Handbook

for

An Egyptian Archaeological Database

Kent R. Weeks (ed.)

Theban Mapping Project, 2018

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Theban Mapping Project

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This is a Preliminary Edition of the EAD Handbook. A future edition will also include: a chapter on the conservation of mud-brick by Lisa Shekede; an ECR Checklist by Stephen Rickerby and Lise Shekede; and an extensive treatment of subjects in Section 2: Existing Condition Reports. We welcome suggestions, comments, additions, and corrections. Please contact weekstmp@yahoo.com.

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Chapter 1

Preparation of the Egyptian Archaeological Database

1.0. Introduction

No greater challenge faces Egyptologists today than the protection of Egypt's ancient monuments. Virtually every archaeological site in the country is threatened with destruction: sites in the Nile Valley, in deserts and oases, cities and villages, beneath Egypt's adjacent seas—no matter where they are, theft, vandalism, growing tourism, quarrying, rising ground water, expanding agriculture and urban sprawl, changing climate and pollution are taking their toll. And as Egypt's population increases, the threats grow in number and the need for site protection becomes even more acute. Without its monuments, Egypt's tourist economy will wither and humankind's cultural heritage will suffer a devastating loss.

Yet, however urgent the need, effective site protection first requires careful planning. Before work can be undertaken, sites must be documented and their history, use and re-use, current condition, rate of deterioration, and potential threats evaluated. Such documentation forms what are called Existing Condition Reports. When compiled for the many sites in Egypt, they create what we have termed an Egypt-Wide Archaeological Database, an EAD. We know from other countries that such databases are essential for archaeological preservation. Site managers need these reports before they work at a site for the same reasons physicians need a patient's medical records before performing an operation: without them, even the most well-intentioned intervention can be fatal.

The Theban Mapping Project has been working for several years to create an EAD of Egypt's pre-Islamic sites. There are at least 10,000 such archaeological sites in Egypt, from simple graffiti to gigantic stone temples. If we do not know how such sites became what they are today, we cannot control what they will become tomorrow. Without an EAD and its site condition reports, we cannot effectively allocate the limited resources available for their protection.

A database of Egyptian sites is not a new idea. Several projects to document them have been proposed in the past. They were called National Registers, Site Inventories, Historic Site Catalogues. (See, e.g., National Center for Documentation of Cultural and Natural Heritage of the Ministry of Communications and Information Technology, *Strategic Approach to Egypt's Cultural Heritage, Final Report,* Cairo, 2001). But each was abandoned, victims of ill-defined goals, inadequate planning, lack of trained staff, high overhead costs, lack of administrative or financial support.

A more ambitious inventory than these was the Egyptian Antiquities Information Systems (EAIS) of the Ministry of State for Antiquities. But after an impressive start in 2000 it is now moribund, in part because of financial problems, in part because it became bogged down trying to describe in great detail the complex legal status and boundaries of each site. The EAD has established a close working relationship with the small EAIS staff that remains, a relationship that is being formalized in a Memorandum of Understanding between the Theban Mapping Project and the Minister of State for Antiquities. It will help ensure that the EAD benefits from the work of the EAIS but avoids the problems it encountered.

For the past several years, the Theban Mapping Project has been developing and testing the design of an EAD and soliciting comments on its contents from a wide range of potential users. From the outset, it was clear that the EAD must be computer-based, accessible both in the office and on-site, fully searchable, easy to maintain, and available in English and Arabic. Its data had to be easy to update, its proposals for site management realistic and cost-effective. And its contents had to be accessible to all the stakeholders in Egypt's archaeological heritage, not only conservators, inspectors, professional

Egyptologists, and other scholars, but young students, government and business officials, tour guides, and tourists, European and Egyptian.

Designing an EAD that caters to a such broad audience from so many backgrounds requires care, but it is not an impossible task, as the Theban Mapping Project's website www.thebanmappingproject.com has shown. Combining in a single website both basic and specialized Egyptology, the TMP's carefully defined approach allows it successfully to reach a large audience that includes elementary school students as well as professional Egyptologists. The site has won dozens of awards for its content and design. The website teaches a simple lesson: to be accessible to a diverse audience, an EAD needs to clearly explain its data, not dumb it down. It also demonstrated that the EAD's broad accessibility could help encourage site protection at the community level, and in the process make professional site management more cost-effective and more likely succeed.

1.1. Arches Software

An EAD that includes thousands of Egypt's sites necessarily requires many terabytes of data and the specialized software to manage them. Fortunately, we have been able to adapt Arches, software developed by the Getty Conservation Institute and the World Monuments Fund, for this purpose.

Arches is an open source, standards-based web platform developed to record large quantities of archaeological data. An early version, Arches 2, was developed for the MEGA-Jordan project, a bilingual inventory of the archaeological sites of Jordan, commissioned by the Jordanian Department of Antiquities. Later, Getty modified Arches, creating Version 3, to also accommodate an inventory of the historic buildings of Los Angeles. It is this version that we have used for the EAD.

A content management system that includes such disparate subjects as ancient Jordan and modern Los Angeles is necessarily a very general one, and our project has spent much of the past year adapting Arches 3 to the very different data that ancient Egypt's archaeological inventory includes. We have had to create new drop-down menus to catalogue sites and make database entries searchable; create new rules for determining site names and other designations; develop new methods and terms for location description; and establish new standards for documenting the present condition of sites in a wide variety of changing environments.

Chapter 2

Arches Customization and Implementation for the Egyptian Archaeological Database

by Lucy Fletcher-Jones

2.0. Introduction

Various software options were considered for hosting the EAD, a large, complex and varied archaeological inventory. Creating a tailor-made inventory from scratch would have been a very costly and time consuming project. Options such as licensing ArcGIS are also costly in the long term and there would again be the extra cost in customizing it. But the software product, 'Arches', is a very good fit for the EAD. It is open source, and therefore freely available, with no licensing fees. It provides the ability to input more than one name for an archaeological site and to enter multiple chronological phases for a site. It can also be viewed and operated in more than one language. But given the unique nature of Egyptian archaeological sites, Arches needed to be tailored to fit the EAD requirements more precisely. Thus Arches was customized for the EAD as follows.

2.1. Recording Chronology

Arches v3 uses a mandatory date in the form of day, month, year which is not appropriate to archaeological sites, in general and especially not to Egyptian archaeological sites. The age of a site is often uncertain or unknown and Egyptologists debate the absolute dates for each pharaoh's reign so the only satisfactory method of recording the age of a site is to record its cultural period, dynasty (or sub-period for pre-dynastic and post dynastic sites) and reign of the ruler, be it an Egyptian Pharaoh or a Roman emperor. Therefore, we removed all absolute dates, the date slider, and the date filter used in the search screen. As absolute dates are pervasive throughout Arches V3, technically this proved more difficult than anticipated. We also added the dynasty and reign to the chronological classification section (new data fields were added to the POSTGIS database) in order to record this data for each phase of the site.

2.2. Recording Location Coordinates

The difficulty of locating many Egyptian archaeological sites especially mines that are below ground, and the fact that we had no previous inventory to migrate the location data from made the many Arches methods for entering the location of the site redundant. The EAD has the latitude and longitude coordinates for the rough center of each site so we added a further method of simply entering the coordinates in degrees decimal for latitude and longitude, to 5 decimal places. This places a marker on the Bing Satellite base map, and it is then possible to fine tune the location for more visible sites with extant, above- ground structures by zooming in on the map and using the mouse to drag the location marker to the correct center of the site. The Bing maps are continually being updated revealing more exact locations. The reports and map pop-ups in Arches were all changed to add the location of the sites in degrees, minutes and seconds and in degrees decimal.

2.3. Recording Grid References

The lack of street addresses of most Egyptian sites also rendered the Bing map geocoding function redundant and the input of street address data impossible. However, Egypt has unique location data in the form of grid references such as the JOG and Survey of Egypt references. We removed the geocoding and we customized Arches to allow input of the JOG and Survey of Egypt references for the sites. In order to conform to the CIDOC CRM standards (International Committee for Documentation Concept Reference Model http://www.cidoc-crm.org), a new entity and node (data field) were added to the Arches relational database.

2.4. Adding Arabic

Arches provides the 'hooks' for adding a second language to the web site, but changes and additions had to be made to the software to install a second language such as Arabic. Also, the nature of Arabic being read from right to left causes some unusual problems! A new text box was created to enable input of the site description in Arabic which also required a new node to be added to the database. We also needed to provide our own translations of the major drop-down lists and of any additional or changed text we had made to the reports, the home and search pages. The use of Rosetta makes the entering of Arabic translations relatively straight forward, but time consuming.

2.5. Reference Data Changes (Drop-Down Lists)

Arches 3 had been released with a sample Heritage Inventory Package (HIP) that included reference data from the Historic Los Angeles project and used vocabulary suited to modern times. The reference data are the concepts used in categorizing cultural sites (e.g. temple, hydreuma, settlement), in dating them (Old Kingdom, 4th Dynasty, Khufu) and a host of concepts used to describe types such as types of variant site names, types of description, site condition. These concepts control the indexing of the site in a standardized way and comprise the drop-down lists on the input form. There are 57 of these lists or authority files, each of which had to be customized to the needs of Egyptian heritage data. Section 3.5. below describes the drop-down lists of most importance to the EAD. This data was developed and then loaded into Arches prior to archaeological site input.

2.6. Text Most text headings used on the input forms, maps, and reports were changed to more appropriate labels: e.g. 'Heritage Resource Type' was changed to 'Archaeological Site type', 'Information resource' was changed to 'Bibliography, Images and Other documents'.

2.7. Primary Name

The EAD uses a 'primary name' as the unique reference to an archaeological site or complex, therefore we needed to customize Arches to look for this 'primary name', always use it on the map, and to display it on the reports as the first name on the list.

2.8. Digital Maps

Arches uses the Bing map service as its base map on which the sites are marked. But other digital maps may also be added as layers or overlays. For EAD the Pelagios map service has been added, a map of Egypt in classical times showing Roman roads and sites such as forts and quarries. It is a 'Commons' digitization project based on the Barrington Atlas. This is particularly helpful in locating and corroborating location data for the EAD's Roman mines, forts and quarries in the eastern desert.

As 'Google Maps' is a little more detailed than Bing, the ability to link to Google maps using site coordinates was added to the archaeological site report.

2.9. Security Function

The website is designed to be viewed by any guest surfing on the web but only permitted users can enter site data or reference data. The user permissions for Arches were extensively revised and simplified.

2.10. Arches Modifications

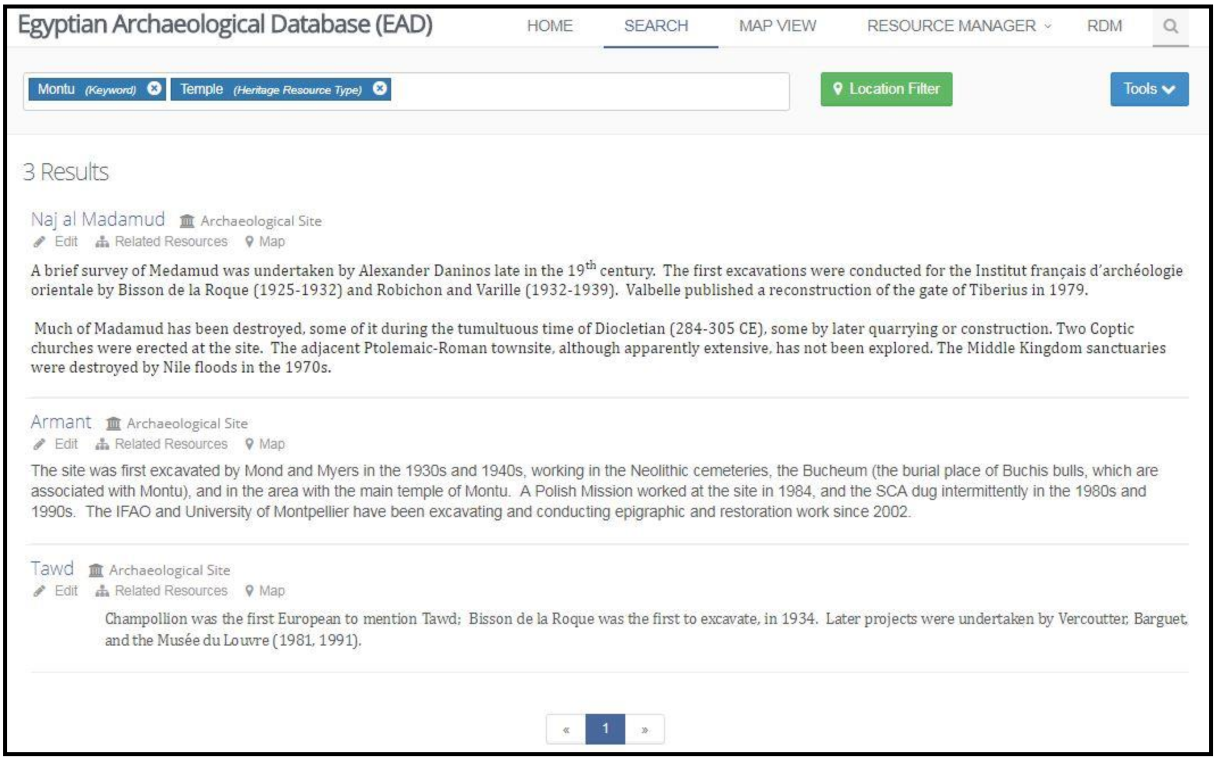
It proved very difficult to find a programmer in Egypt with the necessary expertise in Python, HTML5 and JavaScript, with an understanding of GIS and the non-standard Arches relational database. The non-standard Django web framework also proved difficult to manipulate. Only hiring an Arches technical expert solved the problem. Finally, as with many software products, Arches was released with many programming errors, which needed to be fixed.

2.11. Implementation of Arches

Whilst Arches was being customized, the EAD data was added to and improved and transferred to Excel spreadsheets to facilitate inputting into Arches. 10 student inputters have been entering the EAD data from the Excel spreadsheets, checking it, entering related sites and updating the languages of the variant names. So far, 220 man hours have been spent on this work. Separate bibliographies for each site are being created; images are being identified and uploaded to Arches. Full descriptions are also being written, site classifications being checked and uploaded.

2.12. Search in Arches

The search function in Arches is fairly sophisticated. To find a particular site, you can input any of the variant names we have entered into Arches or a name with a similar spelling. A list will appear from which you can choose the site you want.
It is possible to obtain a list of sites in a particular area of Egypt by either drawing a polygon on the base map, or by entering a JOG or Survey of Egypt Reference in the search box.
It is also possible to obtain lists of sites that are of a particular chronological period, of a particular site type, associated with a particular Egyptian deity, or a combination of all these. To find all temples associated with the deity Montu, go to the search page and type in “Montu”. Choose “Montu (keyword)” from the drop-down list. Type in “Temple”. Choose “Temple (Heritage Resource Type)” from the drop-down list. The following figure shows the list produced when searching for temple sites associated with the god Montu.



Chapter 3

The EAD's Contents, 1: Site Names

3.0. Introduction

The EAD includes text-based sections of site designations, descriptions, and location; classifications of sites by functional types, chronological periods, reigns, deities, and languages; illustrative material such as photographs, maps and plans; links to satellite images and other web sites; and bibliographies. The following is a list of the categories included in the first part of the EAD (§3.1 – 9.0); the second part, Existing Condition Reports, is outlined in §10.0.

§3.1. Site Names and Other Designations
§4.1. Site Location
§5.1. Site Description (History, Archeological Content, Excavation, and Exploration)
§5.2. Drop-Down Menu: Site Type
§5.3. Drop-Down Menu: Chronology (period, dynasty, reign, other)
§6.1. Drop-Down Menu: Deities
§6.2. Cross-References to Other Sites
§7.1. Bibliography and Web Links
§7.2. Historical and Contemporary Photographs, Drawings, Maps, Plans, Satelllite imagery
§8.1. List of Sites in Arches (March 2018)
§9.0. EAD *Users' Manual*

3.1. Site Names and Other Designations

3.1.1. Sources of Names.

The names by which Egyptian archaeological sites are known today have long and complicated histories. Some sites still bear their ancient Egyptian name (*Hatnub*); others have taken names given by Greeks (*Philae*) or Romans (*Mons Claudianus*) or Copts (*Dayr al-Baramus*). Sites can be named for a nearby village (*Naqadah*), early settlers (*Bani Hassan*), or a geographical feature (*Qurnah*). Others have names given recently by local villagers (*Ismant al Kharab*). Some names, assigned to a small site, are actually the names of huge areas covering hundreds of square kilometers (*Fayum*). Modern archaeologists have named sites using geological terminology (*Nabta Playa*). Others names recognize an Egyptological colleague (*el-Omari,* after the site's discoverer, Amin el-Omari), acknowledge a local notable (*Shaykh Ibada),* or a prominent local feature *(Tree Shelter* site*).*

Many names have changed over time. For example, the Upper Egyptian site we today call *Qus* was *Gjs* in the Old Kingdom, *Gsj* in the Middle Kingdom through Late Period*, Apollonopolis parva* in Ptolemaic times, *Diocletianopolis* in Roman, *Kos* and *Kos Barbir* in the Byzantine or Coptic Period. Some names are the result of geographical misunderstandings, but gained credence because they have been frequently cited. There is no tell at *Tall al-Amarinah*; that name is a conflation of the names of two nearby villages, *Al-Tall* and *Al-Amariyah.*

Early Europeans travelers, who usually did not know Arabic, spelled site names in unpredictable ways, mishearing or misremembering what their guides had said and creatively writing in their own language the foreign sounds of Arabic. Thus, for جيزه, Europeans have written Giza, Guizeh, Giseh, Gizeh, Geeseh, Jiza, or Jezah, among many examples; دفنه has become Daphnae, Dafanah, Deffena, Defeyneh, Tahapanes and Tahpanhes. If such unusual spellings recur in publications of archaeological importance, they are included in the EAD as variant names. Names that have appeared only once in the literature are ignored, as, for example, these attempts at phonetic spelling from Edward Lane's *Description of Egypt* (1825-1828): *Ben'ee Hhas'an, Ckin'ë,* and *Sack'cka'rah (*Bani Hassan, Qina, and Saqqarah).

Some names are common to several localities: there are perhaps twenty *Abu Sir*s in Egypt, more if one includes the variant *Busiris*, and at least five *Kawm al-Ahmar*s. Such common names are listed in the EAD, and a search for one will reveal all of them. The user will have to decide, probably based on variant names, site location, or description, which is the specific site being sought. To make reference easier, the EAD assigns numbers to sites sharing the same name (thus: *Kawm al Ahmar* 1, *Kawm al Ahmar* 2, *Kawm al Ahmar* 3, etc.). They are numbered in the order they were entered in the database. Once users know which *Kawm al Ahmar* is wanted, they can enter its name + number and call it up directly.

3.1.2. Numbered Sites

Some sites have been assigned numbers rather than names. Isolated, prehistoric desert sites excavated since the 1950s, usually by North American archeologists, are often identified that way (WEA 83/33), following systems used in North American archaeology.

Others surveys use numbers, too. The Egypt Exploration Society (EES) has been surveying in the western Delta since 1997 and assigns five-digit numbers to sites in the order in which they were surveyed. The Egyptian Antiquities Organization (EAO)—before 1971 called the Egyptian Antiquities Service (EAS), after 1994 the Supreme Council of Antiquities (SCA), since 2011 the Ministry of State for Antiquities (MSA), and since 2016 the Ministry of Antiquities (MoA)—has used several numbering systems; its numbers are often but not always preceded by "EAO," "SCA," or "MSA." Some Delta sites have both EES and EAIS numbers, and most also have names. Thus, *Kawm Abbuda = EES 0372; Kawm al Abd = MSA 100115* and *EES 00393*. When possible, the EAD prefers names instead of numbers as "primary," and EES and MSA numbers are entered as variants (the EAD calls them "external system references").

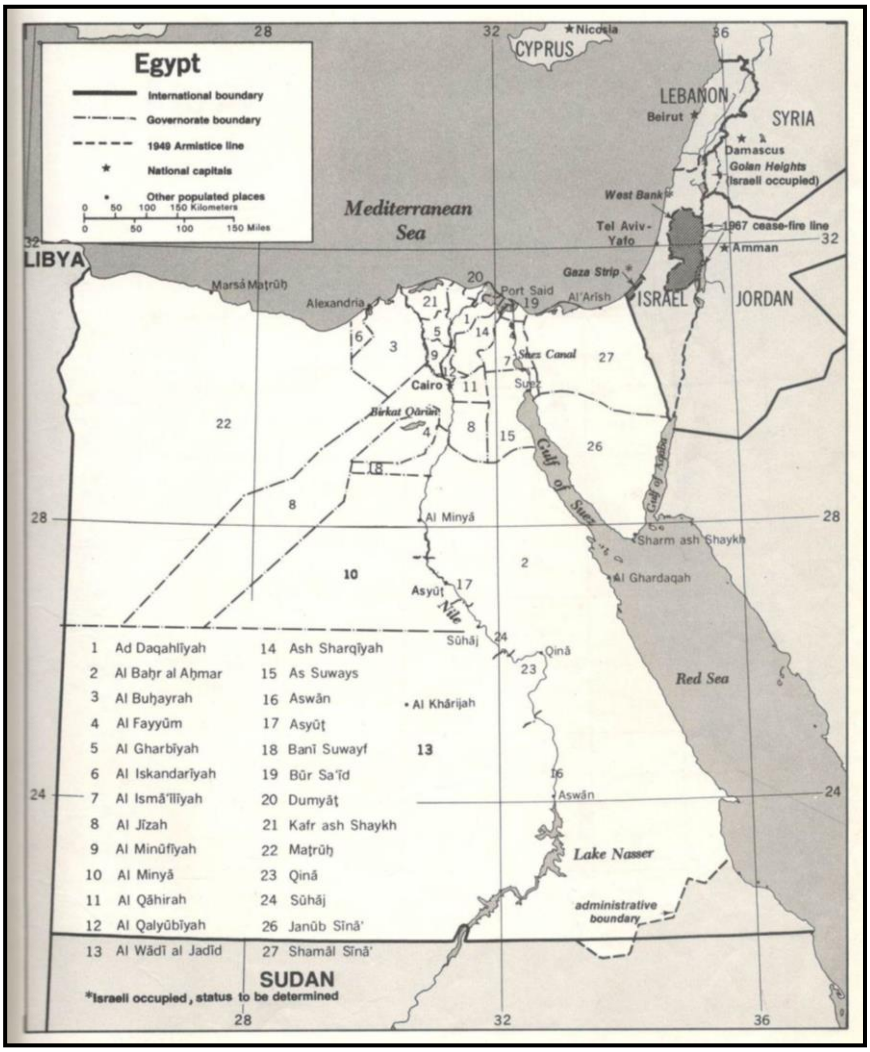
3.1.2.1. EAIS Numbers

EAIS numbers were assigned by the SCA/MSA's Egyptian Archaeological Information System, established in 2000 (for a reference, see §10.0.). To date, they have published a selection of sites in Sharqiyyah, Kafr al Shaykh, Fayyum, Bani Suef, Qina, and Al Uqsur Governorates. EAIS site numbers take the form "eXXYYZZZZ," where "e" identifies a site as ancient Egyptian, as opposed to "i", Islamic; XX is the number of its governorate; YY is its *markaz*; and ZZZZ the site number. Thus, "e13030007" is an ancient Egyptian site ("e"). Reading from right to left, it is the 0007th site to be listed in the *markaz Al Zaqaziq* (03) in Sharqiyyah Governorate (13). (The name of the site is Tall Basta, or Bubastis.)

Selected Sharqiyyah sites were published by the EAIS on its website, on CD-rom, and in abbreviated form in a hard copy version. But the data is hard to come by. A very limited number of the hard copy editions were printed, and they are available in very few libraries. The EAIS website is no longer available, and the cd was published using software that cannot be accessed on modern computers.

Each of Egypt's 27 governorates, *muhafza,* pl. *muhafazat*, is divided into smaller administrative units called *markaz*, pl. *marakiz*, of which Egypt had 371 as of 1997. Lists of *marakiz* may be found online (www.statoids.com/yeg.html). Over the years, the *muhafazat* have changed. Recently, for example, Helwan Governorate was made part of Al Qahira Governorate (Cairo). Al Uqsur (Luxor), formerly a part of Qinah Governorate, is now separate. Sinai has been split into North Sinai and South Sinai. These administrative changes have not affected the numbers already assigned to sites, but what will happen if in future other changes occur is unclear. The numbers assigned to governorates intentionally omits 5-10, 20, and 30, perhaps anticipating such future changes.

Governorates of Egypt		
1 Al Qahirah (Cairo)	16 Al Gharbiyah	26 Suhaj
2 Al Iskandariyah (Alexandria)	17 Al Minufiyah	27 Qina
3 Bursaid	18 Al Buhayrah	28 Aswan
4 Al Suways	19 Ismailiyah	29 Al Uqsur (Luxor)
11 Dumyat	21 Al Jizah (Giza)	31 Al Bahr al Ahmar (Red Sea)
12 Daqahliyah	22 Bani Suwayf	32 Al Wadi al Jadid, including the oases of Kharijah, Dakhilah, and Farafirah, but excluding Bahariyah, which is part of 21: Al Jizah; and Siwah, which is part of 33: Matruh
13 Sharqiyah	23 Al Fayyum	33 Matruh
14 Qalyubiyah	24 Al Minya	34 Shamal Sina (North Sinai)
15 Kafr al Shaykh	25 Asyut	35 Janub Sina (South Sinai)



Governorate borders valid before recent changes. Library of Congress
Gazeteer of Egypt, Washington, D.C., 1987

3.1.2.2. Survey of Egypt Numbers in Dakhilah Oasis

The Dakhleh Oasis Project uses Survey of Egypt map coordinates to locate and identify the sites it has surveyed. Project director Anthony Mills explains the system:

> The Dakhleh Oasis Project has adopted a system which locates each site within a given square kilometer in the oasis. It is based on a set of detailed maps of the oasis . . . on a scale of 1:25,000 . . . published in 1932 by the Egyptian Government Survey Department. They basically show the pattern of land use at that time together with some relief indicated by contours. The grid system employed on these maps is set out in one kilometer intervals, based on a zero point at Gebel Uweinat, at the junction of the borders of Egypt, the Sudan, and Libya. Accordingly, each map sheet is identified by a numbering system which denotes the bottom or south margin and the left or western margin. Thus, the map entitled "El Qasr" is sheet number 33/390, and the adjacent sheet to the south, "Gedida", is 32/390.
>
> Each map sheet covers 15 km E-W and 10 km N-S. The fifteen kilometer squares across are successively lettered A to P (omitting O) from left to right, and the ten squares down are numbered 1 to 10 from the top. Any individual square can now be identified by its letter and number in combination, eg., C8, M7. A square kilometre in the whole oasis can now be identified, first, by the map number, and, second, by the grid reference designation. Examples are 33/390-F8 and 31/420-M3.
>
> Individual sites within each square kilometer are simply numbered consecutively in the order of their finding, eg., 33/390-H7-1, 33/390-H7-2, 33/390-H7-3. Unless a site has a specific name, such as the temple of "Deir el Haggar," it will be referred to by its number. Individual features within a site, such as houses or graves, can be given a separate distinguishing number, which would form a fourth component in the identification system.

There are also site-specific numbering systems, such as those assigned to cemeteries and their architectural contents at Jizeh (G6020), individual tombs in the Valley of the Kings (KV 62), the Valley of the Queens (QV 64), the Theban Nobles' tombs (TT 100), Saqqarah, Bani Hassan, Elkab, and others.

3.1.3. Primary Names and Spelling

One site name and one spelling of that name have been chosen by the EAD as a site's "primary" name. A site's Arabic name rather than its Greek or Latin or common European name is the preferred "primary" name, because that is the name most likely to be used by the Library of Congress, British Library, European libraries, by the MoA, and by local Egyptians. In the EAD, the Arabic name is written in transliteration according to standards given in the Library of Congress's *Gazeteer of Egypt* and by the British Library, but without diacritical marks. A transliteration with diacriticals is given as a variant (external system reference) name. It is usually also the name and transliteration used as the preferred Arabic name by the U.S. Board on Geographic Names, the U.S. Defense Mapping Agency (now the National Geospatial - Intelligence Agency), the Permanent Committee on Geographical Names for British Official Use, and the British Board on Geographic Names.

Where possible, Greek and Latin names follow the spelling used in Trismegisgtos.org. Coptic names are usually those found in standard reference books, such as Aziz Atiya's *Coptic Encyclopaedia* or Crum's *Coptic Dictionary*. Transliterated hieroglyphic names follow standard references, such as the *Lexikon der Agyptologie*, Gardiner, and J. P Allen.

Ideally, the EAD's "primary" name is also the one chosen by the Egyptian Government as the name by which a site is known in official government documents, the name used on official *amlaak* maps, and the name used in Egyptian Antiquities Information System (EAIS) site registers. But because foreigners are not allowed to purchase *amlaak* maps, and the EAIS has so far listed only a few hundred Egyptian sites in its publications, the EAD's Primary Name could not be confirmed in every instance to be the official Egyptian Government site name.

In addition to a Primary Name, the EAD includes as many of a site's common alternative names and spellings as possible. Each is searchable in the Database. For example, a search for *Hierakonpolis, Kawm al Ahmar, Ahmar Kawm al,* or *Nekhen*, will direct one to *Kawm al Ahmar* 1, the "primary name." There are several Egyptian sites called *Kawm al Ahmar*, but there is only one EAD entry that is numbered "1" and that gives *Hierakonpolis* and *Nekhen* as variants.

The EAD list of site names by no means includes all variants, but French, German, and other European spellings are usually given. Ancient Egyptian, Coptic, Greek, and Latin names are listed if their identification with the site is generally agreed among scholars. In many cases, the EAD makes reference to the very useful website www.Trismegistos.org, and to the *Lexikon der Agyptologie,* where additional information on Classical names, with references, may be found.

Language of Names Drop-Down List	
Name Type	**Arabic**
Primary	الإسم الرئيسي
English	الإنجليزية
Arabic	العربية
Other	أسماء أخري
Coptic	القبطية
Demotic	الديموطيقية
Egyptian	اللغة المصرية القديمة
French	الفرنسية
German	الألمانية
Greek	اليونانية
Italian	الإيطالية
Latin	اللاتينية
Spanish	الإسبانية

One can search for a site in the EAD by any of its listed names. But the "primary" name will be the name used by the EAD in its text and on all its accompanying maps, plans, and charts. It is also the name most likely to be found on modern maps of Egypt published in Arabic or English, and the name used in most European library catalogues. Note, however, that in the latter there may be slight differences in spelling. For example, the English *Aswan, Egypt* is the French *Assouan, Egypte*, German *Aswan, Ägypten*, and Italian *Assuan, Egitto*.

For convenience, the accompanying tables give the Coptic and Egyptian alphabets in the characters at www.Unicode-table,com, the preferred source used by most Egyptologists today. (See also James Allen, *Middle Egyptian.* Cambridge: Cambridge University Press, 2000, pp. 14-17). The Arabic and English equivalents of the Egyptian hieroglyphic and Coptic alphabets are also given.

Arabic transliterations in the Database follow rules outlined in the Library of Congress's *Gazeteer of Egypt.* The EAD usually ignores the hamza in transliteration but not, of course, when writing Arabic script. For some site names in Egyptian hieroglyphs, Greek, Coptic or other *scripts,* one also may refer to the www.Trismegistos.com; *Thesaurus Linguae Aegyptiae* (www.aaew.bbaw.de/tla/serviet/S05?d=d001&h=h001); and standard references such as the *Lexikon der Ägyptologie.*

Coptic Translations

English	Coptic	Arabic
a	ⲁ	أ
b	ⲃ	ب
g, k	ⲅ	ج
d, t	ⲇ	د
e	ⲉ	إ
s	ⲋ	س
z	ⲍ	ز
e	ⲏ	إي
th	ⲑ	ت, ث
i, y	ⲓ	ى
k	ⲕ	ك
l	ⲗ	ل
m	ⲙ	م
n	ⲛ	ن
ks	ⲝ	إكس
o	ⲟ	أو
p	ⲡ	ب
r	ⲣ	ر
s	ⲥ	س
t	ⲧ	ت
u	ⲩ	و, ى
ph	ⲫ	ف
kh	ⲭ	خ, ش
ps	ⲯ	بس
o	ⲱ	او
sh	ϣ	ش
f	ϥ	ف
kh	ϧ	خ
h	ϩ	ه
j	ϫ	ج
q	ϭ	ك، ج
ti	ϯ	تى

English-Arabic

a	أ
b	ب
t	ت
th	ث
g	ج
h	ح
kh	خ
d	د
th	ذ
r	ر
z	ز
s	س
sh	ش
s	ص
d	ض
t	ط
th	ظ
a	ع
gh	غ
f	ف
q	ق
k	ك
l	ل
m	م
n	ن
h	ه
w	و
y	ي

Hieroglyph Translations

English	Hiero	Arabic
a	𓄿	أ
i	𓇋	إ
y	𓇌 , 𓏭	ى
ʿ	𓂝	ع
w	𓅱	و
b	𓃀	ب
p	𓊪	
f	𓆑	ف
m	𓅓	م
n	𓈖	ن
r	𓂋	ر
h	𓉔	ه
h	𓎛	ح
kh	𓐍	خ
ch	𓄡	غ
s	𓊃 , 𓋴	س
sh	𓈙	ش
q	𓈎	ق
k	𓎡	ك
g	𓎼	ج
t	𓏏	ت
tj	𓍿	ث
d	𓂧	د
dj	𓆓	ج

3.1.4. Standardizing Arabic Names.

The Arabic definite article is written as *Al* or *al*, even when it precedes what are called sun letters. It is capitalized (*Al)* when it begins a name or name phrase, but not elsewhere (thus, *Al Wahat al Kharijah).*

Persons not familiar with the Arabic definite article are often unsure when it is to be used. These standard names of three Egyptian oases show different patterns of use and illustrate why it is confusing: *Al Wahat al Dakhilah, Wahat al Farafirah,* and *Wahat Siwa.* To avoid confusion, the EAD ignores *Al* and *al* when alphabetizing names in the Database: *Al Lahun* is alphabetized under *L; Abu al Zur* is alphabetized as if it were *Abuzur.* This is standard practice in Arabic.

An initial *Al* follows its noun in the Database Primary Name box: *Lahun, Al,* not *Al Lahun.* The primary entry for *Alexandria* is in its Arabized form, *Iskandariyah, Al.* Note also that it is *Qahirah, Al,* not Cairo, and *Uqsur, Al*, not Luxor. *Elkab* is not *Al Kab* because it has no definite article; it derives from ancient Egyptian *Nekheb.* The *ta marbutah (ة)* at the end of certain Arabic words is transliterated as *h* (*Jazirah),* unless it is followed by a modifying word, when it is written as *t* (*Jazirat al Faras*).

Many Arabic and Coptic site names are compounds, such as ***A****bu Sir,* ***A****bd Allah,* ***A****nba Bakhum,* ***A****rab Mutayr, Bani Hassan,* ***B****int Abu Qurayyah,* ***S****haykh Fadl,* ***U****mm Dabadib.*

Abd	slave
Abu	father
Anba	Coptic priestly honorific
Arab	Arab
Bani	children
Bint	girl
Ibn	son
Shaykh	shaykh
Umm	mother

These are treated as single entities, to be alphabetized under the compound's first letter (bold-faced in these examples). This follows both the Library of Congress's *Gazeteer of Egypt* and common Arabic usage.

Generic terms, however, which describe a site's type or geographical setting, and which are less closely tied to a specific name, are not alphabetized as part of the primary name. These include such terms as *Kawm, Tall,* and *Jabal*. Thus, *Jabal Musa* is entered as *Musa, Jabal;, Kawm al Ahmar* as *Ahmar, Kawm al;* and *Al Wahat al Kharijah* (Kharga Oasis) as *Kharijah, Al Wahat al.* The following is a partial list of these terms with their English translation and examples of their occurrence in the Database:

Site Description	Arabic	English Translation	Example
haram, ahramat	هرم،اهرامات	pyramid	Abu Sir, Ahramat
ayn	عين	spring, well	Sukhna, Ayn
bab	باب	door	Mukhayniq, Bab al
bahr	بحر	sea	Youssef, Bahr
balad, bilad	بلد، بلاد	region	Bilad al Rum
bayt	بيت	house	Khallaf, Bayt
bir, abar	بير,ابار	cistern, well	Umm Fawakhir, Bir
birkah, birkat	بركة، بركه	bay, lake	Habu, Birkat
bursaid	بورسعيد	Port Said	Bursaid*
dayr	دير	monastery	Durunkah, Dayr
hawd	حوض	irrigation basin	Qaw, Hawd

hawsh	حوش	plain	Ghanaym, Hawsh al
ilwah, ilwat	علوه، علوة	hill, mound	Shaykh Abd al Qurnah, Ilwat al
izbah, izbat	عزبة، عزبه	farm	Rushdi, Izbat
jabal	جبل	hill, mountain	Ahmar, Jabal
jazirah, jazirat	جزيرة، جزيره	island	Dabarosa, Jazirat
jurf	جرف	cliff, ridge	Husayn, Jurf
kafr	كفر	hamlet, small village	Shaykh, Kafr al
kawm, kiman	كوم،كيمان	mound, mounds	Faris, Kiman; Umbo, Kawm
khawr	خور	inlet, wadi	Daud, Khawr
madinah, madinat	مدينه، مدينة	city	Quta, Madinat
magharah, magharat	مغاره، مغارات	cave	Magharah, Wadi
mahjir	محجر	quarry	[no exx. in EAD]
manjam	منجم	mine	[no exx. in EAD]
marsa	مرسي	bay, cove	Alam, Marsa
mastabah, mastabat	مصطبه،مصطبات	mastaba	Firawn, Mastabat al
mazar	مزار	shrine, sanctuary	Bani Mazar
mons	منص	mountain	Claudianus, Mons
naj	نجع	hamlet, small village	Dayr, Naj al
qalah,qal'at	قلعه، قلعة	citadel	Qalah, Al
qanah, qanat	قناه، قناة	canal	Suways, Qanat al
qarn	قرن	horn, peak	[no exx. in EAD]
qaryah, qaryat	قريه، قرية	village	Mustafa Amr Jum'ah, Qaryat
qasr, qusur	قصور،قصر	palace	Zayyan, Qasr al
qubbah	قبه	dome	Hawa, Qubbat al
rawd	روض	valley, wadi	Faraj, Rawd al
sad	سد	dam	Sad al Ali, Al
sharm	شرم	bay, inlet	Shaykh, Sharm al
tall, tilal	تل	hill, mound	Ruhban, Tall al
wadi	وادي	wadi, valley	Natrun, Wadi al
wahat, wahah	واحه، واحات	oasis	Siwa, Wahat

* In Egyptian Arabic, Port Said is written as one word: Bursaid. Other ports' names, such as Port Tawfiq, are written as two words and entered here in standard EAD format: Tawfiq, Bur.

