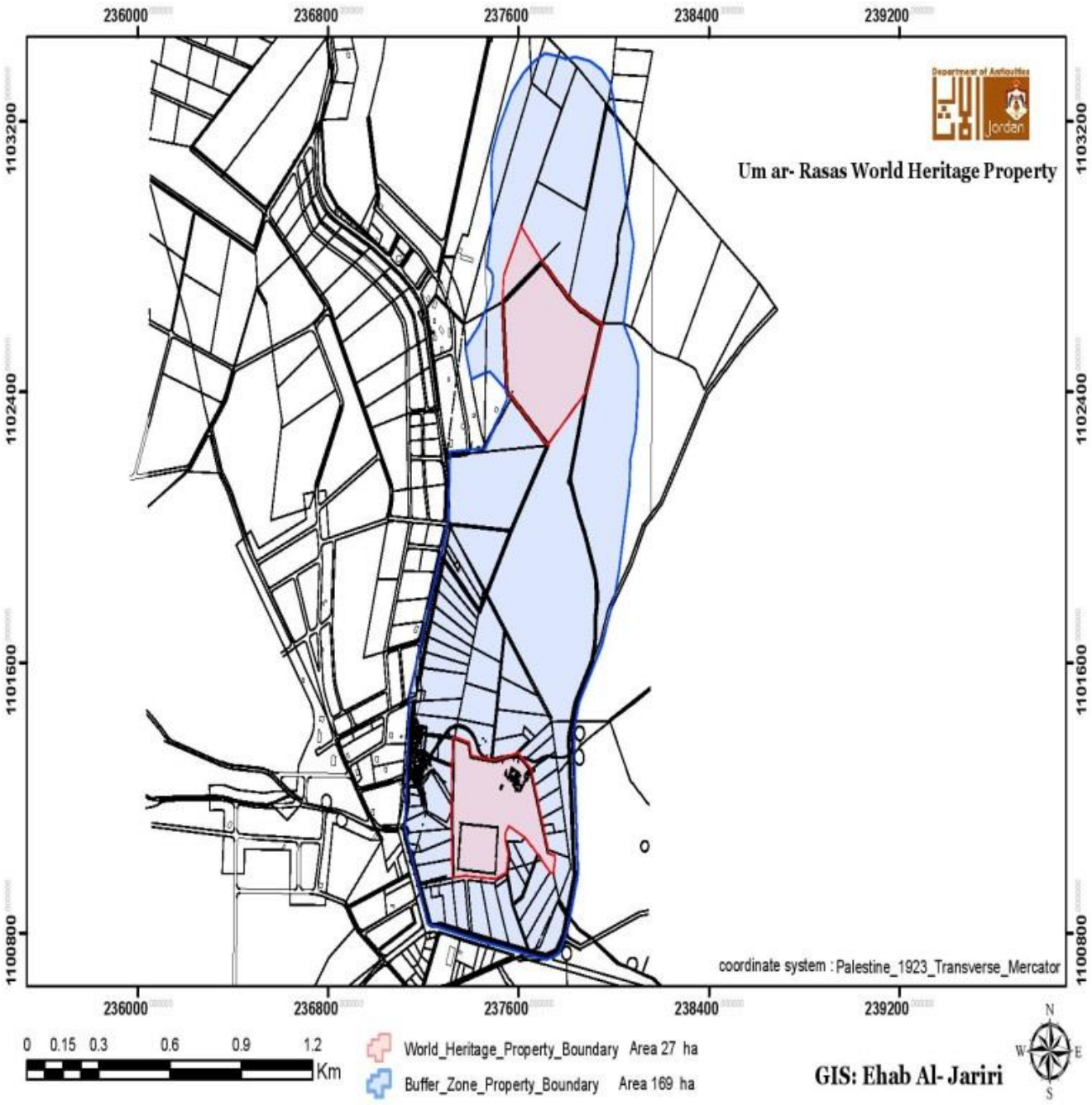

Figure 4 : Boundaries of the Site

Source: DoA

Other Current Conservation Issues

The Department of Antiquities have taken several progressive procedures to maintain the state of conservation of the property, which are:

1. Adopting and Implementing the Management Plan

The Um er-Rasas Site Management Plan was adopted and have officially been implemented since May 2018, several goals are being achieved in the site, such as:

1.1 Water Treatment of the Shelter

The south part of the Church of St. Stephen had been suffering from salinisation and humidity due to a leakage of rain water from the water collection basin in the shelter, which in turn was affecting the mosaic floor.

Therefore, the Department of Antiquities implemented rescue procedures to solve this issue as follow:

1. Covering the southern section of the drainage pipes using a coating of Polymerizing Vinyl Chloride (PVC) to prevent leakage.
2. Change the level of the ground pipe between the shelter and the drainage manhole by lowering it 20 cm in order to avoid the possibility of rainwater flooding.
3. Change the level of the pipe connecting manhole No. 1 and manhole No. 2 in the southeast façade to treat the drainage issues in that area.
4. A 10 cm sand barrier has been stacked in order to direct water collected by rain into a separate manhole.

