Conservation of Erbil Citadel, Iraq - Assessment of the situation and recommendations

David Gandreau, Sébastien Moriset

United Nations Educational, Scientific and Cultural Organization
منظمة الأمم المتحدة للتربية والعلم والثقافة

World Heritage Convention
اتفاقية التراث العالمي

UNESCO office in Iraq

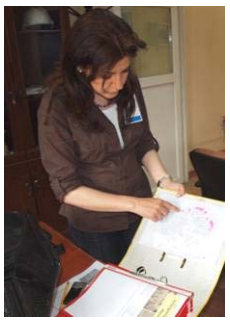
Conservation of Erbil Citadel

Iraq

Assessment of the situation and recommendations

Mission report, CRAterre-ENSAG, May 2011

David Gandreau, archaeologist
Sebastien Moriset, architect



www.unesco.org
www.craterre.org
www.erbilcitadel.org
www.unesco.org/en/iraq-office

Organisation des Nations Unies pour l'éducation, la science et la culture

Chaire UNESCO Architecture de terre

CRAterre ENSAG
école nationale supérieure architecture grenoble

CRAterre project code : IRQ 002

This mission was organised by the:

UNESCO office in Iraq

and the:

HCECR

High Commission for Erbil Citadel Revitalization

The present report was prepared by:

CRAterre-ENSAG

International Centre for Earth Construction - National Superior School of Architecture of Grenoble

David Gandreau, archaeologist, and
Sebastien Moriset, architect,

The mission took place in Erbil from the 14th to the 19th of May 2011

The mission, which aimed to assess the situation and propose guidelines for the conservation of Erbil citadel, was implemented in close collaboration with the HCECR and UNESCO staff

May 2011

For more information, contact:

CRAterre
David Gandreau / Sebastien Moriset
BP2636
38036 Grenoble Cedex 2 France
Phone. +33 476 69 83 35
E-mail: gandreaudavid@hotmail.com
sebastien.moriset@grenoble.archi.fr

www.craterre.org

UNESCO
Mourad Zmit, Project manager
May Shaer, Field Project Officer
Phone: +962 (6) 59 02 340 ext. 156
Mobile: +962 (0) 776 723 423
E-mail: m.zmit@unesco.org
E-mail: m.shaer@unesco.org
www.unesco.org
www.unesco.org/en/iraq-office

HCECR
Dara Al-Yaqubi, Head of HCECR
Cell Phone : +964 750 445 0838
E-mail: dalyaqubi@yahoo.com

Ranan Khasraw Tawfiq,
Chief architect
E-mail: ranan.hcecr@yahoo.com

www.erbilcitadel.org

Acknowledgements

We wish to thank all those who have contributed to the organisation of the mission:

High Commission for Erbil Citadel Revitalization:

- Dara Al-Yaqubi, Head of the High Commission
- Ranan Khasraw Tawfiq, Chief architect

UNESCO office in Iraq:

- Mourad Zmit, Project manager
- May Shaer, Field Project Officer
- Karzan Habeeb, civil engineer

CRAterre-ENSAG:

- Hubert Guillaud, architect
- Thierry Joffroy, architect
- Marina Trappeniers, administrator
- Nathalie Chapuis, secretary

Contents

A. Background information

B. Guidelines for the conservation of Erbil citadel

C. Appendixes

A. Background information

A1. Mission Objective and Terms of reference

The mission aimed to assess the situation and propose recommendations for the conservation of Erbil citadel.

The terms of references as described in the UNESCO contract for services to CRAterre (N° 4500139087) were as follow:

1. Mobilization
2. Carry out a 6 days working mission to Erbil
3. Site visit and meeting with UNESCO and HCECR
4. Assessment of the current overall situation and conservation needs according to the discussion with UNESCO and HCECR
5. Agree with HCECR and UNESCO a preliminary vision and overview of the results of the discussion and site visit and agree on the outline of the report to be submitted
6. Submit a report on the items agreed upon with UNESCO and HCECR

A2. Mission content

Following a preliminary study of the documentation in France, two experts from CRAterre (Sébastien Moriset and David Gandreau) have undertaken a 6 days mission to Erbil, from the 14th to the 19th of May 2011, in close cooperation with HCECR and UNESCO staff, mainly:

- HCECR : **Dara Al-Yaqubi**, Head of the High Commission and **Ranan Khasraw Tawfiq**, Chief architect
- UNESCO : **May Shaer**, Field Project Officer and **Karzan Habeeb**, civil engineer

Daily site visits were undertaken as well as studies of the documentation kindly provided by HCECR and UNESCO. Five formal meetings with both HCECR and UNESCO were organised during the mission to discuss the proposed guidelines for conservation and the content of the report.

Saturday	14	Departure from Lyon St. Exupery (07:30) and arrival et Erbil Int. airport (19:00).
Sunday	15	Meeting with HCECR and UNESCO and site visit with Mr. Dara Al-Yaqubi, Head of HCECR. Study of the documentation. Visit of three houses under restoration.
Monday	16	Meeting with HCECR and UNESCO. First proposal of the report content. Inspection of the slopes. Study of the documentation. Visit of three other houses under restoration.
Tuesday	17	Meeting with HCECR and UNESCO Second proposal of the report. Inspection of the perimeter wall. Visit of HCECR offices. Preparation of the content for the conservation manual and building regulation.
Wednesday	18	Meeting with HCECR and UNESCO Second proposal of the report. Presentation of the content for the conservation manual and building regulation.
Thursday	19	Final meeting with HCECR and UNESCO. Presentation of the timetables for the preparation of the conservation handbook and the building regulation.
		Departure from Erbil International airport. (19.45).

A3. Documents consulted during the mission

We sincerely thank UNESCO and HCECR for the documentation made available before and during the mission, which saved us a significant amount of time. The main documents consulted are listed below:

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Summary of the conservation and rehabilitation master plan and other project outputs*. Huszar Brammah and associates. Euronet consulting. Joint venture. October 2010. Extended January 2011. 33 pages.

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Conservation and rehabilitation master plan. Part 1 of 2*. Huszar Brammah and associates. Euronet consulting. Joint venture. September 2010. Extended January 2011. 316 pages.

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Conservation and rehabilitation master plan. Part 2 of 2*. Huszar Brammah and associates. Euronet consulting. Joint venture. September 2010. Extended January 2011. 244 pages.

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Conservation and rehabilitation master plan. Annexes*. Huszar Brammah and associates. Euronet consulting. Joint venture. September 2010. Extended January 2011.

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Architectural documentation of the existing fabric of the citadel, building and streets. Volume 1, studies*. Huszar Brammah and associates. Euronet consulting. Joint venture. June 2009. 214 pages.

- Revitalisation of Erbil citadel, Iraq, Phase 1. Ref N° IRQ/RFP/08/012. *Report on data collection*. Huszar Brammah and associates. Euronet consulting. Joint venture. October 2008

- *Erbil citadel, Restoration and Rehabilitation of Chalabi houses. Documentation, Condition assessement, Re-use plans, Technical drawings, Implementation phasing*. IFPO, Institut Français du Proche Orient. Dr. Mahmoud Bendakir. February 2010

- *Urgent preventive works of Erbil citadel, Irak. Phase 1. Intervention for ten buildings. Structural study report*. Centre for conservation & preservation of Islamic architectural heritage. Prof. Dr. Ashraf Osman. August 2009. 51 pages

- *Monitoring files* (files where all monitoring and conservation activities are systematically recorded : descriptions and photographs), HCECR

- *Photographic archives* (document presenting all archive photographs compiled by HCECR), HCECR documentation, Erbil Citadel

- *Architectural details files* (Files compiled by HCECR architects presenting a photographic inventory of architectural details, including doors, windows, wall decorations, sculpted wooden pillars, etc…), HCECR documentation, Erbil Citadel

B. Guidelines for the conservation of Erbil citadel

B1. General introduction

"Erbil Citadel Town, which is situated dramatically on top of an artificial, 32-meters high earthen mound, and visually dominating the expansive modern city of Erbil, is believed to have been in continuous existence for 7000 years or even more. Thus, it may be regarded as the oldest continuously inhabited settlement in the world. Because of its past fortifications and steeply inclined mound, which is at some locations nearly 45 degrees, it has managed to survive numerous sieges and fierce attacks. The existing fabric, however, goes back to several hundred years but is, nevertheless, of extreme vernacular architectural and urban interest, not only for Iraq but also for humanity at large.**"**

Extracted from the Tentative List, on the UNESCO-WHC website.
More information on: **http://www.erbilcitadel.org & http://whc.unesco.org/en/tentativelists/5479**

The citadel rises 28-32 m above the surrounding city, with successive layers of settlements: Assyrian, Akkadian, Babylonian, Persian Greek and Ottoman…

Current state of conservation of the Citadel

All the buildings which can be seen today in the citadel represent the most recent occupation periods, generally dating from the mid-eighteenth century to the 1990s. They mainly consist of houses, but 13 public buildings have also been identified. The 587 fired bricks buildings recorded (with few mud bricks or concrete blocks buildings) are generally in a poor state of preservation. In the **conservation and rehabilitation master plan**, 97,5% have been graded as in critical condition and only 2,5% as having limited problems.