3.1.5. Complex Sites

An archaeological site may be defined as a geographical area containing the physical remains of past human activity. That activity may have taken place a century ago (the minimum age specified by the Egyptian Government for it to qualify as a protected archeological site), or a hundred thousand years ago. The site might have been occupied for a few days or dozens of centuries. It might cover a few square meters or many kilometers. It might include only a few petroglyphs cut into a rock face, or a complex with many hundreds of tombs and houses and storerooms and shrines. It might include different building types, from pens to palaces to homes for the gods. But any of these archeological sites may be entered in the EAD if it meets two requirements: it must contain remains of pre-Islamic date (before 622 AD); and it must have been mentioned at least once in Egyptological literature, since at this point the EAD has conducted no on-the-ground surveys and would not know of its existence.

Some sites are so complex they require their own database; they are not included in the EAD. Thebes is an example of such a huge, long-lived site, and The Theban Mapping Project's online Theban Database is such a dedicated resource (see www.thebanmappingproject.com). It covers all aspects of the archaeology of the West Bank at Luxor and is divided into the following sections:

a. General works on Thebes (West Bank at Luxor)
b. Valley of the Kings
c. Valley of the Queens
d. Memorial Temples and Others
    i. Dayr el-Bahari
    ii. Amenhotep III
    iii. Seti I
    iv. Ramesseum
    v. Madinet Habu
    vi. Other
e. Tombs of the Nobles
f. Malqata and Birkat Habu
g. Dayr el Medinah and other workmen's sites
h. Other Theban Sites
    i. Prehistoric sites
    ii. Coptic sites
    iii. Other

Luxor East Bank sites, however, including Karnak and Luxor temples and the Avenue of Sphinxes, are included in the EAD, entered under *Karnak, Al* and *Uqsur, Al*. *Jizeh* is being catalogued by the Museum of Fine Arts/Harvard University, and the EAD links to their site, www.gizapyramids.org. Saqqarah will also be treated separately.

Some large sites in the EAD are divided into several parts. Such sites are called "Archaeological Complexes," and their division may be based on geography, chronology, building types, cultural divisions, or a combination of these. Abydos, for example, has three entries in the EAD, as Abydos (Predynastic and Early Dynastic); Abydos (New Kingdom Temples); and Abydos (South). All three are considered parts of the single site, Abydos, and a search for Abydos will reveal all of them. Examples of complex sites include Aswan, Jabal Silsilah, Elkab, Tall al Amarinah, Suhaj, Wadi Natrun, and the Western Desert oases. A site having several parts and whose name is the same as other sites, might have an entry llike this: Kawm al Ahmar 3 (Settlement). For multiple sites having the same name see above, §3.1.3.

Chapter 4

The EAD's Contents, 2: Site Location

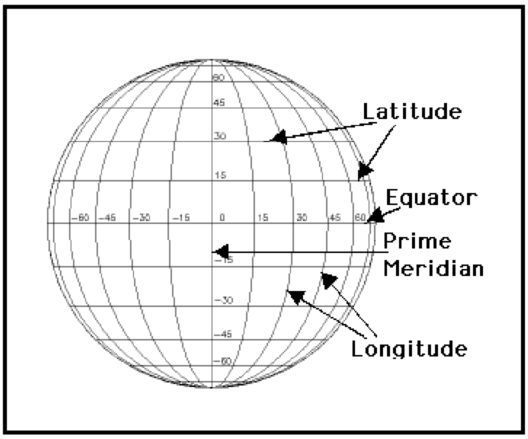
4.1. Site Location

Sites entries in the Database note geographical location in several ways: by latitude and longitude; by Survey of Egypt grid reference; by JOG reference; and by written directions. Of these, latitude and longitude is the most widely used and the most precise.

4.1.1. Latitude and Longitude

Lines of *latitude* circle the earth parallel to the equator. There are 90 such lines, also called parallels, north of the equator (in the Northern Hemisphere) and 90 south of it (in the Southern Hemisphere). Each line represents one degree of latitude (the degree symbol is °), and there are 90° between the equator and the North Pole. The equator is at 0°, the North Pole at 90°. Each degree is divided into 60 minutes (written 60'), each minute into 60 seconds (written 60"). The approximate distance between latitudinal lines is: one degree = 110.8 km.; one minute = 1846 m.; one second = 30.7 m.; 0.1 seconds = 3.07 m.; 0.01 seconds = 0.31 m.; 0.001 seconds = 0.031 m. or 3.1 centimeters; 0.0001 seconds = 3 millimeters. (Measurements are rounded.)

Degrees of *longitude* are lines east or west of the Prime Meridian (0°) at Greenwich, England. There are 180 degrees of West Longitude (in the Western Hemisphere), 180 degrees of East Longitude (in the Eastern). Since lines of longitude encircle the Earth from north to south and converge at the North and South Poles, they do not run parallel to each other, and the distance between lines them varies from 0.0 km at the poles to 111 km at the equator. The approximate distance between longitudinal points at 30°N (the latitude of Cairo) is: one degree = 96.5 km.; one minute = 1.6 km.; one second= 26.8 m.; 0.1 seconds = 2.68 m.; 0.01 seconds = 0.27 m.; 0.001 seconds = 0.027m. or 2.7 centimeters; 0.0001 seconds = 2.7 millimeters. (Measurements are rounded.) For formulae to calculate the distance between degrees of longitude see, e.g., www.csgnetwork.com/degreelenllavcalc.html.



The location of a site is given in latitude and longitude, and where those two lines cross, their intersection defines the site's coordinates. When writing the coordinates, it is customary to give latitude first, then longitude. However, a few software applications reverse this order-- and can cause confusion by doing so.

Latitude, if followed by an "N" or preceded by a "+", lies in the northern hemisphere. If written with an "S" or "-", it lies in the southern. "E" or "+" indicate east longitude; "W" or "-" indicate west longitude. For example, 25°N 32°E marks a point in the northern and eastern hemispheres; in fact, it is in Upper Egypt, near Al Uqsur.

Latitude and longitude may be written in several ways, as illustrated by these coordinates for Izbat Bashindi:

(1) In degrees, minutes, and seconds: 25°31'36.6" N, 29°17'44.4" E
(2) In degrees and decimal minutes: 25°31.613' N, 29°17.738' E
(3) In decimal degrees: 25.52683 N, 29.29567 E

All three of these coordinates refer to exactly the same point on the ground. Many maps and charts locate points using (1), but most software today requires (3), which is what the EAD prefers. In the EAD, we give the coordinates in both (1) and (3), when possible writing the latter at least to five decimal places. Some publications give coordinates in (2), (e.g., Cassandra Vivian, *The Western Desert of Egypt: An Explorer's Handbook,* Cairo: AUC Press, 2000, 2nd ed, 2008). If one enters coordinates as (3) in the database, Arches will automatically convert it to (1), and both will be printed in the EAD. If one wishes to enter (1) or (2), however, conversion to (3) must be done by hand. The conversion formulae for this may be found at http://www.rapidtables.com and at http://www.maptools.com/index.html.

Sites that have their latitude and longitude given in the EAD only in degrees and minutes but not in seconds, that write seconds as 00", or that give no latitude or longitude at all, were probably published before GPS became widely available. Until those sites can be revisited and precise GPS readings taken or searched on satellite images, those coordinates are unlikely to be refined.

The EAD prefers to specify a site's location using Google Maps or Bing, and the EAD writes those coordinates to five decimal places. Second choice is to use recently-published GPS readings (e.g., those recorded by Klemm and Klemm for Western Desert gold mines). Third and least accurate choice is to use the published coordinates found in older archaeological reports. Their source is usually not specified, but it was probably determined by scaling the location on paper maps and therefore is accurate oniy to within a few minutes.

In some cases, the EAD does not give the specific location of a site for reasons of security. Publishing the precise locations of newly discovered or unprotected sites could invite vandalism and plundering. That said, most sites listed in the Database are already known; their locations have appeared in easily accessible archaeological reports, guidebooks, online gazeteers, or in the private newsletters sent to members of Egypt's many off-road vehicle clubs (see, for examples, www.saharasafaris.org.). Unfortunately, many sites have already been damaged because of this. The problem is a serious one, and the Theban Mapping Project continues to work closely with the Ministry of State for Antiquities to protect Egypt's patrimony. Entries in the Database that give no location for security reasons will be so noted in the site description box.

4.1.2. Survey of Egypt Grid References

Begun in the early 1900s, the Survey of Egypt (SOE) has been publishing maps of most areas of Egypt at scales of 1/250,000 and 1/100,000, with some areas published at 1/25,000 and 1/5,000. (1/100,000 means that a line one centimeter long on the map is equivalent to a line 100,000 centimeters--one kilometer--long on the earth.) Many fewer maps are published by the SOE today than in earlier years, and most of the older maps are now in need of correction, but all are useful.

Until recently, instead of using lines of latitude and longitude, SOE maps used a unique grid network inspired by the U.K. Ordnance Survey's Grid Coordinate System. The SOE grid extended north and east from the country's southwesternmost corner, at Jabal Uwaynat. Its grid numbers are shown on the Survey's map sheets, and in an *Index of Place Names* published by the SOE in 1932 in Arabic and English. We quote the Survey's explanation of how its grid system works:

> The same standard grid is adopted in three series of maps issued by the Survey of Egypt [the 1:100,000, 1:25,000 and 1:5,000].
>
> Each sheet in these series covers an area on the map of 40 cms. from south to north by 60 cms. from west to east. In the case of the 1/100,000 series each sheet therefore covers an area of 40 x 60 kms. . . .
>
> Each sheet . . . is given a number which is the co-ordinate of its south-west corner expressed as a fraction, the northern co-ordinate being the numerator and the eastern co-ordinate the denominator.
>
> As the co-ordinates of the corner of each 1/100,000 sheet are always multiples of 10, the co-ordinates in the sheet numbers are expressed in tens of kilometres. Both the numerator and denominator will therefore be composed of only two digits . . .

The Index gives the name of towns, villages and 'ezbas [plantations] in the Nile Valley and Delta of Egypt, that appear on the 1/100,000 series, lists the markaz [rural directorate], the mudiriya [formerly a ministerial district, now the geographical equivalent of a governorate] and gives the number of the sheet in which it falls, and its two co-ordinates.

The co-ordinates of any point are its two perpendicular distances in kilometres, measured north and east, from two axes which intersect at right angles near the south-west corner of Egyptian territory.

As each centimetre on the 1/100,000 scale map represents one kilometer on the ground, the co-ordinate of any point may be considered as centimetres measured north and east on that map.

The detail shown on every sheet of the 1/100,000 series embraces a rectangular area on the map which measures 40 centimetres from south to north, and 60 centimetres from west to east.

On the sheet lines, round the margins, there are small marks at intervals of 10 centimetres. When corresponding marks on opposite sides are joined by straight lines the sheet is divided into 24 square of 10 centimetres sides; these form part of the standard grid. The sides of each square are numbered in the margins. These numbers are the co-ordinates of the 10 kilometre grid lines.

To find the position on the map of any town:--

Find from the index the co-ordinate of the town and the number of the 1/100,000 sheet in which it falls. Obtain this sheet and mark along the sheet line in the west and east margins the points which correspond to the north co-ordinate of the town. This is easily done with the aid of the co-ordinate card provided with the index or by using an ordinary centimetre scale. Join these two points by a straight line. Then mark in the north and south margins the points which correspond to the east co-ordinates of the town. Join these two points with a straight line. The two straight lines intersect in the town required. . . .

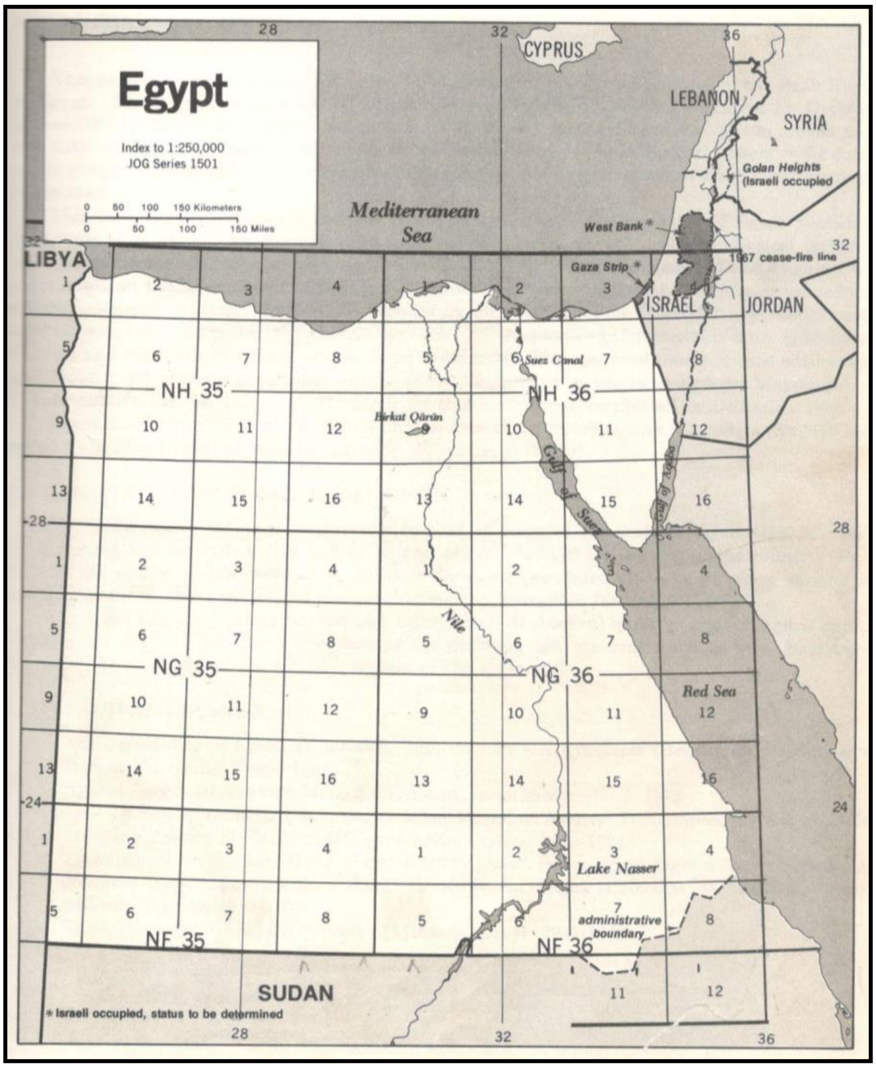
Example:--

To find the position on the map of "El Marg" –

Looking up the index under "Marg, el" one finds the co-ordinates given as 826.8 kilometres N, and 647.4 kilometres E, and that the town falls on sheet 80/60. Get this sheet and you will find the numbers 800, 810, 820, etc., written in the east and west margins. Measure a distance of 6.8 centimetres north of the 820 mark in each margin and draw the grid line 826.8 across the sheet. Similarly from the 640 grid line marked in the north and south margins measure a distance of 7.4 centimetres to the east and draw the 647.4 grid line. These two grid lines will then be found to intersect in the centre of the town "El Marg."

4.1.3. JOG References

In 1891, a proposal was made to create a 1:1,000,000 "International Map of the World" using what then were the most modern cartographic techniques. For various reasons, plans for the International Map were abandoned. But the worldwide grid it established has remained a standard of modern map-making, and today it is part of what is called the Joint Operations Graphic (JOG).



JOG map, Library of Congress *Gazeteer of Egypt,* Washington, D.C., 1987

The JOG system divides the earth into grid units, labeled N in the northern hemisphere, S in the southern. Each hemisphere is divided into horizontal strips measuring 4° top to bottom and labeled A (at the equator) through V (at the poles). Vertical strips are divided into 6°-wide grid units, starting from longitude 180° in the Pacific Ocean and moving eastward. These are numbered 1-60. Egypt comprises all or part of six JOG units: that covering northwest Egypt, for example, is NH35; the Delta and the Sinai lie in NH36. Each grid unit is sub-divided into 16 numbered units (arranged 4 x 4). Al Qahirah, for example, lies in NH36-05, Al Uqsur in NG36-10.

While the EAD pinpoints the location of *individual* sites using latitude and longitude, the JOG grid provides the means to locate *groups* of sites. For example, the Roman port Marsa Nakari lies at 24° 55' 30"N, 34° 57' 44.4"E. One can locate sites in its surrounding area by searching all of NG36-16, the JOG grid in which Marsa Nakari lies. One can also search the adjacent grids to its north, west, and south, NG36-12, NG36-15, and NF36-04 (the Red Sea lies to its east). At the latitude of Egypt, each of these grid units measures approximately 144 km east to west and 110 km north to south, each covering about 12,540 km^2.

There are also other ways of searching geographical areas in the EAD. For example, one can draw a polygon of any size on the Arches Database map and call up sites within that area. Searches can be limited to reveal only sites of a specific date or a certain building type by using the Database's controlled language. (For more on searching the Database, see section 2.2.14.)

4.1.4. Maps

The most common paper maps are noted here because they can be useful trying to locate sites mentioned in early travellers' accounts. Some entries in the EAD do not yet give detailed latitude and longitude, and paper maps, which early excavators relied on to describe a site's location, still are useful for determining its approximate position. Paper maps continue to be used by some archaeologists when locating or numbering sites (see §3. 1. 2. 2).

Topographic maps of Egypt have been published for the past 110 years. The Survey of Egypt series (1:250,000 and 1:100,000) were the earliest, and continue to be published, although much less frequently than in the past. Other countries have also produced maps of Egypt. German military maps (1:500,000 and 1:1,000,000) of the Western Desert and of Egypt south to 26°N were published in 1942. The United States and Britain produced maps at 1:250,000 (with others at 1:500,000 and 1:1,000,000) between 1956 and 1982. (In 1941-1945, the UK War Office and the US Army Map Service published series 4085, 1:100,000 sheets covering the Western Desert and northern Egypt.) The Soviet Union produced very useful 1:200,000 and 1:500,000 series of all Egypt (beginning in the late 1960s), a 1:50,000 series covering the Egypt-Israeli border (1980), and a few others of limited coverage, including a 1:100,000 of the Gulf of Aqaba. The Gulf of Aqaba was also mapped at 1:50,000 by the Israelis in 1993. There are other, more recent, topographic maps as well, some in digital format, but they are expensive and difficult to locate. (See, e.g., www.omnimap.com and www.mapstor.com.) And, of course, Google Maps, Bing, and other online satellite sources provide detailed coverage. Many maps intended for tourists are available, a few of them of general usefulness (e.g., *Agypten- Egypt 1:1,300,000*, Budapest: Gizi Map, 2007).

A selection of 16th-19th century historical maps has been collected in *Egypt in the Cartographic Heritage (1595 – 1840 A.D.): The Cartographic Collection of the National Library of Egypt*, Cairo: Dar al-Kutub wa al-watha'iq al-Qawmiyah, 2008. A beautiful collection of early maps may be found in Albert Kammerer, *La Mer Rouge, l'Abyssinie et l'Arabe*, Cairo, 1929-1952, 4 vols. in 7 parts. Such maps, besides being works of
art, are useful for tracking the history of site names and now-lost geographical features. Some early site maps are listed in Porter and Moss, *Topographical Bibliography*. Fine examples may be found in the *Description de l'Egypte* (1798), which, interestingly, used the top of the Great Pyramid as the zero-point for its Egyptian survey grid.

An excellent map of classical sites in the Nile Valley, Eastern Desert, and Al Wahat al Kharijah (between latitudes 24° and 28°) is: David Meredith, *Tabvla Imperii Romani: Map of the Roman Empire Based on the International 1:1,000,000 Map of the World, Sheet N.G. 36: COPTOS* (Oxford: Oxford University Press, for The Society of Antiquaries, London, 1958). Broader but less detailed coverage is to be found in Richard J. A. Talbert (ed.). *Atlas of the Greek and Roman World* (Princeton: Princeton University Press, 2000), available in both hard copy and electronic form.

Aeronautical charts (1:500,000, with 500-feet contours and shaded relief), published by US and UK government agencies, are updated every 2-3 years.

The Egyptian Survey Authority (ESA = www.esa.gov.eg) is an important source for maps (although they do not sell to foreigners; an Egyptian must buy them on a foreigner's behalf). The range of maps includes topographic, meteorological, economic, and census maps, but many are out of print and unavailable, or can be had only in photocopy.

The maps of the *Amlaak* Properties Department record boundaries of private and government property and are used by the MSA to determine the "official" name of an archaeological site. The official, legal boundaries of most sites are not settled, however. The EAD acknowledges *Amlaak* names and gives them priority when choosing a Primary Name (see above, § 2.1.3).

The Geological Survey of Egypt, www.EGSMA.gov.eg, is a source for geological maps. It produced a 1:500,000 series in 1978 and a 1:2,000,000 map of Egypt in 1981. Cadastral surveys of irrigated Nile Valley lands have been issued since 1892, initially at 1:4,000, later at 1:2,500, by the Survey Department of the Ministry of Irrigation. Geological maps have also been published by the Ministry of Petroleum and Mineral Wealth. A 1:2,000,000 geological map of Egypt was published by the Survey and the Ministry in 1981; a series of 1:500,000 geological maps was published jointly by the Ministry and USAID in 1978.

Archeological site reports often include maps made by travellers and excavators. Their quality varies greatly. Among the earliest maps of Thebes are those by Pococke (1771) and Wilkinson (1835). A few large sites have been mapped systematically. A part of the Theban Necropolis, for example, was mapped at 1:500 by Emilio Baraize in 1904 and at 1:1000 by the Survey of Egypt in 1919-1924. A French photogrammetric survey in 1969 resulted in a 1:10,000 map of Thebes, with 1:1000 details of the Valleys of the Kings and Queens. Maps of specific areas include those of Taarif by the Austrians (1:1000); the Valley of the Kings in 2000 by the Theban Mapping Project (1:2500, 1:250); and the area around the Colossi of Memnon in 2004 (at 1:500) by a German-led project. Two very useful sketch maps, one showing tomb and temple locations on the West Bank at Luxor, the other the complex of temples at Karnak on the East Bank (at about 1:5000) were published in 1972 in German by Gerhard Hauptmann. Maps of principal cemeteries at Jizah were published by Reisner (1936, 1942) and Junker (1929-1955). (See www.gizapyramids.org). A convenient but incomplete listing of early maps of many sites may be found in Porter and Moss (1927-1972).

4.1.5. Written Descriptions of a Site's Location

Before now-ubiquitous GPS technology and trained surveyors became regular members of archeological projects, site locations were often vaguely written descriptions: "Walk through the village on the path by the Nile and turn left at the palm tree." Such directions are rarely enough to locate sites today, in part because the topography of Egypt changes: a site once on the banks of the Nile now may lie several kilometers to its west; a village has grown and covers ancient walls; the palm tree has died. But written descriptions, even imprecise and dated ones, can still be useful, if not for directions, then for what they reveal about a site's past condition. Today, those who write existing condition reports should also include written directions to a site's location and not rely solely on maps and GPS coordinates. They will prove useful a few decades from now.

Chapter 5

The EAD's Contents, 3: Site Description and Date

5.1. Site Description

Depending on the size, complexity, and longevity of a site, its written description will vary greatly in length and detail. The description should nevertheless provide an overview of the site's history and its functions, the names of the rulers in whose reigns it was particularly active, a survey of its principal architectural features, descriptions of its archaeological remains, and a list of those who explored or excavated it. For some sites, this may be a brief paragraph. For others, it may be necessary to divide a long text into sections: history; architectural and archaeological description; exploration and excavation. The site bibliography should direct the reader to sources of further detail. Whenever possible, illustrative material, including historical photographs, maps, and plans, should accompany the entry (§ 7.2.). Emphasis should be given to i*n situ* remains, not to artifacts or objects in museums (unless they come from the site's architectural components). The building materials used and an indication of their present condition should be noted, although detailed condition surveys can await Existing Condition Reports.

5.2. Site Type

There are many different kinds of archaeological sites in Egypt. Their variety is the result of Egypt's several different environments that provide building materials and building sites; its long-lived but changing indigenous culture; and the influences of other cultures. The EAD has compiled a list of many of the most common functional types (below). It is by no means complete, and some general terms (such as "hydrological feature") include several building types. But the list should be useful when searching the EAD. Site types not on the drop-list can be marked as "other" and entered in the "Site Description" field. "Unidentified remains" refer to archaeological traces whose function is unknown or uncertain.

Site type Preferred name	Alternative names Synonyms to aid search	Arabic
Administrative center	Verwaltungszentrale	إداري مركز
Bathhouse	Sauna, spa, hammam	حمام
Cemetery	Cimetière, necropolis, nekropole	جبانة
Church	Basilica, cathedral, kirche, église	كنيسة
Fortification	Watch tower, praesidium, skopelos	مراقبة برج ،حصن
Graffiti	Petroglyph	جرافيتي ،مخربشات
Hydreuma	Well, spring, water station, rest stop	عين،نبع ،للسقاية مكان ،بئر
Hydrological feature	Canal, dam, dyke, barrage, irrigation, flood control	كوبري ,سد ,للري قناه
Inscriptions	Inschriften	نقوش
Magazine	Granary, storeroom, animal pens	مخزن
Mammisi	Birthhouse	الولادة غرفة ،الولادة بيت
Mine		منجم
Monastery	Laura, kloster, ermitage	دير
Nilometer		النيل مقياس
Other		أخري
Palace		قصر
Port	Shipyard, wharf, harbor	السفن مرسي ،ميناء

Pyramid complex		هرمية مجموعة
Quarry		محجر
Religious complex		ديني مجمع
Settlement	Town, village, hamlet, city, camp	مستوطنة
Shrine		مقصورة
Stela		لوحه
Temple		معبد
Temple, cult	Kulttempel	شعائر معبد
Temple, memorial	Totentempel, mortuary t., funerary t.	الذكري تخليد معبد
Theater	Odeon, coliseum	مسرح
Tomb	Crypt, grave, mausoleum, grab	مدفن, مقبرة
Town quarter		حي
Unidentified remains		تحديدها يتم لم بقايا
Workshop		عمل ورشة
Worksite	Workstation	عمل منطقة

5.3. Chronology: Cultural Periods, Dynasties, and Reign

Egyptian chronology can present thorny problems, but many can be avoided by ignoring absolute dates. That is what the EAD's menus do: they give periods, dynasties, and reigns, but not calendar dates CE/AD, BCE/BC, or years BP. If one knows the reign in which a site or part of a site was built, then that ruler's name should be checked in the drop-down list of rulers and the dynasty in which he ruled and the period in which the dynasty falls also checked. Many sites include remains from several different periods; each component should have the appropriate period(s) noted in the chronology lists.

5.3.1. Egyptian Cultural Periods

These are the most general chronological indicators, useful when no more specific information is available.

Cultural Periods	
Period	**Arabic**
Predynastic	عصر ماقبل الاسرات
Palaeolithic/Epi Palaeolithic	العصر الحجري القديم
Neolithic/Chalcolithic	العصر الحجري الحديث
Proto-Dynastic	عصر قُبيل الأسرات
Dynastic Period	عصر الاسرات
Early Dynastic Period	عصر الاسرات المبكر
Old Kingdom	الدولة القديمة
First Intermediate Period	عصر الانتقال(الاضمحلال)الاول
Middle Kingdom	الدولة الوسطي
Second Intermediate Period	عصر الانتقال(الاضمحلال)الثاني
New Kingdom	الدولة الحديثة
Third Intermediate Period	عصر الانتقال(الاضمحلال)الثالث
Late Period	العصور المتأخرة

Late Antiquity	أواخر العصور القديمة
Ptolemaic	العصر البطلمي(البطالمة)
Roman	العصر الروماني
Byzantine Period/Coptic	العصر القبطي (البيزنطي)
Modern, Islamic	العصر الاسلامي الحديث
Unknown	غير معرف
Nubian Periods	عصور الحضارة النوبية
A-Group	المجموعة**A**
C-Group	المجموعة**C**
X-Group	المجموعة**X**
Meroitic Period	العصر المروي

5.3.2. Predynastic Cultures and Dynasties

Entries here include predynastic cultures and dynasties. No absolute dates are given.

Dynasty Drop-Down List	
Dynasty or sub period	**Arabic**
Maadian	حضارة المعادي
Badarian	حضارة البداري
Naqada I	حضارة نقادة 1
Naqada II	حضارة نقادة 2
Dynasty 0 (Naqada III A-B)	الأسرة ٠ (حضارة نقادة 3 A-B)
1st Dynasty (Naqada III C-D)	الأسرة الاولي (حضارة نقادة 3 C-D)
2nd Dynasty (Naqada III D)	الأسرة الثانيه (حضارة نقادة 3 D)
3rd Dynasty	الأسرة الثالثه
4th Dynasty	الأسرة الرابعه
5th Dynasty	الأسرة الخامسه
6th Dynasty	الأسرة السادسه
7th Dynasty	الأسرة السابعه
8th Dynasty	الأسرة الثامنه
9th Dynasty	الأسرة التاسعه
10th Dynasty	الأسرة العاشره
Early 11th Dynasty	بداية الاسرة الحادية عشر
Late 11th Dynasty	اواخر الاسرة الحادية عشر
12th Dynasty	الأسرة الثانية عشر
13th Dynasty	الأسرة الثالثة عشر
14th Dynasty	الأسرة الرابعة عشر
15th Dynasty (Hyksos)	الأسرة الخامسة عشر(الهكسوس)
16th Dynasty (Hyksos)	الأسرة السادسة عشر (الهكسوس)
17th Dynasty	الأسرة السابعة عشر
18th Dynasty	الأسرة الثامنة عشر
19th Dynasty	الأسرة التاسعة عشر

20th Dynasty	الأسرة العشرون
21st Dynasty	الأسرة الحادية والعشرون
22nd Dynasty	الأسرة الثانيه والعشرون
23rd Dynasty	الأسرة الثالثه والعشرون
24th Dynasty (Sais)	الأسرة الرابعه والعشرون (سايس)
25th Dynasty (Nubian)	الأسرة الخامسه والعشرون (العصر النوبة)
26th Dynasty (Saite)	الأسرة السادسة والعشرون (العصر الصاوي)
27th Dynasty (1st Persian)	الأسرة السابعة والعشرون (العصر الفارسي الاول)
28th Dynasty	الأسرة الثامنة وعشرون
29th Dynasty	الأسرة التاسعة وعشرون
30th Dynasty	الأسرة الثلاثون
31st Dynasty (2nd Persian)	الأسرة الحادية والثلاثون (العصر الفارسي الثاني)
Macedonian	العصر المقدوني
Ptolemaic	العصر البطلمي
Roman	العصر الروماني
Unknown	غير معروف

5.3.3 Rulers

This list of pharaohs and Greek and Roman rulers makes no claim universal acceptance. It is adapted from several recent sources. No absolute or relative dates or sequential order are necessarily implied. The spellings of names are generally accepted, but they will differ among European languages and writers' personal preferences.

Ruler Drop-Down List		
Ruler Name (for categorization)	**Arabic Name**	**Ruler alternative names (for Search)**
Aha	عحا	
Djer	جر	
Djet	جت	
Den	دن	
Merneith	مريت نيت	
Anedjib	عج اب	
Qa'a	قا عا	
Hetepsekhemwy	حتب سخموي	
Reneb	رع نب	Raneb
Nynetjer	ني نثر	Ninetjer
Weneg	ونج	
Sened	سند	
Peribsen	برإب سن	Perabsen
Khasekhem	خع سخموي	Khasekhemwy
Djoser	زوسر	Netjerikhet; نثر-خت
Sekhemkhet	سخم خت	Sechemchet
Snefru	سنفرو	Snofru; Seneferu
Khufu	خوفو	Cheops; Kheops
Redjedef	جدف-رع	Djedfru; Djedefre

Khephren	خفرع	Chephren; Chefren; Khafre
Menkaure	منكاورع	Mycerinus
Shepseskaf	شبسكاف	
Userkaf	وسركاف	
Sahure	ساحو-رع	
Neferirkare	نفر اركارع	
Niuserre	ني وسر رع	
Djedkare	جد كارع	
Unas	اوناس	Wenis; ونيس
Teti	تيتي	
Pepi I	بيبي الأول	
Pepi II	بيبي الثاني	
Nebhepetre Mentuhotep	نب حتب رع- منتوحتب	Mentuhotep II منتوحت الثاني
Sankhkare Mentuhotep	ساعنخ كارع- منتوحتب	Mentuhotep III منتوحتب الثالث
Nebtawyre Mentuhotep	نب تاوي رع - منتو حتب	Mentuhotep IV منتوحتب الرابع
Amenemhet I	أمنمحات الأول	Amenemhat I;Ammenemes
Sesostris I	سنوسرت الأول	Senwosret I
Amenemhet II	أمنمحات الثاني	Amenemhat II
Sesostris II	سنوسرت الثاني	Senwosret II
Sesostris III	سنوسرت الثالث	Senwosret III
Amenemhet III	أمنمحات الثالث	Amenemhat III
Amenemhet IV	أمنمحات الرابع	Amenemhat IV
Sobekneferu	سبك-نفرو	Nefrusobk
Seqenenre Tao I	سقنن رع - تاعا الأول	
Seqenenre Tao II	سقنن رع -تاعا الثاني	
Kamose	كامس	
Ahmose	أحمس	Amosis; Ahmes
Amenhotep I	أمنحتب الأول	Amenophis I; Amenhetep I
Thutmosis I	تحتمس الأول	Thutmose I; Tutmose I
Thutmosis II	تحتمس الثاني	Thutmose II; Tutmose II
Thutmosis III	تحتمس الثالث	Thutmose III; Tutmose III
Hatshepsut	حتشبسوت	Hatschepsut; حاتشبسوت
Amenhotep II	أمنحتب الثاني	Amenophis II; Amenhetep II
Thutmosis IV	تحتمس الرابع	Thutmose IV; Tutmose IV
Amenhotep III	أمنحتب الثالث	Amenophis III; Amenhetep III
Akhenaten	أمنحتب الرابع	Amenhotep IV; AmenhetepIV; Ikhnaton;أخناتون
Smenkhkare	سمنخ كارع	Semenkara; Smenkhare
Tutankhamun	توت عنخ امون	Tutanchamon; Tutankhaten توت عنخ اتون
Ay	آي	

Horemhab	حورمحب	Haremhab
Ramesses I	رمسيس الأول	Ramses I; Rameses I
Seti I	سيتي الأول	Sety I; Sethos I
Ramesses II	رمسيس الثاني	Ramses II; Rameses II; Ramesses the Great
Merenptah	مرنبتاح	Merneptah
Seti II	سيتي الثاني	Sety II; Sethos II
Amenmesse	أمون- مس	Amenemes
Siptah	سبتاح	Merenptah Siptah مرينبتاح سابتاح
Tawosret	تا-وسرت	Twosre; Tausert
Setnakht	ست-نخت	Sethnakht
Ramesses III	رمسيس الثالث	Ramses III; Rameses III
Ramesses IV	رمسيس الرابع	Ramses IV; Rameses IV
Ramesses V	رمسيس الخامس	Ramses V; Rameses V
Ramesses VI	رمسيس السادس	Ramses VI; Rameses VI
Ramesses VII	رمسيس السابع	Ramses VII; Rameses VII
Ramesses VIII	رمسيس الثامن	Ramses VIII; Rameses VIII
Ramesses IX	رمسيس التاسع	Ramses IX; Rameses IX
Ramesses X	رمسيس العاشر	Ramses X; Rameses X
Ramesses XI	رمسيس الحادي عشر	Ramses XI; Rameses XI
Smendes	سمندس	
Psusennes	بسوسنس الأول	
Shoshenq I	شوشنق الأول	Sheshenq I;شاشانق الآول
Shoshenq II	شوشنق الثاني	Sheshenq II;شاشانق الثاني
Osorkon I	وسركون الأول	اوسركون الأول
Takelot I	تكلوت الأول	Takeloth I
Osorkon II	وسركون الثاني	اوسركون الثاني
Shoshenq III	شوشنق الثالث	Sheshenq III شاشانق الثالث
Kashta	كاشتا	Kaschta
Piye	بي	Piya
Shabaqa	شباكا	Shabaka; Schabaka
Taharqa	طهرقا	Taharka
Psammetichus I	بسمتك الأول	Psammetichos I
Necho II	نكاو الثاني	
Psammetichus II	بسمتك الثاني	Psammetichos II
Apries	أبريس	
Amasis	أمازيس	Ahmose II أحمس الثاني
Psammetichus III	بسمتك الثالث	Psammetichos III
Cambyses	قمبيز	Kambyses
Darius I	دارا الأول	Darios I داريوس الأول
Xerxes I	إكسركسيس الأول	Xerxes the Great إكسركسيس العظيم
Amyrtaios	أمير تايوس	

Nectanebo I	نختنبو الأول	Nektanebo I نكتانبو الأول
Nectanebo II	نختنبو الثاني	Nektanebo II نكتانبو الثاني
Artaxerxes III	إكسركسيس الثالث	
Alexander III	إسكندر الثالث	Alexander the Great اسكندر الاكبر
Philip Arrhidaeus	فليب ارهيدايوس	Philip III;فيليب الثالث
Ptolemy I Soter I	بطليموس الاول - سوتر الأول	
Ptolemy II Philadelphus	بطليموس الثاني - فيلادلفوس	
Ptolemy III Eugertes I	بطليموس الثالث -يوارجيتس الأول	
Ptolemy IV Philopator	بطليموس الرابع - فيلوباتور	
Ptolemy V Epiphanes	بطليموس الخامس - إبيفانيس	
Ptolemy VI Philometer	بطليموس السادس - فيلوماتور	
Ptolemy VII Neos Philopator	بطليموس السابع - -نيوس فيلوباتور	
Ptolemy VIII Eugertes II	بطليموس الثامن - يوارجيتس الثاني	Physcon فيسكون
Ptolemy IX Soter II	بطليموس التاسع - سوتر الثاني	
Ptolemy X Alexander I	بطليموس العاشر- اسكندر الآول	
Ptolemy XI Alexander II	بطليموس الحادي عشر- اسكندر الثاني	
Ptolemy XII Neos Dionysus	بطليموس الثاني عشر - نيوس ديونوسوس	Auletes الزمار
Ptolemy XIII Theos Philopator I	بطليموس الثالث عشر	
Cleopatra VII	كليوباترا السابعه	Cleopatra كليوبترا
Augustus	اغسطس	
Tiberius	تبيريوس	
Gaius Caligula	جايوس -كاليجولا	
Claudius	كلوديوس	
Nero	نيرون	
Galba	جالبا	
Otho	اوتو	
Vespasian	فسبسيان	
Titus	تيتوس	
Domitian	دوميتيان	
Nerva	نرفا	
Trajan	تراجان	
Hadrian	هادريان	
Antoninus Pius	انطونينوس بيوس	
Marcus Arelius	ماركوس اوريليوس	
Lucius Verus	لوكيوس فيروس	
Commodus	كومودس	
Septimus Severus	سبتميوس سفيروس	
Caracalla	كراكلا	

Macrinus	ماكرينوس	
Antoninus	انطونيوس	Elegabalus; الجبالوس
Severus Alexander	سفيروس -إسكنر	
Maximinus the Thracian	مكسيمينوس - ثراكس	
Gordian III	جورديان الثالث	
Philip	فيليب	
Decius	داكيوس	
Trebonianus Gallus	تريبونيانوس جالوس	
Valerian	فاليريانوس	
Gallienus	جالينوس	
Claudius II	كلوديوس الثاني	
Aurelian	اوريليان	
Tacitus	تاكيتوس	
Probus	بروبوس	
Diocletian	دقلديانوس	

Chapter 6

The EAD's Contents, 4: Deities and Cross-References to Other Sites

6.1. List of Deities

Ancient Egypt had hundreds of deities, but most are rarely mentioned. The drop-down list includes thirty-one gods and goddesses whose names occur most often and who are frequently mentioned in architectural contexts. One may note evidence of other deities in the "Site Descriptions." All names are searchable.