As a result of the aforementioned procedures, the leakage to St. Stephen Church has been stopped completely, and during the current rains season, the church has not been affected by the rain.

Figure 5: The leakage in St. Stephan shelter
Source: DoA

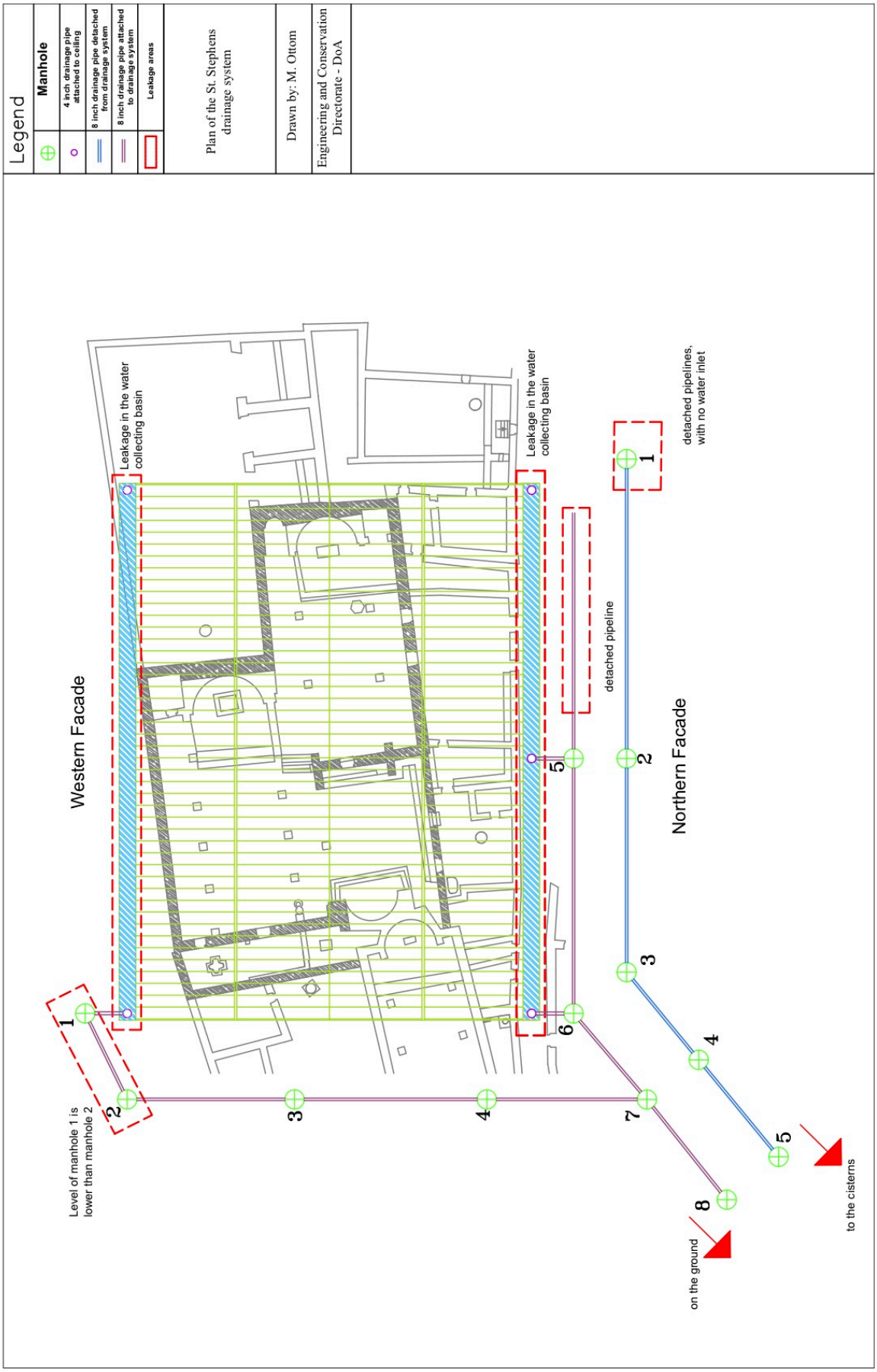

Figure 6: Plan of the drainage system of St. Stephen drainage system

Source: DoA

1.2 Protection of the Mosaics

Various projects to cover the mosaic floors of several churches were conducted utilising the Geotextile method, such as in the Lion Church and the Twin Churches, with constant monitoring and reconditions when necessary.