For more information on the state of conservation, see the **overall structural assessment**, page 139 of the conservation and rehabilitation master plan Part 1.

Standing structure in a good state of conservation

Standing structures requiring conservation work

Partially collapsed structures

Management and co-ordination mechanisms in place

In order to preserve and enhance this unique historic town, the Kurdistan Regional Government (KRG) established the High Commission for Erbil Citadel Revitalization (HCECR) in 2007. An official agreement with UNESCO was signed in September 2007 to advise the Commission on this project and to prepare a "*Conservation and rehabilitation Master Plan*" for the Citadel. This plan prepared from September 2007 until August 2011 is abundantly documented and gives the orientations for the revitalization of the citadel. It serves as a major decision making tool for HCECR.

The HCECR premises are efficiently located in the hearth of the citadel, which allows continuous monitoring of the structures and constant interaction with the community of workers/conservators actually working at the citadel. The HCECR staffs at the moment of the mission was composed of approximately 30 people, including 3 architects, 2 engineers, a graphic designer, administrative and logistic staff. The UNESCO support staffs based within the HCECR premises were composed of 1 architect and 1 civil engineer. The team supervises maintenance, documentation but also rehabilitation works, and has achieved amazing results within a few years.

Major conservation issues

The vision for the citadel as stated in the Master plan is to:

“Become, through World Heritage inscription, internationally recognised as a symbol of the development of human culture and urban civilisation, but also the living dynamic and self-sustainable centre of the modern city of Erbil and the Kurdistan region of Iraq, conserved to international standards for future generations and interpreted for visitors from inside and outside Iraq.” P13

It is foreseen that the citadel which was depopulated in November 2006 will be able to accommodate a daily population of 4000, including visitors, workers in the citadel services as well as the permanent population in 10 years. The idea is to revitalize the citadel by integrating various sustainable activities into the site, including accommodation, businesses, recreation and tourism activities.

In terms of conservation, the challenges are to:

- Ensure a preliminary maintenance of the entire site so as to preserve as much as possible of the historic fabric for future generations;
- Implement a monitoring process to better understand the speed of deterioration and the decay processes;
- Respect international norms and standards on conservation and develop specific techniques and tools adapted to Erbil citadel;
- Define clear design guidelines and building regulations for the rehabilitation of the existing buildings and/or new constructions in order to protect the universal outstanding values of the site while taking into consideration the needs to adapt its use to the modern living standards.
- Reinforce the capacities of HCECR team to enable them implementing and recording effective conservation activities within a short time span (10 years);
- Build capacities within Erbil city to ensure availability of qualified craftsmen and contractors in the future;

The HCECR, with the support of the UNESCO team in place, already responds very effectively to these challenges, as explained in the following chapters. In order to improve on the responses developed by the team in place, the present report provides guidelines on the following 4 issues:

- Maintenance
- Monitoring
- Conservation handbook (Building knowledge)
- Guidelines an building regulations document for the rehabilitation of the existing buildings and/or the new constructions

B2. Regular maintenance

B2.1 Current practices

Regular maintenance to avoid further destruction of the standing structure is a priority for HCECR. The High Commission is continuously working in the ruined areas to slow down the deterioration processes and prevent the collapse of buildings, which is an excellent approach. The maintenance team, established by HCECR in 2010 is currently implementing a wide range of preventative actions, which include:

- Removal of debris and cleaning of the ruined sites to better understand the structures;
- Documentation of the sites before and after cleaning;
- Covering of the leaking roofs with plastics sheets;
- Propping and Shoring of all deformed structures;
- Dismantling of the weak walls which represent a threat for visitors and workers;
- Dismantling of ceilings which threaten to collapse
- Dismantling of ceilings to reveal the original roof and better assess the state of conservation
- Removal of plaster layers to reveal the brickwork and study the state of conservation of the walls
- Partial reconstruction of walls to avoid immediate collapse (reconstruction of wall bases for example)
- Systematic documentation and recording of all activities and works
- Detailed documentation of all important architectural details and decorations features
- Safekeeping of valuable materials which could be stolen (Wrought Iron Window rails for example)

B2.2 Recommendations on drainage

Despite all commendable efforts developed by HCECR to reduce the speed of deterioration of the Citadel, we believe that more could be done on the control of drainage slopes, to avoid humidity-related destruction processes. We understand that a complete drainage plan has been prepared and that it will be gradually implemented, but preventive actions could be taken in the meantime, to reduce the flow of water towards the structures. In some areas, very simple changes in the topography can drastically reduce the amount of humidity absorbed by the structures, and therefore reduce the threat of structural deformation or collapse.

Avoiding water stagnation near structures

Most of the rain water falling on the citadel ends up being trapped within the site, sometimes at the base of standing buildings. Some of these stagnation zones only collect small amounts of water, but some others accumulate large quantities of water, collected on large areas which can reach 2000 m².

We suggest, as it is shown on the following pages, that a survey of the existing slopes be carried out on the entire site, to understand the water distribution system in the ruins, and identify the most dangerous water concentration zones. This can easily be done by eye with minimal equipment (long spirit level). The survey can also be done under the rain for more accuracy.

Surface drainage

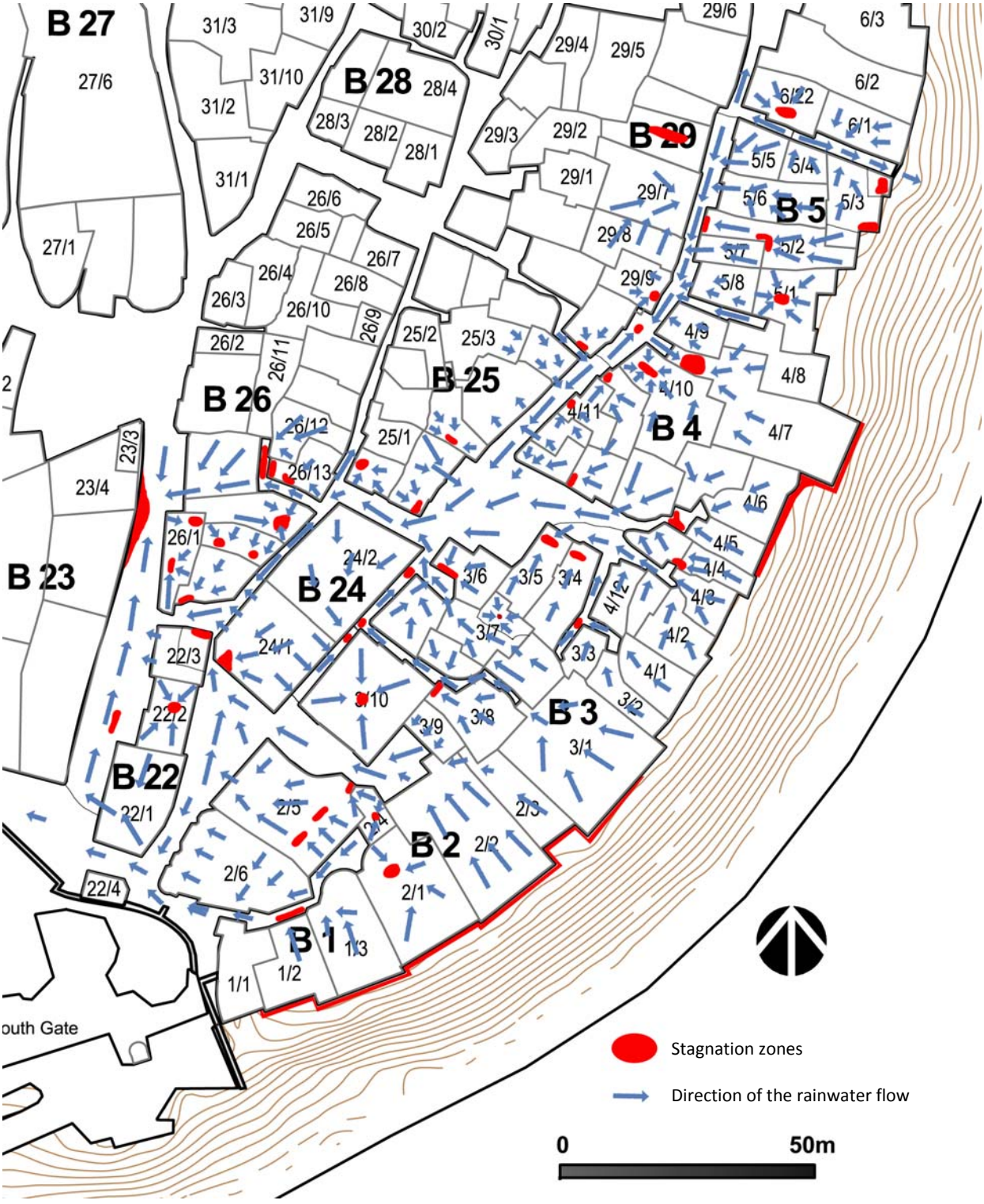
Moisture is a major destruction factor. Surface drainage consists in directing the waters to places where they are less likely to damage the structures. Drainage is usually ensured by slopes on the ground that direct the water towards specific areas. A shallow slope of less than 5% is enough to guarantee the water run-off.