Drop-Down List of Deities		
Deity Name	**Deity Alternative names/spellings**	**Arabic**
Amen	Amon; Amun	امون
Anubis		انوبيس
Amen-Re	Amon-Re; Amun-Re	امون رع
Apis		ابيس
Apophis		ابوفيس
Aten	Aton	اتون
Atum		اتوم
Bastet		باستت
Benu		بنو
Horus		حورس
Hathor		حتحور
Isis		ايزيس
Khepri		خبري
Khnum		خنوم
Khonsu		خنسو
Maat		ماعت
Min	من	مين
Montu		مونتو
Mut		موت
Neith		نيت
Nut		نوت
Osiris	اوزيريس	اوزوريس
Ptah		بتاح
Re		رع
Sekhmet		سخمت
Seth		ست
Serket		سركت
Sobek		سوبك
Sokar		سوكر
Taweret		تاورت
Thoth	جحوتي	تحوت

6.2. Cross-References to Other Sites

In some instances, it is useful to call attention to other sites that share features in common with the site one is studying: one might note sites that have similar architectural features, or are associated with the same deity or ruler, or use the same unusual building material or location or environment. Two examples: temples at Tawd, Armant, Madamud, and North Karnak were each dedicated to Montu and built to protectively surround the Amen complex at Karnak; Rameses III carved similar stelae at Al Babayn, Tihna, and Khazindariyah, all quarry sites for building stones used in temple construction.

Chapter 7

The EAD’s Contents, 5: Bibliography, Maps, Photographs

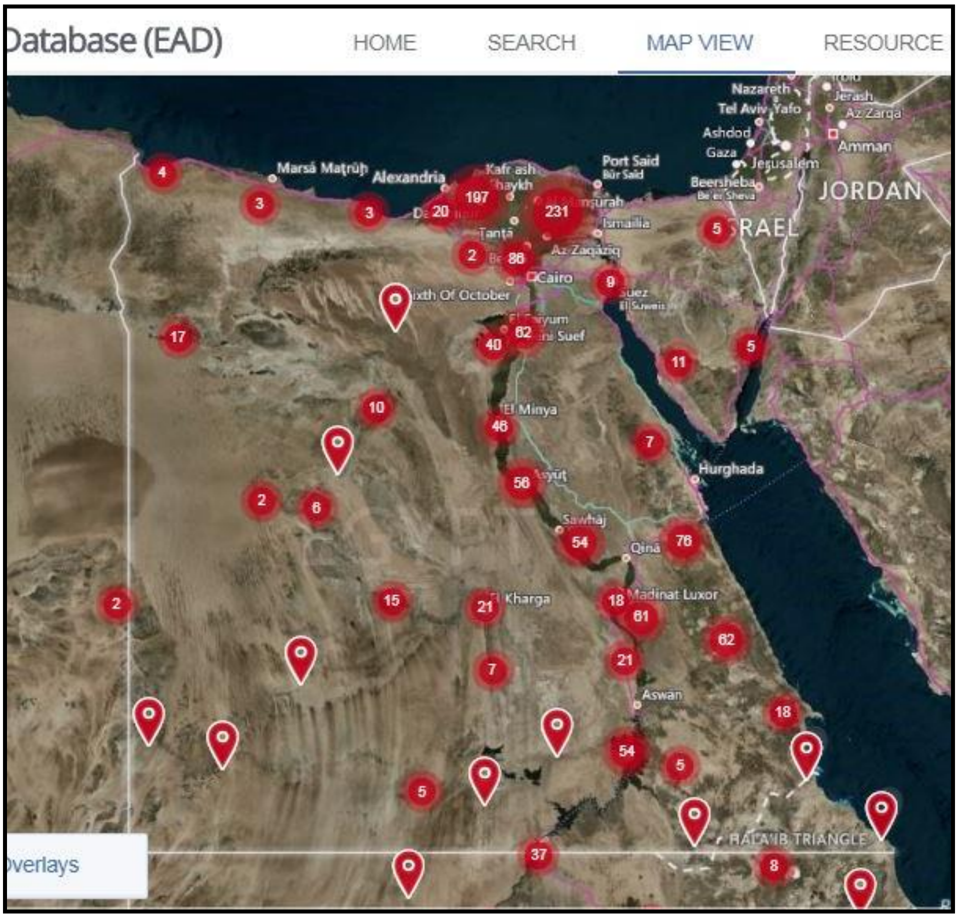
7.1. Bibliography and Links to Websites

All sites currently entered in the EAD have been published or mentioned at least once in journals or books. Every site in the EAD will therefore have at least one bibliographic reference. Some sites have been extensively published, and include many records of visits, excavations, and surveys. The bibliographical entries here document that work, but they are not comprehensive: they emphasize *in situ* architectural and archaeological remains, their excavation, description, study, and conservation. They do not include grammatical studies of inscriptions at the site, descriptions of scenes in wall relief, typologies of pottery, or catalogues of objects now in museum collections. (Although they do refer to architectural fragments such as pillars or sections of walls and ceilings that have been removed from a site and are now in museums.) Because it is meant to be useful to a broad audience, the bibliography includes general works likely to be found in non-specialist libraries as well as hard-to-find technical publications.

The Bibliography is not meant to replace the very useful *Online Egyptological Bibliography* (the *OEB*, www.oeb.griffith.ox.ac.uk, formerly the *Annual Egyptological Bibliography*), which is a comprehensive and regularly-updated listing of nearly all Egyptological publications (although a number of entries in the EAD do not appear there). Generally, the differences between the OED and the EAD bibliographies are: (1) the EAD’s is less comprehensive and does not provide abstracts of works or cite reviews; and (2) the EAD does not charge a users’ fee. An increasing number of archaeological projects now publish interim reports of their work on the Internet. Some, like the Oriental Institute of the University of Chicago, publish their works simultaneously in hard copy and online, and this is becoming an increasingly common practice. Wherever possible, we have included in the bibliographies the web addresses of online site reports. Eventually, we will provide links to them. The number of online resources is growing and the EAD will regularly update bibliographies and the lists of websites.

7.2. Plans, Maps, Drawings, Satellite Imagery, Historical and Contemporary Photographs.

Wherever possible, the EAD includes maps of archaeological sites and plans of their architectural remains, as well as photographs and early drawings showing their past and present condition. Proposed reconstructions of architectural features are sometimes also included. The purpose of this illustrative material is to complement site descriptions and help to identify the causes of damage. Aerial photographs, from aircraft or balloons, can be especially useful for tracking the encroachment of surrounding agricultural land and modern buildings before satellite imagery became available (the earliest aerial photos were taken about 1919). Additional terrestrial photography is a standard part of the Existing Condition Reports, outlined in §10.0. Satellite imagery is playing an increasingly important role in field reports as well as in determining the precise location of archaeological sites and their components (below). Arches uses the Bing Map Service to display satellite imagery, and the EAD also links to Google Maps. A brief survey of early maps of Egypt may be found in section 4.1.4.



Example of a Bing Satelite map showing some site locations in Arches.

Chapter 8

Examples of Sites

8.1. List of Sites in Arches

As of 1 March 2018, 1,600 sites were entered in the EAD. Their Primary Names are listed below. More are added regularly. An abbreviated example of one of these entries, for the site of Armant, excluding the ECR, follows the list. A preliminary version of the "Data Input Instructions" Manual is in §9.0.

All Sites (by Primary Name) in Arches March 2018		
Abar al-Kanayis	Abu Al Zarazir, Tall	Abu Hijalij
Abbad, Bir	Abu Al Zur, Kawm	Abu Hinnis, Dayr 1
Abbad, Wadi 1	Abu Alalik	Abu Hinnis, Dayr 2
Abbad, Wadi 2	Abu Ali	Abu Hireiz, Kawm
Abbadiya	Abu Al-Lif	Abu Hummus
Abbasiyah, Tall Al	Abu Anqa, Khawr	Abu Huna
Abbuda, Kawm	Abu Ashayir	Abu Husa, Tall
Abd al Qadir 1	Abu Atwani	Abu Hussain, Bir
Abd al Qadir 2	Abu Atya	Abu Iqaydi, Wadi
Abd Al Rahman Amir, Izbat	Abu Awali	Abu Ishaq, Dayr
Abd Allah Nirqi	Abu Awdah 1	Abu Jaridah
Abd, Kawm Al	Abu Awdah 2	Abu Jaridh, Wadi
Abdu Basha	Abu Aziz, Tall	Abu Jilbanah
Abdu, Kafr	Abu Ballas 1	Abu Jirab
Abirkateib	Abu Ballas 2	Abu Jirab, Madinat
Abisco	Abu Billu, Kawm	Abu Jirj
Abjij	Abu Dabbab, Bir	Abu Khalifa, Kawm
Abka	Abu Daraj, Dayr	Abu Khallaf, Kawm
Abnub	Abu Darbayn	Abu Kharof, Tall
Abqain, Kawm Al	Abu Daud, Tall	Abu Ku
Abraq, Bir	Abu Dawm	Abu Kuweib
Abtujah	Abu Dhiabah	Abu Lifah, Dayr
Abu Aggag, Wadi	Abu Fana, Dayr	Abu Mandur
Abu Aggur, Kawm	Abu Fawdah	Abu Manga, Kawm
Abu Akim, Tall	Abu Gaharish	Abu Maqrufah, Dayr
Abu Al Afrita Al Kabier, Tall	Abu Ghaliqah, Wadi	Abu Matta, Dayr
Abu Al Afrita Al Saghir, Tall	Abu Ghallib	Abu Midrik
Abu al Auwaf	Abu Ghusun	Abu Mina
Abu Al Felus,Tall	Abu Girfan	Abu Minqar
Abu Al Gheranieq	Abu Guduur	Abu Mitawi, Jazirat
Abu al Hid	Abu Had, Wadi	Abu Muawad
Abu Al Humer Al Kebir, Kawm	Abu Halbanah, Dayr	Abu Muraywah
Abu Al Ida, Kawm	Abu Hamad	Abu Musa, Dayr
Abu Al Khair, Tall	Abu Hasah al Bahri,Wadi	Abu Naama, Tall
Abu Al Nur	Abu Hasah, Jabal	Abu Noshra
Abu Al Qirdan	Abu Hasah, Tall	Abu Numrus
Abu Al Qirdan, Tall	Abu Hashim, Bir	Abu Oruq
Abu Al Rus, Tall Izbat	Abu Hawr	Abu Qaria
Abu Al Sobh, Tall	Abu Helal, Tall Kafr	Abu Qarqurah, Dayr

Abu Qir 1	Abyar	Alqam
Abu Qir 2	Abydos 1	Aluwe, Tall
Abu Qurayyah	Abydos 2	Alwani
Abu Qurayyah, Wadi 1	Abydos 3	Amada
Abu Qurayyah, Wadi 2	Adaimah	Amarah East
Abu Qurqas	Adda, Jabal	Amarah West
Abu Quway, Jabal	Adda, Kawm al	Amarinah, Al
Abu Rawwash 1	Adhra, Dayr al 1	Ambaud, Bir
Abu Rawwash 2	Adhra, Dayr al 2	Ambukul, Khawr
Abu Rihal, Bir	Adindan	Amd, Tall
Abu Safa, Bir	Adowel, Tall al	Amhaydah
Abu Sandur	Adwa Al	Amir Tadrus, Dayr al 1
Abu Sarabam, Dayr	Afiyah, Jubb	Amir Tadrus, Dayr al 2
Abu Sari	Ager	Amir Tadrus, Dayr al 3
Abu Sayf, Tall	Aghnamiya, Al	Ammar, Kafr
Abu Sayfayn, Dayr	Aghurmi	Amrah, Naj al
Abu Shaar	Ahad, Kawm al	Amur, Ayn
Abu Shafi, Tall	Ahaiwah, Al	Amur, Wadi
Abu Shahbah	Ahmar, Jabal al	Amya, Tall
Abu Shalbiya, Kawm	Ahmar, Kawm al 1	Anba Abshay, Dayr
Abu Shihat	Ahmar, Kawm al 2	Anba Antuniyus, Dayr
Abu Shisha, Tall	Ahmar, Kawm al 3	Anba Bakhum, Dayr 1
Abu Shuruf	Ahmar, Kawm al 4	Anba Bakhum, Dayr 2
Abu Siha	Ahmar, Kawm Izbat al	Anba Balamun, Dayr
Abu Simbel	Ahmar, Tall al 1	Anba Bidaba, Dayr
Abu Sir 1	Ahmar, Tall al 2	Anba Bisadah, Dayr
Abu Sir 1A	Ahmar, Tall al 3	Anba Bishoi, Dayr 1
Abu Sir 2	Ajuz, Al	Anba Bishoi, Dayr 2
Abu Sir Al Malaq	Ajuz, Qasr al	Anba Bula, Dayr
Abu Sir Bana	Akashah	Anba Hadra, Dayr
Abu Soliman, Tall	Akhdar, Kawm al 1	Anba Hur, Dayr al
Abu Suwayr	Akhdar, Kawm al 2	Anba Jeremiah, Dayr
Abu Tabari	Akhdar, Tall al	Anba Maqar, Dayr
Abu Tartur	Akhdar, Wadi al	Anba Phoibammon, Dayr
Abu Tij	Akher, Al	Anba Samwail Qalamun, Dayr
Abu Tisht	Akhmim 1	Anba Shinudah, Dayr
Abu Umran	Akhmim 2	Ansar, Al
Abu Umuri	Aksha	Aqabah, Khawr al
Abu Wasil, Wadi	Alam, Marsa	Aqama, Al
Abu Zabal	Alamayn, Al	Aqfahs
Abu Zawal, Wadi	Alaqmah, Al	Arab al Aliqat
Abu Zeid, Kawm	Alawi, Kawm	Arab al Atiyat
Aburah	Alawna, Naj al	Arab Al Sawalah
Abyad, Dayr al	Alayem, Al	Arab Al Sheykh Mubarak
Abyad, Tall	Aliakateb	Arab Hamada
Abyad, Tall	Allaqi, Wadi al	Arab Mutayr
Abyad, Wadi	Allam, Bayt	Arab, Kawm al

Arab, Naj al	Atrash, Wadi al	Banat, Qasr al 1
Arab, Tall al	Atud, Wadi	Banat, Qasr al 2
Arab, Wadi al	Atulla, Wadi	Banat, Qasr al 3
Arabah, Wadi al	Awaya, Tall al	Banat, Wadi al
Arabat, Al	Awlad Daud, Tall	Banawan, Al
Arabiah	Awlad Musa	Banawit, Al
Aradiyah, Jabal	Awlad, Kawm	Banha
Araki, Jabal al	Awsim, Kawm	Bani Amir
Aranib, Kawm, Al	Ayn, Tall al	Bani Hassan
Areg, Wahat	Ayyad, Kawm	Bani Hassan al Shuruq
Argin	Azab, Dayr Al	Bani Helal
Argo	Azizah, Kawm	Bani Khalid
Arish, Al	Aznin, Tall	Bani Mazar
Armant	Azraq, Jisr Al	Bani Suwayf
Arminna	Azzaziyah, Bir Al	Bani Ubayd
Ars, Wadi	Babylon	Banna, Al
Asas, Al	Badari, Al	Baqar, Kawm al
Asfun al Matainah	Badia	Baqliyah, Al
Ashkit	Badrashayn, Al	Baqur
Ashma, Kafr	Bagawat	Baraghid, Al
Ashmun	Bahaim, Tall al	Baramkin
Ashmun al Rumman	Bahan, Khawr	Baramus, Dayr al
Ashmunayn, Tall al 1	Bahbit al Hijarah	Baranis
Ashmunayn, Tall al 2	Bahlog, Wadi	Baris
Ashrin, Kawm	Bahnasah, Al	Barkal, Jabal
Ashrubah	Bahrayn, Al	Barnugi, Tall al
Ashry, Kafr al	Bahriyah, Al Wahat al	Barramiyah, Wadi al
Asil, Ayn	Bahsamun	Barriya, Tall al
Askut	Bakarasha, Tall	Barriya, Tall al
Aswad, Al Tall al 1	Bakhanis	Barriyat, Al
Aswad, Al Tall al 2	Bakht, Wadi	Barsha, Dayr al
Aswan 1	Bakrag, Kawm	Barshawi, Wadi al
Aswan 2	Bakriya, Wadi	Barsiq, Kawm
Aswan, Jazirat	Balabish	Barsiw, Kawm
Asyut 1	Balaim, Tall	Barud, Kawm
Asyut 2	Balamun, Tall al	Barud, Wadi
Asyuti, Wadi	Balansurah	Basaliyah Gharb Qibli
Ata Allah, Wadi	Balat	Basaliyah Sharq Qibli
Atal Al Shinawy	Balaydah	Bashandi, Izbat
Atala el Khadra, Kawm	Balayzah, Dayr al	Bashindi, Izbat
Ataminat al Jaafirah	Balbaah	Bashtil
Atawilah, Al	Bali, Wadi	Bastah,Tall al
Atbarah	Ballanah	Basunah
Atfih	Ballas, Dayr al	Bat Al Kawm, Tall
Athar al Nabi	Balsun, Tall	Batal, Tall al
Athar Al Saadiyyin	Baltim	Batn al Baqara
Atrash, Tall al	Banat, Dayr al	Batn al Hajar

Bawiti	Bus, Tall al	Daud, Khawr
Bay, Tall al	Busa, Al	Dawafer, Tall al
Bayda, Bir	Bush	Dawud, Bayt
Baydah, Kawm al	Buwayb, Alam al	Dayr al Hamra, Tall al 1
Bayzah, Wadi	Buweib, Tall al	Dayr al Hamra, Tall al 2
Behaira, Kawm	Buwit	Dayr, Al
Behbeit Al Hagar	Claudianus, Mons	Dayr, Kafr al
Belqas	Daba al Bahari, Kawm al	Dayr, Naj al
Berenice Panchrysos	Daba al Qibli, Kawm al	Dayr, Tall al
Betekon	Dababa, Kawm al	Dayrut
Biba	Dababaiyah, Al	Defshu, Kawm
Bijah, Jazair	Dab'ah, Al	Deibi, Kawm al
Bilaq	Dab'ah, Tall al	Dendekan, Wadi
Bilaqs	Dabarosa, Jazirat	Denjayah
Bilbays	Dabashiyeh, Ayn	Derr
Billa, Tall	Dabbah, Al	Desie Kanaiyes
Bilqa, Al	Dabenarti	Dhahab, Al
Bimbam	Dabia, Al	Dib, Ayn al
Bint abu Qurayyah	Dabud	Dib, Wadi
Bir al Ayn, Wadi	Dafanah, Kawm	Dibeira Gharb
Birbiyah, Ayn	Daghbaj, Bir	Dibeira Sharq
Biriyat, Al	Daghbaj, Wadi	Dibgu, Tall
Birkah, Tall al	Dahab, Kawm al 1	Dibi
Birkawi, Al	Dahab, Kawm al 2	Difra
Birma	Dahab, Kawm al 3	Difshu, Kawm
Bisay, Ayn	Dahabija	Dihibah
Bishara, Tall	Dahshur 1	Dihmit
Bishat Qaid	Dahshur 2	Dijlah, Wadi
Bisintawy, Tall	Dakhilah, Al Wahat al	Dik, Dayr al
Bisit	Dakhrour, Jabal al	Dilingat, Kawm
Bisrah, Dayr al	Dakkah, Al	Dimai
Bissah, Qarat	Dalalil, Wadi	Dimeis, Kawm
Biyahmu	Dalas	Dimeiyn, Al
Biza, Bir	Dallah, Ayn	Dimiqrat, Al
Borek, Ayn	Dalja	Dimri
Bugdumbush	Damalun, Tall al	Dineiqil
Buhah, Al	Damanhur	Dinshal, Kawm
Buhen	Damirah	Dirdir, Tall al
Bunduq, Kawm	Dandahur, Tall al	Dishashah
Burashiya, Tall al	Dandarah	Disheimi, Kawm
Burj	Dandur	Dishna
Burj, Al	Danjal	Disuq
Burj al Arab	Daqadus	Diwan, Al
Burj, Tall al	Daqahlah	Diwani
BurSaid	Dar Al Salam	Dodekaschoinos
Burulus, Al	Dara, Kawm al	Dongola Reach
Burunbul, Al	Darah, Wadi	Dorginarti

Dosha, Jabal	Fuwah	Habrah, Tall al
Dubur, Marsa	Gabaideb, Wadi	Habu, Birkat
Dumyat	Gadiyeh, Ayn	Habwah, Tall
Dundit, Tel	Galbat, Kawm	Haddadi, Kawm al
Dunqash Bir	Gamus, Al Tall al	Hadra, Ayn
Dunqash, Bir	Ganadi	Haeh, Kawm al
Dush, Qasr	Garad, Kawm al	Hagres, Tall
Ehteita, Tall	Garadat, Al	Hairiri
Elkab 1	Gassa, Tall	Hajar al Gharb
Elkab 2	Geb, Qasr al	Hajar Idfu
Epiphanius, Dayr	Gebeit Sharq	Hajar, Naj al
Etwal wa Yuksur, Kawm	Geif, Kawm	Hajarisah, Al
Ezza, Ayn al	Gendiya, Tall al	Hajir, Dayr al
Fadil el Zawahriya, Tall Izbat	Geradat	Hajj Qandil, Al
Fagere, Qalt al	Geriri, Jabal al	Hajj Zeidan, Naj al
Fagi, Tall	Ghadir, Wadi	Hajj, Al
Fakhuri, Dayr al	Gharraq al Sultani, Al	Hajj, Kawm al
Falusiyat, Al	Ghashashim, Qasr al	Hajja, Tall al
Faqus	Ghasuli, Kawm al	Halbouny, Tall al
Farafirah, Wahat al	Ghawet, Tall al	Halfa, Wadi
Farag, Kawm al	Ghayt Abu Mansur	Hamadah, Kawm
Farain, Kawm al	Ghazali	Hamam, Kawm al
Farama, Tall al	Ghazali, Tall	Hamama
Faranah, Tall al	Ghazza, Wadi	Hamamat, Kawm al
Faraon, Wadi	Gherier, Tall	Hammadi, Naj
Fararagi, Qarat al	Gheyta	Hammam, Dayr al
Faras	Ghozza	Hammam, Jabal al
Faras, Jazirat al	Ghueita, Qasr	Hammam, Naj al
Farasha, Tall al	Ghuraf, Kawm al	Hammam, Naj al 1
Farhin	Ghurayyib, Hawd al	Hammam, Naj al 2
Farkha, Tall al	Ghusun, Wadi	Hammamat, Bir
Farun, Tall	Ghuzz	Hammamat, Wadi al 1
Fashn, Al	Ghuzz, Kawm al	Hammamat, Wadi al 2
Fatirat al Beida, Wadi	Ghuzz, Tall al	Hammamiyah, Al 1
Fauziya, Tall	Gidami	Hammamiyah, Al 2
Faw al Qibli	Gill, Kawm al	Hamrah, Al
Fayran, Wadi	Gimeima, Tall	Hamrit, Kawm
Fayyum, Al 1	Ginidba, Tall	Hamsh
Fayyum, Al 2	Ginn, Tall al	Hamuli
Ferka	Gir, Kawm al	Hanadi, Naj al
Filah, Jazirat	Girgawi, Naj al	Hanana, Tall
Filus, Kawm al	Giridli, Tall al	Hanash, Kawm al
Firawn, Jazirat	Giza, Kawm al	Hanjaliyah, Wadi
Fir'awn, Tall	Gomaa, Kafr	Hara, Tall al
Firayn, Kawm	Gumah, Tall	Haraja, Al
Fons Tadnos	Gumaiyima, Tall	Harbit
Foqaa, Tall	Habash, Tall al	Haridi, Jabal

Harmin, Dayr	Hur	Jamai
Harrah, Al	Hurbeit	Janila
Hasaya al Gharbiya, Naj al	Hussayn, Jurf	Jarawi, Wadi 1
Hashiem, Kawm	Hussayn, Wadi	Jarawi, Wadi 2
Hashim al-Asiri, Naj	Huwariyah	Jarmashin, Ayn
Hassan Daoud, Tall	Hypselis	Jarnus, Dayr al
Hassan Daud, Kafr	Iayyan, Bir	Jasus, Wadi
Hassan, Kawm 1	Ibn Salem, Kawm	Jayli
Hassan, Kawm 2	Ibrahim Awad, Tall	Jazareen, Ayn al
Hassanin, Tall	Ibrim, Qasr	Jazirah, Naj al
Hatiyat Ris	Ibsai	Jidami, Wadi al
Hatnub	Ibshan	Jilfa
Haunebu	Ibshaway	Jill, Al
Hawa, Dayr al	Idfu	Jimal, Wadi al
Hawamdiyah	Idku	Jinn, Tall al
Hawashim	Idris, Kawm al	Jira
Hawawish, Al	Ihnasiyat al Madinah	Jirja
Hawd, Wadi al	Ihteita, Tall	Jirzah
Hawf, Jabal	Ijli, Wadi	Jizah, Al
Hawl, Wadi al	Ikhmindi	Julab, Jabal al
Hawsh al Ghanaym	Ikinji Maryut	23 July Al Marj
Hawsh, Al	Ineizi, Kawm al	Junnah, Jabal
Hawshat al Ruzayqat	Iqaydi	Jurf, Wadi 1
Hawwarat al Maqta Haram	Iqlul	Jurf, Wadi 2
Haytah, Al	Isawiya, Kiman al	Juwaysis, Marsa
Hayz, Al	Isfaht, Kawm	Kab al Abiad
Hefnah	Ishqaw, Kawm	Kab Amiri
Heiba, Izbat	Ishu, Kawm	Kabashi, Qasr al
Herr, Tall al	Iskandariyah, Al	Kadadah
Heymur	Ismailia, Al	Kadero
Hibah, Al 1	Ismant al Kharab	Kadruka
Hibah, Al 2	Isna	Kajuj, Naj al
Hibis	Istabl Antar	Kalabishah
Higalig	Itjtawy	Kalalat, Wadi
Hilayla, Tall al	Itlidem	Kalalba Area
Hillah, Al	Izam, Dayr al	Kanais, Al
Hishmat, Tall	Izzah, Ayn al	Kanais, Tall al
Hisinat, Al	Jabal, Kawm al	Kanisah, Al
Hisn, Kawm al	Jabalaw, Al	Karaibitar
Hissat, Jazirat al	Jabalayn, Al	Karanog
Hitan Rayan	Jabbanah, Al	Karara
Hiw	Jabrawi, Dayr, al	Karaym, Bir
Hubayah, Ayn	Jadarah, Kawm, al	Karmah Al Nuzul
Hudayn, Wadi	Jadida, Ayn	Karnak, Al
Hudi, Wadi al	Jadidah, Qasr	Kashir, Wadi
Hufra	Jahdam	Kawa
Hulwan	Jallaw, Ayn	Kawamil, Al

Kawdy, Tall	Korgus	Malak Ghubrail, Dayr al
Kawm Sauwan, Tall	Kortas, Kawm	Malak Mikha'il, Dayr al 1
Kayaser, Tall al	Kubri, Al	Malak Mikha'il, Dayr al 2
Kebir, Tall al	Kulb	Malak, Dayr al
Keijal, Al	Kulliyat	Mallawi
Kellis	Kulubnarti	Mamariyah, Naj al
Kenisa	Kulyayt, Jabal	Manawar
Khabbatah	Kumma	Manfalut
Khaleesh, Kawm	Kura, Al	Manih al Hayr
Khallaf, Bayt	Kurkur, Wahat al	Manqabad
Khalwah, Kawm al	Kurru	Mansurah
Khamsini, Kawm al	Kurti	Manzilah, Al Buhayrat al
Khanziri, Kawm al	Kurusku, Wadi	Mar Buqtur, Dayr
Kharaba, Kawm al	Kusaybah, Bir	Mar Jirjis al-Hadidi, Dayr
Kharabah al Kabir, Kawm al	Kushtamnah	Maraghah, Al
Kharabat, Ihrit	Kwei	Marakah, Tall
Kharafish, Wadi	Labeka, Qasr	Maraqiyah, Al
Kharbta	Lahmi, Wadi	Marea
Kharif, Kawm al	Lahun, Al	Marimdah Bani Salamah
Kharijah, Al Wahat al	Laqeita	Maris, Tall al
Kharit, Wadi al	Lessiya, Al	Marra, Tall al
Khartum	Lisht, Al	Maryut 1
Khashm al Menih	Lykabettus	Maryut 2
Khasna, Tall al	Maabidah, Hawd al 1	Mashaikh, Naj al
Khatana	Maabidah, Hawd al 2	Mashalah, Tall al
Khatimi, Kawm al	Maaddiyah, Al	Maskkutah, Tall al
Khattara, Al	Maadi, Al	Masra
Khawalid, Kawm al 1	Maallah, Al	Mastabat Firawn
Khawalid, Kawm al 2	Maasara	Masuda, Qasr
Khelwa Senhawa, Khawr	Madamud, Naj al	Matariyah, Al 1
Khilqan, Kawm	Madinat al Ghurab, Kawm	Matariyah, Al 2
Khirba, Kawm al	Madinat al Fayyum	Matiur, Tall
Khirba, Tall al	Madinat Al Nuhas , Kawm	Matmar, Al
Khubbaza, Kawm al	Madinat Madi, Kawm	Matruh, Marsa
Khunfis, Kawm al	Madinat Watifah	Mawta, Jabal al
Khuzam	Maghaghah	Maydum
Kibrit, Mahattat al	Magharah, Wadi	Maymun, Dayr al
Kidweh al Banat	Maghrabiya	Mayyah, Jabal
Kifriya, Al	Mahallah al Kubra, Al	Mayyanah
Kilabat, Naj al	Mahamid al Qibli, Hawd al	Mazen, Kawm
Kilabiyah, Wadi al	Mahamid, Al	Mazghunah
Kilh, Al	Mahar, Kawm al	Mazin, Kawm
Faris, Kiman	Mahasinah, Al	Meinarti
Kirdasah	Maher, Kawm	Meris
Komit	Makboura, Tall	Meroe
Konosso	Makhadma	Migysbah, Qasr al
Kor	Maks	Milij

Minih, Bir	Nabi, Wadi	Nukhayl, Bir al
Minshat Abu Umar	Nabta Playa	Nukhayl, Wadi al
Minshat al Gharbi, Hawd a	Nadarah, Qarat al	Nukhaylah, Wadi
Minshat al Sudr	Nadurah, Al	Nuqrus, Wadi
Minshat Damalu	Nafiryam, Wadi	Nuri
Minshat Ezzat	Nagadiyeh	Nus al Kebir, Kawm al
Minya, Al	Nagi, Kawm	Nus al Saghir, Kawm al
Mir	Nagla , Kawm	Nuwaybi
Mir, Kawm	Naguib	Nuwaymisah, Al Wahat
Mirdas, Tall	Naj, al Jabal	Onib
Mirgissa	Nakari, Marsa	Ophiates, Mons
Misk, Kawm al	Nakheila, Tall	Papremis
Misr al Jadidah	Nakheila, Wahat al	Porphyrites, Mons
Mit Ruhaynah	Nakhlah, Kawm	Qabrit, Tall
Mit Yaish	Nakhlah, Wadi	Qadah, Kawm al
Miyah, Wadi	Naqa	Qadi, Kawm al
Moeris	Naqadah	Qadis, Ayn al
Mohamed Ahmed, Kafr	Naqlun, Dayr al	Qaha
Mohmed Abu Hassan, Tilal	Nasb, Wadi	Qalah
Mubarak, Marsa	Nashwein, Kawm al	Qalyub Al Balad
Muftah, Tall	Nasr, Kawm al	Qamadir, Al
Muftaylah, Ayn al	Nassar, Izbat	Qamh, Kawm
Muhameriah	Natrun, Wadi al	Qamula, Hawd
Muhammad Tulayb , Ayn	Natura, Wadi	Qanatir, Kawm al
Muharraqah	Naucratis	Qantarah, Al
Muissat	Nauri	Qantarah, Kawm al
Mukhayniq, Bab al	Nawahid, al	Qantir
Munajat, Al	Nawam, Kawm al	Qaraqarah, Tall al
Munayyar, Al	Nazlah al Mustajadah, Al	Qarat al-Farargi
Muqdam, Tall al	Nazlat Abu Ginan	Qarat Qasr Salim
Murrah, Tall al	Nazlat al Batran	Qarat Umm al-Sughayyar, Al
Murshid Gharb	Nazlat al Surafa	Qarawi, Tall
Musa, Ayn	Nazlat Awlad Al Shaykh	Qarfunah
Musaid	Nazlat Biblaw	Qarnien, Kawm al
Musawwarat al Safra	Nazlat Sultan Pasha	Qarra, Naj al
Mushabbi, Wadi	Nazlet Khatir	Qarun, Birkat
Mushu	Nefrusi	Qarun, Qasr
Mustay, Tall	Nefwa, Al	Qarya bil Diweir, Al
Mut el Kharab	Negeim	Qarya, Al
Muttin, Dayr al	Nemra, Tall	Qaryat Nawai
Mutubis, Tall	Nibeira	Qasaba, Qasr al
Muwayh, Wadi	Nigili, Kawm al	Qashsh, Wadi Al
Muwaylihah, Bir	Niqeiza, Kawm	Qasr, Al 1
Muzawwaqa, Al	Nisf, Kawm al	Qasr, Al 2
Naba, Wadi	Nisg, Jaziret al	Qasr, Al 3
Nabasha, Tall	Nosraniya, Tall al	Qasr, Al 4
Nabi Salah	Nugus, Kawm al	Qasrawat