Figure 7: Geotextile in the Lion Church
Source: DoA

1.3 General Consolidation Works

During the periodic monitoring, and by referring back to the periodic reports of the site, occasionally the site staff notice that some of the mosaic floors are affected by the weathering conditions, visitors and some animals that wonder around the site at night, therefore, the Department of Antiquities have implemented direct consolidation procedures especially in St. Stephan Church, such as the consolidation of the floors' edges by specialised conservators from the local community in consultation with the Madaba Mosaic School. It is worth mentioning that the conservators were trained in a specialised workshop in cooperation with the EKBMM and The Architectural Conservation Laboratory of the University of Attica (ACL-UNIWA). Moreover, the site staff are regularly cleaning the mosaic floors from the birds' droppings.

Figure 8: Conservators working on consolidating St. Stephen Church
Source: DoA

2. Improving Visitors' Experience

The Department of Antiquities is currently working on implementing several project to improve the visitors' experience and understanding of the site, including:

2.1 Installing New Panels

New panels were installed in June, 2018 showing the locations of the main archaeological features of the property.

Figure 9: Newly installed panels
Source: DoA

2.3 Interpretation Panels

The Department of Antiquities is currently planning to consult with different stakeholders and possible fund agencies to initiate a project to install interpretation panels explaining in details the archaeological sites in Um er-Rasas.

2.4 The Wells

Hitherto,143 wells have been discovered. Although the majority of them are far away from the touristic trail, a few are somehow close and needs to be covered to insure the safety of the visitors, therefore the DoA is planning on designing proper protections promptly.

Figure 10: A well near the visitors' trail
Source: DoA

3. International Cooperations

3.1 Research Project - Italy

A research project in Um er-Rasas through new collaborations between Italian institutions. These institutions are: University of Perugia; University of Rome - Tor Vergata; University of Ancona; Italian Ministry of Environment; ISPRA and the second most important public research institution in Italy (ENEA).

The project will be developed in three years and will consider several different activities.
The activities are intertwined to each other and every activity is aimed at studying particular aspects of the archaeological complex: from the topographical point of view to the enhancement of the site through the use of 3D Laser Scanning and photogrammetric techniques.

The main activities will be focused on the area between the Castrum and the complex of the two byzantine churches. In this area laser scanning and photogrammetric surveys will be performed on the extant structures. Topographical surveys will be conducted using the GPS and remote sensing tools. To achieve better results we would also ask for the permission to fly over the site with the aid of a drone provided by a local service company. The study and the analysis of the topographical surveys are fundamental to produce the site map and to design touristic paths.

Geophysical prospections will be performed in the area between the churches and the Stylite Tower that could be particularly interesting from an archaeological point of view.
These prospections are aimed at detecting possible anomalies, which would show the presence of underground structures. Where anomalies are found, archaeological soundings will be carried out to explore the potential extent of the urban area.
Furthermore, geophysical analyses will be run also on other sectors of the site in order to study the hydraulic network, since some water tanks and wells have been located during the last survey campaign at Um er-Rasas in December 2017.
Thanks to all these activities we will be able to study and identify the ancient city’s road network.
A specific technical study will be carried out on the Stylite Tower. An interdisciplinary team composed by engineers and architects with different fields of expertise will work together to analyse the static and seismic issues affecting the stability of the Tower. Computer simulations will be performed to estimate the potential damages caused by weathering and earthquakes. This

study is aimed also at designing a future restoration intervention for the monument's conservation. Lastly, petrographic analyses will be made on the ancient masonries (stone blocks and mortars) of the churches, the residential buildings, their adjacent structures and the Tower. These analyses are fundamental to deepen the knowledge on the construction techniques used at Um er-Rasas from the Roman to the Early Islamic period. (for the full details of this cooperation, the objectives and timelines of the project, kindly see Annex V)

3.2 Mosaic Training Workshops - Greece

Due to the abundance and importance of mosaics in Um er-Rasas, a collaborative training program took place between the Department of Antiquities, the EKBMM and ACL-UNIWA, which focused on the training of young conservators and technicians in the monitoring and maintenance of mosaics. Another program will be the follow up of a training program that has been in place since 2013. The follow-up program will include conservation, training and awareness activities. (Kindly see Annex VI for more details)

To provide the framework for the currents collaboration regarding the Training Program on the Documentation, Conservation and Maintenance of Mosaics to be undertaken at the Twin Churches, a Memorandum of Understanding is in the process of being signed between the Department of Antiquities (DoA), the ACL-UNIWA, and EKBMM.

List of Annexes

Annex I	Public Use Plan
Annex II	Regulations for the Archaeological Projects in Jordan
Annex III	Seismic Analysis of the Stylite Tower at Um er-Rasas
Annex IV	Geotechnical, geophysical and geostructural analysis for conservation of the Stylite Tower of Um er- Rasas
Annex V	Cooperation with Italian Institutions
Annex VI	Documentation, Conservation and Maintenance of Mosaics at Um er-Rasas