Sample map prepared during the mission

We recommend preparing a complete drainage map of the Citadel, to identify all the water stagnation areas which could threaten standing buildings.

Based on the sample survey shown below, prepared in 2 days, we estimate that 12 working days would be required for 1 person to survey the entire citadel:

- 6 days for surveying the slopes on site
- 6 days for preparing the maps showing the various water distribution zones

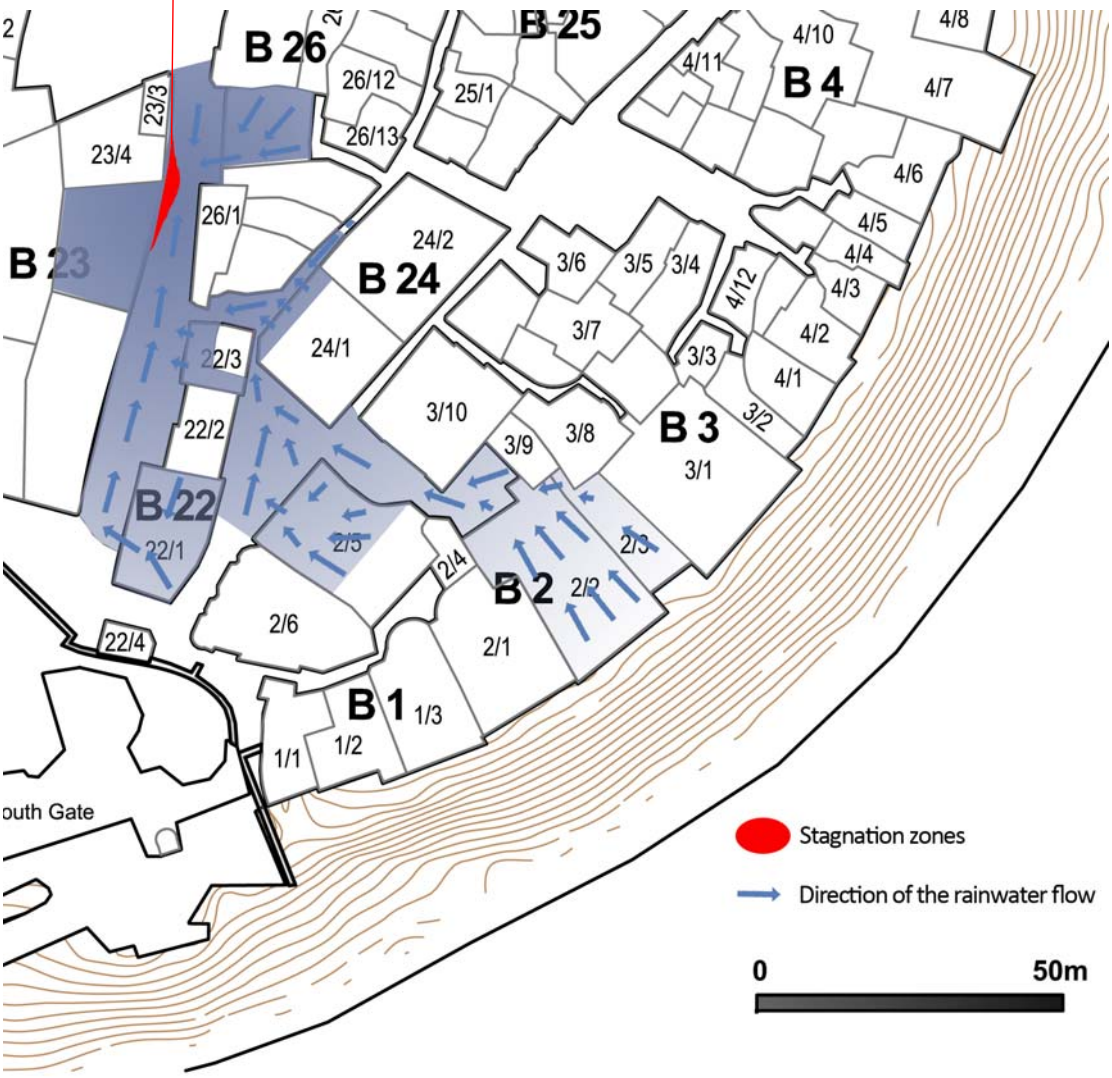


Direction of the rainwater flow and stagnation zones (sample)

Trapped water: example

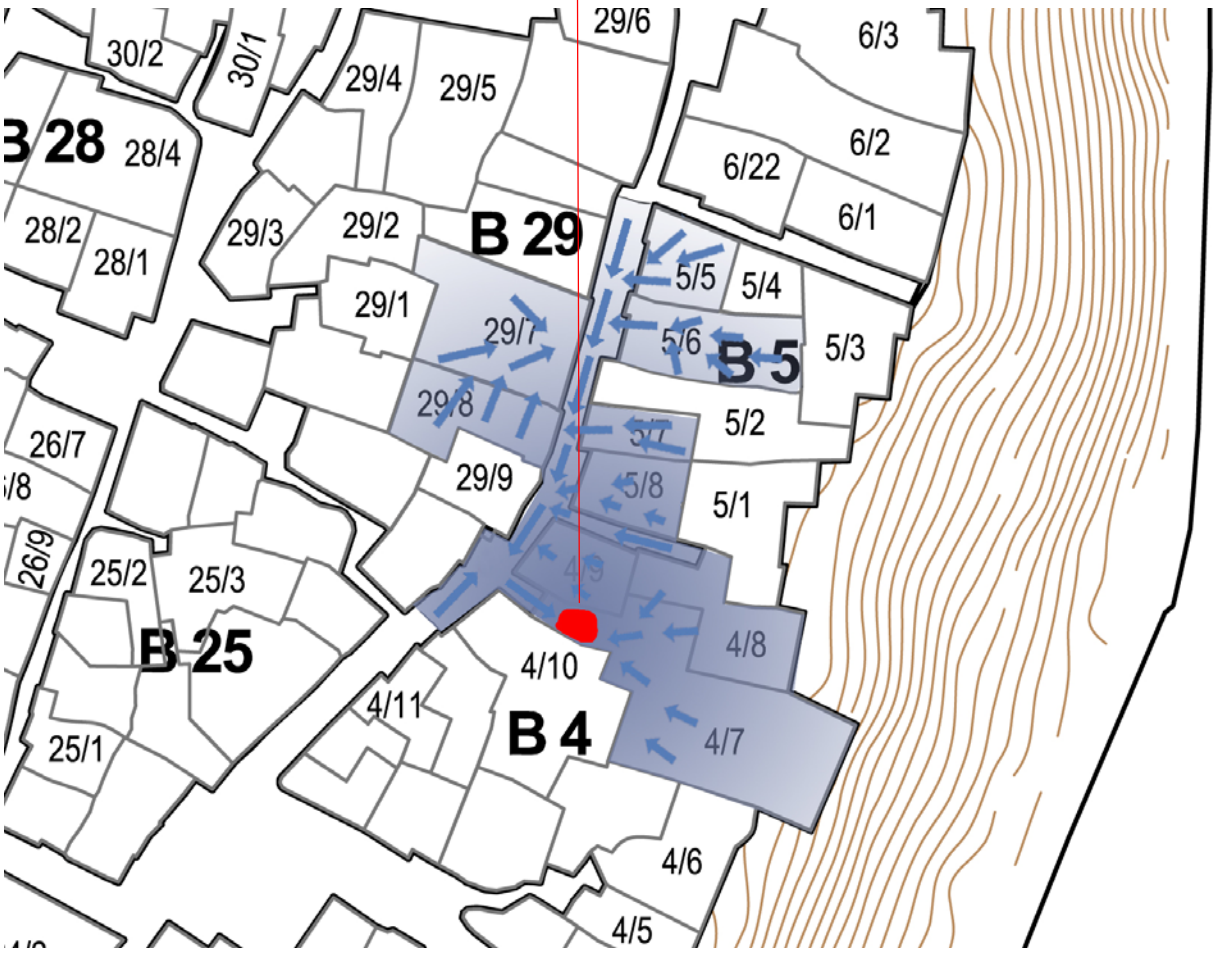
The map below is extracted from the general map shown on the previous page. It shows that the water stagnating in plot B23 is actually collected on a very large area, which extends to the perimeter wall.