Qassiba, Kawm al	Quwaysina	Sabagura
Qata, Al	Radisiyah, Al	Sabak Al Dahak
Qattar	Radwan, Kawm	Sabakha, Tall al
Qaw al Kebir	Raghib, Tall	Sabakhiya, Tall al
Qaw Hawd	Raheiya, Wadi	Sab'at Jibal, Dayr al
Qaw Kharabah	Rahib	Sabiya, Kawm al
Qawatir, Al	Rahmaniya	Safajah
Qays, Al	Raiya, Tall	Saff, Al
Qedwa, Tall	Rakotis	Safih, Izbat al
Qeid Al Gahsh	Ramlah, Jabal	Safsaf, Bi'r
Qerri	Raqaqinah bi al Shawahin	Saft al Gharbiyah
Qiddis Bulus, Dayr al	Rasas, Kawm al	Saft al Hanna
Qiddis Mar Jirgis, Dayr al	Rashid	Saft jidam
Qiddisah Katrina, Dayr al	Rawd al Kanais	Saghah, Qasr al 1
Qift	Rawd al Liqah	Saghah, Qasr al 2
Qila al Dabaah	Rawdah, Jazirat	Sahaba, Tall al
Qina	Rawdat, Wadi al	Sahil al Baqliyah, Al
Qinan, Tall al	Rayayna, Al	Sahra, Bi'r al
Qinas, Kawm	Rayyan Wadi al	Said, Qasr al
Qirqafa, Tall	Rekawyeh	Saieda, Kawm
Qirtasi, Khawr	Renih, Wadi	Saieda, Tall al
Qitah 8, Al	Reseiris, Izbat	Sakha
Qitah 9, 10, 11, Al	Rifah, Dayr	Salah, Bir
Qitna, Wadi	Rimaly, Al	Salamant
Qubaniyyah, Wadi al	Riqa, Al	Salamuni, Al 1
Qubbah	Riqqah	Salamuni, Al 2
Qubban	Ritabi, Kawm al	Salaset Ghabat, Kawm al
Qubur	Riyad, Tall al	Salatna, Al
Qudayrat, Wadi al	Rizaiah, Izbat	Salih Refat, Izbat
Queisna	Rizimat, Tall al	Salimah, Wahat
Quleia, Kawm	Rizq, Kawm	Sallum, Al
Qulzum	Rub, Tall al	Salmiyah, Hawd al
Quraga, Tall	Ruba, Tall al	Samad, Tall
Qurayshat, Ayn al	Ruba'ijin, Al	Samalut
Qurayyah	Rubiyat, Bahr	Samannud
Qus	Ruhban, Tall al	Samarah, Tall al
Qusayr al Amarina 1	Rum, Bilad al	Sami, Tall
Qusayr al Amarina 2	Rumadinya, Kawm al	Samnah, Bir
Qusayr Al Qadim	Ruq Salim	Samnah, Wadi 1
Qusayr Muharib	Rusas, Jabal	Samnah, Wadi 2
Qusayr, Dayr al 1	Rushdi, Izbat	Samuel, Dayr al Anba
Qusayr, Dayr al 2	Ru'us, Jabal al	Samuni, Tall
Qusiyah, Al	Sa al Hajar	Samut, Bir
Qusqam	Saadiya, Kawm al	San al Hajar
Qustul	Saalik, Wadi	Sanam Abu Dawm
Qusur al Banat	Saba, Kawm al 1	Sandala
Quta, Madinat	Saba, Kawm al 2	Sandanhor

Sangar, Tall	Shammamah, Abar al	Sherif Khalaf, Tall
Sanhur	Shams el Din	Shibeika, Naj al
Sanhur, Tall	Shams, Jabal al	Shikryai
Sanjaha, Jazirat	Shanhur	Shimuli, Kawm al
Sannur, Wadi	Shanobkwan	Shohada, Izbat al
Sanyura, Tall al	Shanshaf	Shuhada, Dayr al
Saqi, Wadi	Shaqadud	Shuqafiyah, Kawm al
Saqyah, Kawm	Shaqafiah, Tall al	Shurafa
Sarabit al Khadim, Jabal	Sharan, Kawm	Shurafa, Naj al Hayy
Sarahij, Kawm al	Sharannis	Shurafa, Wadi al
Sarari, Tall	Sharawinah, Wadi al	Shutab
Saras	Sharifah, Tilal al	Shuwan, Tall al
Sarawah	Sharunah	Sibaiya
Sarif, Kawm	Shatt Al Rijal, Wadi 1	Sibayna
Saririyah, Wadi al	Shatt Al Rijal, Wadi 2	Sibrit, Wadi
Sarjah, Wadi	Shatta, Tall	Sibu, Wadi al
Sarra	Shawni, Marsa	Sidi Abd Al Raziq, Kawm
Sauwan, Kawm al	Shaykh Hassan	Sidi Ahmed Al Tawil
Sawadah	Shaykh Abd Al Raziq, Al	Sidi Musa
Sawaitah, Wadi al	Shaykh Atiyah, Al	Sidi Selim
Sawamiah, Al	Shaykh Fadl, Al 1	Sidi Uqba
Sawba	Shaykh Fadl, Al 2	Sidi Yussef
Say, Jazirat	Shaykh Faraj, Hamrayat al	Sidi Zaid
Saylah	Shaykh Haridi, Jabal al	Sidmant, Jabal al
Sayyalah	Shaykh Ibadah, Al	Sihiel, Kawm
Sebah, Kawm 1	Shaykh Ibrahim, Kawm al	Sile
Sebah, Kawm 2	Shaykh Ismail, Tall al	Silsilah, Jabal al
Sedeinga	Shaykh Marzuq, Ayn	Sinbillawayn, Al
Sefa	Shaykh Mubadir, Naj al	Sineita, Jazirat
Sefier, Tall al	Shaykh Mubarak, Al	Sinki
Semna	Shaykh Nasr, Al	Sinnuris
Semsem, Tall	Shaykh Said Ahmed, Kawm al	Sintiris
Sersenna	Shaykh Said, Izbat al	Siqdit, Bir
Sesibi	Shaykh Said, Jabal al	Sirbakis, Bir
Shablanga	Shaykh Said, Tall al	Sitra
Shablul	Shaykh Soliman, Tall al	Siwah, Wahat
Shagamba	Shaykh Suliman, Jabal al	Siwi, Ayn
Shagra, Tall	Shaykh Timay, Jazirat al	Smaragdus, Mons
Shahabya, Al	Shaykh Zoaydah, Al	Sobek al Dahak
Shaheinab	Shaykh Zubaydah	Sokar
Shahidi, Al	Shaykh, Ayn al	Soleb
Shalawi, Kawm	Shaykh, Kafr al	Sonki
Shaliqan	Shaykh, Muftah al	Souq Al Gamaya, Tall
Shalshalamun	Shaykh, Wadi al	Sudmayn, Wadi
Shalul	Shayma, Naj al	Sudr, Wadi
Shalul, Bir al	Shelfak	Sufaytah
Shamkhiya	Shellal	Suhaj

Suhayl, Jazirat	Tibni, Kawm al	Umm Ashsh
Sukayt, Wadi	Tihna al Jabal 1	Umm Atala, Tall
Sukhna, Ayn	Tihna al Jabal 2	Umm Awad, Wadi
Sukkary	Tima	Umm Balad
Sukkary, Wadi	Timay, Tall	Umm Balad, Wadi
Suleiman, Kafr	Tin, Kawm al	Umm Dabadib
Sultan Al Akhder, Tall	Tinjar, Jabal	Umm Dabadib, Ayn
Sultan Hassan, Jazirat al	Tinnis, Kawm	Umm Dalfa, Wadi
Sumaria, Qasr al	Tondi	Umm Diqal, Wadi
Sumut, Bir	Tubgi, Al	Umm Eleiga
Sunbat, Dayr	Tubul, Kawm al	Umm Esh al Zarqa
Sunufar	Tukh al Malaq	Umm Fahm
Surah, Wadi	Tukh al Qaramus	Umm Fit Fit
Suryani, Dayr al	Tukh Dalakah	Umm Gafar, Kawm
Suwa	Tumas wa 'afiyah	Umm Garaiyat
Suwayqat, Wadi	Tumaylat, Wadi	Umm Hadd
Suways, Al	Tumbos	Umm Harb, Tall
Tafa	Tunat al Jabal	Umm Hugub
Tahta	Tunaydah	Umm Huwaytat Bahri
Talat al Farraj	Tunip	Umm Huwaytat Qibli
Tal'at al Zarga	Tura 1	Umm Kabu
Talatah, Bayt	Tura 2	Umm Kharija, Wadi
Talet Gadalla, Wadi	Tura al Asmant	Umm Khunan
Tall, Izbat al	Turujah, Kawm	Umm Khuyut
Tallah	Tushkah	Umm Nabardi
Tamlikh, Tall	Uar	Umm Naqqat, Jabal
Tammuh	Udayd, Wadi	Umm Rashid, Wadi
Tanan	Ukma	Umm Rus
Tanbul, Tall	Ulayjah, Al	Umm Salam, Wadi
Tangur	Umari, Al	Umm Salatit
Taramisah	Umbu, Kawm	Umm Salim
Tarfawi	Umm Agram, Jazirat	Umm Samra
Tarfawi, Bir	Umm Agram, Tall	Umm Sawwan
Tarfaya, Kawm	Umm al Arbein, Jazirat	Umm Sidrio
Tasa, Dayr	Umm al Athl, Kawm	Umm Sulaymat
Tawd	Umm al Braygat, Tall	Umm Tawat
Tawila, Al Jaziret al	Umm al Fawakhir, Bir	Umm Ubaydah
Tayr, Jabal al 1	Umm al Hagar, Tall	Umm Ushra
Tayr, Jabal al 2	Umm Huyut	Umm Ushsh, Wadi
Tayr, Jabal al 3	Umm Al Khadra	Unaybah
Tayyibah, Al	Umm al Laban, Kawm	Ungat
Temai Al Amdid	Umm al Lahm, Tall 1	Unibu, Kawm
Terfayah	Umm al Lahm, Tall 2	Uqsur, Al
Thalath	Umm Al Rakham	Urban Jazirat Abu Imran
Thufiya, Tall	Umm Al Zaiyat, Tall	Urf, Wadi al
Tibilla, Tall	Umm Arbaain, Jazirat	Uronarti
Tibn, Kawm al	Umm Ashira	Uthmaniyah, Khawr al

Wali, Bayt al	Zaaf, Ayn	Zawiyat al Aryan
Wanninah al Gharbiyah	Zaazi, Tall	Zawiyat al Mayyitun
Waq, Tall al	Zabahiy	Zawiyat Al Rozien
Ward Miriyam, Wadi	Zabarah, Jabal	Zawiyat Barmasha
Wardan	Zabu, Al	Zawiyat Dahshur
Wasif, Bir	Zalat, Kawm al	Zawiyat Razin
Wasitah, Al	Zaqaziq, Al	Zawya, Kawm al
Wastaniyah, Ayn al	Zarabi, Al	Zayt, Jabal
Widan al Faras	Zarqa, Al	Zaytun, Ayn al
Wisa, Naj	Zarqa, Kawm al	Zayyan, Qasr
Wist, Kawm al	Zawaidah al Gharbi, Hawd al	Zebedya, Kawm al
Yahud, Tall al	Zawiyah	Zifta
Yahudiyah, Tall al	Zawiyah, Ayn al	Zila, Kawm al
Yaser Amur, Izbat	Zawiyah, Tall	Zinein, Tall
Yusuf, Bahr	Zawiyat Abu Musallam	Zirnikh
		Zuwelen, Tall

8.2. Arches Sample Report: Armant

2/4/2018 ead

Armant Archaeological Site

Archaeological Site Description

Archaeological Site Summary: Names

Armant (Primary)
ارمنت (Arabic)
Ermant (French)
Hermonthis (Greek)
Erment (Other)
Έρεσβυθος (Greek)
Hermunthus (Latin)
Iwnw-Montw (Egyptian)
Iwnw-Šma (Egyptian)
Eresbythos (Greek)
Ermont (Coptic)
Έρμωντ (Coptic)
ΈρμωνΘις (Greek)
Pr-Montw (Egyptian)

Archaeological Resource Types

Archaeological Site

Deities Associated with Site

Montu

Armant, Google Earth, 1984.

Armant, Google Earth, 2016.

Site Descriptions

1 History

Lying about 20 km south of Thebes on the West Bank of the Nile, across the river from the site of Tawd, Armant has been occupied continuously since predynastic times. It was called *iwnj-šm'j*, the southern Heliopolis, in Ramesside times; *jwnw mnṯw*, the Heliopolitan Montu, in Late Dynastic. The Roman name, Hermonthis, comes from the Greek, Ἑρμωνθις, as does the Coptic EpMoNt.

Armant is the site of one of four contemporaneous temples in the Theban area dedicated to the god Montu; the others are Tawd, Madamud, and Karnak.

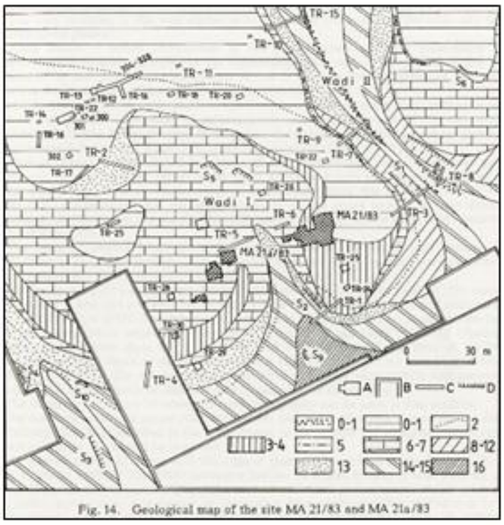
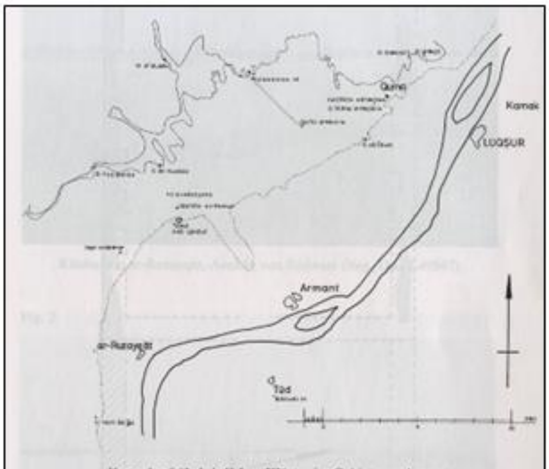


Fig. 14. Geological map of the site MA 21/83 and MA 21a/83

Predynastic Settlement near Armant. Boleslaw Ginter and Janusz K. Kozlowski Heidleberger Orientverlag



Karte der frühchristlichen Klöster im Gebiet von Armant

Journal of Coptic Studies, Louvain Peeters Press, Vol. 9, 2007.

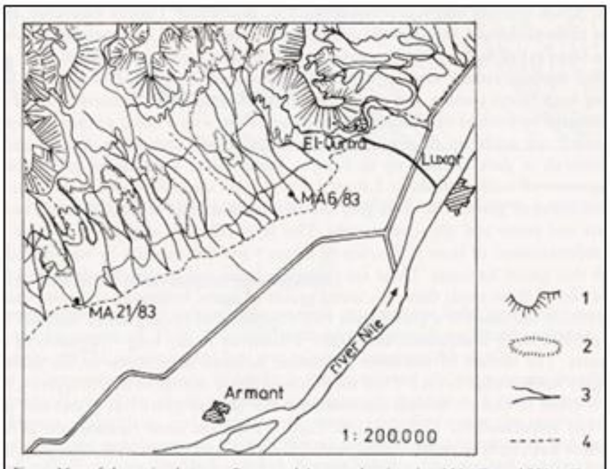


Fig. 1. Map of the region between Qurna and Armant showing sites MA6/83 and MA 21/83.

Map of the region between Qurna and Armant. B. Ginter, J.K. Kozlowski, M. Pawlikowski, MDAIK, vol 43, 1987.

2 Archaeological Content

Mond and Myers devoted several seasons to excavating the Neolithic cemeteries in the low desert west of the Montu temple, and their publication is still one of the most comprehensive for any Egyptian Neolithic site. The two major cemeteries were labeled Areas 1400 and 1500. They contained about 200 graves dating from Naqada Ic to IIIa2 and covered about 29,000 meters^2. Burials here were single, and flexed, laid parallel to the Nile, the pits sometimes lined with linen, matting or wood. There was little indication of social stratification. To the east lay Area 1300, with both dynastic and predynastic tombs, and Area 1200, with tombs dating to Naqada IIIb. Earlier graves were found in Area 1000, which also revealed a damaged settlement (site MA21/83)(that was excavated by the Polish mission in 1984.

Remains of Early Dynastic, Old Kingdom, and First Intermediate period materials lie beneath the foundations of the so-called Great Temple of Montu, but the earliest architectural evidence dates from dynasties 11-13. Extensive additions were made in the New Kingdom most of the by Thutmosis III, Rameses II and Merenptah. The Middle/New Kingdom temple was dismantled and replaced in the Late Period and early Ptolemaic Period. The New Kingdom pylon remained, however, and a *mammisi* was built by Cleopatra VII, a gateway by Antonius Pius, and the whole area enclosed by a wall in Roman times. Much of this was destroyed in modern times when stone blocks were removed for use in the construction of a nearby sugar factory. In addition to the predynastic cemetery, settlement, and Great Temple of dynastic and later times, Armant boasts the Graeco-Roman Bucheum (the burial place of Buchis bulls, which are associated with Montu), the Baqaria (28 tombs of female Buchis cattle), settlements, baths, cemeteries, and several Coptic churches and monasteries.

Ermant I Les Cryptes du temple ptolemaique Christophe Thiers IFAO

Armant: View of Armant. Oxford Encyclopedia of Ancient Egypt, D. Redford (ed.), Vol 1.

Egyptian Archaeology (The Bulletin of The Egypt Exploration Society). https://halshs. archives-ouvertes.fr/halshs-01002538/doc

Egyptian Archaeology (The Bulletin of The Egypt Exploration Society). https://halshs. archives-ouvertes.fr/halshs-01002538/doc

Site Descriptions (cont.)

3 Exploration and Excavation

The site was first excavated by Mond and Myers in the 1930s and 1940s, working in the Neolithic cemeteries, the Bucheum and in the area with the main temple of Montu. A Polish Mission worked at the site in 1984, and the SCA dug intermittently in the 1980s and 1990s. The IFAO and University of Montpellier have been excavating and conducting epigraphic and restoration work since 2002.

Site Descriptions - Arabic

تاريخ الموقع

تقع ارمنت بحوالي 20 كم جنوب مدينة طيبة القديمة بالبر الغربي, وغرب النيل من معبد طود, سُكنت مدينة أرمنت بشكل مُستمر منذ عصر ماقبل الاسُرات. وقد كانت تسمي iwnj-sm'j عين شمس الجنوبية (أونو) في عصر الرعامسة, jwnw mntw, في عصر الأُسُرات المتأخرة. الاسم الروماني, هرمنتيس, مأخوذ من الاسم اليوناني, كذالك الاسم القبطي, Ermont, معبد أرمنت هو واحد من أربع معابد المعاصرة في منطقة طيبه كُرست لعبادة ألاله مونتو. وتقع الثلاث معابد الاخري في قرية الطود, المدامود والكرنك.

المحتوي الاثري

خصص Mond and Myers عدة مواسم في اكتشافات جبانة العصر الحجري في الصحراء المنخفضة غرب معبد مونتو, وتظل منشوراتهم الاكثر شمولا في جميع المواقع الاثرية من العصر الحجري. الجبانتين الرئيستين سميتا 1400 و 1500. وتحتويان على 200 قبر تقريباً ترجع من عصر نقادة

Egyptian Archaeology (The Bulletin of The Egypt Exploration Society).
https://halshs. archives-ouvertes.fr/halshs-01002538/doc

Egyptian Archaeology (The Bulletin of The Egypt Exploration Society).
https://halshs. archives-ouvertes.fr/halshs-01002538/doc

Site Descriptions – Arabic (CONT)

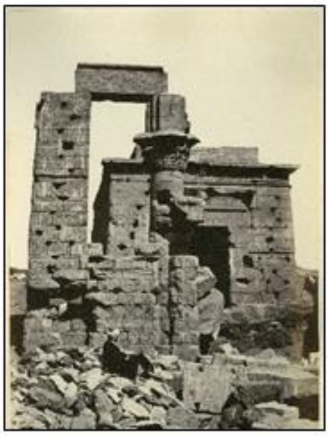
Ic الي نقادة IIIa2 , وتغطي 29,000 م². كان الدفن هنا بشكل فردي مُنحني وموازي لنهر النيل, كما حُدد الحفر في بعض الاحيان باستخدام الكتان, الحصيرة والخشب. وجدت هناك بعض الدلائل القليلة علي ان المقابر لأفراد من الطبقات المجتمع المختلفة. علي جانب المنطقة الشرقية 1300 , و مقابر من عصر ما قبل الاسُرات وعصر الاسُرات, كذالك المنطقة 1200 تحتوي علي مقابر ترجع الي عصر نقادة IIIb . كما عُثر علي مقابر أقدم في المنطقة 1000 , التي كشفت بعد ذالك عن مستوطنة مهدمة (الموقعMA21/83) الذي تم التنقيب به بواسطة البعثة البولندية عام 1984 .

عُثر علي بقايا من عصر الاسُرات المبكر, الدولة القديمة, و العصر الانتقالي الاول تحت اساسات المعبد المسمي بمعبد مونتو العظيم, لكن الادلة المعمارية المبكرة ترجع الي عصر كل من الاسرات 11_13 . وقد حدثت أضافات واسعة في الدولة الحديثة, أغلبها من قبل تحتمس III , رعمسيس II , و مرنبتاح. معابد الدولة الوسطة والحديثة أُزيلت وتم أعادة بنائها في العصر المتأخر والعصر البطلمي المبكر. ومع ذالك بقي صرح الدولة الحديثة, والماميسي(بيت الولادة) بُني بواسطة كليوبترا السابعة كما بُني المدخل علي يد أنطونيوس بيوس, و المنطقة بأكملها محاطة بجدار من العصر الروماني. معظم هذه المباني قد تهدمت في العصر الحديث أستُخدمت أحجارها في بناء مصنع السكر المجاور.

الاستكشاف والحفريات

أول من نقب في هذا الموقع كان Mond and Myers عام 1930 و 1940 , وقد بدأوا بجبانات العصر الحجري, البوخيوم (مكان دفن 33 عجل بوخيس التي ترتبط بالاله مونتو), وبالمنطقة مع معبد مونتو الرائيسي. كما عملت بعثة بولندية في نفس الموقع عام 1984 , ونقبت ايضاً وزارة الدولة لشؤن الاثار بشكل متقطع في الثمنينات والتسعينات. بدء IFAO (المعهد الفرنسي) وجامعة مونبلييه بعملية الترميم والتنقيب منذ عام 2002 .

Armant Image Sat GE



Ermant I Les Cryptes du temple ptolemaique, Christophe Thiers, IFAO

Location Information

Location Coordinates

25° 37' 20.9" N, 32° 0' 38.4" E (25.62247, 32.544)

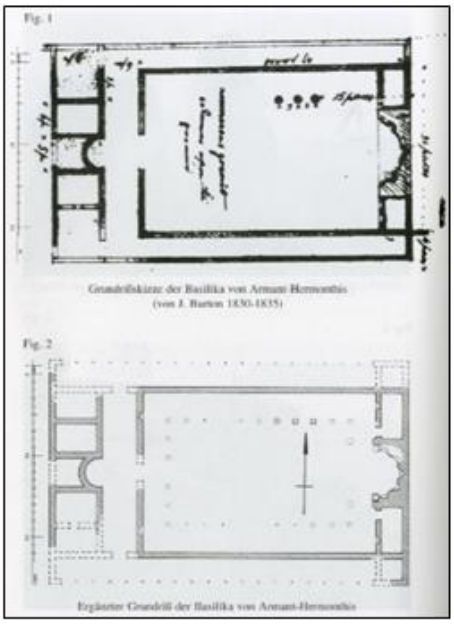
click to view in Google Maps (http://maps.google.com/maps?z-7&t-k&q-loc:25.62247+32.544)

Grid References

NG36-10 JOG Reference

325.5N/769.9E (32/72) SOE Reference

Ermant I: Les Cryptes du temple ptolemaique. Christophe Thiers, IFAO

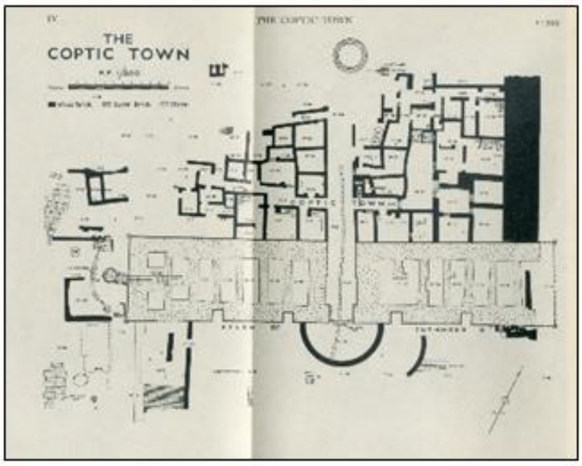


Basilica of Armant. Journal of Coptic Studies, Louvain Peeters Press, Vol. 9, 2007

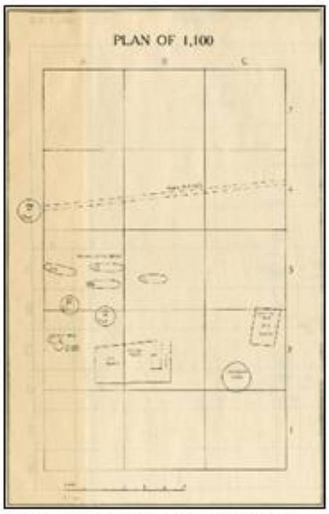
Classification/Components

Classification

Type	Settlement	Cultural Period	Neolithic/Chalcolithic, Early Dynastic Period, Old Kingdom First Intermediate Period, Middle Kingdom
Type	Temple	Cultural Period	New Kingdom, Ptolemaic
Type	Cemetery	Cultural Period	Neolithic/Chalcolithic, Early Dynastic Period, Late Period, Ptolemaic
Type	Church	Cultural Period	Byzantine Period/Coptic



Coptic Town. Journal of Coptic Studies, Vol 9, Louvain Peeters Press, 2007



Cemeteries of Armant 1. Mond and Myers, 1937

Related Resources

Related Archaeological Sites

Al Karnak

Tawd

Naj al Madamud

Related Documents

Armant Bibliography

Armant Illustrative Material

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Chapter 9

EAD Arches Site Data Input Manual

By Lucy Fletcher-Jones

9.0. Introduction

This EAD Users Manual includes instructions for Entering Archaeological Site and Complex Data into Arches

9.1. Sources

The data for an archaeological site or complex will be taken from two sources:

a. Excel spreadsheet (there is one for each letter of the alphabet). The spreadsheet data is organized to match the order of Arches input, as below.

b. A folder containing Word documents of the site descriptions and the bibliography, a PDF document of the bibliography, and image files. There is a folder for each site or complex.

The Resource Manager is used to input all archaeological site data.

9.1.1 Archaeological Site

For an archaeological site, from the Resource Manager drop-down menu, select 'Archaeological Site'. The resource Summary Input form will be displayed.

9.1.2. Archaeological Complex

For an Archaeological Complex, from the Resource Manager drop-down menu, select 'Archaeological Complex'. The same Summary input form will be displayed.

9.1.3. Resource Summary Form (Data in Spreadsheet)

This form functions in the same way as most of the Arches input forms. When inputting data, always select 'Add' to add each piece of data. For some data fields there can only be one value, for others (e.g. names) there can be many values. Select 'Add' after each one and check it has been entered correctly underneath. It can be edited or removed if incorrect. To edit, select it and change it in the box and add again. To remove, select the red delete symbol, 'x' in the red circle.

When this form is complete, select 'save edits' to update the database. The form is returned so further editing may be done, if necessary. From the spreadsheet input the following data in this form. Some data fields are mandatory (M) and some optional (O).

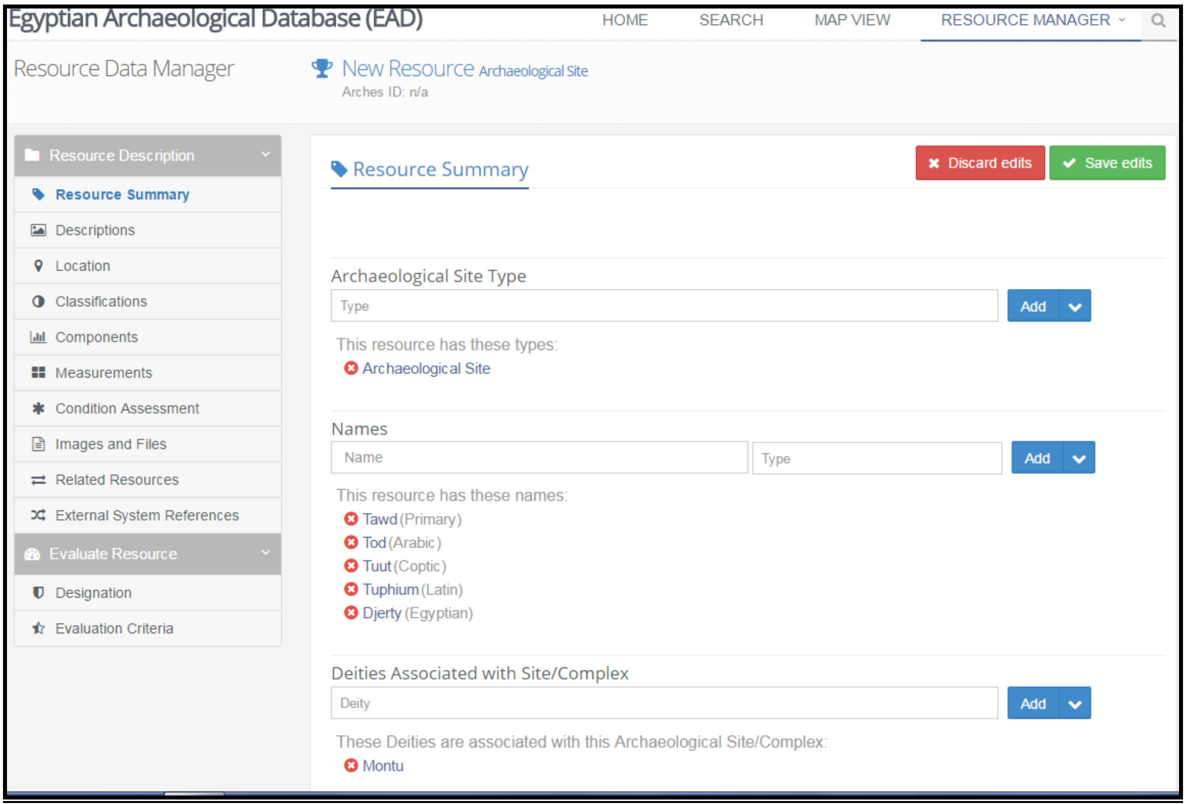
a. Archaeological Site Type (M). This is a general site type. Select 'Archaeological Site' for a site but 'Archaeological Complex' for a complex.

b. Names: Input the primary name, and select the type as 'primary'. The 'Primary name' is mandatory. This is the name shown on the map and in the searches. Select add. The primary name does not need to be entered first. If you forget to input a primary name, the site will be called 'unnamed resource'. It is best to use copy/paste from the spreadsheet to eliminate typographical errors.

c. Enter any variant names with their appropriate language as 'Type'. 'Type' is optional for these names. It is preferable to use copy/paste for these names to ensure that the diacritics and spellings are correct.

d. Deities associated with the site/complex (O): Select any deities associated with the site.

e. Select 'save edits' to save the data and then select the Resource Descriptions Form.



Resource Summary Form: Inputting new Archaeological Site

9.1.4. Resource Descriptions Form (Word File in Site Folder)

This is where the site description is entered into Arches. There will be two descriptions in Word documents for each site – one in English and one in Arabic. Before inputting the descriptions ensure that the font used is Cambria 12. If not, use Word to change to this font and size.

The English description is entered into the first box, the Arabic into the second box. The following instructions apply to both.

Some descriptions are very short and will be titled ‘General Description’, others are longer and are divided into up to 3 sections: ‘1. History’, ‘2. Archaeological Content’ and ‘3. Exploration and Excavation’.

a. Resource Descriptions Type: Box 1 (M): select ‘1. History’ or ‘General Description’.

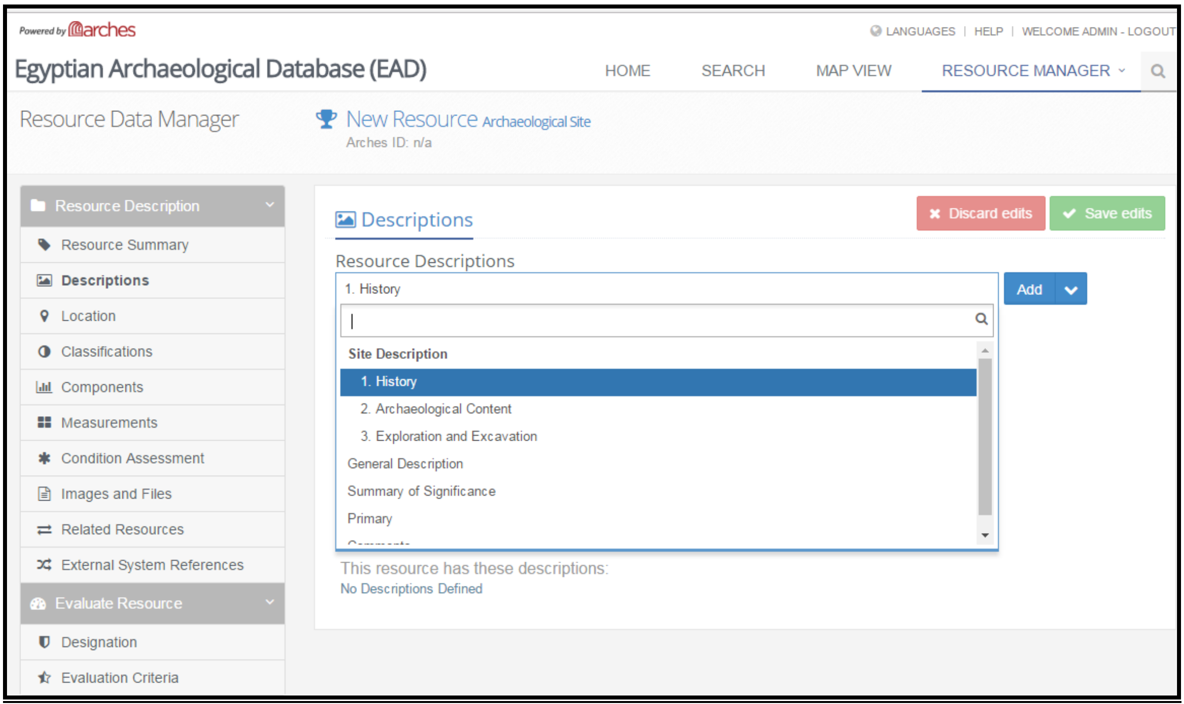
b. Text Box (M): Copy and paste in the ‘History’ section or the whole description of the site description from the appropriate Word file in the folder. Select ‘Add’. The description will appear below.

c. If available, select ‘Archaeological Content’ as the description type and copy that section as above. Select ‘Add’.

d. If available, do the same for the ‘Exploration and Excavation’ section, selecting that heading as the type. Select ‘Add’.

e. Check the formatting and make any corrections.

f. Save the form and then select the Location Form.



9.1.5. Location Form

All data is on the spreadsheet. Use this form to enable the site/complex to be viewed on the map and to provide other location information.

a. For a site, enter the latitude and longitude site coordinates. Select ‘Add Geometry’ and ‘Enter latitude/longitude’ boxes. Input the latitude and longitude in degrees decimal to 5 decimal places. The text will show red until you enter 5 decimal places, so add zeroes if there are less than 5. It is preferable to use copy/paste for entering this data too. The coordinates will be displayed in degrees, minutes and seconds as a check that the input is correct. Check it and select ‘Add to Map’. The point location will be shown on the map. The geometry type ‘center point’ will be automatically input.

b. If the coordinates are incorrect, the location can be deleted by clicking the ‘x’ by ‘point’.

c. If the given coordinates are inaccurate, a more precise location may be recorded by simply dragging the marker (green circle) on the map into the center of the site. See example, below, of the center of the pyramid of Maydum.

d. For a Complex, draw a rough polygon around the area, by using the ‘draw new polygon’ option.

e. Location Grid Reference: Grid reference and type: Input the JOG Ref value and select ‘JOG Ref’ for type. Mandatory. If there is an SOE ref or other reference, enter with the appropriate type.

f. Location Description: (O). Enter if available.

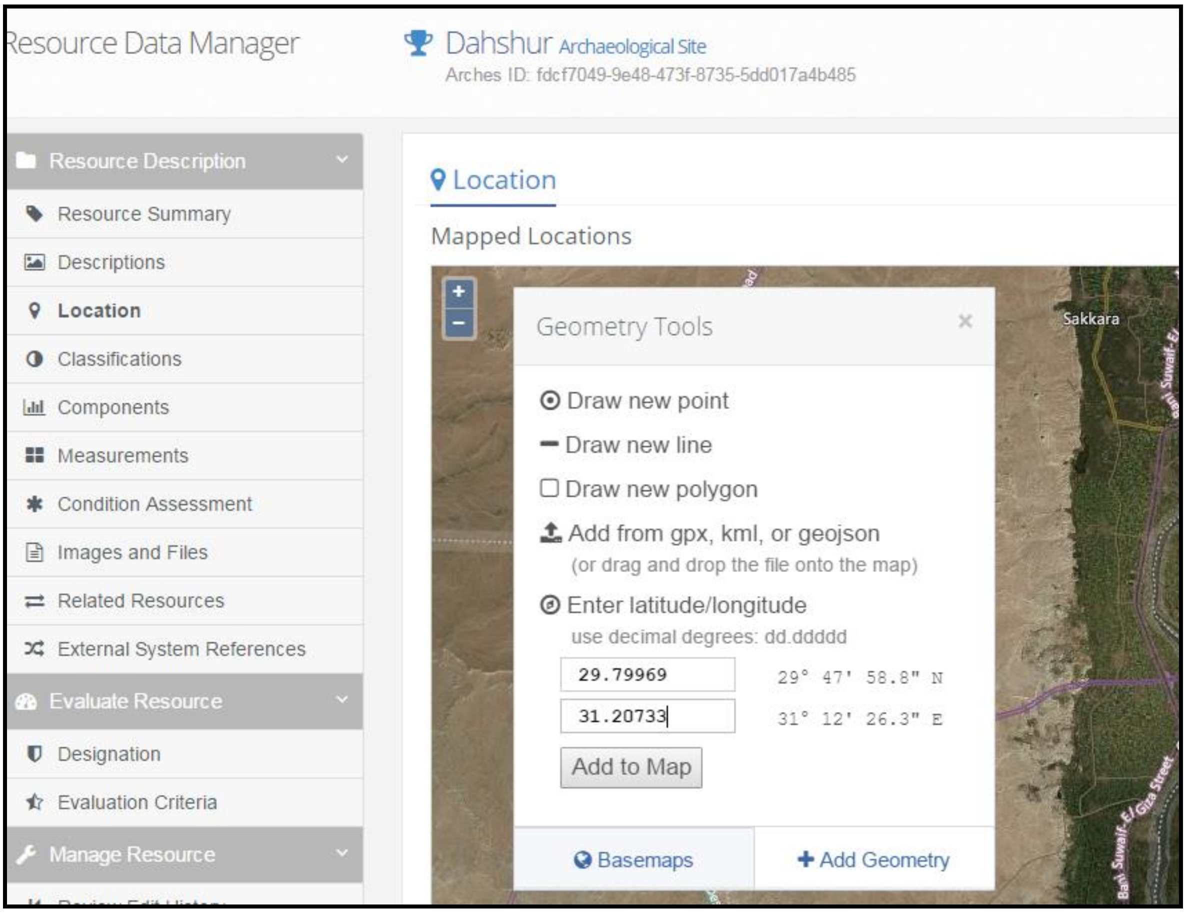
g. Environmental Settings: (O). Select if available.

h. Administrative Areas: (O) Ignore if data is not available.

