

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
IMPROVEMENT OF THE SURROUNDING AREA OF
THE VALLEY OF THE KINGS
IN
THE ARAB REPUBLIC OF EGYPT**

October 2004

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

YACHIYO ENGINEERING CO., LTD.

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PREFACE

In response to a request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a basic design study on the Project for Improvement for the Surrounding Area of the Valley of the Kings in the Arab Republic of Egypt and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Egypt a study team from May 9, 2004 to June 5, 2004.

The team held discussions with the officials concerned of the Government of Egypt, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Egypt in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the teams.

October, 2004

Seiji Kojima

Vice-President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

October, 2004

We are pleased to submit to you the basic design study report on the Project for Improvement for the Surrounding Area of the Valley of the Kings in the Arab Republic of Egypt.

This study was conducted by Yachiyo Engineering Co., Ltd., under a contract to JICA, during the period from May, 2004 to October, 2004. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Egypt and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

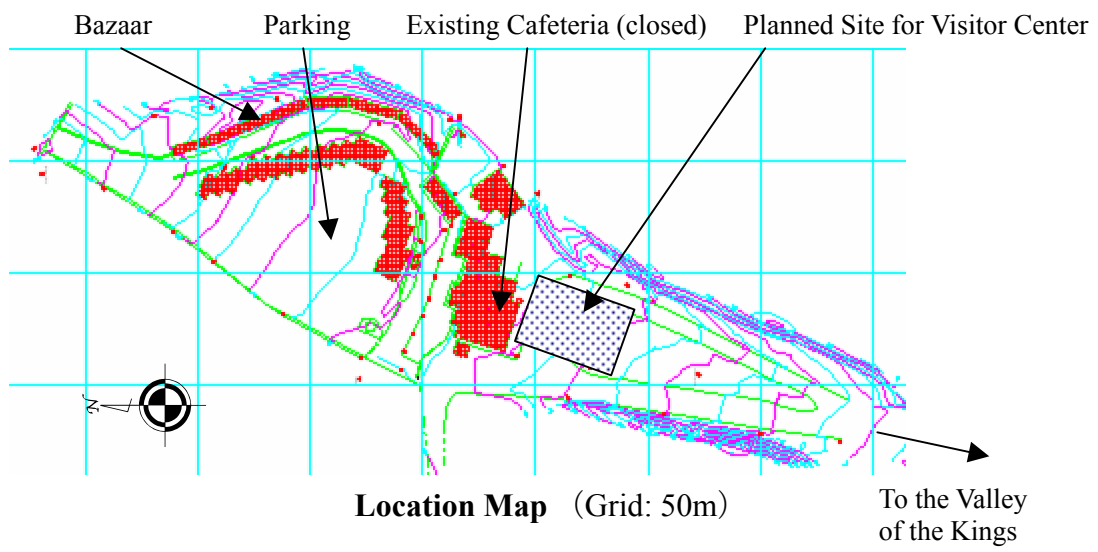
Naoyuki Minami

Project Manager,

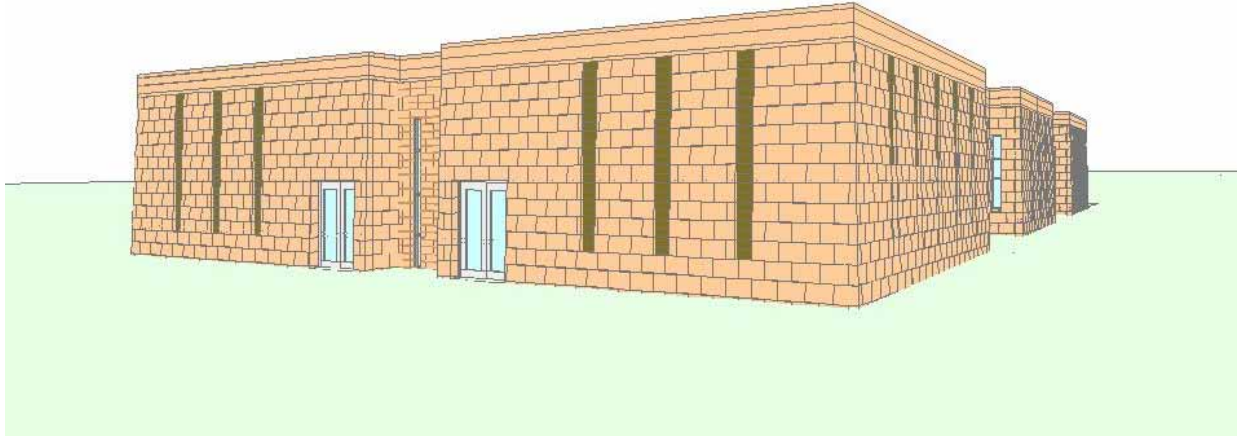
Basic design study team on the Project for
Improvement for the Surrounding Area of
the Valley of the Kings

in the Arab Republic of Egypt

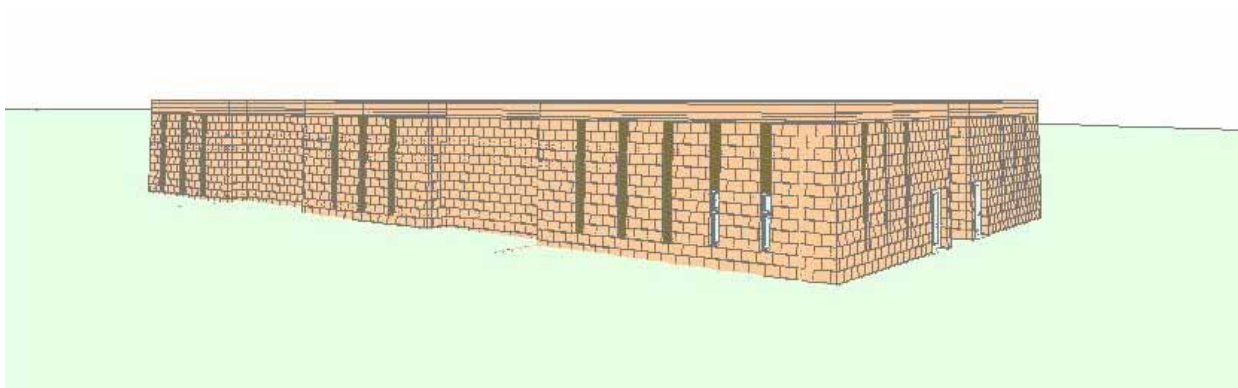
Yachiyo Engineering Co., Ltd.



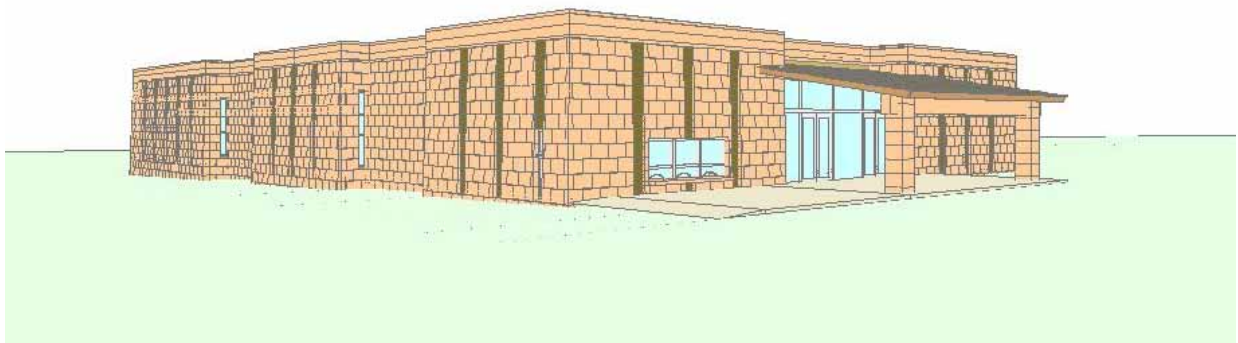
View of the Planned Site from the south
 (From the point 1 in the above location map)