This building is suffering from the excess of humidity



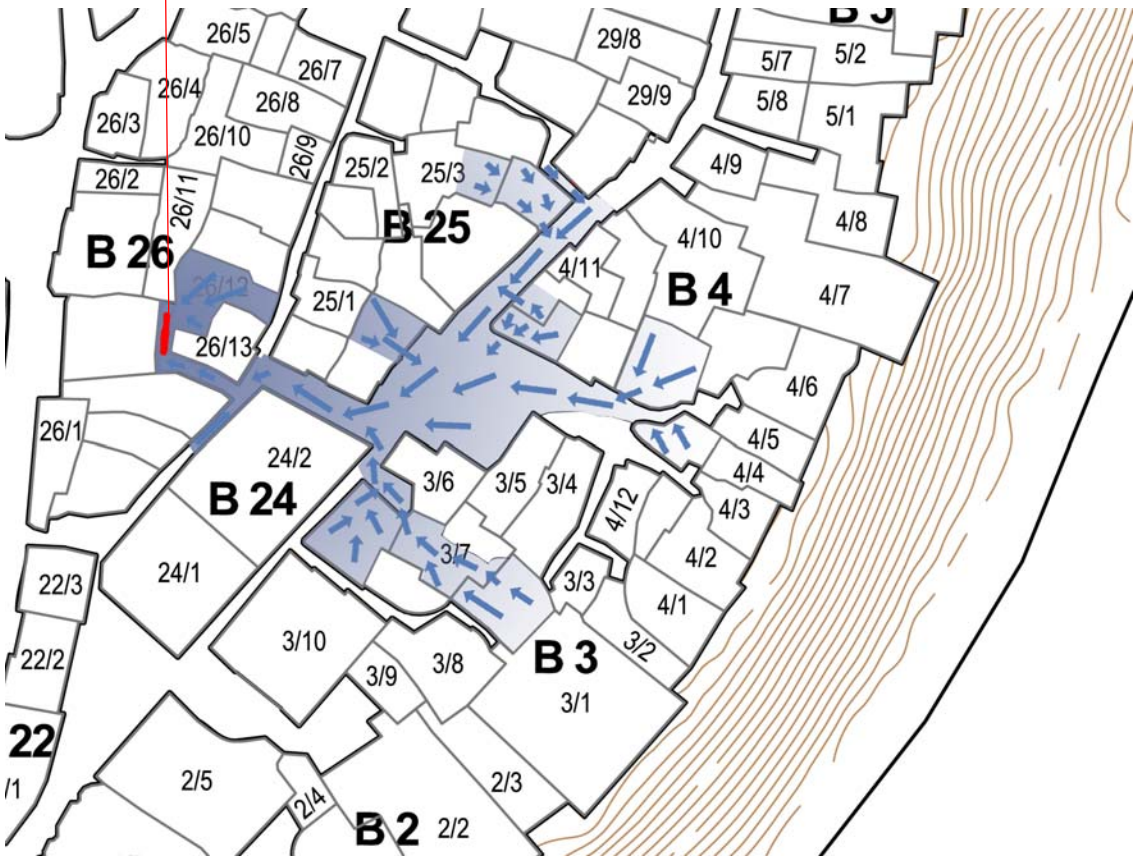
Water trapped in B4/9

The drainage map shows that large quantities of water flow towards B4/9, where it is trapped under the vaulted room. All this humidity is absorbed by the structures which loose their compressive strength and suffer structural deformations. As an emergency measure, we recommend blocking the water in the courtyard and the alleyways.



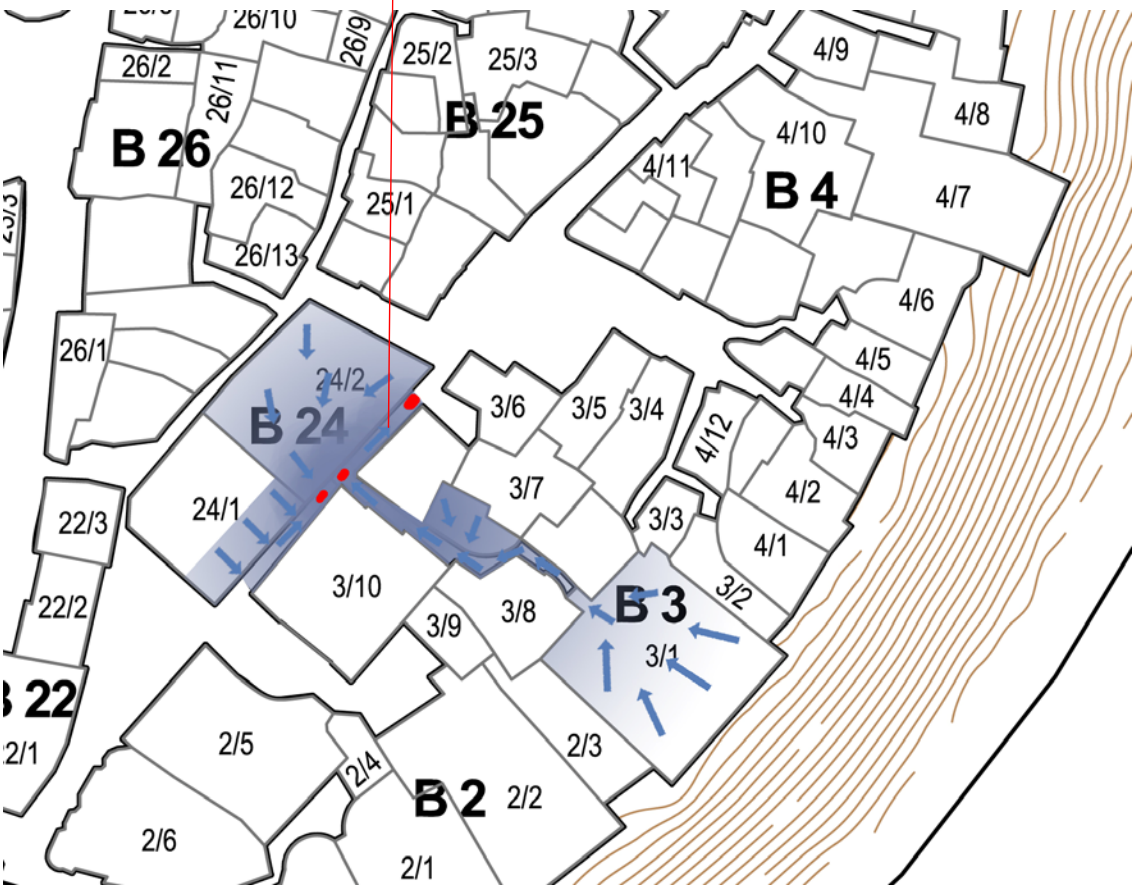
Water trapped in B26/12

Plot B26/12 also concentrates important quantities of water. But in this case, the buildings affected are short courtyard walls, of lesser importance than the building previously shown (B4/9).