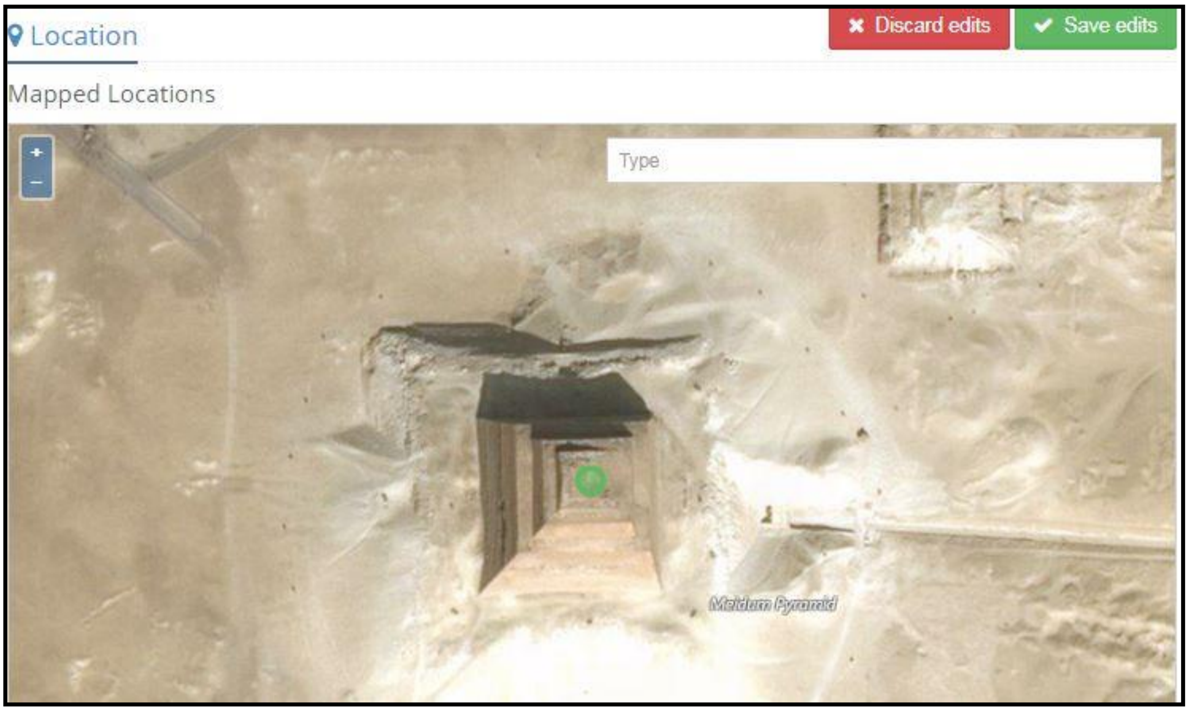
1. Type: Select Governorate
2. Governorate: select the governorate name from the drop-down list.

i. Cadastral references: ignore.

j. Select ‘Save edits’ and then select the Classifications form.



Location Form: Above: Input of Coordinates ; Below: site location precision to center of the pyramid



9.1.6. Classifications Form (Data from Spreadsheet)

Use this form for classifying each chronological phase of a site by type of site and by cultural period and more precisely by dynasty and ruler, if the information is available on the spreadsheet.

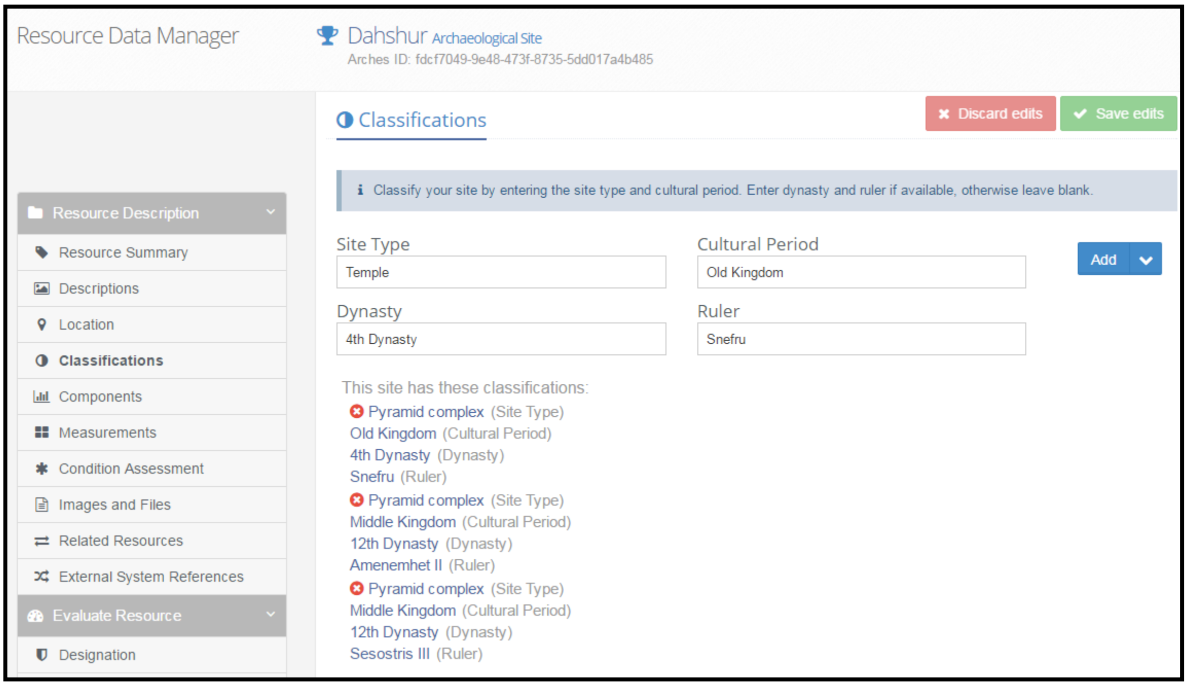
a. For each phase/type: input the following set of data:

I. Site Type (M): select site/complex type from drop-down list.
II. Cultural period (M): select cultural period from the drop-down list.
III. Dynasty (O) if available, select from the drop-down list. Otherwise leave blank.
IV. Ruler (O) if available, select from the drop-down list. Otherwise leave blank.

b. Select 'Add'. The information will be displayed under the input boxes. It can be edited by clicking on the data or it can be deleted by selecting the red delete symbol.

c. If an error message is displayed upon adding the data because a box has been filled in incorrectly or left blank, select 'discard forms', under the arrow by the 'Add' button and start again.

d. Select 'Save edits' to add the data to the Arches database, then select the ''Images and Files Upload Form'.



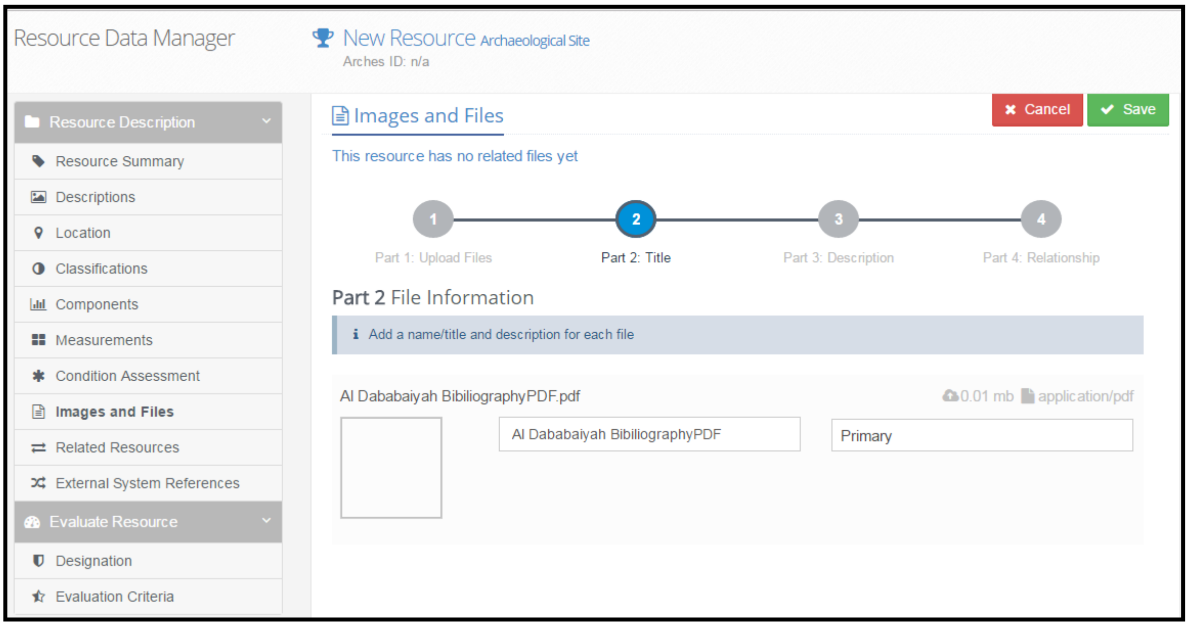
9.1.7. Images and Files Input Form (Site Folder)

This form is to be used for Sites only, not Complexes.
Use this form to upload the bibliography 'doc' and 'PDF' files and any photographs, plans and other images we have for the site. Each image or document may be uploaded individually or together.

Select 'Add' to add a file(s) to Arches

a. Part 1: Click and select the file(s) to upload from the matching folder. (Do not use drag and drop to access images as this does not work well.)

b. Part 2: Title and Title Type: the name of the document e.g. 'Al Dababaiyah Bibliography' will be shown in the box, select type as 'primary'. This name will be seen on search lists.

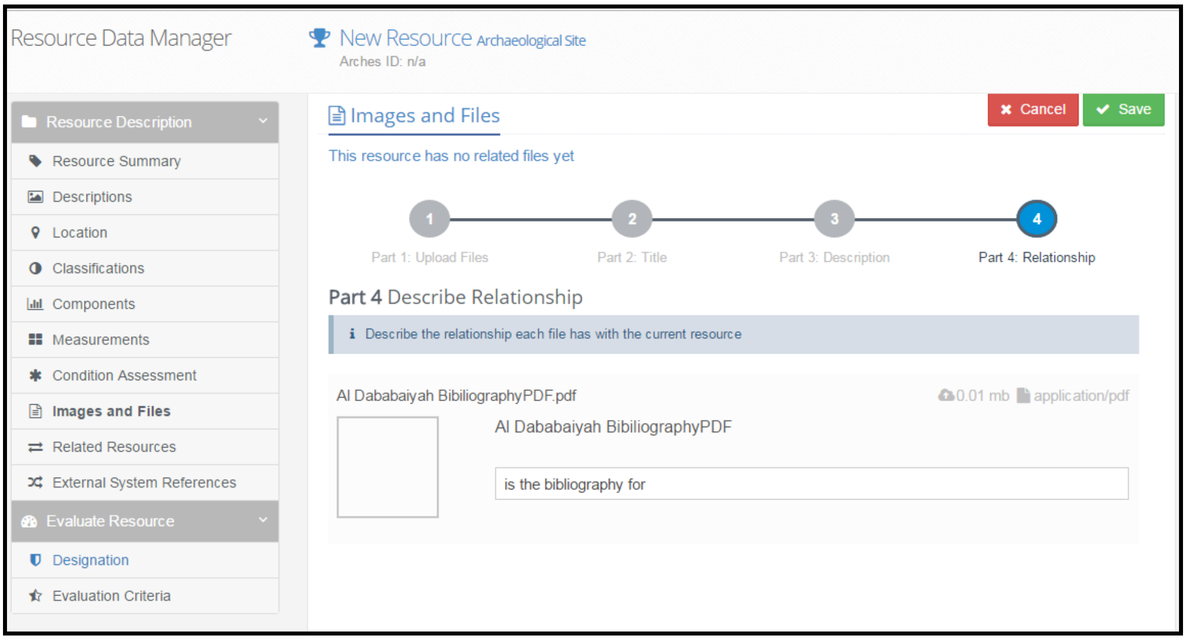


Images and Files Input Form (cont.)

c. Part 3: Type and Description: select 'Primary' as type and add a short description which will be the same as the title for bibliography. If it is an image, however, Arches will provide a synopsis of the photo or plan e.g. "Historical photograph of Tawd taken in 1871." This description will also be seen on search lists.

d. Part 4: Describe the relationship between the site and the file: This will also appear on reports. If the file is a bibliography, then select 'is the bibliography for'. If it is an image, select 'is the image for' or 'is the plan for' as appropriate.

e. Finally click 'Save' to upload the files(s) to Arches.



Further information such as the format type and accreditation in the case of photographs, should be input for each bibliography or image using the 'Bibliography/Images/OtherDocs menu option under Resource Manager. See Section 10: What is it in this document?

9.1.8. Related Resources Input Form (Data from Spreadsheet)

This is used to show connections between similar archaeological sites or to show sites that are part of one archaeological complex, e.g. the Siwa Oasis. This Oasis will be input as an 'Archaeological Complex' and all the sites in the oasis will be input as individual archaeological sites. It is only possible to relate to a site that has already been input.

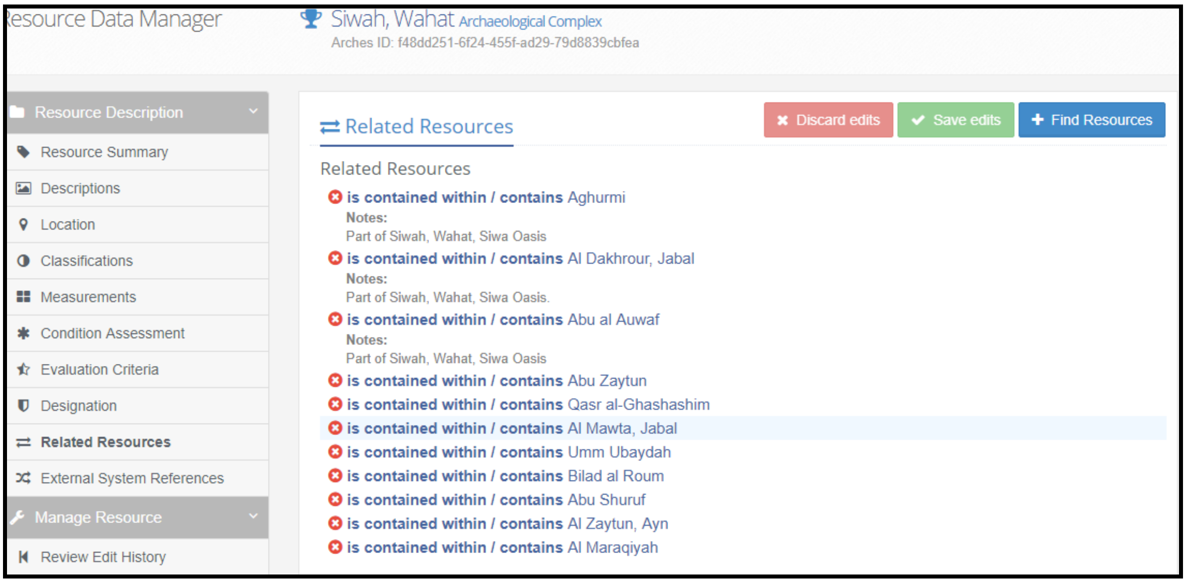
a. Find resources: Select this to bring up a list of archaeological sites and other resources.

b. To find the sites in the 'Related Sites' column of the spreadsheet, select 'Attribute filter', which displays a search box. Input the name of the related site in this search box to display it.

c. Select 'Add Relationship'. Select the appropriate relationship depending on the site: 'is related to' for a similar site, 'is contained in' for a site that is part of a larger complex.

d. Input any further information on the relationship in the free text box. Select 'Add' and on the next screen. Select 'save edits' to save the relationship. It is still possible to delete the relationships.

e. It is possible to also use the map filter to facilitate search but we have already identified the name of the site to relate to so this will not usually be used. The map filter brings up the map from which you can further select areas of Egypt to find the site you wish.



This form can also be used to 'relate' or link the site to its bibliography and images, but EAD will usually use Part 4 of the Images and file upload input form to perform this function.

9.1.9. External References Input Form (Spreadsheet Data)

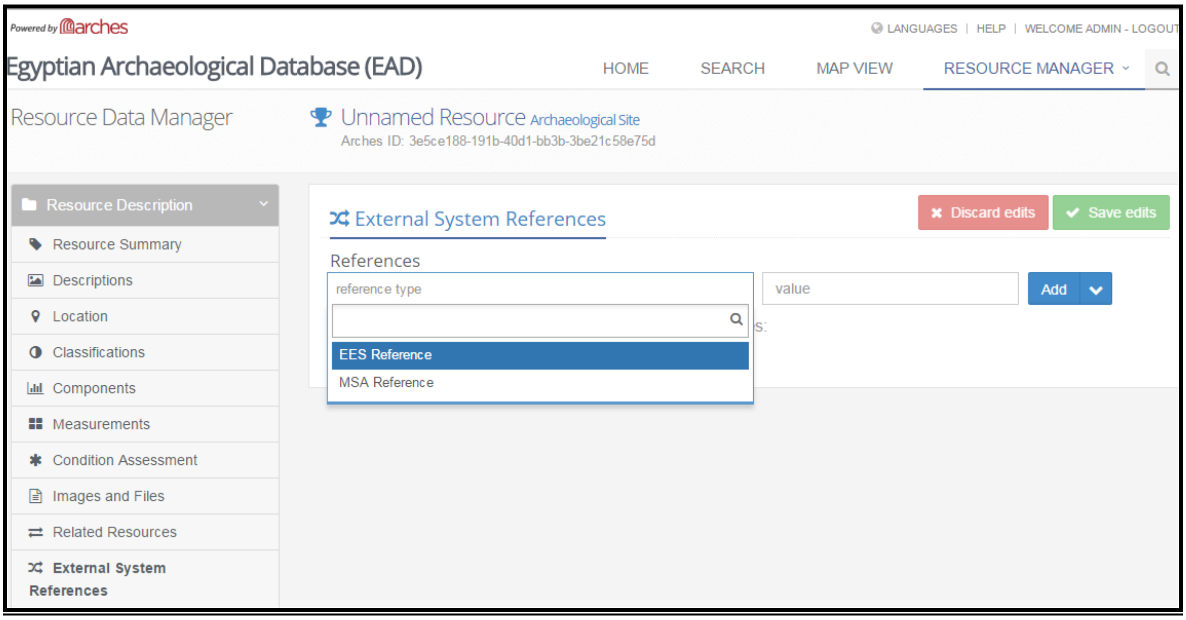
Use this form to input the Ministry of Antiquities (MoA) reference number (also shown on some spreadsheets as the SCA ref no or the MSA ref no), the Egyptian Exploration Society (EES) reference number and any reference numbers used by other organizations for the archaeological site.

a. Reference Type: Select the appropriate reference type, such as 'MSA reference' from the drop-down menu.

b. Value: Input the matching reference number from the spreadsheet.

c. Select 'Add' and check the values that appear below the boxes. Edit if necessary.

d. Input any further references in the same way.



9.1.10. Bibliography/Images/Other Docs

In order to add credit information, search for the image or document e.g. “TawdImage_modern3” and select it for editing:

a. The title and type will already be loaded in the boxes

b. Select the format e.g. JPEG or GIF for images and PDF or DOCX for documents. Select ‘Add’.

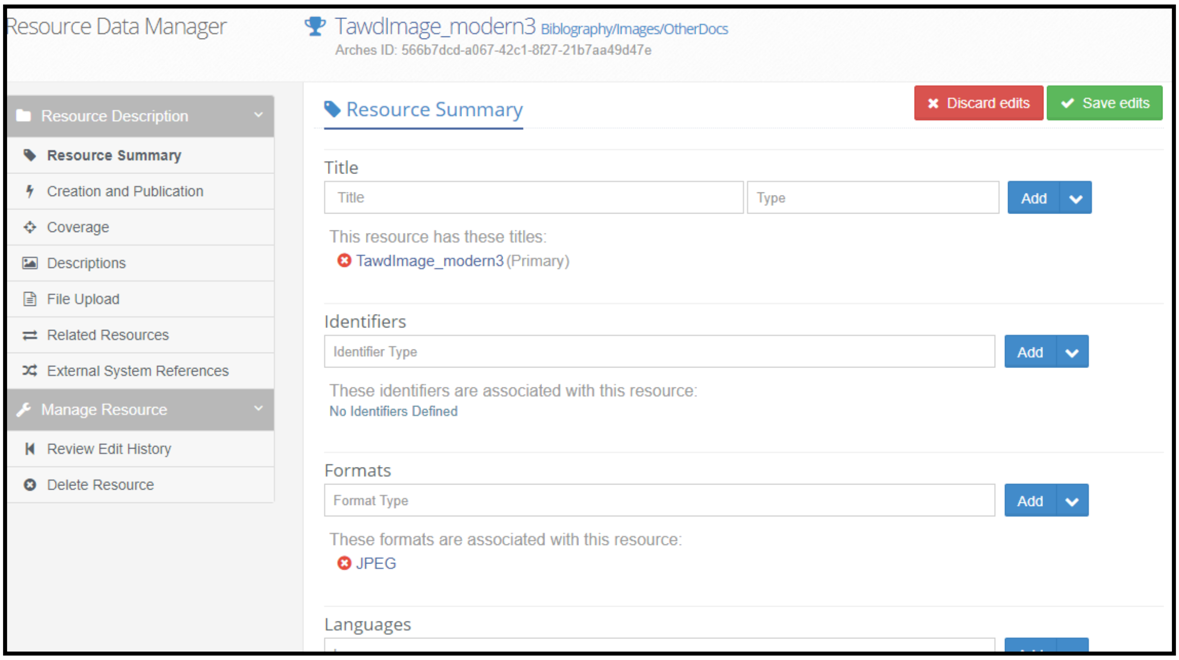
c. If this document is written in a language other than English, select the language and ‘Add’.

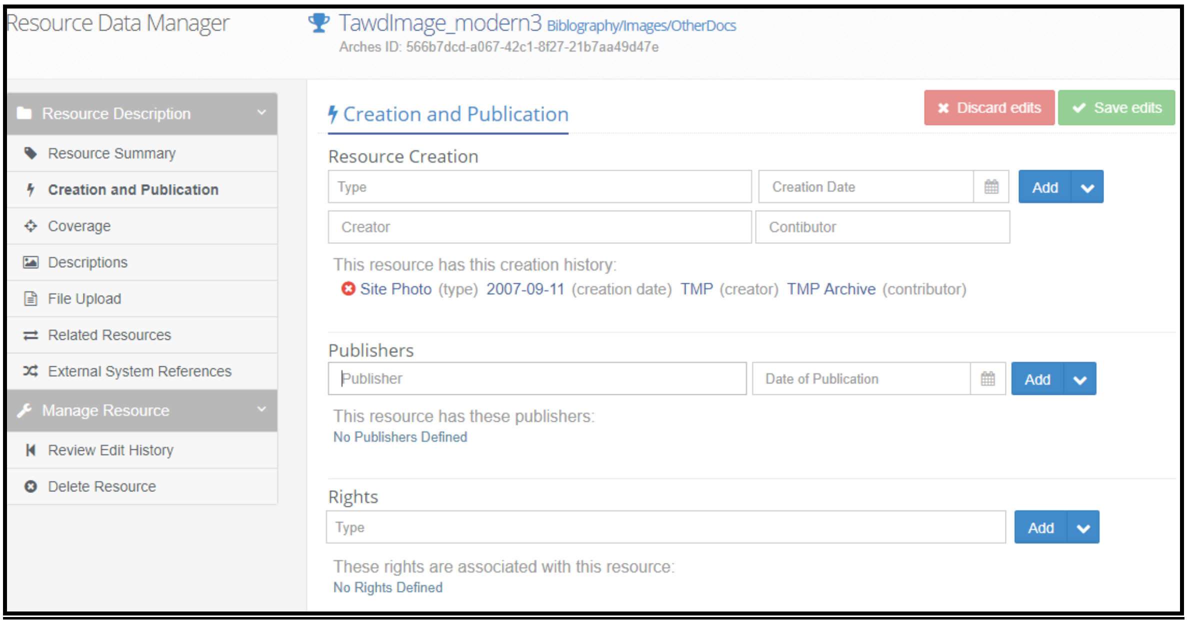
d. Select ‘Save Edits’ and select the ‘Creation and Publication’ option.

e. Select Type (Site Photo/Plan for image or Bibliography for the bibliography). This is all that is needed for bibliographies.

f. For images and other documents:

- Add a creation date if known in format YYYY-MM-DD.
- Input the Creator name, if known – this will be the author and title of the publication from which the images were copied. If the image originated from the TMP Archive, ‘TMP’ and ‘TMP Archive’ should be input here.
- Select ‘Save Edits’.





Input form for image or document such as bibliography: Creation and Publication details

Chapter 10

Existing Condition Reports.

10.0. Introduction

What has been discussed above constitutes Stage One of the EAD's development. It is basically an historical overview of each archaeological site and a survey of how it came to be what it is today. Stage One lays the foundation for Stage Two, which will include detailed Existing Condition Reports, compiled by personnel specially trained to evaluate on-site conditions. It will describe the site's physical state, identify current and potential threats, and recommend ways to ensure its future security. The training of MSA personnel to conduct these inspections has been discussed with the MSA and details of the program will be presented in the 2018-2019 report of EAD work (subject to funding).

The following outline lists the information the Existing Condition Reports will include. Categories marked with an asterisk (*) are discussed in the *Conservation Guide* (§10.2). They will be based upon on-site inspection. Categories marked with a double asterisk (**) require data that must be supplied by the Ministry of State for Antiquities and the Egyptian Department of *Amlaak* through EAIS. Such data are briefly discussed in Naguib Amin (ed.). *Historical Sites of Egypt: A Comprehensive Atlas-Ebook of the Egyptian Antiquities Information System of the Supreme Council of Antiquities,* I: *Ash-Sharqiyyah Governorate, Cahiers of Historical Sites.* Cairo: EAIS, 2005. Pp. 18-24.

10. 1 * Current site description and condition, to include additional site photography and maps

10. 1. 1. **Location (political entities [governorate, markaz, gihah, etc.], agricultural and irrigation divisions, other)

10. 1. 2. **Legal definition of site boundaries

10. 1. 3. **Current status of site

10. 1. 4. *Current condition and physical environment of site, including stone, soil, brick, and other

10. 1. 5. 1. *Natural features

10. 1. 5. 2. *Man-made features

10. 1. 5. 3. *Surface of site

10. 1. 5. 4. *Physiography of site

10. 1. 5. 5. *Hydrology of site

10. 1. 5. 6. *Current threats, natural and human

10. 1. 5. 7. *Potential future threats

10. 1. 6. Local lore concerning site

10. 1. 7. Importance of site (archaeologically, ethnographically, other)

10. 1. 8. Urgency of protection, preservation

10. 1. 9. Site protection proposals

10. 2. Conservation Guide for Egyptian Archaeological Sites and Monuments

By Stephen Rickerby

10.2.0. Overview

Conservators Stephen Rickerby and Lisa Shekade have prepared a *Conservaion Guidel* for the training of MSA inspectors who will undertake on-site examination of archeological sites and compile Existing Condition Reports for each of them. Those reports will include surveys of the subjects listed above (§ 5. 1. 0 – 5. 1. 9). The MSA have already agreed to this training program and to the preparation of Existing Condition Surveys. A Memorandum of Understanding between the MSA and the TMP will be signed shortly, and training and on-site surveys could begin in 2018, subject to funding. What follows is he first version of the *Conservation Guide*.

10.2.1. Introduction

10.2.1.1. Context

Ensuring the survival of Egypt's vast archaeological heritage presents daunting challenges for those tasked with its care and preservation. Both the threats and the nature of the sites themselves are many and varied, meaning that conservation decisions cannot be made routinely. Constructed sites may exist in varying states of ruin, from remnant layers of mud-brick or stone walling to standing remains of substantial height, perhaps partly roofed, that present structural risks; or they may survive instead as complete and intact buildings that present numerous and varied problems of preservation. They can be constructed from varying combinations of building materials, including different types of stone, marble, wood and brick (fired and unfired). Bonding mortars used between built components may be of earth, gypsum or lime, mixed in varying proportions with different aggregates and additives, of both organic and inorganic origin. Some sites originally constructed above ground may now survive partly below ground, such as when urbanisation raises the surrounding ground level; or they may be entirely buried, as when desertification completely covers over archaeological monuments. Rock-cut sites may be above or below ground, excavated into bedrock of varying type and quality, and be of varying size and depth, and survive in vastly differing states. Other sites or site components may not even register a material presence, but be preserved as a footprint or impression in the landscape.

A great number of sites will preserve applied or tooled finishes, and decorated surfaces. These may be executed directly on their primary supports, as in the case of carved stonework; or on secondary layers of various types, applied in numerous combinations. Secondary layers can include plaster layers of different composition, thickness and number, and preparatory layers and grounds. Carving, into stone or plaster, may be of raised or sunk relief, or combine both. Paint materials include a diverse range of natural and synthetic pigments and colourants, applied in different ways and employing different binding media. Original varnishes may be present, applied comprehensively or selectively. Decoration can include attachments fabricated from various materials. In short, the number and diversity of original materials used in the decoration of Egyptian monuments is vast.

The natural and human threats to this archaeological heritage are equally diverse. Environmental deterioration has many forms, which often occur in combination. They include: weathering and pollution; light-related degradation; biodeterioration, ranging from micro-organisms (bacteria, algae, fungus, lichens) to macro-organisms (plants, insects and animals, people); temperature and humidity fluctuations; direct and indirect effects of moisture, both as liquid water (ie, rising ground water, rainwater infiltration) and vapor (ie, condensation, hygroscopicity); and salt-related deterioration. Salts may be contributed from external sources, or originate in the archaeological fabric itself. Inherent aspects of geological and hydrology may undermine the foundations of a site constructed above ground, or destabilise one excavated underground. Many forms of environmental deterioration will be slow and inexorable, and may be difficult to detect. But environmental disasters, such as floods, fires or earthquakes, will result in immediate and usually devastating damage to archaeological sites.

The impact of humans is no less pervasive and devastating, and also has many forms. Acts of aggression include iconoclasm, vandalism and theft. The dangers from tourism, and from modern construction and development, are well known, and since these activities are linked to economic growth, they are usually also difficult to halt or control. Archaeology itself can be destructive. Some sites may still remain in use, posing conflicts of interest with preservation aims. Inappropriate reuse of sites presents similar problems. Conversely, neglect of other sites will be the main threat to their survival. Perhaps most regrettably, our own efforts at preservation often have damaging consequences, albeit mostly unintended: interventions fail and exacerbate pre-existing problems; treatment materials degrade, sadly causing greater harm to original historic materials than if they had not been applied at all.

These are some of the circumstances and issues relating to the material composition and survival of Egypt's sites and monuments, and the types of damage and deterioration they face, which those responsible for their care – administrators, site managers, inspectors, conservators – have to consider and address. If all this were not challenging enough, other factors are also influential. These relate to resources, of time, funding and skills; and to administrative hierarchies and exterior pressures. Imperatives to carry out conservation interventions very often come from external sources, imposed on those who care for sites on a day-to-day basis, and who usually have very different priorities. Requested interventions may be driven too not by conservation needs, but by other pressures, such as the perceived requirement to make a site look presentable when important dignitaries visit. On other occasions, real damage or deterioration, especially if it occurs suddenly, will most likely elicit an immediate remedial response, even if the most appropriate decision is to wait and collect more data, so that better informed conservation choices can be made. Even perceived and unverified threats and risks provoke this type of response. In such circumstances, it is very difficult for those responsible for the preservation of vulnerable sites to *appear to be doing nothing*.

Resources are always in some ways limited, if not extremely scarce, and most conservation decisions have to be made under constrained conditions. The necessary skills may not be in place to diagnose problems correctly, or to implement appropriate conservation measures to optimal standards. Those carrying out remedial interventions may not be sufficiently qualified or experienced. Requests imposed on site administrators and managers to intervene at archaeological monuments may come with artificial deadlines that do not allow enough time to carry out these tasks well. Even when conservation is well funded, unpredicted difficulties of dealing with complex site and deterioration issues mean that resources are never enough. Resource issues are brought into sharper focus by the nature and location of archaeological sites. Many are extremely large, over which resources may need to be spread thinly. Sites or site elements are often found in remote locations that are difficult to reach (eg, petroglyphs in deserts), placing them beyond access to most resources and normal levels of administrative care. Difficult resource decisions may need to be made on the basis of percent of the site preserved and on its current threat evaluation, factors that may change should more of the site be revealed and the nature of the threats vary or increase.

Underlying all these problems and issues is one unavoidable truth: nothing lasts forever. The inevitability of deterioration, change and eventual loss are an intrinsic aspect of site preservation. Many components of the archaeological fabric will have already undergone such radical alterations that imagining how they originally appeared is difficult, if not impossible. The materials used in the construction of sites may contain ineradicable contaminants. In-situ conservation is therefore complex, difficult to do, and ultimately finite. We can only hope to slow rates of adverse change, not halt them entirely. In fact, recognizing this from the outset will help our conservation efforts to be safer and more effective.

Example 1: Site Diversity

These four sites – the 3rd Dynasty step Pyramid of Djoser at Saqqara, the 20th-Dynasty mortuary temple of Ramses III at Medinet Habu, the necropolis of El Muzawwaka with its hundreds of tombs from the Roman period, and the early Christian cemetery at Bagawat – provide a snap-shot of the range and diversity of Egypt's archaeological heritage, which span millennia, are each built from different materials and construction methods, vary in size, form and function, and survive in differing states of preservation. Administrative oversight also varies, depending on the relative remoteness of the sites and their accessibility to tourism. The range of threats to these four sites alone is numerous. All are exposed to diverse effects of environmental deterioration that are largely uncontrollable. Notably too, all these sites preserve decorated surfaces, which form particularly vulnerable interfaces for deterioration.

10.2.1.2 This Guide: What It Contains, and How It Should Be Used

A guide provides advice to help others form a knowledgeable opinion or make a decision that is soundly based. In relation to the conservation of Egypt's archaeological sites and monuments, this guide aims to help those responsible for their care make responsible decisions. The best way to do this is to provide a framework of conservation approaches and principles, which comply with recognized modern-day standards of theory and practice.

This is not, however, what those in the field usually want to hear. When faced with a collapsing tomb, or a wall painting that is severely threatened by salt-related deterioration, they want solutions, usually almost immediately. But these two imagined (though not unrealistic) examples pose many questions: how do we know that the tomb is, in fact, collapsing?; if there is a problem, what evidence is there to say that collapse is occurring at a rate that is concerning?; what type of evidence do we need to collect to answer these questions reliably, and who has the competence to do this?; and, if real risk is established, what are the causes of the problems, and how can we be sure that our proposed interventions address them appropriately and do not make the situation worse in the longer term? For the wall painting with salts, the questions are similar: how do we know that salt-related deterioration is active?; if it is, what are the causes and activation mechanisms of deterioration, and the rate of loss?; which types of salts are present and in what quantities, and where do they come from?; who has the expertise to carry out this type of investigation and diagnosis?; and how do we treat this problem without risking greater deterioration?

These examples illustrate two essential points: damage and deterioration of archaeological sites involve complex issues and processes, which are generally poorly understood and misinterpreted; and addressing these correctly requires a process of information gathering, assimilation and diagnosis, before deciding on appropriate conservation options. Appropriate in this context means arriving at conservation measures that are both safe and long lasting. Of course, levels of complication will vary, and many situations are more straightforward than others. Nevertheless, every situation is different, and few assumptions can be made, even in the simplest instances. Site decisions should be considered on a case-by-case basis. For these reasons, conservation advice cannot be reduced to a set of simple recipes and formulas. This guide does not, for example, provide the material composition and proportions of grouts or mortars used for structural repair, or specify the types of materials and procedures used for cleaning wall paintings. Such information, if misapplied in the wrong circumstances, and with insufficient understanding – both of the treatment materials themselves, and of the original materials on which they are used – can do greater harm than good. The history of conservation is relatively short, yet full of examples of treatments and interventions that have not only failed but caused irreparable harm to the monuments they were meant to preserve.

To avoid this, it is necessary to give conservation decision-makers a set of approaches and principles that allows them to evaluate and deal with problems effectively with the resources that are available, however limited. If, as often happens, our interventions and treatments fail and have to be re-done, this is not only bad for the monuments, it is also an inefficient use of scarce resources. Conservation administrators, site managers, inspectors and conservators need to use their limited resources wisely. In the first instance, this means understanding the aims and requirements of conservation, which, surprisingly, are often not known or are ignored, resulting in wrong decisions and actions. We next need to identify and evaluate the nature of the problems that are encountered at archaeological sites. This involves a process of diagnosis, pursued along methodological and verifiable lines of inquiry. With our findings, we then have to be able to assess conservation options in terms of their effectiveness, and by their adherence to certain standards and criteria. And, finally, we need to be able to judge and evaluate the conservation measures that are decided upon, to be sure that they are safe.