Visitor Center from North-West side



Visitor Center from high point on North-East side



Visitor Center from South-West side

**THE PROJECT FOR IMPROVEMENT OF THE SURROUNDING AREA
OF THE VALLEY OF THE KINGS**

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Abbreviations

Abbreviation	English
ADL	Alexandria Datum Level
A/P	Authorization to Pay
AUC	The American University in Cairo
AV	Audio Visual
B/A	Banking Arrangement
CDCL	The Comprehensive Development Plan of the City of Luxor
GPS	Global Positioning System
EAIS	Egyptian Antiquities Information System
E/N	Exchange of Notes
HCLC	Higher Council of Luxor City
JICA	Japan International Cooperation Agency
LE	Egyptian Pound
MHUUC	Ministry of Housing Utilities and Urban Communications
M/D	Minutes of Discussions
OA	Office Automation
PC	Personal Computer
RC	Reinforced Concrete
SCA	Egyptian Supreme Council of Antiquities
TMP	Theban Mapping Project
UNDP	United Nations Development Program
UNESCO	United Nations Educational Scientific and Cultural Organization

SUMMARY

SUMMARY

The Valley of the Kings is situated on the west bank of the Nile in Luxor (hereinafter referred to as the “West Bank area”) located some 670 km from Cairo, the capital of the Arab Republic of Egypt (hereinafter referred to as “Egypt”), and is also used to describe a group of tombs of ancient Egyptian pharaohs. Luxor was once Thebes, an ancient capital of Egypt circa 2040 BC in the 11th Dynasty of the Middle Kingdom. The prosperity of Thebes peaked around 1565 BC when it once again became the capital in the 18th Dynasty of the New Kingdom and its period of prosperity lasted for some 200 years. Around 1520 BC, Tutmosis I created the first tomb in a dry valley located at the foot of a pyramid-shaped mountain called Al Qurn. The construction of many tombs followed until around 1070 BC, the time of Rameses XI of the 20th Dynasty. The Valley of the Kings consists of the East Valley with 58 tombs (rock caves) and the West Valley with four tombs, totalling 62 tombs, all of which are numbered. Many burial accessories have been found from these tombs and the colourful wall paintings are extremely important heritage of the world’s first class as they reflect the religious beliefs, lifestyle and art of the ancient Egyptian dynasties. The West Bank area also hosts many scattered cultural heritage sites, including the Valley of the Queens, Tombs of the Nobles, Deir el-Bahari, the Ramesseum and the mortuary temple of Rameses III at Medinet Habu. In 1979, Ancient Themes with Its Necropolis was inscribed as a World Heritage Site by the UNESCO.

In the Valley of the Kings, many underground tombs constructed some 3,000 – 3,500 years ago are scattered over a wide area and it is difficult for visitors to obtain a picture of the entire site. A precise understanding of the site is made even more difficult by the fact that the tombs of the kings are constructed underground, thereby having no external shape. Despite this difficulty, there are no adequate facilities at the site to provide vital information on the Valley of the Kings. Visitors have to walk to the entrance of each tomb in the scorching sun. Even though guides are prohibited from explaining the tombs inside the tombs, there are no adequate facilities where explanations can be made in the shade or where visitors can rest. As these tombs are open to the public, prevention of any further deterioration is an urgent task as they are being damaged by hand contact by visitors, camera flash and high humidity caused by the breathing of many visitors. At present, five tombs of the kings are either being excavated or restored while more than 30 tombs require excavation or restoration. The limited facilities to publicise the situation of the work in progress and the importance of these tombs means that the public have no knowledge of these issues. Against this background, the Government of Egypt requested the Government of Japan’s provision of grant aid for the construction of a visitor centre and the necessary equipment for the purpose of providing information on the Valley of the Kings, thereby contributing to the preservation and utilisation of this important cultural heritage.