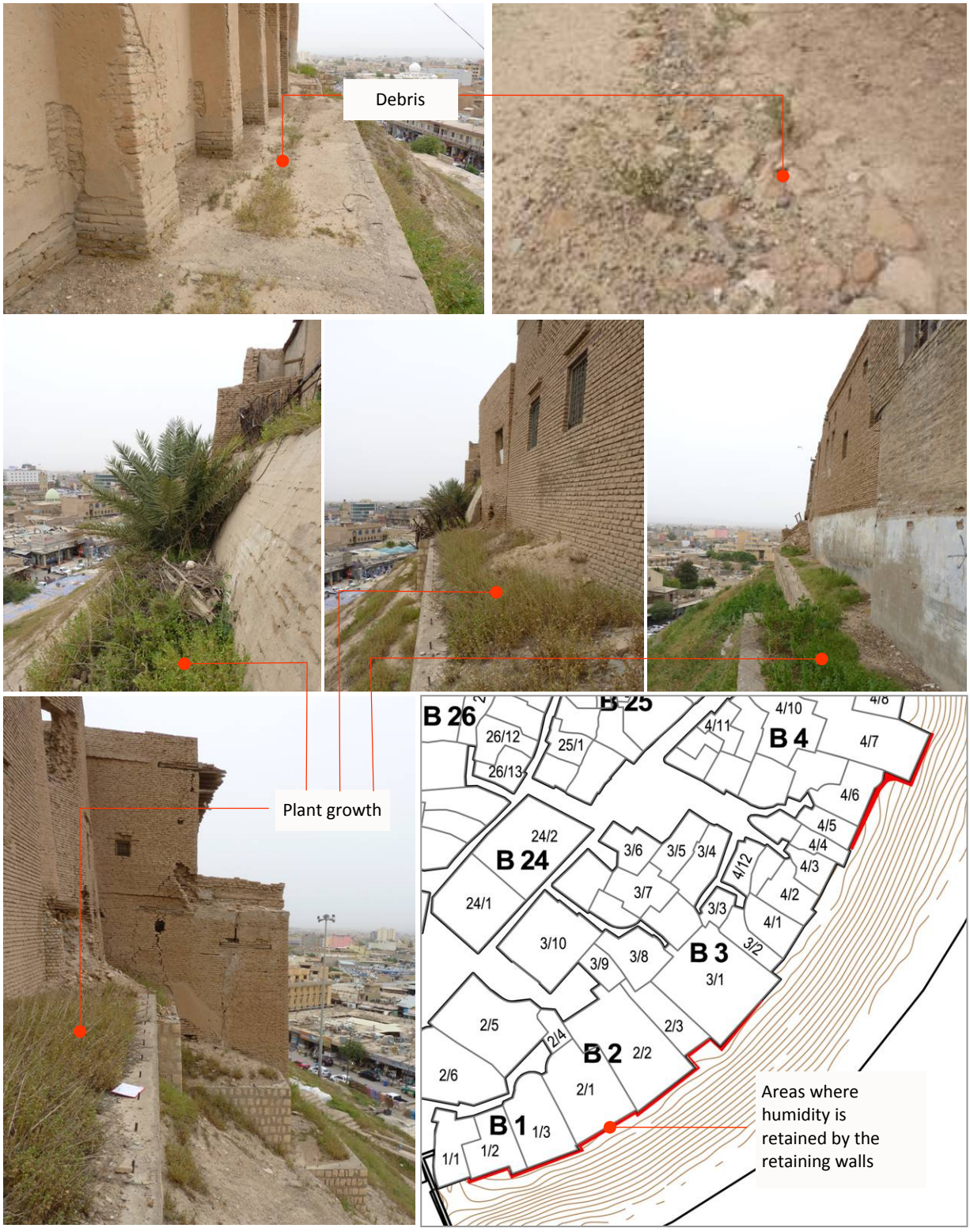
Water trapped at the base of B24/2

The traces of humidity confirm what the drainage plan shows. This building is absorbing more humidity than the other buildings in this block. Simple slopes along the walls could help to divert the water flow away from the wall, towards the courtyard on the northern side.



Drainage of the perimeter wall

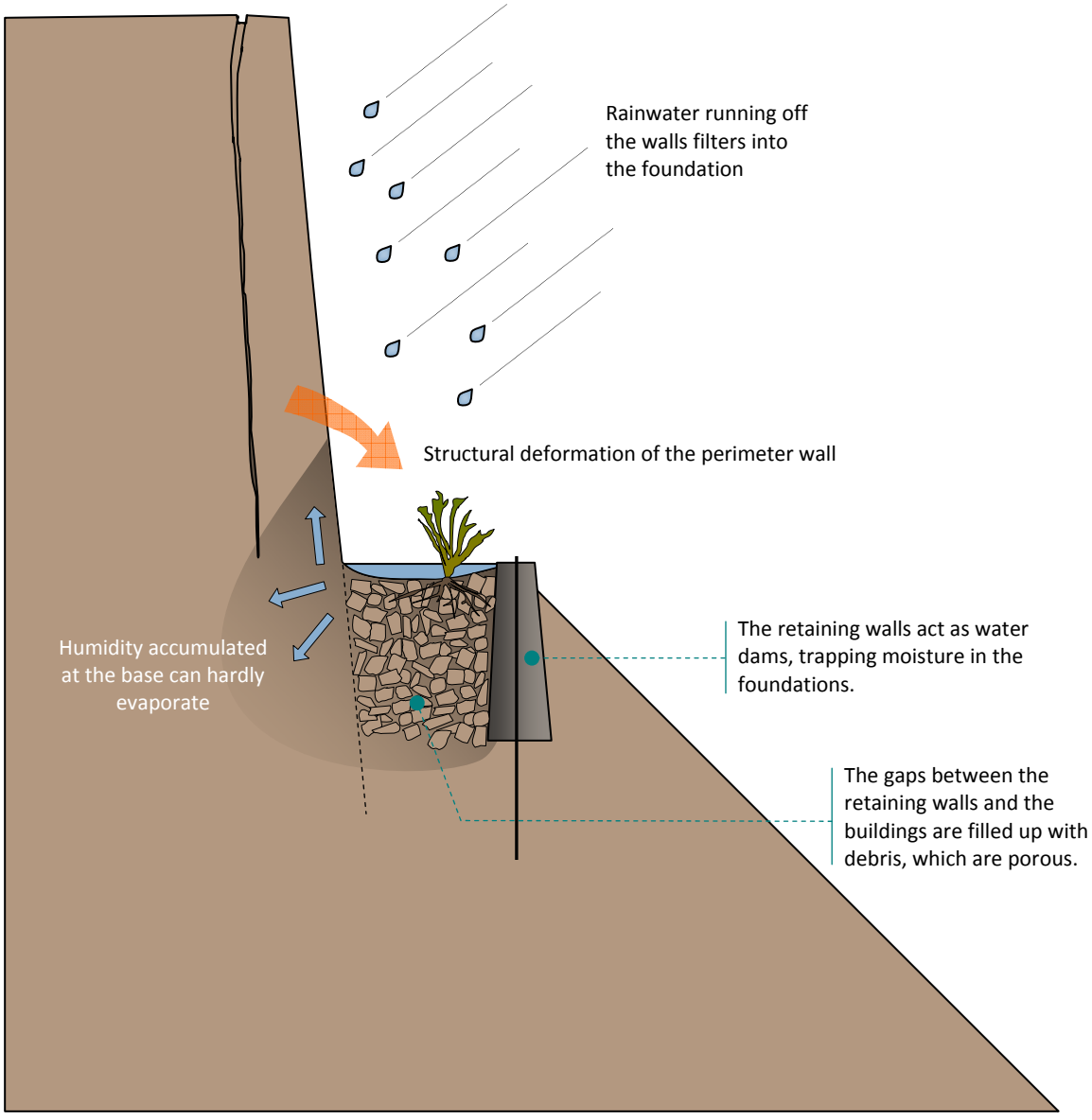
The images below show that the perimeter wall also suffers from humidity, despite the steep slope of the citadel. The main problem, as explained on the drawing (next page), is the retaining concrete wall, which blocks humidity along the perimeter wall. The gap in between the perimeter wall and the building seems to be filled up with debris only, a porous material which allows water to penetrate deeply into the building foundations.



Photographs of the base of the perimeter wall, where retaining walls have been built.

Observations:

- The retaining walls retain the ground, but also retain humidity;
- Most buildings behind the retaining walls are cracked;
- The spaces in between the buildings and the walls are filled up with debris;
- Plants and small trees are developing very fast, as a result of the high humidity.