These steps and requirements, which form the contents of this guide, provide the foundation for making the difficult decisions involved in site preservation. They are important because those who have the responsibility of looking after sites cannot have all the requisite skills or expertise to know how to respond to every situation demanding their attention. They will need to recognise their own limitations of knowledge in order to consult appropriate outside help. They will need to decide what should *not* be done as much as what can be done. In all decisions, they will need to exercise critical judgement within consistent, verifiable boundaries. It is hoped that this guide provides this framework. It is, admittedly, an ideal aim, which will not often be easily realizable in real-life situations, in which various constraints will have an impact. But it is nevertheless important to set out these standards as a benchmark that should be aimed for in site practice.

10.2.2. What Is Meant by Site Conservation?

The aims and requirements of site conservation are frequently misinterpreted, and yet internationally recognized guidelines, principles and procedures already exist, providing the basis for our preservation activities. Modern approaches to conserving archaeological sites developed from museum conservation practice in the second half of the 20th century, and have since been included in numerous international charters and guidelines, and in national legislatures. They continue to be updated, to adapt to the changing nature of threats in the modern world, although their fundamental principles remain constant. All too often, conservation decisions are made without reference to these established approaches. It is therefore important to be aware of them, and they are integral to this guide.

10.2.2.1. Aims and Objectives

The aims and objectives of site conservation as defined by existing charters and guidelines are specific and incontrovertible, and can be summarised succinctly. They are to preserve all historic features and evidence in the condition in which they now survive. The interventions required to do this should be minimal and only carried out when absolutely necessary, namely when there is established risk of serious damage or loss. Other interventions that do not fulfil these criteria should not be made, such as restorations made for cosmetic purposes or to achieve completeness. Interventions at an archaeological or historic site should not overwhelm or compromise its original materials, and they are to remain distinguishable from them. The techniques and materials used for these interventions are to be selected on the basis of recognised conservation requirements, and should be appropriately evaluated and tested, to be sure that they do not contribute to future damage and deterioration. All treatments and interventions should be documented and archived.

Respect for the varied and numerous significance values of the site and its all of its features must guide conservation decisions (see **section 10.2.2.4.1**). Since archaeological sites are a finite resource, it is essential to avoid making wrong interventions. Conservation decisions and interventions should therefore be made with clear objectives and be implemented incrementally, to allow the findings of each step to inform subsequent decision-making. The main purpose of conservation is to preserve the site in its existing condition and to slow deterioration.

10.2.2.2. Conservation/Restoration

Modern approaches to site preservation make clear distinctions and preferences between conservation and restoration practices. Conservation has stabilization of the site in its present condition as its principal objective, whereas restoration emphasizes the recreation of some aspect of the site's past, mainly for aesthetic or cosmetic reasons. The former is upheld as the goal of our efforts, stemming from a realization of the irreversible harm and falsification inflicted on heritage sites by restoration practices carried out in the past. Conservation, instead, privileges the preservation of what is authentic over aesthetic considerations.

Choosing conservation over restoration is also an ethical decision, bringing us back to the issue of using scarce resources wisely. Interventions that are mainly concerned with improving the appearance of site features – for example, by reconstructing a fallen monumental sculpture – usually do not address underlying deterioration, and do not anticipate the future likelihood of other types of failure. In the case of the reconstructed monumental sculpture, how long will it take in an exposed environment for the joins between the reattached fragments to fail? (Interfaces between materials are where failure inevitably occurs). If, as is often the case, the fragments had previously been buried in damp conditions, once removed from this environment, damaging salts within the stones may begin to crystallize and cause disruption. The better conservation decision would therefore have been *not* to reassemble the fragments, thereby avoiding creating conditions for failure that waste resources.

In this example, the problems of choosing restoration over conservation are made clear; but it also hints at the pressures and temptations that make restoration popular. Restoration achieves conspicuous visible results. It provides tourists with something new to see, and makes for good publicity. For these reasons, restoration attracts funding. Conservation, on the other hand, is often 'invisible', and its returns on expended resources are therefore difficult to justify or be attractive to potential funders. Although this is a short-sighted and mistaken viewpoint, it is prevalent. It is partly for these reasons that considerable confusion exists in usage of the terms *conservation* and *restoration*: they are used interchangeably and indiscriminately to refer to preservation measures carried out at sites. But interventions that are often promoted as conservation are, in fact, restoration measures. Conservation is both intentionally and unintentionally used as a cover for restoration activities.

A genuine reason for this conflation of language and meaning is that some forms of conservation do overlap with restoration, and boundaries between the two become indistinct. Repairs made to a ruined building that is on the verge of collapse function to *stabilise* and *conserve* the fabric in its current condition; but they also *restore* lost aspects of its structure and appearance. Cleaning a wall painting that is covered in dirt *restores* something of its former appearance; but if the dirt is also contributing to deterioration of the painting, its removal simultaneously achieves its *stabilization* and *conservation*. It might also be argued that even if the dirt covering a wall painting is *not* contributing to its deterioration, its removal aids the preservation of the painting by making its presence more appreciable and less likely to be neglected in future. Given the nuanced nature of these circumstances and arguments, it is not surprising that the terms *conservation* and *restoration* lack distinction in many languages.

Nevertheless, taking our lead from the clear-cut advice provided by international charters and guidelines, it is important that site preservation decisions have irrefutable conservation objectives. Above all, it is important that our interventions do not result in falsification. For the nuanced situations where aspects of conservation and restoration merge, extra care must be exercised. We need to qualify the intent and extent of such interventions, so that the authenticity of the site in its historic condition is not overly compromised. Measures that result in diminishment of significance mean that restoration has gone too far.

Example 2: Karnak and the Ramesseum: Conservation/Restoration

These restored archaeological structures at Karnak and at the Ramesseum illustrate some of the issues involved in making interventions that incorporate some aspect of reconstruction. Sometimes reconstruction is necessary for the stabilization and preservation of the archaeological fabric, but too much can result in falsification and loss of authenticity. Since preserving significance is the highest priority of the site manager, he/she must determine appropriate boundaries between these two positions. Establishing the intent of the intervention is important: is the reconstruction meant to return a structure to a stable condition through the use of essential replacement components, or is it mainly for cosmetic purposes? Questions of how much and what is restored are also important: what proportion of the fabric will be new compared to old?; are the replacement parts mainly made for structural or non-structural reasons? These and other other questions about the balance between conservation and restoration must be critically assessed before proceeding with reconstruction of archaeological remains.

Combining old and new materials in the reconstruction of archaeological structures also raises many practical issues. How will original and added materials interact with each other over the long term? Will they prove to be compatible together? What happen when inherent problems associated with the original materials, such as salts, begin to emerge in the new structure? These and other issues regarding the performance of materials need to be anticipated before embarking on reconstruction.

10.2.2.3. Principal Conservation Measures

Adopting a conservation approach privileges stabilization and preservation of authenticity over aesthetic considerations. This obliges us to understand the site and all of its features in their full context. The most common and widespread preservation measures are remedial in nature – for example, structural repairs and grouting, and consolidation and capping of archaeological remains. This is mainly the case because such interventions are usually considered urgent and necessary, even when evidence is lacking to indicate this. This can give the mistaken impression that there are no other options available to the site manager or custodian. But conservation practice cannot just be concerned with the direct repair of the physical materials and components that make up the site. Rather, as a priority, it must take into full account the contextual and environmental circumstances in which the site and its features exist, and with which they interact.

We therefore acknowledge a hierarchy of preservation measures, which recognises the constraints that influence *in-situ* conservation practice, prioritizing options that achieve long-term effectiveness over short-term 'quick fixes'. This approach is particularly necessary considering the heterogeneous nature of archaeological sites in Egypt, and of the conditions that affect them. The principal conservation measures fall into three categories, which in order of effectiveness are shown in **table 1**:

Table 1: Hierarchy of Conservation Measures, in Order of Effectiveness

Order of effectiveness		
	preventive	measures which prevent the *causes* of deterioration and/ or damage (eg. protective measures, such as flood defenses)
	passive	indirect measures that act on the *activation mechanisms* of deterioration (eg., modifying environmental conditions)
	remedial	direct treatment of the physical remains (eg, *stabilization* treatments, such as grouting)

Preventive measures are most effective in providing long-term conservation solutions. They generally involve making changes to the use of a site: for example, re-routing visitors and minimizing their access to parts of sites; or making parts or all of some sites indefinitely inaccessible. Such measures also have the benefit of avoiding direct intervention on the fabric, fulfilling an important principle of conservation (minimal intervention). It can be seen, though, that preventive conservation, while most effective and minimally invasive, can be unpopular with site administrators, and is therefore little implemented.

Very often causes of deterioration cannot be removed. For example, salts that originate in the fabric of an archaeological site, or are intrinsic to its geological setting, can be present in inexhaustible quantities. In such cases, not only is it impossible to remove the salts entirely, it is dangerous to attempt to do so. But it may be possible instead to control the environmental circumstances that lead to damaging salt crystallization, for example by maintaining parameters of temperature and humidity at a safe threshold. This would be an example of **passive conservation**. Passive conservation is challenging, however, requiring a detailed understanding of the complex interactions involved in deterioation processes and their mitigation. Implemented measures often lead to unintended consequences, too, since deterioration processes are not entirely predictable. Altering envirionmental parameters to address a salt problem, for example, may create conditions for a new problem, such as biodeterioration.

Despite the challenges involved in implementing preventive and passive measures, their prioritization is fundamental to modern conservation practice. They are recognized as offering the best (and most economical) chances of achieving long-term presevation of entire sites and each of their features. This emphasis has grown from awareness of the impact of failed **remedial interventions**, resulting in cycles of deterioration and retreatment. Since remedial interventions generally do not address causes or activation mechnanisms of deterioration, they.are the least effective conservation option if they are the only thing we do: in such circumstances, remedial measures are short-lived and have greatest potential to cause harm.

There is a valid and necessary place for **remedial treatments** in the preservation of sites, in providing for their physical stabilization. But their efficacy depends on them being implemented within a wider conseration framework, in which causes and activation mechansms of deterioration have first been adequately addressed. Many remedial treatment interventions – such as uncovering and unearthing – do not stabilize site elements, but are carried out under the broad umbrella of conservation-related activities.

10.2.2.4. Requirements of Conservation Interventions

The conservation charters stipulate a number of requirements that all site interventions should fulfil, in order to ensure best practice. Among these, the majority are concerned with the nature and impact of remedial treatments, recognizing that – if wrongly formulated and applied – they have the potential to cause great harm. Since some of these conservation requirements also deal with concepts, this leaves them open to misinterpretation when it comes to the hard realities of site implementation. It is therefore essential to understand their core meaning, so that these concepts can be viewed – and applied – in their intended context.

10.2.2.4.1. Preservation of Significance

Preservation of significance is the highest priority of the conservation process, whose principal aim is to retain the authenticity of all features of the site in its entirity. The fundamental significance of a site exists in its inherent, multiple values, considered both individually and collectively. Assessment of signficance values is a professional conservation activity in its own right, and this guide is not the place to elaborate on this. For our purposes, however, it is important to be intimately aware of a number of issues, and to exercise caution in light of these. Significance is varied and layered, including numerous overlapping historical, artistic and scientific values. Some values may not be clearly evident, except to the specialist. Significance may reside in unexpected features. Significance is not a static concept, and values change over time in relation to shifting concepts of importance and increasing rarity: what was once regarded as commonplace becomes exceptional and more valued over time. These factors should indicate that we need to tread extremely carefully in making site conservation decisions. They obligate us to look to the future, to remember that our impact in carrying through conservation decisions can change a site irrevocably, to the detriment of its signficance and authenticity.

10.2.2.4.2. Minimal Intervention

The caution that is required in carrying out conservation measures is reflected in the important principle of minimal intervention. We should aim to do 'as much as necessary, and as little as possible'. As in many areas of conservation, this is a difficult concept to define in practice. If the only way to save a collapsing wall painting is to inject it with many litres of grout, this can be considered a major intervention by any assessment; but this might also be the least that is required to stabilize it. Nevertheless, we are left with a wall painting with its original constituent materials irreversibly and majorly altered, which will have implications for its long-term safety. The notion of *minimal intervention* in this case is therefore ambiguous. This is not an atypical example. Since the concept of minimal intervention is somewhat elastic, it can be abused: doing too much can be justified as the least that is required.

The essential point to remember, therefore, is that our interventions have lasting and potentially possible is therefore an ethical choice: in keeping this principle uppermost in our minds, we endeavour to avoid causing harm.

Sidebar: Compiling a Physical History: the Role of the Site Manager

The site manager is perfectly placed to compile a physical and conservation history of a site, as he/she possesses the overall knowledge of circumstances and events that have had an impact on its condition over time. Such knowledge also needs to be managed and directed, and in this role the site manager is central. The implicit task of the site manager in compiling a physical history is to distinguish between past and present condition, in order to determine whether perceived problems reside entirely in the past or whether they are active and adverse change is ongoing. Although answers to these questions may not be straightforward or immediately apparent, the site manager has a responsibility to collect and archive relevant data for this purpose. There is no definitive checklist of types of information that should be collected, and sources are many and varied, including current and historic images, archival information (such as travelers' accounts), and records of conservation and other interventions. To help make sense of collected information, it is tabulated and arranged in chronological sequence. In this way, cycles of treatment and retreatment may become apparent, for example, indicating rates of failure in archaeological materials. This type of information provides an essential initial basis for diagnosis and prognosis. Since condition is not a static phenomenon, it is important too that compiling a physical history is seen as a dynamic and continuing process.

10.2.2.4.3. Knowledge of Original and Added Materials

Many conservation interventions have caused irreparable damage to important sites, owing to a fundamental misunderstanding of their original and added materials, and the consequent adoption of inappropriate treatments.

The original materials of a site and its components are usually diverse and complex in nature. They can also be much altered from their original nature and appearance, through effects of aging and deterioration. Added materials are also diverse. They may include obvious additions, such as modern fabric repairs made in recognisably different materials. Other additions are more difficult to recognise and identify: contaminants and pollutants can be confusing in their appearance, formation and distribution, leading to wrong assumptions being made as to their nature, the risks that they pose, and how they should be addressed. Even when contaminants (such as salts) are recognizable, issues relating to their nature and origins, their prevalence and distribution (both topographically and in depth), their interaction with original materials, and their status with regard to ongoing deterioration, can be poorly understood.

Many added materials form indivisible bonds with original materials: distinguishing one from the other can be extremely difficult, as in the case of surface contaminants on stone and wall paintings. In a further complication, patinas and stains on exposed painted surfaces can be the product of various phenomena relating to their environmental degradation, which can include reduced components from original paint layers. Indeed, the evidence of an original painted surface may be entirely preserved in its altered trace remains, having the appearance of a contaminant.

These issues are important as many remedial interventions involve the separation of original and added materials (see in particular, **section 10.2.6.**). An understanding of how the fabric and each of its components are made – including applied decorative surfaces – leads to an understanding of how they deteriorate and, ultimately, how they can be best preserved. Acquiring this understanding not only increases (usually) scant knowledge in these areas, it also serves to highlight the nature and extent of potentially vulnerable materials, with implications for future conservation efforts. The complex nature of added materials and their interactions with original materials requires similar understanding. Without this basis of knowledge, remedial intervention risk causing more harm than good.

10.2.2.4.4. Understanding of Physical History and Present Condition

History is past time: a **physical history** is a collection of data relating to events and circumstances that have had an impact on the site over time. This information provides crucial insights to facilitate effective site management and preservation. We look to the past to answer the following questions: was there ever a problem?; when was the problem? what is the rate of change? was the problem ever treated? did the problem return? Asking these questions establishes what we know, and what we *do not* know about the history of the site and changes that have occurred (and, of equal importance, about what has *not* changed). This process is a critical first step in assessing risk and developing hypothesis about damage and deterioration. Sources of information are many and varied, including: archival material and images; historic documents and information; oral information (which may need to be treated with caution); visible and reported archaeological information; and conservation records. Sometimes a **conservation history** – a record of conservation interventions at a site, and of their failures – is compiled separately from more general events.

The corollary of understanding physical history is knowledge of **present condition**. This relates to the state of conservation of a site and its components *at a given time*, and is concerned with the same sequence of questions that underscores the compilation of a physical history (is there a problem? what is the problem? etc.). The purpose of a condition assessment is to record and assess the physical state of a site and its components, providing base-line information against which to assess change, determine risk and make recommendations for conservation. Our role is to make decisions about conservation options (preventive, passive, remedial) based on the risks presented by the physical history and present condition. Assessing present condition requires recording and evaluating effects of adverse change. This involves making sense of original materials in their aged and altered states: recognition and interpretation of conditions can therefore be very difficult. Approaches to carrying out a **condition assessment** are described in **section 10.2.7.3**.

10.2.2.4.5. Knowledge of Conservation Materials and Methods

Just as knowledge of original and added materials is necessary for good conservation practice, a corresponding understanding of conservation materials and methods is also essential. This does not just mean knowing *how* to apply materials (their **working properties**), but rather being able to anticipate implications of their use on the potentially vulnerable materials that constitute the site and its component parts. This acknowledges that all our conservation materials and methods can cause harm.

This approach requires much more that knowledge of the physical and chemical nature of individual conservation materials. Remedial treatments frequently incorporate multiple procedures, and are carried out in sequences involving several types of conservation materials. The interrelated effects that can occur between primary materials (eg, cleaning agents), secondary materials (eg, support systems used to apply cleaning agents) and the original materials of the historic fabric are potentially many. Risks of unintentionally causing damage are high. Understanding the treatment implications of the conservation intervention and each of its components is therefore essential.

Knowledge of conservation materials and methods cannot be reduced to an assessment of their immediate visible results. Adverse effects may only emerge over time or they may be undetectable to normal viewing. Predicting the safety of conservation treatments depends on a thorough knowledge of their potential impact on and interaction with original materials.

10.2.2.4.6. Reversibility/Retreatability

Since remedial treatments ultimately fail, and retreatment is regrettably a prevalent aspect of site preservation efforts, an evolved approach of conservation theory and practice is the concept of reversibility. This anticipates the failure of added materials. It advocates that, in the event of their future breakdown, all applied materials should be readily reversible (ie, removable) without causing harm to original historic materials. Reversibility is only achievable in varying degrees, however, due to the porous nature of historic materials. The size, shape and connectivity of pores have direct influence on how applied materials work together with original materials, and on their ability to be removed. It is generally recognized that few, if any, applied materials can be entirely removed from an open, porous system.

A further problem is that it may be undesirable to extract deposited materials for reasons of safety. Many treatment materials are applied to strengthen or stabilize original materials that exist in weakened states: a grout injected behind a wall painting re-establishes adhesion between one or more separated layers of its stratigraphy; consolidation of stone re-establishes internal cohesion between disaggregated particles in depth. To undo either of these treatments would potentially put the original materials at risk.

Therefore, a parallel concept has been developed, that of **retreatability**. This acknowledges that failed treatment materials may not be entirely removable – either because this is impossible and/or unsafe – and that instead their remaining presence within the porous system, in whatever state, should not impede future treatment options. Assuming that retreatment is desirable, which may *not* be the case, keeping open this window of repeat intervention depends on the **stability** and **compatibility** both of the previously deposited materials and those to be added again; and, critically, on the condition and ability of the original material being treated to withstand yet another intervention.

In practice, concepts of **reversibility/retreatability** are flawed. If anything, retreatment in any form – whether reversing a previous treatment or reintroducing another – is not to be readily advocated, as it risks placing the original, historic fabric under unsustainable pressure. At a certain point in their cycles of remedial treatment, and subsequent failure and retreatment, historic materials become effectively *untreatable*. These concepts should not be ignored, however. They indicate a necessary precautionary approach to conservation practice; and they remind us of the finite nature of our original materials, and the mistakes that should be avoided in treatment implementation.

Finally, **cleaning** as a remedial intervention requires special consideration. In removing unwanted materials from an historic surface, sculpture or wall painting, it constitutes in *irreversible* action: what is removed can never be replaced. The particular issues relating to cleaning and irreversibility are considered later in **section 10.2.6**.

10.2.2.4.7. Stability of Materials and Treatment Outcomes

It is reasonable to assume that remedial interventions should be done with materials that are stable, that last without adverse change, so that treatment outcomes are also safe and durable. Material stability cannot be assumed, however. To some extent, it can be reasonably determined by using tried and tested materials, which have an established record of reliability; or by subjecting treatment materials to rigorous testing of their **performance characteristics** (see also **section 5**). Some performance criteria will be applicable to all remedial materials, such as being sure that potentially damaging soluble ions are not present. Others will depend on the type of remedial treatment and the circumstances of its use. For example, the stability of a grouting material used in a humid environment requires it to be resistant to biodeterioration. However, whatever precautions are taken, it must be remembered that long-term stability cannot be taken as a predicted outcome: anticipating future failure must be recognized as an aspect of conservation practice.

Stability should not be confused with making materials *strong*. In this matter, the stability of conservation materials is closely related to the principle of **compatibility** (see **section 10.2.2.4.8.**).

10.2.2.4.8. Compatibility of Materials

In conservation practice, the principle of compatibility – the ability of two or more materials to combine and work together without problem – is of paramount importance in formulating treatment materials. Failure between incompatible modern materials can be seen all around us: for example, at the junctures between different types of building materials. Since remedial conservation involves the addition of new materials to old, the risks of setting up incompatible combinations are particularly high.

An example of an incompatible treatment approach is the prevalent use of lime-based repairs for stabilising Egyptian New Kingdom tomb paintings in the Theban area. These are poorly matched to the properties of original plasters, and they contribute to new cracking and loss in the weaker, ancient materials. There is now a body of evidence to indicate that most original plasters were derived from local clay-containing calcitic deposits. Establishing and understanding the source materials of ancient Egyptian plasters are therefore key factors in being able to formulate compatible materials for their repair.

An essential component of remedial conservation treatment, therefore, is that original and added materials behave similarly, so that they function well together. This usually involves including in repairs materials that replicate key constituents of original materials. Making such decisions may be relatively straightforward, and can be based on easily accessible knowledge. Other situations will be more complicated, requiring evaluation of specific **performance characteristics** in proposed repair materials, based on knowledge of these characteristics in the original materials, including mechanical strength parameters, water vapor permeability, porosity and density. An important aim is that in repair materials these parameters should be the same as, or less than, those found in original materials. This level of evaluation and formulation also demands appropriate expertise.

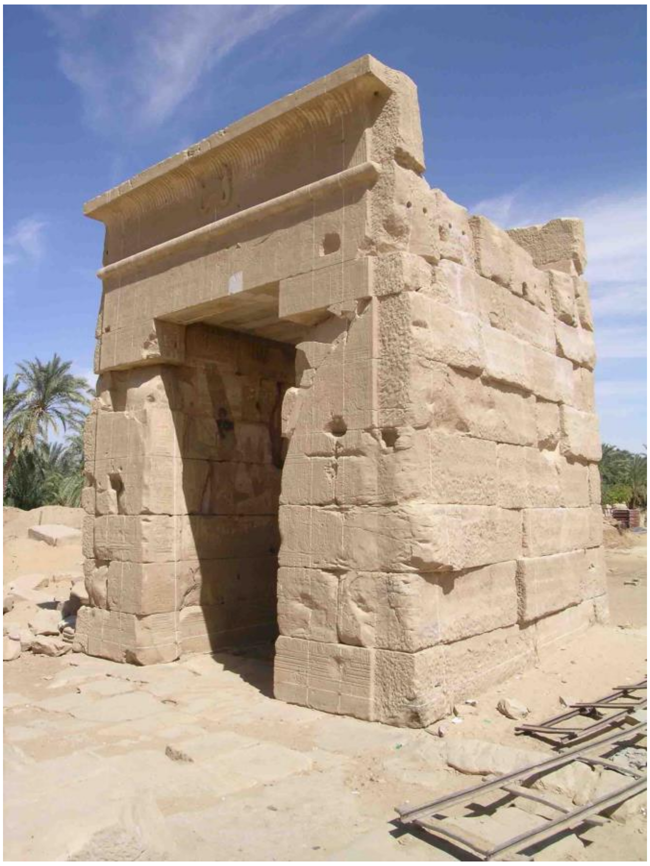
Achieving compatibility is particularly important in the case of reactive materials. Earth-based materials, such as mud-bricks, and earthen supports and renders, are an example. Earth remains a reactive and responsive material after drying, due to its clay chemistry. Reactivity varies depending on the clay types present, and their quantity. It is therefore crucial in the repair of original earthen materials to select repair materials with similar reactive properties, making compatible sourcing an important component of treatment design.

Example 3: A Consideration of Different Archaeological Materials: Limestone, Sandstone and Mud-brick: Hibbis Temple, Ramesseum Temple, Deir el Haggar Temple

Limestone, sandstone and mud-brick are among the most common construction materials found at archaeological sites in Egypt, as shown in these examples: Hibbis Temple in the Kharga Oasis is a limestone construction; much of the Rammesseum is constructed from sandstone; and large parts of Deir el Haggar Temple in the Dakhleh Oasis are constructed from mud-brick.

Each of these building components exhibits different types and rates of deterioration when subject to environmental exposure, determined to a large degree by their specific mineralogical and geochemical composition. Limestone and sandstone are both sedimentary rocks, whose behavior is influenced by the nature of their bedding planes. The durability of sandstone is additionally affected by factors such as grain size and compaction, which influences internal cohesion, and by clay mineral content, which contributes to swelling and contraction in response to humidity fluctuations. The quality of Egyptian limestone varies widely, depending on sourcing. But a prevalent problem is the presence of autochthonous salts, most commonly sodium chloride and gypsum; clay content can also be a critical factor. Mud-bricks are fabricated from a combination of aggregates and a clay-based binder. The physical and chemical properties of clays vary widely, influencing factors such as plasticity, resistance to liquid moisture, swelling and contraction. For all these building materials, porosity has a fundamental impact on deterioration processes, and this will differ in all cases. Of course, there are not only significant differences between these building materials in terms of their performance and deterioration, but also within each type.

Approaches to conservation must therefore take account of both these general and specific differences. An understanding of geological sourcing is important, and of the likely decay mechanisms that may be associated with this. In all cases, characterization, quantification and evaluation of weathering behavior and rates of deterioration are essential objectives before determining conservation options. Classification systems have been developed for assessing weathering states of Pharaonic sandstone monuments in Luxor, and such efforts provide examples of how to understand manifestations of deterioration in other building materials [see B. Fitzner, K. Heinrichs, D la Bouchardiere, ‘Weathering damage on Pharaonic sandstone monuments in Luxor, Egypt, in **Building and Environment**, 38 (9) 2003, 1089-1103]. In all cases too, it is essential to understand activation mechanisms of deterioration.



10.2.2.4.9. Health and Safety
An important emphasis in preserving archaeological sites is to carry out conservation measures that are both safe and long lasting. Safety in this context means the long-term wellbeing of the archaeological fabric. Safety must also extend to practitioners of conservation. They should not be exposed to either short- and long-term hazards in the implementation of conservation. Since the public use archaeological sites, often in large numbers, it is also an important responsibility to ensure their safety during and after conservation measures.

10.2.2.4.10. Documentation
It is essential to document each stage in the conservation process, to provide an archival record and up-to-date conservation history. Without this recorded knowledge, future site custodians will not know what interventions have been done, or where. Documentation is an obligation, to us as professionals involved in the care of sites, to the conservation community and the public, and to the site itself. It facilitates informed and effective management of archaeological heritage.

This obligation raises many questions and problems, however, relating to resource issues (of funding, time and expertise): what precisely should be recorded and how? in which format should information be collected and presented? what proportion of a conservation budget should be given over to documentation? where should the collected material be archived and stored? who is qualified to carry out these tasks effectively? These are difficult issues that site custodians need to consider and evaluate as part of conservation management.

10.2.3. Causes of Adverse Change
Understanding the nature of adverse change at archaeological sites is an essential prerequisite to determining safe conservation measures. Distinguishing damage from deterioration can be difficult, and is rarely done methodically. Damage is usually an immediate consequence of traumatic or imposed events, whereas deterioration is mainly a gradual process of adverse change due to inherent and/or prevailing conditions. However, damage may also occur gradually, and deterioration can sometimes happen extremely fast. Adverse change is also a complex and dynamic process, involving physical, chemical and biological transformations and alterations. Damage and deterioration become interrelated. Some forms of damage may become causes of deterioration.

Given these complications, conservation decisions are often based on assumptions about adverse change, which are frequently wrong. This can result in mistreatment. Different types of damage and deterioration need to be identified and characterised from each other, as each unique condition needs to be approached separately in relation to the available conservation options. In this section, as a first step in this process, the main types of damage and deterioration that affect sites are briefly categorized and described. It is important to consider adverse change in terms of whether its causes are human or environmental, and whether impacts are direct or indirect, intended or unintended: this will help us to formulate appropriate conservation responses.

10.2.3.1 Human Aggression/Interference

10.2.3.1.1 Iconoclasm, Vandalism and Theft
Acts of deliberate aggression include **iconoclasm**, **vandalism** and **theft**, which can be carried out illicitly or be sanctioned. Periods of social unrest and civil strife provide the climate in which these activities typically occur, although by no means exclusively. These acts of aggression result in immediate damage, which can be very similar in appearance to each other. However, each act is done with different intent, which may leave behind different effects.

- **Iconoclasm** is the action of attacking monuments – buildings, images, or sculptural features – as a form of rejection for what they mean or stand for, which may be done for religious, political or other reasons. While iconoclasm can be carried out indiscriminately, it is often targeted, which is reflected in the consequent damage. Iconoclastic damage may accrue significance, challenging normal concepts of conservation. Examples in Egypt include, in the Ancient era, the deliberate defacement of imagery and cartouches associated with preceding or discredited rulers and officials; and, subsequently, during Coptic reuse of temples and tombs, the defacement of Ancient Egyptian gods and their replacement with Christian imagery. In conservation practice, damage is normally repaired (and, as a result, often disguised). In cases where iconoclastic damage has significance, different repair approaches are necessary.

- **Vandalism** is more random in its effects. It includes graffiti, which can be applied (in a variety of materials) and/or incised. As with some forms of iconoclasm, graffiti may take on significance over time. This usually applies when information of documentary importance is conveyed. Examples in Egypt include ancient graffiti left be visitors to tombs in the Valley of the Kings during the Greek and Roman eras; and later graffiti in tombs and on other monuments left by explorers and famous visitors in the 19th century. Again, these examples of significant vandalism challenge conservation norms. Other forms of vandalism cause physical damage of various types (eg, impact damage, gouging, scratching, firing, obliteration), each of which will present different problems for their remedial treatment.
- Some forms of **theft** will leave no impact other than the removal and loss of a particular site component. Consequent conservation measures will need to balance potentially intrusive safety measures (which previously may not have existed) against future risk. But more often than not, theft involves forcing one material from another, resulting in severe damage. The theft itself may fail due to disintegration of the weaker original materials that are targeted. Both successful and unsuccessful thefts can leave highly conspicuous damage and loss in areas of historic fabric or painting that may otherwise survive largely intact. In these cases, pressures to resort to restoration to compensate for areas of damage/loss are usually strong, particularly if the missing element has iconic or documentary importance, and the site is highly visited.

10.2.3.1.2. Impact of Archaeology

Archaeology can be destructive, too, intentionally so if certain historical layers are sacrificed to reveal others; and unintentionally, through the process of exposing archaeological stratigraphies and remains to the 'shock' of new environmental conditions. In the latter case, outbreaks of deterioration may occur very fast with devastating consequences, prompting demands for immediate conservation treatment, which can be equally disastrous. Archaeology also has an impact in contributing more material remains that require short- and long-term conservation, placing pressures on (scant) resources.

10.2.3.1.3. Effects of Tourism

Mass tourism to iconic sites brings about a number of well-known adverse effects, ranging from physical damage and attrition to the creation of detrimental environmental conditions. Combating such threats is difficult in a tourism-dependent economy. It is important to understand and separate the different impacts of tourism on archaeological sites:

- **Direct:** tourists cause direct though usually unintended damage to historic fabric, through their footfall or by touching, in the form of physical impact damage, wear and tear, abrasion, dirt accumulation, etc. Intended damage includes **vandalism** and **theft**. In all these cases, effects will be mostly immediate, although recognizing the problem may only occur over time when accumulated damage has reached a critical point.
- **Indirect:** use by tourists can also indirectly affect sites, usually by altering the microenvironments of enclosed spaces: for example, by raising ambient humidity to dangerous levels in tombs, thereby activating deteriogens such as salts and biodeterioration, and leading to conditions of gradual deterioration.
- **Reactive:** tourism also stimulates reactive damage and deterioration. Measures implemented to address tourism issues can create new problems. Barriers and pathways installed to protect vulnerable parts of sites may redirect damage elsewhere; their installation may themselves cause damage. Ventilation systems intended to improve microenvironments may have unintended detrimental effects, leading to different types of deterioration.

- **Incidental/unplanned/unintended:** many effects of tourism are incidental, unplanned and unintended: for example, vendors may set up illicit stalls on site, causing direct and indirect damage.

10.2.3.1.4. Construction and Development

Modern construction and development pose dangers to known and undiscovered sites alike, and since such activities are linked to economic growth and national pride, they are usually difficult to halt or control. As with impacts of tourism, effects are many and varied, and can be direct or indirect. Destruction and damage are the most common impacts, either unplanned or planned. Sites and monuments discovered during construction and development are particularly at risk, as damage and loss may occur without appropriate oversight. Prestigious development projects may overrule preservation priorities. Indirect effects include vibration damage that occurs during construction, or that results from usage after construction (as in the case of roads, for example). Urban development that causes a rise of the water table can contribute moisture and salts to archaeological sites; agricultural practice can do the same. Conversely, some forms of development may lower the water table, leading to destabilization of geological and structural foundations. These are only a few examples of the adverse impacts of construction and development.

10.2.3.1.5. Damaging Use/Reuse

Some sites may still remain in use, such as those with a continuing religious function, raising issues that conflict with the needs of preservation, which will be contested between religious custodians and those in the conservation profession. Issues may be difficult to resolve, since both sides will argue that they are preserving the site in its authentic state. Reuse, such as the utilization of archaeological sites for concerts or other public events, present yet more safety issues for their material remains. As with other imposed external threats, the organization and implementation of prestigious events may overrule preservation imperatives.

10.2.3.1.6. Preservation Efforts: Unintended Consequences

Well intentioned but misguided preservation efforts too often cause irreparable harm to archaeological sites, through unintended consequences. Poorly selected treatment materials fail and degrade from environmental exposure: applied materials, such as consolidants and adhesives, contract and expand, discolor and become insoluble; structural repair materials that are too strong cause harm to weaker adjacent original materials; cleaning removes barely detectable and vulnerable original features. Conservation implications are serious and long-lasting, and are often irreversible. A fundamental issue is that harm caused to original materials by repeated remedial treatments cannot be sustained indefinitely: at a certain point, the original materials will be too undermined and weakened for retreatment to be safely possible.

The problem of failed treatments is so prevalent that probably a majority of conservation resources is devoted to undoing past preservation efforts. This wastes finite resources, detracting them from more valuable and lasting preventive and passive conservation measures. These circumstances emphasize our need for caution and restraint, and for a sound decision-making process when it comes to implementing conservation measures.

10.2.3.2. Neglect

Neglect poses interesting preservation issues. What could be loosely termed *benign* neglect, where sites are left entirely undisturbed, may facilitate their survival in states of authenticity that are rarely found elsewhere. *Active* neglect – which might incorporate acts of aggression, such as the theft of building materials for reuse – will be the main threat to the survival of other sites. However, it is a danger to regard benign neglect as a desirable state, as the site will be highly vulnerable to damage and deterioration occurring at any given time, which will likely go unnoticed. Nevertheless, many neglected sites present rare circumstances where archaeological fabric and remains have not been compromised by previous interventions and modern usage. This places a particular responsibility on conservation professionals to provide protection without disrupting the historic features in the condition in which they exist.

10.2.3.3. Structural Failure/Collapse

Causes of structural failure and collapse at archaeological sites, both above and below ground, are numerous, including: inherently faulty design and construction/excavation; inherent aspects of geology and hydrology; failure of building materials due to deterioration/damage; displacements due to foundation failure; the impact of extraordinary loads and shocks; unexpected modes of failure; and combinations of these factors. Aggravating factors include: movement (earthquake, settlement, vibration, wind); heat (insolation, internal heating, fire); moisture (flooding, liquid water [infiltration, capillary movement], water vapor); and pollution (eg, by leading to erosion of structural elements).

10.2.3.4. Inherent Characteristics

It is not only external agents that present deterioration risks. The materials from which archaeological sites are constructed or excavated may be inherently weak or prone to failure, or contain deteriogens that are intrinsic to their nature. Since this means dealing with problems that are effectively ineradicable, conservation options are usually severely constrained. Remedial treatments generally fail and cause greater harm under these circumstances; preventive and passive measures may be difficult or impossible to implement, or be limited in their scope and effectiveness. Recognizing these limitations is, however, an essential aspect of site management and conservation: we need to know what *not* to do, as much as what we should do.

10.2.3.4.1. Susceptibility of Original Materials

Susceptibility of original materials is their tendency to alter over time, due to some inherent aspect of their nature that predisposes them to degradation. In wall paintings, many paint materials – pigments and colorants, binding media and original coatings – are susceptible to change because of some aspect of their physical and/or chemical nature. The blue pigment used in ancient Egyptian painting, Egyptian blue [$CaCuSi_4O_{10}$], is a good example: this artificial pigment, composed of copper calcium silicate, undergoes several degradation changes, including alteration to malachite, atacamite and paratacamite; blackening, which is possibly related to tenorite or cuprite formation; and/or degradation of its glass component. This is just one example of the many historic materials that undergo complex alterations.

These generally unstoppable alterations place limitations on conservation options. For the site manager or custodian, there is also the difficulty of recognizing and identifying alteration products and phenomena. These can be easily mistaken as non-original and unwanted components that should be removed, whereas they are significant aspects of original technology. Attempting to remove what is non-removable can cause great damage and loss. These are particular concerns for decorated and painted surfaces (see **section 10.2.6**).