In response to this request, the Government of Japan decided to conduct the Basic Design Study and the Japan International Cooperation Agency (JICA) dispatched the Basic Design Study Team to Egypt from 9th May to 5th June, 2004 to confirm the contents of the request and to conduct a site survey and other related field work. On its return to Japan, the Basic Design Study Team analysed the gathered information and compiled a report outlining the Basic Design. The same team was then dispatched to Egypt from 20th August to 1st September, 2004 to explain this report outlining the Basic Design to the Egyptian side. The present Basic Design Study Report has been compiled, incorporating the results of a series of visits to Egypt and the work conducted in Japan. The principal purpose of the Basic Design Study is to study the present conditions of the proposed project by the Government of Egypt in order to examine the contents and outcomes of the project and the relevance of the project to the grant aid scheme of the Government of Japan.

The project aims at assisting the active utilisation and conservation of the cultural heritage at the Valley of the Kings through the construction of a visitor centre providing information on the Valley of the Kings and the provision of the necessary equipment.

The planned visitor centre is conceived as a facility through which all visitors to the Valley of the Kings will pass to and from the Valley. It consists of exhibition and information halls without partitions to provide information on the Valley to visitors and the auxiliary facilities include an administration office and toilets, etc. The functions of the exhibition and information halls will be duly performed with the use of information boards informing visitors of what they should be aware during their visit to the tombs, a topographical model of the Valley of the Kings and various information panels (maps, drawings, photographs and descriptions, etc.) In particular, the topographical model placed in a central position in the building will allow visitors to understand the locations of the underground tombs, etc. at a glance. Moreover, the environment for visitors to the Valley of the Kings will be much improved.

The planned visitor centre consists of rooms of the following sizes and functions.

Room	Floor Area (m ²)	Main Functions
Exhibition and Information Halls	663.0	The space is to provide visitors with easy to understand information on the Valley of the Kings using panels, models, photographs and videos, etc. The central corridor with ramps will be wide enough for visitors to pass each other and a transparent topographical model of the Valley of the Kings will be placed in the central position. Remodelling will be easily conducted because of the absence of any partitions.
Reception and Back Room	32.8	The reception desk will be constantly manned to provide information and for monitoring purposes. The projectors and other equipment will be stored in the back room.
Administration Office	41.0	The office is responsible for the operation and maintenance of the visitor centre.
Ticket Office	24.6	The existing ticket office for the Valley of the Kings is a simple shed and is due to be demolished. Tickets to the Valley of the Kings will be purchased from the new ticket office before boarding the tram.
Toilets	57.4	The toilet will be provided for visitors, the number of which is estimated to be 1,400/hour during maximum peak times.
Security Area	126.6	The security checking of visitors will be necessary prior to their entry to the main building. Four X-ray machines will be installed by the Egyptian side.
Vestibule	24.0	The vestibule is located at the south entrance to enhance the efficiency of the air-conditioning.
Entrance Porch	40.0	The entrance porch will be introduced to prevent any adverse impacts of sunlight and wind inside the building.
Gross Floor Area	1,009.4	Gross floor area of the visitor centre, including that of the entrance porch and others.

On the Egyptian side, the Supreme Council of Antiquities (SCA) will be responsible for project implementation as well as the operation and maintenance of the visitor centre. The Egyptian side will also be responsible for the information service, exhibitions and security at the visitor centre. As the SCA has much experience of the construction, operation and maintenance of existing visitor centres at other archaeological sites as well as museums, no specific problems are anticipated in these aspects for the implementation of the project. The maintenance cost of the new facilities to be constructed under the project is estimated to be approximately LE 300,000 a year. As this is less than 10% of the SCA's maintenance budget for FY 2002/2003 of LE 3.62 million, this extra maintenance cost is within the budgetary capability of the SCA. The West Bank Antiquities Department of the Central Department of Upper Egypt and Luxor (Oasis) Antiquities, SCA, which will be responsible for the operation and maintenance of the new visitor

centre, employs some 273 persons and is judged to have sufficient organizational as well as manpower strength to provide 6 – 9 new staff members to operate and maintain the visitor centre.