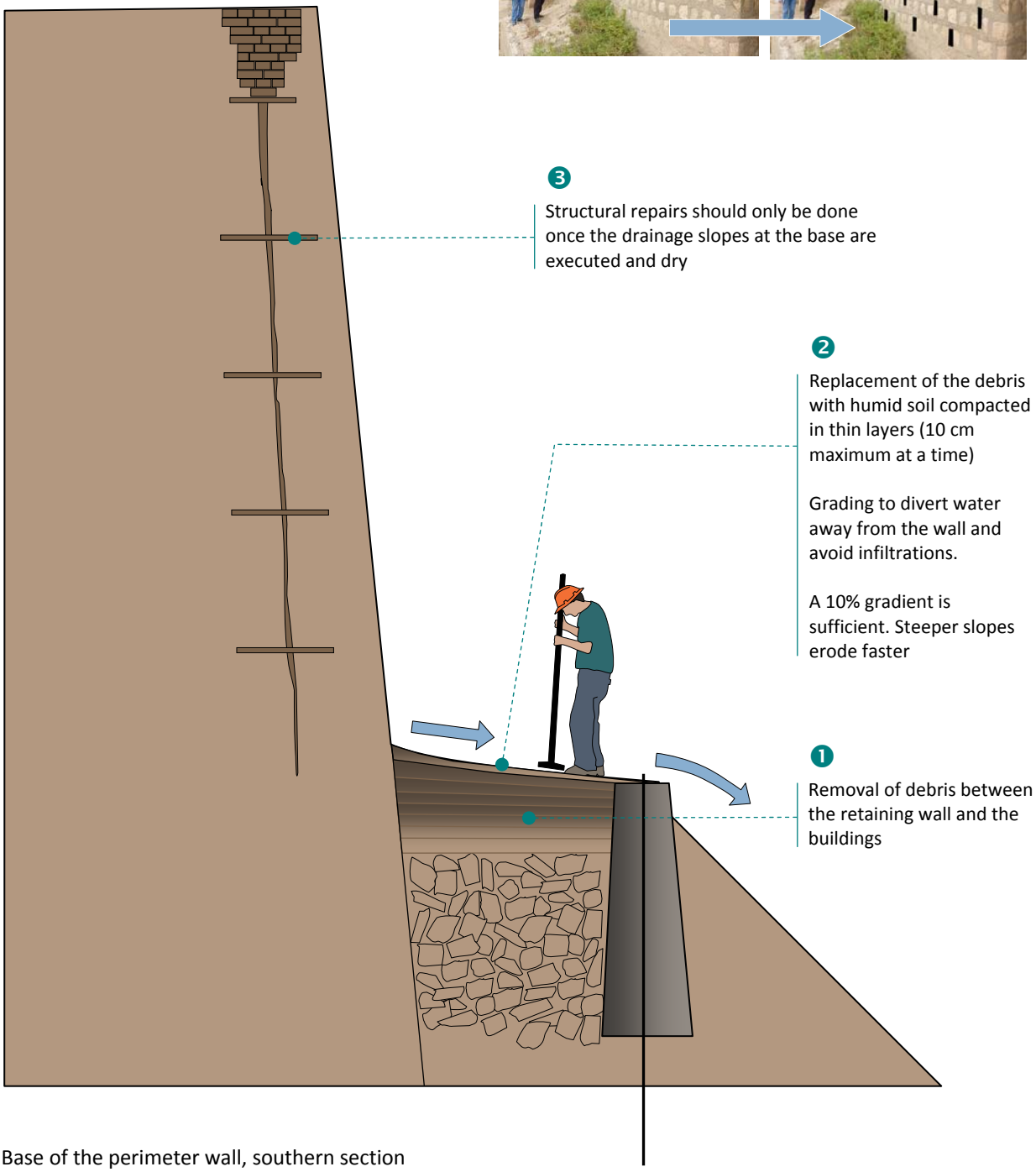
Base of the perimeter wall, southern section

Current situation

We recommend:

- removing a layer (approximately 1 meter) of debris behind the retaining walls;
- Filling the gap with thin layers of compacted soil until the gap is completely filled up;
- Creating a slope covering the retaining wall to make sure that water can flow over the wall.

If other retaining walls are built in the future, we also recommend leaving holes in the walls to allow water to evaporate very rapidly.



Base of the perimeter wall, southern section

Proposal to reduce humidity in the foundations

B3. Monitoring

B3.1 Current practices

Monitoring is ensured in different ways by HCECR:

- The conservation and rehabilitation master plan provides detailed descriptions and clear maps on the condition of the citadel in 2010. It serves as a reference to monitor the evolution of the buildings, the open spaces, the uses, etc...
- All conservation activities are documented and registered in files dedicated to each building. The regular picturing of the buildings and the efficient classification of the pictures clearly show how the state of conservation of these buildings evolves.
- Numerous tell tales have been placed on the perimeter houses of the citadel to monitor the cracks on the walls. A map indicating the locations of the tell tales, done in September 2010 is available.
- Regular visits under the rain are undertaken to identify the drainage problems.

B3.2 Recommendations

A periodic monitoring report as a tool for decision making

The aim of a periodic monitoring report is to compile all the observations made by HCECR related to the monitoring of the citadel in one synthetic document that would enable the management board to:

- Assess regularly the threats in the citadel
- Measure the speed of deterioration and understand the evolution of the structures
- Better understand the decay processes that affect the citadel
- Clearly identify the risks and the priorities
- Adapt the conservation strategies according to the priorities identified on a regular basis

The periodic monitoring report should be updated at least every four months and should include:

- A summary describing the main evolutions of the site
- A selection of pictures showing the main evolutions on representative areas of the citadel
- Results of the tell-tales monitoring
- Rainfall and temperature data
- Visitors data (Which can be recorded at the gate)
  - Citizenship:
    - Erbil citizens
    - Other Iraqi visitors
    - Foreign countries (country to be recorded)
  - Number per months
  - Profile:
    - Official visitor
    - Tourist (Individual / Group)
    - School pupils (Individual / Group)
    - Scholars (Individual / Group)
    - Other
- Series of maps regularly updated (available on the conservation and rehabilitation master plan):
  - Overall Structural Assessment map (Page 139)
  - Proposed land-use zoning map (Page 168)
  - Historic fabric map (Page 184)
  - Priority area map (Page 208)
  - Shacks recommended for demolition map (Page 292)
  - Proposed archaeological areas and excavations map (page 302)
  - Urgent intervention map (page 325)
  - Open spaces map (page 337)

Systematic Photographic monitoring
General site condition and change can be monitored using photography. This is already done for the buildings, but it could also be done with general views of the site. We recommend selecting a series of important viewpoints in the citadel (20 to 40 points maximum), where the same picture would be taken every 4 months. A good photographic monitoring programme would provide a permanent record of the site conditions for comparison over time.

B4. Conservation handbook for Erbil citadel

B4.1 Opportunities

The conservation activities at Erbil citadel are mainly undertaken by local or foreign private contactors, selected for their skills in conserving historic buildings. This brings to the site a great deal of practitioners who experiment various techniques to find the best responses to all the technical problems they have to solve. This knowledge, which is building up every day, deserves to be capitalised in one document that would serve as a reference tool for the contractors and the HCECR permanent team.
The opportunity to build capacities on existing skills is a key issue that will add to the sustainability of the conservation and rehabilitation efforts. As the skills and specific conservation techniques evolve, the handbook will have to be regularly updated to insert the best practices observed for the citadel. The process of writing the conservation handbook should involve the HCECR staff and the masons as much as possible, in order to ensure a real appropriation of this tool by the end-users.

B4.2 Objectives and target audience

Objectives:
- Bring together capitalized experiences, and make them available to all craftsmen and site foremen, to help them take the best decisions;
- Encourage sharing of technical information between the various working teams ;
- Provide a clear and reliable guide to those working in the citadel;
- Assemble vital information for heritage practitioners in a handbook format, which can easily be carried to the worksite;
- Improve on conservation practices by providing clear technical recommendations;
- Serve as a control and reference tool for HCECR;
- Promote good practices which comply with international standards.

Target audience:
- Contractors and site foremen;
- Masons and other craftsmen;
- HCECR Managers, technical staff, architects and engineers;
- Other conservation teams in the region;
- Institutions who want to rehabilitate a building to launch new activities;
- Private investors who want to invest in new activities;
- Students who want to know more about conservation practices in the citadel.