10.2.3.4.2. Influence of Porosity

The fabric of constructed archaeological remains includes composite materials, and different materials used side-by-side, each having differing inherent porosities. In a geological context, porosities will vary between rock bedding planes and different rock formations.

Archaeological remains in both built and rock-cut contexts are therefore connected to each other, and to the ambient environment, by their porous structures. An original feature such as a wall painting, which is composed of layered porous materials, reacts physically and chemically with both its support – which could be either constructed or rock-cut – and with the ambient environment. Liquids and gases pass through porous structures, and, as a result, deterioration and failure often occur at the junctures of porous interfaces. For example, salts in solution will preferentially crystallize at the internal and external interfaces of a wall painting, undermining its stratigraphic integrity. The influence of porosity as an inherent feature of original archaeological materials has critical implications for conservation.

10.2.3.4.3. Autochthonous Deteriogens

Autochthonous deteriogens refer to agents of deterioration that are inherent to a material, having formed or grown in situ. Many salts are autochthonous, in contrast to others that are transported from elsewhere. The sodium chloride salt deposits and veins that form part of the geology of the Theban area, undermining the stability of many tombs excavated there, are examples of autochthonous salts. Building stones sourced from the same geology will contain the same autochthonous salts, which will then also have a detrimental impact in constructed sites. Autochthonous deteriogens present particularly challenging conservation issues, as their presence is usually inexhaustible and ineradicable. This means that preventive and passive measures are the only viable conservation options.

10.2.3.4.4. Physiography and Geology

Inherent aspects of physiography present largely intractable problems at many archaeological sites in Egypt, particularly those excavated underground. Subsurface characteristics such as rock fracturing and fault systems may be intrinsic geophysical features, resulting in rock quality of varying stability. Highly expansive clay minerals in the limestone geology of the Theban area contribute to destructive rock swelling in ancient tombs. Some rock types will be more susceptible to weathering than others, such as poorly compacted sandstones. **Autochthonous deteriogens**, such as salts, have geological origins. Varying **porosity** between bedding planes is another inherent geological feature that influences deterioration.

Environmental factors exacerbate many of these geological problems, and manifestations of deterioration are likely to include rock fracturing and collapse, damage and loss resulting from variations in swelling and contraction, precipitation and dissolution of clays and carbonates in response to humidity fluctuations, and the activation of damaging soluble ions. Deterioration that originates in and is indivisible from its geological context, and is activated by uncontrollable environmental factors, inhibits conservation options. Even preventive and passive measures may not be feasible. Recognizing and accepting this is difficult, but it is necessary if potentially damaging cycles of mistreatment and retreatment are to be avoided.

Example 4: Inherent Characteristics: Tomb QV60, Valley of the Queens, Luxor

Periodic flash floods have had a devastating impact on tombs in the Valley of the Queens, Luxor, leading to catastrophic rock collapses, such as shown here in the 19th Dynasty tomb of Nebattauy (QV 60). Liquid water from past flooding has been an activation mechanism for numerous forms of deterioration that are inherent to the location and nature of the tomb. Swelling of the clay-rich limestone geology has resulted in destructive deformation of the rock-cut interior, leading to its destabilization and internal collapse. The rock also contains damaging sodium chloride salts. These are an autochthonous deteriogen, inherent to the geology of the Theban area. These causes of deterioration cannot be removed, which limits remedial treatment options, and places the emphasis of conservation efforts on preventive and passive conservation options instead.

10.2.3.4.5. Hydrology
The impact of the movement and distribution of the earth's water on Egypt's archaeological heritage has particular relevance in the context of the country's desert conditions and climate. Effects of groundwater (or its absence), infiltration, soil moisture, surface water flow, precipitation and evaporation individually and collectively present a wide range of direct and indirect impacts on Egypt's monuments, many of which are already being realized, others presenting potential threats of great magnitude. For example, in the Valley of the Queens, Luxor, there is no greater threat to its tombs and monuments than that of flash flooding: a single episode of torrential rain would produce runoff from the valley's watershed in the magnitude of tens of thousands of cubic metres, and transport tons of mud and rock debris from the slopes into tomb openings and over other ancient site features.

10.2.3.5. Passage of Time
All archaeological sites are distinguished by their age, even in the case of 'modern' archaeological heritage. The histories of sites embody adverse changes. Changes of original function – such as from a tomb to a place of habitation – usually involve alterations and additions that cause damage and deterioration. Abandonment itself can be a change of function, presenting other conservation challenges. During periods of active historic use, which may span centuries, the fabric can undergo numerous damaging alterations due to changing taste. A stratigraphic accumulation of historic changes – of building phases, and of applied decoration and painting – pose challenges of legibility, interpretation and conservation. There may be pressure to preserve one layer at the expense of others (usually the earliest layer is prioritized), potentially conflicting with conservation principles. One historic layer may be a cause of harm to another, requiring difficult conservation decisions to be made. Since failure typically occurs at interfaces, historic stratigraphies often present difficult conservation problems.

10.2.3.6. Disasters [Natural/Human]
Disasters, of natural or human origin (earthquakes, fires, flooding, wars, etc.) usually occur with no or little warning, and are, by their nature, catastrophic in their impacts. Because they also usually occur infrequently and sporadically, and cannot be predicted with certainty (if at all), they tend also to fall off conservation agendas. Given the potential scale and impact of a single event, however, in which an entire site or collection of sites could be seriously damaged or destroyed, this neglect is short sighted and culpable. Disaster preparedness is an important responsibility. Sites may exist in known seismic zones, or in areas of historic and expected flooding, meaning that certain measures can be implemented that are tailored to expected events, however infrequent. These measures include those that prevent or mitigate the effects of disasters *before* they occur, and others that provide vital aid immediately *afterwards*. For example, preventive flood barriers and diversionary channels could be installed to anticipate a flood event; while clearance equipment could be readied, and staff trained, to cope with the aftermath of a flood. These measures can make all the difference in salvaging a site from sudden disaster.

10.2.3.7. Environmental Deterioration/Aggression
Environmental deterioration takes many forms, which are often interrelated. Identifying types of deterioration can be difficult, since deterioration processes involve the formation of alteration products that often defy easy recognition, even on an analytical level. One type of deterioration can create conditions for another, leading to multiple combinations of deterioration, and further complicating identification of phenomena. Correctly identifying causes and effects, and phenomena in changed states of existence is a complication process of diagnosis, which must be evidence-based. It is therefore important as a first step to classify deterioration types as accurately as possible.

10.2.3.7.1. Biodeterioration
Biodeterioration is divided into two categories, **micro-organisms** and **macro-organisms**. **Micro-organisms** include bacteria, algae, fungus and lichens. The conditions that govern the growth of each of these types vary widely, ranging from acidic to neutral to alkaline, low and high moisture, saline and non-saline, with or in the absence of oxygen, and on organic and inorganic substrates. Effects of

microbiology are correspondingly diverse. They form obscuring biofilms, resulting in staining and discoloration. They can encourage weathering (eg, by absorbing atmospheric moisture). Fungi penetrate vulnerable surfaces, such as wall paintings, causing damage and disruption, and secrete enzymes that chemically undermine susceptible features of original technology (eg, pigments and other paint materials). Development between microbiological types also occurs: for example, algae can provide a food source for fungi and bacteria.

Macro-organisms include plants, insects and animals, and people. Macro-organisms are easier to diagnose than micro-organisms, although deterioration phenomena can be confusingly similar. Effects are also diverse and therefore easily misunderstood. Damage and deterioration relating to bat behaviour provide a notable example. Bat roosting causes mechanical damage to original surfaces. Bats accumulate fatty reserves and exude greasy deposits. Bats engage in social activities that coincide with discharging faeces and urine on walls and floors over wide surface areas: a colony of 50 bats may produce 6-9kg of faeces and up to 33l of urine in 5-6 months; the proportion of urine production to total food intake can be up to 75%. Damaging salts and adverse chemical effects are numerous. Urine is mainly composed of urea (NH_2CONH_2) [up to 70%], leading to the formation of sodium, potassium, and chloride ions; oxidation can produce damaging nitrates and ammonia. Oxidation and reduction processes of decaying faeces can lead to formation of nitrates, phosphates and ammonia. Decaying faeces and urine provide a food source for micro-organisms. There are serious health and safety risks for humans.

Example 5: Diagnosing Effects of Macro-Biology: Tomb QV42 Valley of the Queens, Luxor

Damage and deterioration from bat infestation in the 20th Dynasty tomb of Parcherunemef and Minefer (QV 42) is extensive and diverse in its forms. At first glance, the condition phenomena are difficult to understand and interpret, and causes could be easily misinterpreted. In cases such as these, it is important to approach the problem first by describing the various conditions on a phenomenological basis, and establishing their spatial distribution. This information then needs to be related to the physical history of the site. Arriving at the conclusion that bats are responsible requires a step-by-step process of diagnosis, including an understanding of bat behavior and its effects.

10.2.3.7.2. Pollution

The main pollutants affecting archaeological sites and their component parts mainly include sulphur dioxide and sulphates, nitrogen oxides and nitrates, chlorides, carbon dioxide and ozone. In marine environments, it is important to separate the effects of human-made pollutants (eg, vehicle emissions, industrial side-effects) from marine sources of the same substances. The effects of particulate matter, of various type and origin, are also an important category of pollution. Many archaeological materials are sensitive to the corrosive and soiling mechanisms of pollution, including many stone types and decorated surfaces. The influence of environmental parameters of **temperature** and **humidity** on pollutant behavior is an important consideration is assessing deterioration effects: for example, the atmospheric corrosion of exterior original materials is related to acidification of air, induced by gases such as sulphur dioxide, and is intimately connected with moisture, either in the form of rain, dew, condensation, or high relative humidity (RH). In the absence of moisture, many contaminants would have little or no corrosive effect. Manifestations of deterioration include losses of mass, erosion, expansion and deformation, changes in porosity, discoloration and embrittlement. It can be difficult to disassociate effects of historical and modern pollution, or establish background rates of deterioration in the absence of pollutants.

A major conservation concern is the indivisible boundary that forms between deposited pollutants and original surfaces. This is increased by chemical reactions between original and added materials, formed under the influence of environmental exposure. These factors have implications for the safe separation and removal of pollutants. Irreversible damage can be caused to original surfaces in the process of trying to remove pollutant materials.

10.2.3.7.3. Temperature

The adverse effects of temperatures (either too high or too low, or fluctuating) on materials in an archaeological context are often observed after considerable time has passed, and so the slow deterioration that results is often underestimated. Exposed archaeological sites are composed of multiple and usually composite materials, each having their own rates of thermal expansion and contraction, which can cause physical damage as a result of temperature fluctuations. High temperatures promote faster chemical reactions, and so the overall degradation of materials occurs more quickly. High temperatures can also accelerate desiccation of materials, leading to loss of flexibility and cracking. Temperatures that are too cold can cause embrittlement in certain types of materials.

The relationship between **temperature** and **humidity** is also of critical importance in deterioration processes. There is an inverse relationship between temperature and relative humidity: as temperature increases, relative humidity decreases. The fluctuation of these environmental parameters provides activation mechanisms for many forms of deterioration, such as salts and biodeterioration. The prospects of controlling damaging temperatures and their fluctuations at archaeological sites are usually minimal.

10.2.3.7.4. Moisture

Effects of moisture are among the most serious and prevalent threats to archaeological fabric and its components, and also the most misunderstood and misinterpreted, with damaging implications for conservation practice. Very often wrong interventions are made on the basis of mistaken assumptions. It is therefore very important to be aware of different types of moisture sources, and of their effects. Moisture affects archaeological fabric in two forms: as **liquid water** and as **moisture vapor** (its gaseous state). Moisture is less frequently a direct cause of deterioration. Instead, **deteriogens** such as soluble salts become a major *cause* of deterioration when they are *activated* by moisture in either of these forms.

10.2.3.7.4.1. Liquid Water

Liquid moisture affects archaeological fabric as **infiltration/penetration** or **rising damp (capillarity).** **Infiltration** occurs in areas of fabric failure (cracks and holes, unfilled joints, faulty roofing), and its impacts are generally zonal/localized, and also usually occur in depth. For example, rainwater infiltration that seeps through a faulty roof will have a localized impact in the vicinity and pathway of the entry point; it will also most likely result in direct damage, for example by eroding/staining vulnerable surfaces. Depending on the amount of infiltration or the number of repeat events, in-depth saturation of the fabric will occur. Some effects of liquid water infiltration will be quite sudden, though others may appear gradually. **Liquid water penetration** refers to water percolation through a porous material, rather than rapid passage via a point of failure. Effects will be similar to infiltration, though they may be delayed. Liquid water infiltration *and* penetration are activation mechanisms of deteriogens, such as soluble salts and biodeterioration.

Capillarity/Rising Damp is the movement of liquid water from ground-level sources through a porous structure. Liquid moisture will move as a result of differences in hygrostatic pressure (pressure differentials drive the rate of moisture movement). The rate and height of liquid moisture transfer is affected by the porosity of the building/fabric materials. Sources of liquid water are various and these influence forms and extent of deterioration, though effects are also generally localized/zonal, and occur in depth. The most common manifestation is a saturated zone of lower walling. However, conditions will vary depending on types of water sources and the rate of evaporation, as influenced by environmental conditions. Ground water sources may be effectively inexhaustible – for example, if the water table is very high or if agricultural use contributes a perennial supply – leading sometimes to permanently saturated lower walling. Water that is dispersed from the fabric – from roofs and drainage goods – around its base may provide infrequent moisture sources, leading to wet zones that are also intermittent in nature. Capillarity/rising damp is also an activation mechanism of deteriogens, such as soluble salts and biodeterioration.

Example 6: Capillarity/Rising Damp: Mosque of Ibn Tulun, Cairo

The 9th-century mosque of Ahmed Ibn Tulun in Cairo is famed for its arcaded courtyard and elegant spiral minaret. Its rendered brick-built walls are now adversely affected by capillarity/rising damp and associated salts deterioration. Patterns of deterioration along the base of the exterior walls are distinctive, exhibiting from the bottom upwards: a lower zone where few salts have precipitated out; intermediary zones of salt efflorescence and decay; a darkened hygroscopic band; and unaffected walling above. The area of greatest deterioration due to capillary rise and salts crystallization is that subjected to the greatest variations in moisture content, between the permanently damp base of the wall and the dry upper parts.

The visible differences in salt banding are due to the differing crystallization parameters of the various salt mixtures present in the fabric. These observable patterns of deterioration provide important indicators for diagnosing the nature and status of liquid water problems.

10.2.3.7.4.2. Moisture Vapor

Moisture vapor affects archaeological fabric through **condensation** and/or **hygroscopicity. Condensation** is the process by which water vapor in the air is changed into liquid water. This phase change is **temperature** dependent: the temperature at which water vapor condenses (reaches saturation) is called the dew point temperature (DPT). **Hygroscopicity** is the phenomenon of attracting and absorbing atmospheric moisture. Many historic and archaeological materials are hygroscopic, exhibiting a strong affinity for moisture vapor: earthen materials are a notable example (eg, earth bricks and renders). Hygroscopic absorption is dangerous because it results in physical change, such as volume increase (followed by its decrease, as moisture is eventually released). Composite materials – which are commonly found in archaeological settings – combine different hygroscopic properties, creating conditions for differential stresses and deformation to occur. Archaeological fabric can additionally contain highly hygroscopic contaminants, such as salts. A salt-contaminated mud-brick wall will therefore be capable of absorbing – and desorbing – relatively large amounts of water from the atmosphere, with detrimental consequences.

Moisture vapor affecting archaeological fabric either as condensation and/or hygroscopicity occurs as an overall environmental phenomenon, and its impact is correspondingly widespread, but also usually superficial. Deterioration related to moisture vapour will therefore take on different distribution patterns from that caused by liquid water. Water vapour is a major activation mechanism of deteriogens, such as soluble salts and biodeterioration.

10.2.3.7.5. Salts

Salts are among the most significant causes of deterioration at archaeological sites, since they are dispersed within practically all the porous materials that constitute their fabric and component parts. Deterioration results when salts, carried through porous materials in solution, crystallize out as the water evaporates, resulting in volume expansion and disruption. These phase changes, which are reversible, are determined by **relative humidity** and **temperature** conditions for each salt species, of which there are many. In porous materials, salt species also combine, altering their phase change parameters. This means that a broad range of environmental conditions is capable of activating salt deterioration in many forms, and in various locations, both topographically and in depth. Salt sources are various, as follows:

- **autochthonous:** originating in geological and building materials that constitute the archaeological remains;
- **added materials:** materials from later building phases, repairs, and conservation interventions;
- **liquid water origin:** capillary rise/rising damp, flooding etc.;
- **aerosol deposits:** airborne dust, atmospheric pollution, soot, sea-water precipitates etc.;
- **organisms:** deposits from micro- and macro-organisms.

Example 7: Autochthonous Salts and Passive Conservation:
QV66 Tomb of Nefertari, Valley of the Queens, Luxor

The tomb of Queen Nefertari, the favorite wife of Rameses II, is famed for the magnificence of its wall paintings, representing one of the highpoints of New Kingdom art. A major cause of deterioration of its paintings has been from the crystallization of sodium chloride salt, which is present as an **autochthonous deteriogen**: the salt originates in the excavated limestone rock, from where it migrated into the painted plaster. It has many crystallization states, including as rock salt, filaments, blisters and pustules. These varied states indicate the complex nature of salt formation in the context of an underground tomb, and the difficulties of understanding these processes completely. As an inherent geological feature, the salt can never be entirely eliminated as a cause of deterioration. It is important instead to maintain conditions that do not allow salts to become active again. This **passive conservation** approach requires monitoring of temperature and humidity both inside and outside the tomb, and the maintenance of stable conditions based on evaluation of this collected data.

10.2.3.5.6. Light

Light is a form of energy, expressed in wavelengths. The light spectrum is divided into three main groups, infrared, visible and ultraviolet, which range from long to short wavelength, respectively. Nearly all types of light contain all three components, but the amount of each varies: daylight and artificial light, particularly fluorescent light, emit large amounts of ultraviolet radiation. For archaeological materials, it is exposure to short wavelength ultraviolet light that is a primary concern, since this radiation is more powerful and therefore damaging.
Light causes deterioration in many archaeological materials: dyes and pigments fade or change appearance; the materials from which objects are made deteriorate as a result of oxidation process; materials with organic components are particularly susceptible to light-induced deterioration. Deterioration occurs even at low light levels, and the adverse effects of light are cumulative: there is no 'safe' level below which deterioration will not occur.

In an archaeological context, exposure to sunlight (insolation) is the main source of light-induced deterioration. Artificial illumination is probably a lesser concern, although not to be ignored.

10.2.4. Conservation Measures and Remedial Interventions

Having considered the main categories of damage and deterioration, we can consider our conservation options, and the challenges these conditions impose on their effective implementation. This section does not provide a step-by-step guide of how 'to do' conservation, but indicates the issues that those involved in site preservation need to be aware of, mindful of the problems associated with misdiagnosis and mistreatment. A number of remedial interventions carried out at archaeological sites fall outside strictly defined conservation aims and objectives, but are nevertheless commonly implemented. They are also considered in this section in terms of their potential impacts, issues and risks.

10.2.4.1. Preventive Measures

A consideration of the wide range of damage and deterioration types indicates that preventive conservation measures are the most effective means of addressing them. Whether problems are caused by human interference, or by salts, biology, pollution, moisture, and/or inherent characteristics, it is clear that they are best dealt with by tackling their causes, not their symptoms.

Examples of **preventive measures** are: flood defences, protective barriers and screens to prevent physical damage, diversionary walkways, screening to exclude animals and birds, relocation of bird and animal habitats, and exclusion of visitors from vulnerable parts of sites. Many of these measures can be attributed to the application of common sense, but as with all conservation interventions, unintended (and unwanted) consequences frequently occur: flood channels may safely remove floodwater from one location, only to divert it to another location where greater damage occurs; a glass screen may provide physical safety but set up a damaging microclimate between it and the original materials it is placed against; diversionary walkways may establish new patterns of attrition. Preventive measures therefore require careful planning and implementation, and, importantly, surveillance of results, so that corrective modifications and improvements can be made.

A majority of the environmental causes of adverse change facing archaeological sites are not capable of being solved definitively. Preventive options may be limited in their scope and effectiveness.

10.2.4.2. Passive Measures

If preventive measures are limited in their application and viability, it may be possible to implement **passive measures** instead, which address the activation mechanisms of deterioration, with the intention of mitigating or controlling their adverse effects.

Increasing awareness of the need to understand the mechanisms of deterioration before making conservation interventions has led inevitably to assessment of the impact of the surrounding environment. This is especially true for archaeological sites and their components, where there is often limited potential for the control of environmental parameters such as temperature, relative humidity, and exposure to solar radiation and particulate deposition. Environmental monitoring of these parameters is aimed at the systematic gathering of information regarding both quantitative assessment and the determination of patterns of change over time. Collected data is then interrogated in order to determine passive conservation strategies (eg, restricting air exchange between an underground tomb and the exterior environment, to prevent damaging fluctuations of temperature and humidity).

Although much progress has been made in many areas of environmental monitoring and assessment, associated difficulties are considerable and varied. As with preventive conservation, it is not always possible to implement passive options effectively: prevailing circumstances at most exposed sites will simply not allow it. Even allowing for the possibility that *ambient* environmental conditions can be controlled, this may have limited impact on *internal* conditions within the porous materials of the archaeological fabric. These limitations are important to recognize at an early stage, given the complexities involved in both the data collection and implementation phases of passive conservation, and the resources that they require. Collecting data is difficult to do: which environmental parameters should be recorded and how?; which equipment should be used (and how reliable is it)?; how many sensors should be deployed and where should they be positioned to collect the most informative information?; what happens in the event of equipment failure (a common event)?; how long should the monitoring period be?; who is qualified to make these decisions *and*, most importantly, interpret the collected data?. Passive measures are also difficult to implement, since environmental factors are not entirely predictable or controllable. Unpredicted consequences are common, and repeat monitoring and assessment are usually required to evaluate newly implemented environmental measures and their impact(s).

10.2.4.3. Protective Measures

Protection may be defined as any temporary measure undertaken to safeguard archaeological fabric and any of its immoveable components from damage or deterioration, including those resulting from environmental changes. Protection could be required when works are planned to renovate or alter the fabric, or during provision of services (eg, lighting, drainage systems, security provisions, etc.). The risk factors that protective measures are intended to address in these circumstances include: physical damage; effects of vibration; potential contamination from other materials being used (including water); and deposition of materials. Protection may also be implemented to shield newly revealed features – or those already exposed, but considered to be at risk – from environmental degradation.

Protection can be either direct – a protective system designed specifically for an area at risk, such as a wall painting (eg, application of protective facings, installation of a protective box) – or an indirect procedure necessary to minimize any risk inherent in a particular intervention or circumstance (eg, installation of air extraction to remove particulates during works). Because protection is a temporary measure and also usually a subsidiary intervention, resources and planning tend to be overlooked. As with all remedial interventions, a number of concerns and requirements can be flagged:

- the original features to be protected should first be recorded and their condition assessed;
- the condition, risks and vulnerabilities of the original features will dictate the type and design of the protection measures, which should be implemented to agreed performance criteria for the safety of the original features. This will require appropriate expertise and oversight;
- original features may need emergency or full conservation treatment before being additionally protected;
- consideration must be given to the duration of the protection, to avoid the occurrence of unintended damage and deterioration (eg, the creation of damaging micro-environments inside protective coverings);
- removal of the protection – particularly if it includes direct measures (eg, application of facings) – should be carried out by appropriate personnel.

Since many protection measures conceal original materials, risk management and care do not end with their installation. Damage and deterioration could occur undetected. It may be necessary to maintain a watching brief, allowing the condition of the concealed original feature to be checked on a regular basis. Potential risks posed by external works should be known, so that this can be factored into the monitoring regime. Although protection measures are intended to be temporary, they can become long-term or even permanent fixtures, due to lack of oversight and neglect, and an inability to provide alternative conservation solutions. These possibilities must be considered when providing protection, to avoid creating conditions and circumstances for serious future damage and deterioration.

10.2.4.4. Emergency Measures
Emergency measures may need to be implemented in high-risk situations, when threats of damage or loss of original features are judged to be imminent. Emergency measures can be of various types and some of these may be the same as **protection measures**: wall paintings may be faced with protective layers to safeguard them from sudden external threats; fragile elements at risk of collapse can be supported with braces or props. The same criteria and precautions involved in planning and implementing protection measures apply to emergency measures. However, since emergency measures are usually decided and implemented under difficult and constrained circumstances, the risk of causing unintended harm is very high. There are also risks that emergency measures become long-term or permanent fixtures. On the other hand, emergency measures also allow final conservation decisions to be delayed, allowing time for further investigation, planning and considered decision-making.

10.2.4.5. Remedial Interventions: by Type

10.2.4.5.1. Uncovering/Exposure [Including Unearthing/Excavation]
Uncovering/exposure of original features from beneath opaque covering layers or deposits is carried out at archaeological sites for a number of reasons. Most commonly, it is done simply to expose that which is concealed, so that original features are made known and appreciated. Wall paintings concealed by later plaster layers or skims are uncovered for this reason; archaeological sites are unearthed for the same reason, although different procedures are involved. The main purpose in these cases is retrieval of information. Arguably, this is not a conservation objective, as uncovered features are potentially exposed to damage and deterioration, which then become an added burden on the overstretched responsibilities and limited resources of conservation professionals.

The danger of exposing previously concealed, and therefore protected, original features to new harm is a major concern: removal of opaque covering layers/deposits shifts the interface of potential damage/deterioration to the surface of the original materials instead. Deterioration under these circumstances can be rapid, severe and widespread, driven by environmental ‘shock’: salts that have been in solution under concealed/buried conditions may suddenly crystallize, causing disruption; fragile paint layers can flake and powder with alarming rapidity. Such events also risk provoking immediate and poorly considered remedial interventions that worsen the problem. Assuming that deterioration does not immediately occur, it may emerge instead in the longer term: it cannot be assumed from initial indications that it is safe to uncover a concealed original feature. A further serious concern is the damage that can be done during processes of uncovering/exposing. Covering layers/deposits may be strongly bonded to weaker original surfaces, in which case separating the one from the other will usually involve damage and loss.

Sometimes uncovering/exposure may serve a conservation purpose. Inadvertent damage and loss can occur to archaeological features when they are concealed, and uncovering provides recognition and, hopefully, improved chances of survival. If the covering layers/deposits are causing harm to original features, their removal has conservation benefits too. The attractions of uncovering/exposing site features are obvious, and it is a remedial intervention that is popular in Egypt, particularly with respect to unearthing archaeological remains. It is mostly done not for conservation reasons, however. In this context, its possible positive aspects need to be weighed against the considerable potential risks and disadvantages, both in the short and long term. Conservation priorities are often neglected when it comes to uncovering/exposure.

Example 8: Effects of Unearthing and Reburial: Roman house, Amheida, Dakhleh

This mud-brick house with elaborate wall paintings is one of a number of Roman-period residences to survive at this large archaeological site in the Dakhleh Oasis. Concealed by encroaching desert sands, the house was unearthed during archaeological excavations. Its wall paintings were then exposed to attack by masonry bees, which buried in to and ndermined the earth-based plasters and mud-brick support. To protect the ruined house and its wall paintings, the site was backfilled. This example illustrates both the unintended effects that unearthing can have on sites constructed from vulnerable materials, and the benefits of reinstating the original buried environment to re-establish stable conditions.

10.2.4.5.2. Re-Covering

A number of forms of total and partial re-covering are practiced in the preservation of archaeological sites and their component parts. Compared with other remedial interventions, these measures usually lack specific research, and knowledge of their advantages and disadvantages is largely based on empirical experience. Nevertheless, there is a growing body of evidence that such measures offer lasting (and economical) benefits. As with all remedial interventions, however, awareness of their risks and unintended adverse consequences is necessary.

10.2.4.5.2.1. Reburial/Backfilling

Reburial/backfilling can sometimes be the only conservation option that offers a chance of long-term preservation for archaeological sites and their components. It attempts to reinstate the original buried environment of an excavated site and re-establish more stable conditions. In a conservation context, reburial/backfilling is not simply throwing excavated material back into the excavated site, but is a planned process carried out to required technical specifications. It offers many potential benefits. It protects the site from a wide range of natural and man-made threats; it transfers the surface of deterioration from the original material to a body of 'sacrificial' non-original material; it is a flexible and reversible intervention, allowing all or parts of sites to be protected, and permits options for re-exposure at any time; it acknowledges the possibility that conservation in the future may develop and improve, allowing a site and its components to be revealed at a later date in an uncompromised state, when it an be more appropriately conserved. Overall, the process of 'mothballing' the archaeological fabric saves resources.

The design and implementation of reburial strategies must be carefully considered. Research and testing of materials and methods are necessary. The condition, type and extent of the material remains being covered will determine the nature of the fill materials that can be safely used, and also their methods of application. Specialist fill materials may need to be selected to suit specific circumstances, which may be employed in different sequences and/or as separators, both horizontally and vertically. The intended duration of the reburial will have an impact on the selection of fill material(s). The depth of the fill material has important implications for factors such as damaging moisture transfer and plant growth. Peripheral drainage measures are usually also necessary. Monitoring and maintenance are critical. In a majority of these technical considerations, the influence of **porosity** is a key issue.

Since reburial renders the site invisible, other concerns must be addressed too. Tourism potential is lost, and compensatory measures may need to be considered for those who are adversely affected by the intervention. Reburial intentions need to be effectively communicated to others who may be affected, either directly or indirectly (such as the scholarly community). Administrative considerations after burial include legal, security and safety concerns.

10.2.4.5.2.2. Capping

Coverings built over or applied onto exposed wall-heads in the practice known as **capping** are generally crucial for keeping rainwater out of ruined walls, and protecting them from other forms of environmental aggression. Site practice has witnesses the use of various combinations and types of covering materials, including new mud-bricks built up in layers over original brick walls, recreated masonry coping on top of stone-built walls, and the application of various types of plaster coverings. Since capping only partially re-covers archaeological ruins, the interface between the original and added materials is generally a vulnerable point of failure. Cracking/failure at this interface directs rainwater into the walls and also has the effect of concentrating water flow down wall faces, accelerating erosion. Issues of compatibility, stability, adhesion and porosity between the original materials and those used for covering them are critical to the success of capping procedures. Capping also needs to be viewed as a 'sacrificial' intervention requiring renewal: long-term efficacy and safety depends on monitoring and maintenance.

10.2.4.5.2.3. Re-Covering Single Site Features

Occasionally, single features at sites may be re-covered by a different set of procedures to provide them with protection from damage and deterioration. Examples include wall paintings and other decorated surfaces. Re-covering in this case does not depend on filling, as there is no surrounding structure to allow this, but is achieved by applying an additional covering layer (or layers). Similar criteria apply to this intervention as already discussed for reburial, with some notable additional considerations. The nature of the bond between the applied covering layer(s) and the original surface is of critical importance: avoidance of damage to the original surface is essential; establishing a similar porosity in the covering layers as in the original material is also crucial; and maintaining a bond that is both durable and reversible is necessary. Practically, these requirements are difficult to achieve, and as a consequence this intervention is rarely implemented.

10.2.4.5.3. Re-Adhesion [Including Injection Grouting]

Re-adhesion is the remedial intervention that addresses failure of the adhesive bond between coherent materials. It is primarily concerned with reattaching layers that have separated – or are separating – at their interfaces. These layers can vary from those within the stratigraphy of a wall painting, which can be a few hundreds of microns thick, to separated structural or geological components of considerable width. In both cases, the problem is treated by injecting an adhesive between the separated layers, and uniting the surfaces together. In the case of structural or geological re-adhesion, however, bulking agents are usually added to the adhesive, to form an **injection grout**.

In practical terms, and also with respect to some of the materials used, re-adhesion interventions can overlap significantly with **consolidation** treatments (see **section 10.2.4.5.4.**). This reflects the non-specific nature of the treatment: a material injected into a porous original material with the intention of performing a re-adhesive function may simultaneously act as a consolidant. This indicates some of the problems associated with re-adhesion. As an intervention that is concealed, the penetration and deposition of the adhesive material, its behavior in a multilayered porous structure, and the factors affecting its success or failure cannot be easily assessed. It is a treatment that potentially alters critical features in the original materials, such as porosity and strength properties, but is also effectively irreversible. Risks of failure and exacerbation of existing problems are therefore high. But because re-adhesion is regarded as an intervention that stabilizes conditions where loss is considered imminent, it is widely applied.

Factors and circumstances that must be addressed before undertaking re-adhesion are: establishing if the problem is ongoing and, if so, determining rates of failure and loss; understanding causes and activation mechanisms of adhesion failure; characterizing the problem in relation to original and added materials, and contaminants (such as salts);
understanding the problem in relation to the environmental context; and having a good knowledge of the chemical, physical and aging properties of the adhesive materials – which can be organic or inorganic, or a combination of both, and be dispersed in a number of different systems – and their potential effects in situ.

Re-adhesion is usually accompanied by repositioning of separated/separating layers. This requires an awareness of stress forces, and the tendency of separated materials to become irreversibly deformed, even after the stresses that contributed to their separation have been removed (ie, plastic deformation). One reason why re-adhered layers separate after treatment is that it is no longer possible for them to recover their original alignment. This factor is often overlooked in re-adhesion interventions, leading to inevitable failure.

10.2.4.5.4. Consolidation

Consolidation is a remedial intervention that is intended to address loss of cohesion within porous materials. Loss of cohesion between individual particles or small clusters of particles results in the problem of powdering or decohesion, a deterioration phenomenon that results in gradual disintegration and loss. The condition affects a wide range of materials including geological rock and built stones, plasters and renders (of gypsum, lime and earth), earthen bricks (fired and unfired), fired materials such as tiles, mosaics and wood. Consolidation aims to reestablish cohesion within porous, loosely bound materials by introducing a substance that acts as a replacement binder. Like re-adhesion, it is a common stabilization intervention, a treatment of first choice when conditions of disintegration are considered to be causing ongoing substantial loss. Consolidation (or re-cohesion) as an intervention overlaps considerably with re-adhesion, in terms of its nature, impact and risks (see **section 10.2.4.5.3.**): its effects are concealed and irreversible; treatment application and behavior are hard to assess; original material properties are altered; risks of failure and exacerbation of existing problems are high.

As with re-adhesion, factors and circumstances that must be addressed before undertaking consolidation are: establishing if the problem is ongoing and, if so, determining rates of loss;

understanding causes and activation mechanisms of decohesion; characterizing the problem in relation to original and added materials, and contaminants (such as salts); understanding the problem in relation to the environmental context; and having a good knowledge of the chemical, physical and aging properties of the consolidation materials and their delivery systems, and their potential effects in situ.

10.2.4.5.5. Cleaning

Cleaning can be considered a special case among the remedial interventions practiced in Egypt. It is one of the most popular and prevalent treatments carried out on Egyptian sites and monuments, since decorated and painted surfaces survive in great number and typically on a vast scale. The impact of cleaning is therefore disproportionately high. This merits major concern, since **cleaning is an irreversible action that has the potential to cause permanent harm.** Given these circumstances and implications, cleaning in relation to Egyptian wall painting is considered as a separate category in **section 10.2.6**.

10.2.4.5.6. Mitigating Salts

Although it is clearly preferable to **prevent** salt deterioration through eliminating causes, this is not often possible in an archaeological context: for example, salts in underground sites such as tombs are likely to be **autochthonous**, an **inherent characteristic** of the **geology**, and therefore ineradicable. **Passive measures** – which try to control the activation mechanisms of salt action – are also problematic and difficult both to determine and implement. Therefore, when salts are present in archaeological fabric, such as stone features and wall paintings, the most common **remedial intervention** is to try to remove them. This approach is usually both misconceived and potentially dangerous. Although there has been much scientific research of salts with respect to their origins, formation, transportation, accumulation, concentration and precipitation, comparatively little is understood about their action within porous materials, which has implications for remedial treatment.

The most common remedial treatment for salts is to attempt their reduction through **aqueous extraction**. This involves applying absorbent compresses (often known as 'poultices') soaked in water to salt-affected areas. Salts are removed in two stages: a wetting or penetration stage, whereby the compress introduces water into the porous, original material; and a drying stage, when the compress provides an absorbent layer into which water and dissolved salts migrate, after which the compress (and salts) are discarded. These remedial measures present a numbers of risks, meaning that at best they are not always very effective, and at worst considerable damage is done. The source of salts should dictate whether aqueous extraction is a viable (and safe) remedial option: if the salt source is inexhaustible, extraction is neither useful nor advisable. Even if salt sources are established to be localized and finite, aqueous extraction can lead to damaging redistribution of soluble ions within porous materials, usually at internal interfaces where future deterioration is more likely. Selective extraction of more soluble salts may leave behind a concentration of less soluble – and more damaging – salts, with unknown longer-term consequences. Use of aqueous compresses can damage water-sensitive and water-soluble original materials, or contribute to other damaging alterations. The absorbent materials used for forming compresses also pose risks, for example by introducing contaminants or causing contraction on drying.

Considering these risks, the remedial intervention should be governed by strict **performance criteria**, which include:

- knowledge of the original and added materials;
- knowledge of the salts and their distribution;
- no deleterious effect on the original materials;
- avoidance of potentially harmful redistribution of salts within the porous materials;
- avoidance of selective extraction of more soluble salts leading to enhanced deterioration;
- complete clearance of compresses and extracted salts; and
- monitoring of results.

Surveillance procedures during the treatment and assessment of both its short- and long-term results are generally inadequate, if carried out at all, heightening the numerous serious risks. In particular, knowing which soluble salts are present, and where in the porous structure (both topographically and stratigraphically) is problematic. It is not uncommon for aqueous extraction procedures to result in more and greater deterioration after their implementation.