If the project is implemented with grant aid provided by the Government of Japan, the total project cost is estimated to be approximately ¥273 million (Japanese portion of ¥261 million and Egyptian portion of ¥12 million). It is estimated that the project will require some 15 months to complete, including the period for the detailed design and the construction of the planned facilities.

The implementation of the project is expected to have the following direct and indirect effects.

[Direct Effects]

- Information easy to understand on the Valley of the Kings will be provided for an estimated number of visitors of more than two million a year through a topographical model, various exhibits and video displays, etc.
- The view around the car park situated at the approach section to the Valley of the Kings will be improved.
- Understanding what to do or what not to do inside the tombs, visitors will behave in an appropriate manner while visiting the tombs.

[Indirect Effects]

- Up-to-date information on the state of restoration of the tombs will be provided to meet the demands of individual visitors for detailed information on the Valley of the Kings.
- Spaces for visitors to rest will be provided.

The implementation of the project will improve the environment for visitors to the Valley of the Kings as described above and will have the effect of “improving the preservation conditions of the cultural heritage at the Valley of the Kings and enhancing the recognition of the value of this cultural heritage”.

Given the facts that the project will have the great effects described above and will contribute to improving the preservation and utilisation of the cultural heritage at the Valley of the Kings, the provision of grant aid for part of the project is judged to be relevant to the purpose of Japan’s grant aid scheme for cultural heritage. The manpower strength and technical standard on the Egyptian side are judged to be sufficient for the proper operation and maintenance of the planned facilities.

It is judged that the project will be more smoothly and effectively implemented if the Egyptian side (i) secures sufficient manpower and budget to maintain the building and equipment of the visitor centre and (ii) properly manages the exhibitions, including the exhibits and video software, etc. at the visitor centre to provide up-to-date information for visitors.

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CHAPTER 1 BACKGROUND OF THE PROJECT

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At the Valley of the Kings, a number of tombs created some 3,000 – 3,500 years ago are scattered over a wide area and it is not easy for visitors to quickly understand the outline as well as the importance of this place. Despite this difficulty, there are no adequate on-site facilities to provide vital information on the Valley of the Kings. Visitors have to walk under the scorching sun to the entrance of each tomb of a king and the existing resting facilities for visitors are insufficient. Guides are not allowed to explain the history and other relevant matters to visitors inside the tombs. Under these circumstances, the Government of Egypt has made a request to the Government of Japan for the provision of grant aid for the construction of a visitor center, the purpose of which is to provide information on the Valley of the Kings for visitors while contributing to the preservation and utilisation of cultural heritage, and also for the provision of the necessary equipment.

[Organization Responsible for the Implementation of the Project]

- Supreme Council of Antiquities (SCA), Ministry of Culture

[Contents of the Request]

- Construction of a visitor center (approximately 782 m²)
Information hall; mini museum; shop; rest rooms; administration office
- Provision of the necessary equipment
Tables (16); chairs (64); toilets (10 booths); computers (2); printer (1); digital VCR (1); digital camera (1); projector (1); DVD player (1); showcases (10); television (1)
- Car park (11,449 m²)
- Toilet building (54 m²)

(Among the facilities and equipment listed above, the shop, tables, chairs, car park and toilet building have been omitted from the scope of the Project in consideration of the purpose of Japan's Grant Aid for Cultural Heritage Scheme).

CHAPTER 2 CONTENTS OF THE PROJECT

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2.1 Basic Concept of the Project

The approach to appropriately preserve and utilise buried cultural heritage, such as the Valley of the Kings, largely consists of two stages as described below.