B4.3 Proposed contents

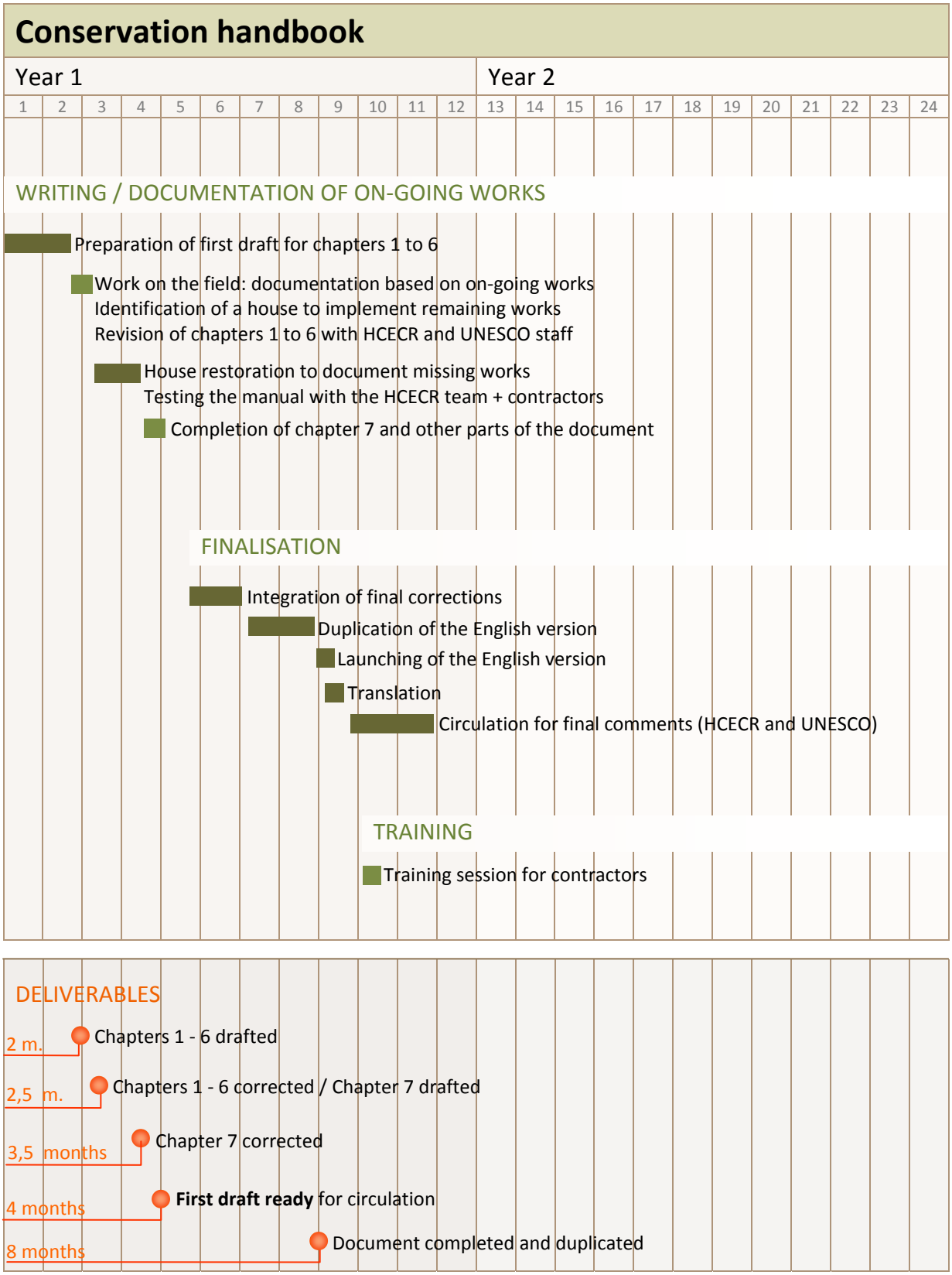
A more detailed version with keywords for each chapter is provided in Annex1.

The handbook is expected to contain more illustrations than texts. Illustrations will include drawings explaining the conservation principles, as well as photographs taken on site showing the various implementation stages.

Conservation handbook

Conservation handbook

B4.4 Proposed timetable for writing the handbook



B5. Design guidelines and building regulations for new buildings

B5.1 Objectives

The conservation and rehabilitation master plan allocates plots in the citadel for new construction. Rules need to be set for all project owners who want to embark in the construction of new buildings. We recommend that a well illustrated document be prepared to facilitate the work of the architects who will have to design these buildings. We recommend the preparation of a rather short document (less than 100 pages), which can easily be understood from its illustrations only. Appropriately made drawings can result in increased understanding of the important architectural design issues involved.

The specific objectives of the document will be to:

- Sensitize all stakeholders acting on the Citadel on the important values of the site and the fragility of this unique urban landscape;
- Provide a simple and clear document which sets rules for architects and designers;
- Present the documentation and human resources available at HCECR;
- Ensure a good integration of contemporary architectures in the allocated zones;
- Prescribe standards for the demolition and construction of buildings;

The target audience will be:

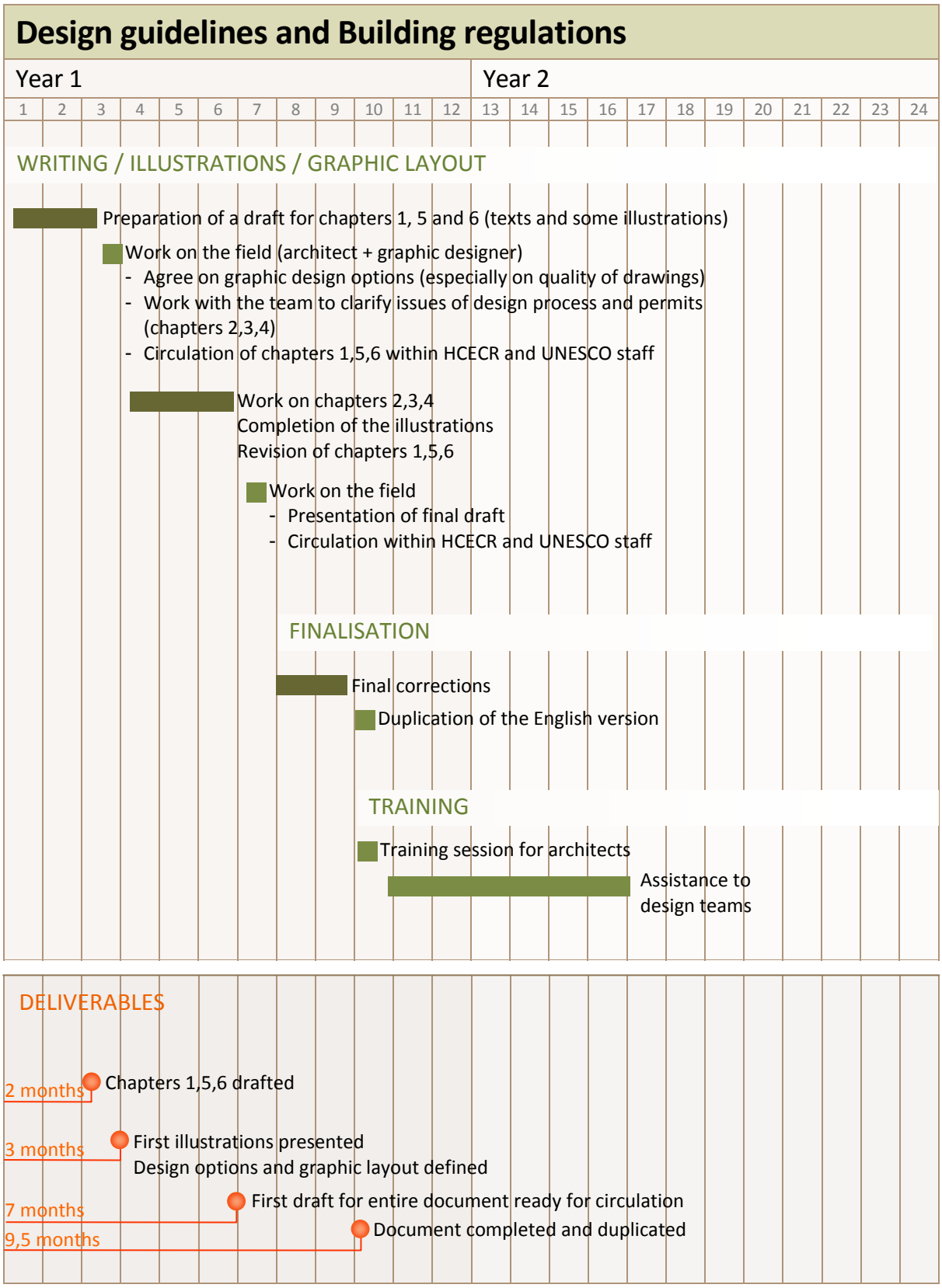
- Architects
- Planners and developers
- Project owners
- Municipality
- Other public institutions who want to insert new facilities in the citadel (heath centre, hotels…)
- Builders
- Craftsmen and technicians

B5.2 Expected results

The building regulations should be a well illustrated document which can easily be understood by non-professionals. The proposed content for the building regulations document is as follows:

Design guidelines and Building regulations

B5.3 Implementation strategy and timetable



C. Appendixes

C1. Proposed keywords for the chapters of the handbook

Conservation handbook

1. Introduction

1.1. Objectives of the handbook

- Bring together capitalized experiences, and make them available to all craftsmen and site foremen, to help them take the best decisions;
- Encourage sharing of technical information between the various working teams ;
- Provide a clear and reliable guide to those working in the citadel;
- Assemble vital information for heritage practitioners in a handbook format, which can easily be carried to the worksite;
- Improve on conservation practices by providing clear technical recommendations;
- Serve as a control and reference tool for HCECR;
- Promote good practices which comply with international standards.