10.2.4.5.7. Organisms

The conservation options for dealing with organisms are few: killing and/or removal. Both measures appear decisive and straightforward, but in reality they are complex and difficult to implement successfully. 'Killing' implies first that we know that biodeterioration is alive and active. But establishing the *status* of many forms of microbiology is not easy. Assuming there is an active problem, the option of 'killing' then implies that this is even possible. Since biodeterioration is driven by environmental factors, eradication is not a simple proposition. 'Removal' implies that this can be done safely (ie, without damage to original materials) and without risk of the problem returning. Again, achieving these outcomes is difficult and not always possible.

Conservation approaches for **micro-biological** deterioration demand specific expertise, both in the diagnostic and treatment phases. Species identification – the focus of most analytical efforts – is difficult to undertake, due to sampling and culturing inconsistencies. The more relevant issue for conservation is defining the *status* of microbiological deterioration. This is also problematic, since analytical approaches are usually based on culturing of removed samples. Microorganisms removed from their original context can cultivate new and unrepresentative organisms, while other organisms that could be present at the sample site may fail to develop under laboratory conditions. Misdiagnosis is therefore common, leading to treatment and retreatment cycles without clear understanding of the problem. Usually, treatment measures address symptoms rather than causes and activation mechanisms of microbiology, meaning that if the problem is active, its recurrence is also inevitable. The misdiagnosis and mistreatment of microbiology remain unresolved issues in conservation practice.

As with microbiology, combating **macro-biological** threats at archaeological sites requires specific diagnostic expertise, and the implementation of carefully considered preventive or passive conservation measures. The problems posed by bats and birds provide an instructive example. Bat and bird infestations are difficult and widespread problems in Egyptian monuments. Exteriors and interiors are often filled with roost sites, and their surfaces are streaked with faeces and urine, even after recent conservation and cleaning. Efforts to keep bats and birds out, such as placing screening over openings, are rarely sufficient and are poorly maintained, allowing re-habitation. Conservation approaches require multidisciplinary input and knowledge. In the case of bats, this can include mapping roost locations, carrying out behavioral surveys and species identification, and researching and establishing alternative roosting sites, forming a basis for effective bat exclusion policies.

10.2.4.5.8. Fills/Repairs

Fills and repairs are remedial treatments that compensate for losses in the archaeological fabric, in effect replacing missing features of the stratigraphy. They are made from various types and combinations of materials, including lime, gypsum and earth-based plasters (mixed with different types and proportions of aggregates), and whole building components (earth bricks, stone, etc.) that are bonded or mortared in place. Repairs are usually matched in some form to the nature and appearance of the surrounding original fabric. They perform non-structural and/or structural functions, depending on the size of the loss being filled, and the location and nature of the repair in the fabric. The function of the repair usually influences material choices. An example of a non-structural repair would be most repairs made in wall paintings. An example of a structural repair would be bricks mortared into the fabric to bridge a structural crack. The size and depth of repairs vary greatly, and this also influences material and application choices. Very large repairs – both in area and depth – are usually built up in layers, which can be of different materials and formulations.

Repairs are among the most common interventions made at archaeological sites, and are therefore usually done routinely without much consideration and planning. As a consequence, they frequently fail, having an adverse impact on weaker original materials. The juxtaposition of and bonding between original and added materials are critical issues for repairs, followed by matters of appearance. The primary concern is whether the repair will behave (perform) in the same way as the original material: attaining similar strength properties, density and porosity between the two are key factors; good adhesion and low shrinkage are also important for the durability of the repair. The fill material should not contribute contaminants to the original materials, an issue that must be considered both during and after application. Water is most often the fluidizer of repairs, and moisture release into original materials during application could be harmful: for example, if **autochthonous deteriogens** such as salts are present, or the original materials are themselves water sensitive/soluble.

Although making repairs is typically considered a simple procedure and is usually left to untrained workers, a wide range of criteria must be considered for the intervention to be done well and to avoid causing harm to original materials.

Example 9: Failing Repairs: Medinet Habu Temple, Luxor

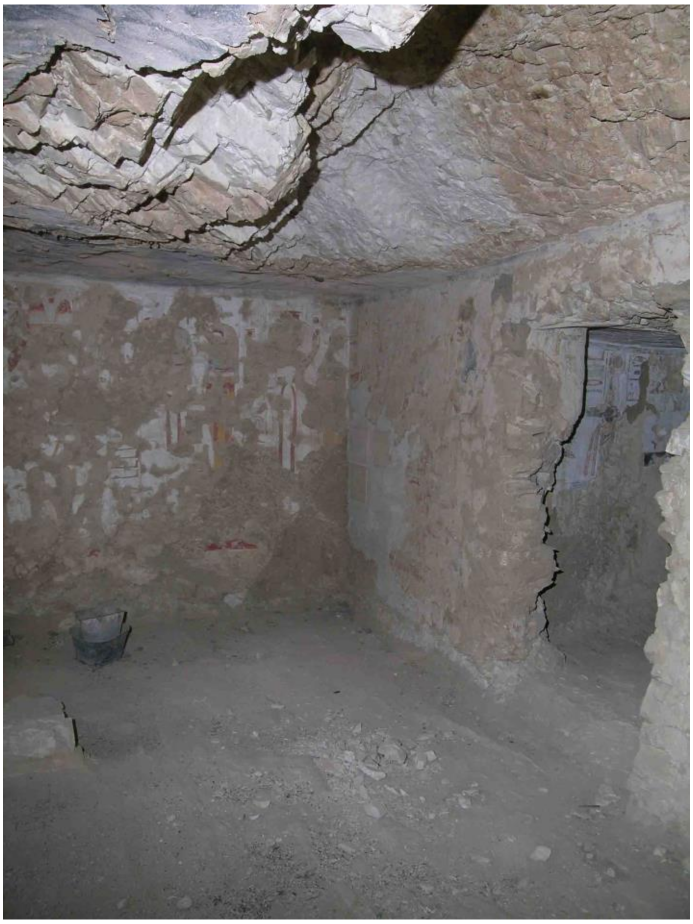
Conservation repairs fail for many reasons but very often causes are environmentally related. These images show a typical cycle of repair, failure and retreatment along the lower walls of Medinet Habu temple, where problems of capillary rise and salts are an ever-present threat. Repairs made within the zone of deterioration have repeatedly failed, and have had to be replaced.
To be more precise, failure and loss have occurred in the surrounding weaker original materials instead of in the stronger repairs. These circumstances demonstrate a number of key issues that are relevant to all remedial interventions. Crucially, they are not only ineffective when causes of deterioration are ongoing, but they also cause greater harm to weaker original materials under these conditions. We therefore need to anticipate failure of our interventions, and formulate them according to specific performance criteria. In the case of conservation repairs, appropriate strength properties are an important requirement (i.e., repairs should have similar strength properties as the original materials).

10.2.4.5.9. Structural Strengthening

Structural strengthening includes many types of intervention, which may be visible or concealed, integrated within a structure or added as a supplementary support system. Examples include pinning, bracing, anchoring, use of armatures and ties, built-in mesh reinforcement, buttressing, post and beam supports, and other supplementary supports in metal, stone, wood and other materials. Structural strengthening may also involve full or partial disassembly and reassembly of original components, and/or replacement of unstable components (see **section 10.2.4.5.10.**). The aim must always be to carry out the minimum intervention to render the monument safe (and retain its authenticity). Determining the least invasive options requires a reliable diagnosis of the state of damage, and how damage interacts with the performance of the structure in its context (ie, its environmental and geological/hydrological setting). Structural responses should not be viewed as a first course of action. Cracks in built and excavated sites are symptoms of stress release, which may or may not indicate risk. Unless cracking is judged an imminent danger, it should be monitored to determine whether it is progressive, and not simply the cyclical product of seasonal movement, or a manifestation of past settlement.

When it is carried out, structural strengthening of weakened archaeological monuments (both constructed and excavated) requires a multidisciplinary approach involving a variety of professionals and expertise (e.g., in structural engineering, architecture, rock mechanics, geology). Correct diagnosis could make the difference between deciding whether a collapsing wall requires rebuilding or can be stabilized using stainless steel ties; or whether cracked stone lintels require bonding with concealed pins or with visible metal supports, or whether limited restoration of lost building components offers a less visually intrusive alterative. Diagnosis requires knowledge of building statics (forces and loading, stress and strain, compression and shear, tension, fracture mechanisms) and depends on quantitative data. For built structures, it also requires an understanding of construction materials and techniques, taking into account the different layers that constitute the fabric.

Since malfunction and failure in strengthening elements usually leads to damage of weaker original components, the long-term behavior of added materials is a fundamental issue. This may not be a primary concern of those involved in diagnosing structural risk (e.g., structural engineers, etc.), who may be unaccustomed to working in an archaeological context, and whose structural recommendations may be motivated by different priorities. It may instead be the responsibility of the site administrator or custodian to highlight relevant conservation issues: the importance of compatibility and stability of materials; the performance characteristics required to ensure that original and added materials function well together. Lastly, the technical aspects of structural strengthening must be viewed in relation to their impact on the values and significance of the site (e.g., negative visual impact, obstruction of important features, effects on authenticity, etc.).



Example 10: Relating Structural Failure, Physical History and Original Technology: Tomb QV73, Valley of the Queens, Luxor

Fractured sedimentary rock deposits of shales, chalks, marls and limestones characterize the geology of the Valley of the Queens, leaving many of its tombs with inherent structural problems.

QV73 is one such tomb, in which a major rock-fault traverses the ceiling of its upper chamber.

Much of the painted ceiling had collapsed along this fault, leaving rock hanging precariously on either side. Risks of further rock collapse seemed imminent and major structural interventions were considered necessary.

Closer inspection, however, revealed that the fault preserved remains of ancient fill material that had been inserted into it during the tomb's original excavation: it is this material that had mostly collapsed, not the rock itself. This information from the physical history and original technology of the tomb's construction provided critical information for redefining risk. Despite the threatening appearance of the ceiling fault, it could be judged to be largely stable. The physical evidence indicated that no major associated rock movement had occurred since the tomb's construction. This diagnosis – which involved the expertise of structural engineers and geologists, but also knowledge of original materials – fundamentally shifted the focus of conservation efforts away from remedial intervention.

10.2.4.5.10. Replacement and Reconstruction

Replacement and reconstruction may be necessary for the stabilization of archaeological fabric. These measures involve returning a structure to a stable condition through the use of essential replacement components, and/or reconstructing damaged or missing components on a substantial scale. Full or partial disassembly and reassembly may be required during these interventions. A high level of impact to the site is involved. Risks of unforeseen circumstances and unintended consequences are considerable. The issues and potential problems involved in combining original and added materials encountered for other remedial interventions (re-adhesion, repairs, etc.) are magnified in scale (and risk). Replacement and reconstruction must therefore be approached with great caution.

Excessive replacement and reconstruction results in falsification, which must be avoided. When replacement and reconstruction overwhelm the original, the outcome is restoration not conservation. Defining boundaries between replacement/reconstruction as a conservation requirement or as an act of restoration may not be clear-cut and can be contested, however. The site manager and custodian must exercise considerable circumspection in overseeing these remedial interventions. Principles of preservation of significance and authenticity must guide decision-making. There is a responsibility to explore other conservation options if these principles are in doubt.

10.2.4.5.11. Maintenance and Monitoring

It is a truism of good conservation practice that regular maintenance and monitoring are the most important responsibilities of a site manager, and that they are more often than not neglected. Maintenance (maintaining drainage routes, clearing debris, making minor repairs, etc.) and monitoring (regular and verifiable checking of condition) are ethical and economical uses of resources because they prevent problems occurring, or alert conservation professionals to damage and deterioration at early stages of their appearance and development. Monitoring and maintenance should be integrated, to identify and address potential threats efficiently. The site knowledge that regular monitoring accumulates becomes a valuable tool for future site management. Importantly, maintenance and monitoring are measures that can be done successfully with minimal resources.

10.2.5. Evaluating Remedial Interventions

The diversity of original materials and the complexity of the types of damage and deterioration that they undergo are emphasized in this guide. So too are the pitfalls and shortcomings of all remedial interventions, which cannot of themselves address causes and activation mechanisms of adverse change, and which frequently result in more harm than good. Assuming appropriate preventive and passive measures have first been put in place, how do we ensure best practice in our remedial interventions, so that no harm is done?

Remedial problems are generally interrelated and inseparable, and our ability to direct interventions at specific problems is limited. Sequences of treatments may vary considerably, depending on the specific materials and conditions encountered. Generally, stabilization measures are done first, such as re-adhesion and consolidation; but it may not be possible, for example, to carry out a consolidation treatment through a dirty surface, which would also consolidate the dirt. Materials and methods for one intervention may affect another, so the interrelation between effects needs to be considered (such as consolidation and cleaning). Some interventions require particular conditions (such as a minimum temperature). In reality, remedial interventions are multiple and overlap in their application procedures and sequencing. Since application procedures and auxiliary materials also have an impact on original materials, they too have to be evaluated in relation not only to their ability to work but also their long-term effects.

It is not the task of site managers, custodians, and inspectors to implement remedial treatments, which is done instead by conservators. Nevertheless, those responsible for site management and preservation usually make key decisions about remedial interventions: they typically decide what is to be implemented, and what is not; they scrutinize conservation plans, and accept or reject proposed remedial interventions. Knowledge of the nature and impact of remedial interventions is therefore essential.

Too frequently remedial interventions are judged only on their **working properties** and short-term efficacy. **Working properties** refer to how remedial interventions function during their application stages. For a structural grout injected to secure collapsing rock in a tomb, for example, working properties would include its ease of preparation, ease of application ('injectability'), its initial rate of set/drying, and its ability to bond separated components straight away. While it is necessary for remedial treatments to 'work', it is their long-term performance that is more important. **Performance characteristics** refer to the properties and behavior of the intervention *after* it has been completed. For the example of a structural grout, its performance characteristics include: no physical or chemical alteration of the surrounding original materials; minimal volume change; good adhesion; similar porosity, water vapor permeability, mechanical strength and coefficients of thermal expansion as the original materials; no soluble ion content; durability and chemical stability; microbiological resistance; low density; and re-treatability. A majority of these performance characteristics are required of *all* remedial interventions, although variations also exist (eg, good adhesion is not a requirement of cleaning).

10.2.6. Cleaning of Wall Paintings in Egypt

10.2.6.1. Context

Wall paintings are a prominent feature of the surviving archaeological record in Egypt. The tombs and temples of ancient Thebes and Luxor, for example, preserve many thousands of square meters of wall painting. Many tomb paintings have been exposed to a wide variety of natural and human threats over millennia, including flood damage, salt deterioration, devastating fires, bat infestations and detrimental reuse, which have altered their condition and appearance in diverse ways. Temples preserve painted surfaces that are vast in scale and mostly exposed, and these too have undergone radical changes: blackening from effects of fires, for example, impedes the legibility of many painted monuments.

Cleaning is probably the most widespread remedial intervention carried out on such monuments, since it produces conspicuous visible results that appeal to administrators, managers and custodians who need to make sites attractive to visitors. Of all remedial interventions, cleaning demands particular scrutiny. **It is an irreversible action that has the potential to cause permanent harm.** Risks are high in the context of Egypt's wall painting heritage, given its vast scale and extent: dangers of causing irreparable harm on a monumental scale are all the greater. Those responsible for the care of painted monuments and sites should be aware of the full range of issues and risks involved in cleaning.

10.2.6.2. Definition and Nature of Cleaning
Cleaning is the removal of unwanted and insignificant, non-original material(s) from original surfaces. This definition implies that in carrying out cleaning we exercise the ability to distinguish 'unwanted' from 'wanted' materials, that we can safely separate non-original and original materials, and that we are able to make informed choices about significance and insignificance. In fact, these criteria are very often overlooked or misunderstood in cleaning interventions. Degraded original materials having significance can be mistaken for 'dirt' to be removed. Certain types of non-original materials – including 'dirt' itself – may carry significance. In a religious context, for example, obscuring layers that have accumulated through religious practices may be regarded as venerable, and should therefore be respected and preserved as part of the significance of the painting.

Situations such as these often lead to divided opinions about the role and impact of cleaning. Cleaning may be considered desirable even if it is not really necessary. If obscuring materials are causing harm to a wall painting, their removal performs a useful conservation purpose. This would be the case, for example, if the expansion and contraction of dirt in response to environmental fluctuations results in damage to and loss of vulnerable paint layers. More often than not, however, cleaning is carried out as a cosmetic measure, to improve the appearance of decorated surfaces. Arguably, this also contributes to preservation aims: an obscured wall painting is overlooked and neglected, leading to its damage and loss; a cleaned wall painting can be appreciated, and is therefore better cared for. Nevertheless, we should be careful of using these arguments to justify cleaning as a necessary measure, given the many serious and irreversible risks that are intrinsic to the intervention.

10.2.6.3. Original and Non-Original Materials
Cleaning involves separating added or acquired, non-wanted materials from original surfaces. A number of potential complications need to be considered. Distinctions between original and non-original materials are often unclear, both compositionally and stratigraphically. The degradation products of aged wall paintings may have the appearance of 'dirt', and can be mistakenly removed when they should be retained. In many cases, degradation products become an integral part of the wall painting's altered nature, and attempting their removal results in irreversible damage to original materials. Many wall paintings in Egypt are damaged and obscured by effects of fire and smoke blackening, circumstances which present particular cleaning issues. Blackening can be thought of simply as a problem of surface deposition, which can be easily removed by cleaning. But combusted original materials may also be incorporated in blackened surfaces, which therefore should not be removed. Immense harm can be done to wall paintings in trying to removed blackened covering layers which have not been properly characterized and understood. Sometimes a painting may be so deteriorated that it survives as a 'negative' image, partly defined by paint losses silhouetted by surrounding dirt. In these circumstances, cleaning can represent a risk to the survival of the image.

Even assuming that non-original materials can be correctly identified, separating them from usually vulnerable paint surfaces presents many risks. Wall paintings are made of porous materials and layers, which interact with their immediate environment. Dirt becomes absorbed into the porous structure of painted surfaces: both the physical and chemical boundaries between original and non-original materials become merged and indistinct, particularly for wall paintings that have been exposed to environmental deterioration. Rarely will 'dirt' be present as a homogenous layer, meaning that cleaning action can be difficult to control and result in uneven effects. Cleaning, therefore, can very easily become a damaging procedure, in which original materials are removed along with non-original materials. Since cleaning is usually judged by its appearance alone, which can be misleading, damage is often not even recognized.

10.2.6.4. Recognizing Vulnerability of Paint Materials
Aged wall paintings usually exist in weakened and altered states. Their original materials – plaster and preparatory layers, sealants, paint layers and glazes composed of inorganic and organic materials applied in various types of binding agents, and original coatings and varnishes – are capable of undergoing diverse changes, rendering them vulnerable to damage from cleaning materials and

procedures. Some original materials may remain as hardly visible traces. Degraded organic components can leave trace evidence of their original extent that is not even visible in normal light. These are not unusual conditions for exposed wall paintings, making them particularly vulnerable to damage and loss. Environmental exposure often leaves wall paintings with patinas and stains. These can be the product of various phenomena, including sulfation, other forms of pollution and contamination, and oxalate formation. But these features can also incorporate degraded or reduced components from original paint layers.

Recognizing the diversity and vulnerability of original materials and their changed states is an essential consideration of cleaning, which is all too often neglected. Damage can remain unrecognized too, meaning that risks are ignored. For Ancient Egyptian wall paintings, the dangers are particularly high. The known palette comprises only six principal colors – white, black, red, yellow, blue and green – achieved by use of a narrow range of pigments. Ancient Egyptian wall paintings are therefore considered to be technically uncomplicated, a misconception that leads to their irreparable damage through inadvisable and inexpert cleaning. In fact, subtle pigment choices (and their preparation) and sophisticated paint application procedures were used to convey both naturalistic and symbolic effects. Pigment texture, brightness and purity, and selective matte and glossy effects, are important aspects of wall painting techniques, communicating important religious beliefs. These features, executed using easily damaged materials and procedures, are easily overlooked, especially if they survive in altered or reduced states, which is not unusual for exposed wall paintings. Cleaning represents a serious threat to the understudied material integrity of Ancient Egyptian wall paintings.

10.2.6.5. Cleaning Agents and Their Action

There are many types of cleaning materials and procedures, which are employed singly or in combination. They include direct mechanical cleaning, using tools such as scalpels and brushes; chemical cleaning with solvents, reagents, enzymes, chelating agents, and detergents and surfactants; and so-called ‘non-contact’ methods such as radiation (laser cleaning), ultrasonic vibration and compressed air. A wide variety of auxiliary materials are used to help apply or deliver cleaning agents (eg, absorbent materials, such as gels and cellulose poultices). Both the materials that do the cleaning *and* their delivery systems have the potential to cause damage (eg, many delivery systems leave harmful residues). Additionally, when auxiliary materials are used, the cleaning action is not usually visible to the operator, and control over cleaning levels is therefore a risk factor.

Cleaning makes use of the physical and chemical differences between unwanted and original materials in order to separate them. Claims are made that cleaning can be discriminating and targeted in its effects. But *no* cleaning procedure is entirely specific in its action, and non-original *and* original materials will always be affected in some way. Usually too, there are also significant similarities between the unwanted and original materials, meaning that cleaning agents selected to remove ‘dirt’ will also affect the wall painting. There are potential problems of harmful residues and prolonged action, even for cleaning materials that are considered volatile. Adverse effects within paint layers can continue long after cleaning has finished. Cleaning materials may activate deteriogens such as soluble salts, setting up irreversible cycles of damage. These effects may not even be noticeable, but can occur on a micro-level, eventually leading to the breakdown of original materials. It is important to recognize that detrimental impacts of cleaning may therefore be both delayed and not detectable to normal viewing. The safety of cleaning interventions cannot be judged by their visible appearance alone, although this is usually the most commonly applied criterion.

10.2.6.6. Effects of Other Conditions

Wall paintings that are cleaned rarely exist in a state in which they are not also affected by other conditions. The stability of the paint layer may be weakened by numerous types of ongoing deterioration, such as disruption by salts. Flaking and powdering of the wall painting may be extensive. Other deterioration could be active and ongoing. The condition of the painting may also vary from one location to another, and these effects will not be entirely predictable. The presence of a variety of non-original materials can complicate cleaning procedures and outcomes. Additional remedial treatments, such as fixing and consolidation, may be required before cleaning can commence, and these interventions will also be influential on cleaning action. Assessing the full extent and nature of other conditions affecting the painting will be difficult if they are concealed by 'dirt' that is opaque and intransigent.

10.2.6.7. When Is It Safe to Clean? How Can Cleaning be Done Safely?

As with other remedial treatment interventions, it will not be the site administrator or custodian who carries out cleaning. But he/she will probably be instrumental in making decisions about whether it happens or not, requiring an understanding of the conditions and circumstances that make the intervention too risky to be implemented. The first and most important criterion is to know when cleaning should *not* be done. This presumes knowledge of the current condition of the painting; of its physical history and rates of deterioration; of its original and added materials, and their interaction with each other; and of the effects of proposed cleaning materials and procedures on original materials. Specific expertise may be required to address these issues, and different types and levels of investigation, depending on individual circumstances. But it is the site manager's responsibility to recognize what additional knowledge and input are required in order to make appropriate decisions about cleaning. If appropriate expertise and knowledge are not available, the responsible decision is *not* to clean: the potential risks of causing permanent harm must outweigh other considerations regarding the unverified desirability of cleaning.

If a thorough risk assessment establishes safe parameters for cleaning, the safety of the intervention is then governed by a number of required criteria. First, there must be minimal physical and chemical alteration of the original materials. This acknowledges that *all* cleaning procedures cause some change in original materials, and that the intervention must be carefully carried out and closely scrutinized to maintain appropriate safety levels. Second, there should be no activation of new deterioration (such as activation of salts). Third, cleaning procedures and materials (including auxiliary materials) should leave no damaging residues. Fourth, the results of cleaning should be homogenous. In practice, this may be difficult to achieve in full, due to pre-existing differences in condition and technology that cleaning will expose. However, an overall level of visual unity is an essential requirement. Last, since cleaning is an irreversible action, the principle of **retreatability** is critically important: cleaning should not chemically and physically alter painting materials so that future treatment options are prevented or become very limited.

These are demanding criteria that are difficult to ensure. It can be difficult to obtain reliable quantitative and qualitative data from real paintings about the effects of cleaning. No standard methods of assessment exist, and judgements are often made subjectively. It is nevertheless the site manager's responsibility to be aware of the many issues involved in cleaning, and be ready to exercise restraint.

Example 11: Conditions That Influence Cleaning Decisions:
Tomb QV74, Valley of the Queens, Luxor

Wall paintings in ancient tombs in Egypt are often concealed by blackening, resulting from effects of fires. Tomb QV74 is a typical example, as shown in these images. Blackened paintings are seen as candidates for cleaning. In such cases, the changed condition of the painting must be seriously considered, before deciding if cleaning is a safe option. In QV74, for example, close examination reveals that the paintings are not only blackened, they are also radically altered by heat damage: areas of yellow pigment have chemically changed to red, under the influence of intense heat. Such evidence should indicate that the condition of the painting is too vulnerable to allow for its safe cleaning. Given the alterations the painting has undergone as a result of heat damage, it is also unlikely that its appearance would in fact be significantly improved by cleaning. These are some of the issues that need to be evaluated in approaching questions of cleaning in these situations.

10.2.7. Planning for Conservation

It may seem strange to place this section – planning for conservation – at the end of this guide. But it only by acknowledging the diverse nature of Egypt's archaeological sites, the many and complex threats to their survival, and the numerous difficulties and pitfalls involved in their treatment – which can often result in more rapid decay afterwards – that we can arrive at an understanding of how best to plan for safe and effective conservation. Most of this guide has concentrated on the problems and difficult decisions that conservation administrators and managers have to confront in their professional roles. This final section provides an approach for dealing with these issues.

10.2.7.1. Understanding and Expertise

A common mistake of those tasked with the care and conservation of archaeological sites is to initiate decision-making with a physical response, before information is known about the nature of the problem and how to address it. Effective conservation decisions are the result of good planning, underpinned by appropriate understanding and expertise. Throughout this guide, the multidisciplinary and specialist nature of the problems that site managers and administrators need to decipher and understand has been a constant theme. Each area of adverse change – salts, moisture, biodeterioration, structural decay, inherent geological risks, light-induced alterations and effects of pollution – demands particular expertise, not only in the diagnosis phase, but also in determining and implementing appropriate conservation measures. All this requires the input of multiple competencies. The role of the site administrator is to identify and manage appropriate knowledge and expertise, and to structure a logical and informed decision-making process based on acquired information.

10.2.7.2. Incremental and Iterative Approach

Conservation planning is constrained by available resources, which will rarely be adequate let alone abundant. This does not diminish the integrity of the process. Conservation planning is not a linear process, but is based on gathering information, developing hypotheses, clarifying and checking hypotheses, conducting further investigations to modify the assessment, and interpreting all the results. This incremental and iterative approach to decision-making 'recognizes that complex problems are best tackled in stages'. This is a valid process precisely because it is a responsible use of scarce resources.

10.2.7.3. Diagnostic Components

There are various recognized components of the conservation planning process. It must begin by establishing the **significance values** of the site, which are usually multiple and are not fixed (see

section 10.2.2.4.1). Since conservation decisions can alter significance, defining and respecting these values from the outset are of fundamental importance. Usually, significance is ensured within the **legal and legislative context** of archaeological sites, but since it is also a mutable concept, expertise and input from various experts and stakeholders may be additionally required.

Conservation planning is undertaking on the assumption that there is a problem to solve. In our context, this usually means the imminent risk of loss of original material. Our task is to verify the nature and urgency of risk, and to determine appropriate conservation measures based on acquired and assimilated data. To make informed decisions, it is essential to understand the original and present (ie, altered) condition of the archaeological fabric. This requires reconstructing the passage of time by assembling a **physical history** (see **section 10.2.2.4.4.**). This compilation of information on condition over time allows a preliminary understanding of the history of adverse change, including possible causes. Archival images, conservation reports and other evidence may assist understanding of the **rate of change** and of the possible failure of previous interventions. Features that appear to be alarmingly deteriorated often turn out to have been in much the same condition over a long period. This knowledge is therefore crucial to understanding the seriousness and rate of deterioration.

If a preliminary hypothesis is formed that deterioration is ongoing, the next step is to understand the **rate of loss**. Useful ways of evaluating this are by visual monitoring of selected areas (eg. by repeatable imaging and/or graphic documentation) and collecting fallen material (eg, paint flakes) over a determined period of time. Compiling basic information on prevailing conditions and site usage during the monitoring period will help to define preliminary hypotheses. The monitoring period will be determined by resources, and by the rate and frequency of the loss of original material, as predicted on the basis of collected information. Understanding the rate of loss will help define conservation requirements and their urgency. It should be emphasized that this type of monitoring can be done effectively with very few resources.

The next step is to characterize the physical manifestations of the problem in a **condition assessment**. It is important not just to define the various forms of adverse change, based on careful observation and characterization of their physical phenomena, but also to evaluate their spatial distribution, and to relate this data to information compiled in the **physical history**. A useful method of characterizing and categorizing different types damage and deterioration is through the compilation of a **visual glossary**. In a visual glossary, each condition is defined, described and imaged. It is generally important that the definition does not designate a cause to the condition, so that inaccurate conclusions are not made too early in the diagnostic process. Sometimes, however, this will be unavoidable. **Graphic documentation** is used to help visualize the topographic distribution of condition phenomena. Although also primarily concerned with effects rather than causes, in allowing a comparison of the spatial relationship between different conditions, it assists in forming hypotheses about causes and activation mechanisms of adverse change. It therefore functions as a management and planning tool, and may also provide quantitative data for monitoring purposes.

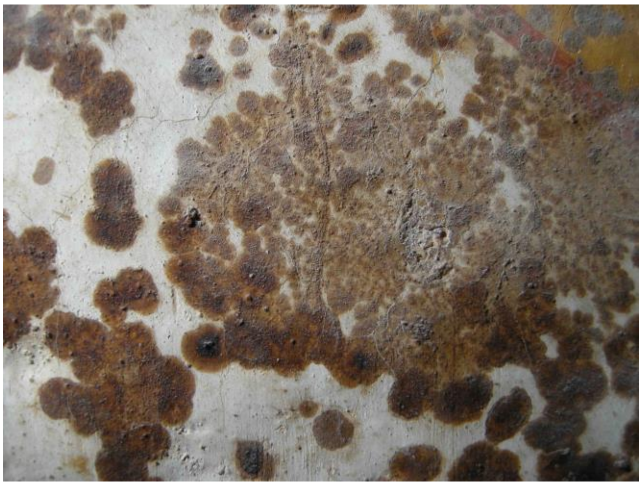
Once the symptoms of our problems have been defined on a **phenomenological** basis, we can then develop hypotheses about their causes and potential risks. This requires an integrated approach, drawing on a range of disciplines and expertise. Further research and investigations are usually necessary, to test and verify hypotheses. This process of **diagnosis** adopts a step-by-step analysis of the current condition to

determine probable causes of adverse change. These steps are not predetermined, but are modified and defined by findings and outcomes of each preceding step. This iterative approach to conservation is the best way to determine causes of ongoing problems so that the most appropriate **preventive**, **passive and remedial measures** are selected to address them.

Example 12: Biodeterioration: A Diagnostic Case Study: Tomb of Tutankhamen (KV62)

The tomb of Tutankahem is probably the most famous in Egypt, owing to the unrivalled wealth of treasures discovered within by Howard Carter in the 1920s. Fame has made the tomb a destination of mass tourism, prompting dire but largely unfounded claims of the deterioration of its burial chamber wall paintings. A major concern is the perceived threat to them from their contamination with dark brown spots, which are usually described as being a fungus. Already present when Carter opened the burial chamber, they are apparently without parallel in other tombs. It is widely reported that rising visitor numbers are promoting their growth, and several biocide treatments of this 'active' problem have been carried out since the late 1980s.

In fact, there is no convincing evidence to support this viewpoint or justify the consequent interventions. Although the potential environmental impact of mass tourism on the paintings is a valid concern, reliable data on both visitor numbers and their influence were lacking; and a comparison of present condition with historic photographs had not been carried out to demonstrate that the problem was ongoing. But making this link between physical history and present crucially shows that the brown spots are unchanged since at least the date of the tomb's discovery. As part of a major project of Egypt's Ministry of State for Antiquities (MSA) and the Getty Conservation Institute (GCI), wide-ranging scientific data have now been collected on the microbial and chemical nature of the brown spots. Results confirm for the first time that the spots are microbial in origin, some thousands of years old, and no longer viable. There is, then, no need to treat the problem as an active one. Indeed, to attempt now to remove the brown spots would cause great damage to the paintings. This case study illustrates how misdiagnosis can result in mistaken treatment interventions, and emphasizes the importance of considering physical history in determining risk and arriving at the correct diagnosis of a 'perceived' problem.



10.2.7.4. Final Remarks

The analogy between conservation and medicine is made so often that it has become a cliché, but it is relevant when interrogated seriously. A doctor must acquire, for example, an extensive knowledge of anatomy and of pathogens, the processes through which the two interact, their various manifestations, the extent to which they are harmful, and how, if at all, they should be treated. The medical records of the patient also need to be taken into account to determine the overall state of health and to inform approach. Collectively this information might lead the doctor to advise rest, or to stop smoking, rather than resorting to drugs; judgements may be required about whether a patient is out of physical danger, or too weak to undergo treatment.

The site administrator's role needs to be just as rigorous and multifaceted, since it is crucial to learn how to recognise and identify the many causes and activation mechanisms of adverse change, their effects on original materials and technologies, and to apply this knowledge to individual situations informed by physical history. This knowledge allows the site manger to make informed judgements on what should, or should not be done – this may for instance lie in evaluating the role of environmental factors, when some form of passive or preventive adjustment may be required rather than remedial treatment; or it may involve assessing the physical capacity for the archaeological site to withstand treatment. Conservation, like medicine, is therefore a series of knowledge-based evaluative processes, rather than a recipe-book of treatments.

10.2.8. Brief Reading List

The literature on approaches to the conservation of archaeological sites is considerable and continues to expand. Only a few recent major references are listed below, in order of publication date (most recent first):

Pedelì, C. and Pulga, S., **Conservation practices on archaeological excavations: principles and methods**, trans., E. Risser, Getty Conservation Institute, Los Angeles, California, 2013.

Sullivan, S. and Mackay, R. eds., **Archaeological sites: conservation and management**, Getty Conservation Institute, Los Angeles, California, 2012.

Agnew, N., and Bridgland, J., **Of the past, for the future: integrating archaeology and conservation, proceedings of the conservation theme at the 5th World Archaeological Congress, Washington, D.C., 22-26 June 2003,** Getty Conservation Institute, Los Angeles, California, 2003. [http://www.getty.edu/conservation/publications_resources/pdf_publications/of_past_for_future.html]

Teutonico, J. M., and Palumbo, G., eds., **Management planning for archaeological sites**, Getty Conservation Institute, Los Angeles, California, 2002. [http://www.getty.edu/conservation/publications_resources/books/mgmnt_planning_arch_sites.html]

Unfortunately, very little relevant literature is currently available in Arabic. However, ground-breaking work on Islamic views on the conservation of cultural heritage, on Arabic terminology for conservation, and the translation of conservation literature from English into Arabic is being carried out by Dr Hossam Mahdy [http://eamena.arch.ox.ac.uk/team/dr-hossam-mahdy/]. His working document **Arabic glossary for the terms of conservation for cultural heritage, with English equivalents** provides an essential means for communicating conservation concepts in Arabic, and can be downloaded from: http://www.iccrom.org/ifrcdn/pdf/ICCROM_16_ATHARGlossary_en-ar.pdf

Cultural heritage charters and guidelines that aim to establish coherent and defensible approaches to the conservation of archaeological and historic sites have proliferated both internationally and nationally since the early 20th century. These efforts represent developments in philosophical approaches to in situ conservation in response to increasing and changing threats to cultural sites. Therefore, it is useful here to cite the most up-to-date and comprehensive example. This is the **China Principles** project, the development of a set of national guidelines for cultural heritage conservation and management for China, first issued in 2010 (revised 2015). Although country-specific, its succinctly expressed principles and guidelines are entirely applicable to site management issues elsewhere. This can be downloaded at:
http://www.getty.edu/conservation/publications_resources/pdf_publications/china_principles_revised_2015.html

10.2.9. Acknowledgements

I am most grateful to Dr Kent Weeks for recognizing the considerable need for a basic guide setting our principles and approaches for the conservation of Egypt's archaeological monuments, and for providing me with this opportunity to try to address this challenging and wide-ranging task. The contents owe much to the work of others who, over many years, have considered in greater depth the difficulties and issues relating to site preservation. I am entirely indebted to Professor Sharon Cather for the lucidity of her thinking in formulating and articulating approaches to conservation theory and practice. For site preservation issues, I draw heavily on major contributions to this field made by Dr Neville Agnew and Dr Martha Demas, as exemplified in the China Principles project, the development of a set of national guidelines for cultural heritage conservation and management for China, first issued in 2010. The entries on re-adhesion and consolidation are based on the research of Amarilla Rava and Sibylla Tringham, respectively. I have great pleasure in acknowledging Lori Wong, who has been my fellow traveller in considering and tackling site preservation issues in Egypt since 2006. Lastly, I thank my wife and partner conservator, Lisa Shekede, who has been my personal and professional mainstay.

Chapter 11

Publication.

11.1.
The EAD will be published online as a website in the public domain. It will be linked to www.thebanmappingproject.com, which provides detailed information on ancient Thebes and the Valley of the Kings, areas not addressed in the EAD. The website will provide instructions for use, particularly for searching, in the form of a *Users' Guide.*

The EAD team will regularly update the web site, and additional archaeological sites and missing data for existing sites will be added through "crowd sourcing," soliciting through the website comments and additional material from the EAD's knowledgeable audience of Egyptologists and other experts. Only the EAD staff will be able to update the database directly, and they will review suggested additions and changes before implementing them.

It bears repeating that the EAD will be published in both English and Arabic. This bilingual format is essential if Egypt's archaeological sites are to receive the care and protection they require.

Chapter 12

Theban Mapping Project / Egypt-Wide Archaeological Database Staff

12.1.

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