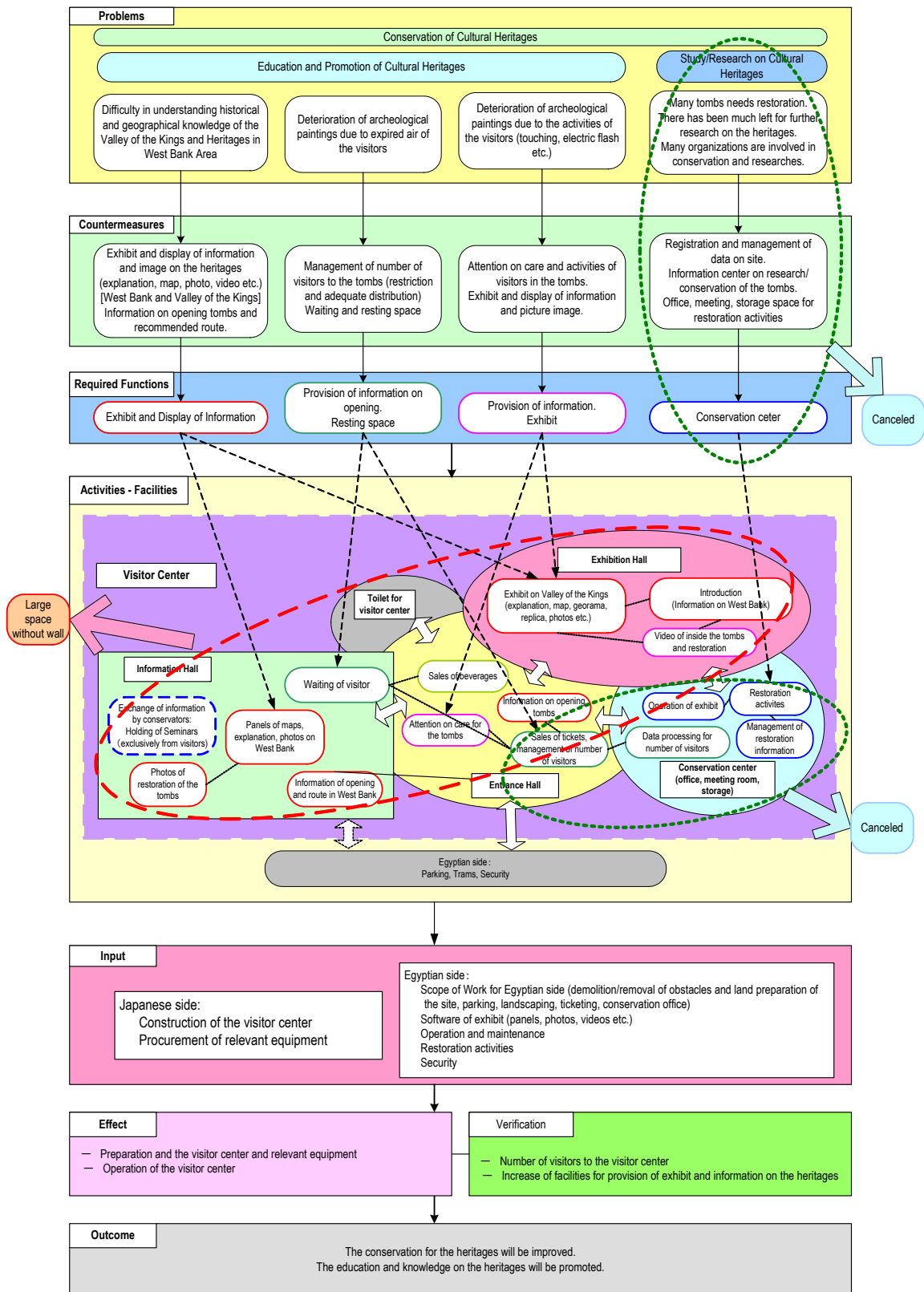
- ① Appropriate excavation is conducted to verify (study) the cultural value of the heritage, followed by the necessary restoration with a view to its opening to the public for cultural use.
- ② This opening to the public is conducted in a manner which allows many people to enjoy cultural information on the heritage. Given the prospect of various adverse impacts in terms of preservation due to many visitors, appropriate preservation measures are conducted.