1.2. Role of the HCECR

This chapter explains how HCECR supervises and controls all conservation activities. It should also explain the management mechanisms between HCECR staff members and contractors working on the citadel, how they meet, how they share responsibilities.

1.3. Working in the Citadel (role and responsibilities of contractors)

Through this chapter, the contractors will clearly understand their role, and their responsibilities vis-à-vis HCECR, but also understand their rights and their obligations as contactors.

1.4. The vision for the Citadel

All contractors should be aware of the vision of the site, and understand which values need to be reinforced and protected. This will help the contractor to adapt his conservation practices to the site and avoid major mistakes which could eventually alter or destroy important values.

1.5. Services and contacts

In this chapter, addresses and phone number of key people will be provided
Some of the detailed administrative procedures will also be explained:

- Format of the contracts
- Contact persons within HCECR administration
- Payment procedures
- Etc…

2. Conservation principles

2.1. The conservation process

This chapter will insist on the fact that working on a heritage site is different from working on a conventional building site. Every step in the conservation process will be explained in detail, from the preliminary cleaning procedures to the final documentation. It will also explain how and when archaeological surveys need to be carried out.

2.2. General rules based on international norms & standards

This will briefly present the general rules provided by international charters, standards, declarations… Only the rules applicable to Erbil Citadel will be extracted and presented in this chapter. This chapter will present a list of approximately 10 basic rules, eventually illustrated, which need to be respected by all stakeholders working in the Citadel.

2.3. Documentation requirements

Technical files should be compiled whenever works are implemented on a structure. Detailed records of all activities should be kept and properly filed to ensure continued improvement in the conservation process. This chapter will explain the procedures, the format and the responsibilities in this documentation exercise. Some examples of good documentation will be shown.

3. Understanding the deterioration factors

This chapter will present a list of drawings, especially sections on structures, explaining the various deterioration factors, and the way they interact. From this chapter, the reader should clearly understand how and where buildings are "attacked". This will help them identify deterioration factors on specific sites.

3.1. Natural factors

List of natural factors, such as the rain, water infiltration, insects, the vegetation, salt crystallisation, which affect buildings...

3.2. Human factors

List of human-related deterioration factors, such as lack of maintenance, neglect, poor construction, inappropriate materials…

3.3. Decay processes and combined factors

Explanation of the "domino effect", which combines various factors (humidity + plants for example)

4. Condition survey and diagnosis

4.1. Methodology for site assessment

This chapter will explain the various steps needed to diagnose a house. It will also explain the resources available at HCECR to assist with the assessment, and the equipment available.

4.2. Expected content of condition survey report

This will present an example of good condition survey report (table of content + few pages).

5. Designing the conservation project

5.1. Design and approval procedures

Before any conservation projects starts, specific procedures need to be respected, and approval must be obtained from HCECR (or a specific technical committee). This chapter will explain these procedures, and explain the type of file which should be prepared by the contractor to seek approval. The chapter should also explain the quality control procedures which need to be respected once work commences.

5.2. Evaluation of conservation options

This chapter will explain the various values which can be found in the citadel, values which need to be considered when taking conservation decisions.

6. Regular maintenance

6.1. Cleaning

What should be cleaned, what should be documented, what can be discarded and where, what could be recorded (including archaeology) what should be kept and where… who should be involved… All these issues should be explained in this chapter.

6.2. Temporary drainage slopes

Why is surface drainage important?
How to divert water away from the fragile structures (drawings + photographs)
Where to bring the water

6.3. Drainage pits

How to create a pit when water can not be diverted towards an alley. How to manage the interferences with the archaeological layers, technical drawings and photos to show the implementation process…

6.4. Shoring and temporary support

Explain how structures can be temporarily supported, how it should be done, what materials and techniques are available to do it (sections and photos), what should be avoided, the dangers involved and risk prevention strategies…

6.5. Covering roofs

Explain when it makes sense to temporarily cover a leaking roof, which material can be used, how and where it should be fixed, how to avoid bringing water to weak areas.

6.6. Consolidation

From the foundation to the roof, this chapter will explain when it makes sense to consolidate a building element, and how it should be done.

6.7. Crack monitoring

How to identify if a crack is dead or alive, how to install a tell-tale and how to monitor the crack. Examples of monitoring sheets will be provided in this chapter.

7. Conservation

7.1. Site security

This chapter will list all the potential dangers within the citadel, and present the security measures which can be taken to protect the working teams. Basic security equipment will also be presented.
This chapter will also explain the procedures to be followed in case of an accident.
Emergency phone numbers should also be inserted in this chapter.

7.2. Site cleaning and archaeological survey

This chapter should explain where archaeological information is located, and when archaeologists are needed on site (text + drawing). The text will also explain the various steps for carrying out the archaeological survey.
An example of archaeological survey should also be shown in this paragraph.

7.3. Site drainage

How to install the final drainage system, where to connect it, and what type of pipes can be used, etc…
A map of the drainage network should be inserted in this part.

7.4. Selection of materials

Materials which are allowed and not allowed
Quality of bricks accepted, and quality control procedures

7.5. Tools and know-how

The text will explain the type of tools used in the past, and list all the tools which have to be avoided, to respect the authenticity of the wall fabric.

7.6. Mortars and renders (aggregates and binders)
Recipes of mortars and renders recommended and forbidden.
The chapter will also explain how to use them.

7.7. Treating humidity problems
Various techniques for reducing humidity infiltrations in the foundation, in wet rooms, …

7.8. Treating cracks
How to fill in and stitch a crack after the monitoring procedures

7.9. Reinforcing the foundation
How to consolidate a weak foundation

7.10. Repairing a wall base
This chapter will explain how to reconstruct a wall from the foundation. Materials to be used, waterproofing layers, implementation steps

7.11. Reconstructing a wall
How to reconstruct a missing wall, where to find documentation on the original structure, which bonding pattern to use, how to differentiate the original wall from the rebuilt wall…

7.12. Changing lintels
Materials which can be used
Various steps to replace a lintel safely without endangering the workers

7.13. Creating new openings
stresses involved and risks
design : which proportions and sizes acceptable
how to avoid weakening the structure
obtaining permission from HCECR
step by step implementation procedure

7.14. Joinery repairs
how to fix a damaged door or window
which part to keep ?
where to find qualified carpenters/woodworkers

7.15. Inserting water supply
Risks for the structure
Where to connect the houses
Procedures for obtaining a water connection
How to treat the floors to avoid water infiltration

7.16. Inserting electrical network and fittings
How to insert the fittings discretely
Type of external lighting
Security Norms

7.17. Re-pointing mortar joints
How to proceed, how to clean, how deep, which mortar, which tools…

7.18. Conserving decorations
Where to find qualified craftsmen ?
Resources at HCECR
Presentation of a step-by-step case study

7.19. Conserving traces of the past
Where and when is it necessary to keep traces of the past.
Examples of elements kept exposed

7.20. Plastering inner walls

Appropriate/inappropriate materials
Plastering or repointing?

7.21. Repairing a roof

This chapter will explain the various steps for repairing a roof, from the dismantling, cleaning, recycling of materials to all the details of the reconstruction process, including the materials, equipments and tools required.

7.22. Rebuilding floors

Appropriate/inappropriate materials to avoid humidity problems
Step-by-step procedures

7.23. Installing a water tank

Where ? how to hide it from the street
Where to install it if installed on a roof.

7.24. Installing a satellite dish

Where ? how to hide it from the street

8. References

This chapter will present a list of Books, reports and websites which can be consulted

C2. Site Map

Map extracted from the rehabilitation and conservation master plan.