The present Project aims at the above second stage, i.e. the utilisation of cultural heritage in appropriate environment, and involves the construction of a visitor center providing vital information on the Valley of the Kings for visitors and the provision of the necessary equipment.

At the early project planning stage, the construction of a visitor center possessing a mini museum, information hall and conservation center, etc. was proposed to address such problems as (i) the difficulty of understanding the heritage at the Valley of the Kings on the part of visitors, (ii) the necessity to pay careful attention to the fact that degradation of the heritage is progressing due to the presence of many visitors and (iii) the necessity to facilitate the study as well as restoration of the heritage. Through consultations with the SCA, however, it was agreed to introduce a single large exhibition and information space without internal walls in order to deal with the expected large number of visitors with layout flexibility. In addition, the idea of incorporating a conservation center was withdrawn as the SCA office is already located on the west bank. Furthermore, the planned display of excavated articles and replicas to increase the attractiveness of the visitor center was also withdrawn due to concern in regard to their security and other reasons. It was agreed that the Egyptian side would undertake improvement of the car parking facilities, display of items other than a topographical model of the Valley of the Kings, on-site security, continued preservation and restoration of the cultural heritage and operation and maintenance of the visitor center.

The planned functions of the exhibition and information halls will be performed using a topographical model of the Valley of the Kings and information panels (maps, drawings, photographs and commentaries). The transparent topographical model of the Valley of the Kings will facilitate visitors to understand the location of each underground tomb at a glance. Small-scale seminars and lectures will be held in the video corner, thus performing part of the function associated with the conservation center. The existence of this visitor center will greatly improve the environment for cultural study by visitors. In short, the new visitor center is expected to have the result of improving the state of conservation of the cultural heritage at the Valley of the Kings and enhancing recognition of its value.

BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF THE SURROUNDING AREA OF THE VALLEY OF THE KINGS



Objectives - Outcome Flow of the Project

Fig. 2-1 Objective-Outcome Flow of the Project

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policy

(1) Natural Conditions

The natural conditions at the project site have three prominent characteristics, each of which is dealt with in the following manner for the project design purposes.

- An expansive shale layer called the Esna layer lies beneath the planned construction site of the visitor center. Although this layer normally, i.e. when dry, does not pose any problems, there is a risk of its expansion with the absorption of water to push up the foundations of the building. To remove this risk, more than 1 m of Esna layer under the building will be replaced by stable soil at the earth work stage.
- While the construction site is almost flat, it inclines by some 3%. To minimise the difference in elevation at the building entrance, the floor of the central corridor of the visitor center will be slightly graded.
- Given the fact that the daytime outdoor temperature can reach as high as 50°C in summer in the area, temperature control inside the building is necessary to provide a suitable environment for visitors. An air-conditioning system will, therefore, be installed. Achievement of a high level of energy saving is planned by means of adopting small openings, automatic doors and a highly insulated roof and walls.

(2) Social Conditions

The Valley of the Kings is a precious international cultural heritage which is expected to be visited by more than two million people a year. The following measures will be necessary in view of such a large number of visitors from all over the world.

- The visitor center will be a gateway facility at the Valley of the Kings in sacred environment of ancient Pharaohs. Appropriate grades in terms of design and finishings, etc. must, therefore, be attained. The opinions and intentions of both the Egyptian and Japanese sides will be incorporated and reflected on the design and finishings, etc. as much as possible. Sandstone will be used for the external finish as it is highly resistant to degradation and discolouration over time. The same kind of material was used at the Luxor Temple.

- The heritages at the Valley of the Kings involve many unpaved roads and steps, making access by visitors in wheelchairs difficult. The visitor center to be constructed under the Project will provide the opportunity for these people to understand the true value of the cultural heritage using models, photographs and video displays etc. For this reason, the design of the visitor center will incorporate the use of wheelchairs.
- The new visitor center will only prove its worth if used by visitors to the Valley of the Kings. This makes the implementation of measures to attract visitors to the center necessary. Special attention should be paid to the flow of visitors so that the entrance to the visitor center enjoys good linkage with the car park and the tram transfer.

(3) Local Design Standards

As Egypt has its own building standards, the design of the visitor center will, in principle, follow these standards. The responsibility to preserve the overall view around the planned construction sites falls on the SCA and the opinions and intentions of the SCA in this regard must be taken into consideration. The design loads for the new building are shown below.

Dead Load	Real loads of structural members and finishing materials
Live Load	Roof: 100 kg/m ²
Wind Load	Neither the wind load nor seismic load are considered as the planned building will be a reinforced concrete single story building with a sandstone finish at a site where no earthquake has ever been recorded.
Seismic Load	

(4) Use of Local Sub-Contractor

The construction industry is vigorous in and around such major urban areas as Greater Cairo and Alexandria but is less vigorous in Luxor and other local cities where the scale of the construction industry is rather small. In terms of actual construction companies, there is no construction company in Luxor which can manage the entire work as a general contractor. This management role will be taken by a construction company based in Cairo or another place for each project.

Local general contractors based in Greater Cairo have the technical expertise to conduct basic civil engineering work and electrical installation work. As none of the work for the facilities planned under the Project requires a special construction method, the construction work can be conducted using a local company and workers under the

supervision of Japanese engineers. The likely scenario in this regard is for the Japanese contractor to use a company based on Cairo as a sub-contractor.

In regard to the television, video and computer equipment, the world's leading manufacturers have sales agents in Cairo, making the local procurement of such equipment possible. Local procurement is preferable because of the need for Arabic language models and after-service. Meanwhile, the transparent topographical model of the Valley of the Kings should be made in Japan as the high quality of this model is essential in view of its important status as a central feature of the visitor center which is expected to attract most of the visitors to the Valley of the Kings.

(5) Operation and Management Capability

The SCA operates and manages a number of museums in Egypt and, therefore, has sound basic operation and management capability. The proper maintenance of the visitor center can be ensured by explaining how to clean the transparent topographical model of the Valley of the Kings and how to operate and maintain the OA (office automation) and AV (audio visual) equipment, air-conditioning equipment and sanitary equipment, mainly at the time of the handing over of the new facilities to the SCA.

(6) Scope of Facilities and Equipment

The scope of the Japanese cooperation for the Project will cover the construction of the visitor center and the procurement of equipment required for the center. The visitor center should be harmonized with the master plan of the Valley of the Kings being developed by the SCA.

(7) Facility and Equipment Specifications

Attention will be paid to the facility and equipment specifications to facilitate the maintenance by the SCA. In regard to the equipment in particular, emphasis will be placed on the procurement of general-purpose products available in the market instead of advanced special equipment for professional use.

(8) Schedule

The Project is expected to take some 15 months from the signing of the E/N (Exchange of Notes) to the completion of the construction work. The visitor center should be completed in a single fiscal year in view of the scheme for grant aid for cultural heritages. Given the assumed timing of the signing of the E/N, the Project shall be completed by March 2006 including necessary official procedures.

2.2.2 Basic Concept

(1) Scale and Number of Visitors

The annual number of visitors to the Valley of the Kings decreased from 1.6 million in 2000 to 0.89 million in 2002 in bottom due to the terrorism on 11 Sept. 2002. However in 2003 it turned to increase to 1.33 million and the forecast is still increase in future.

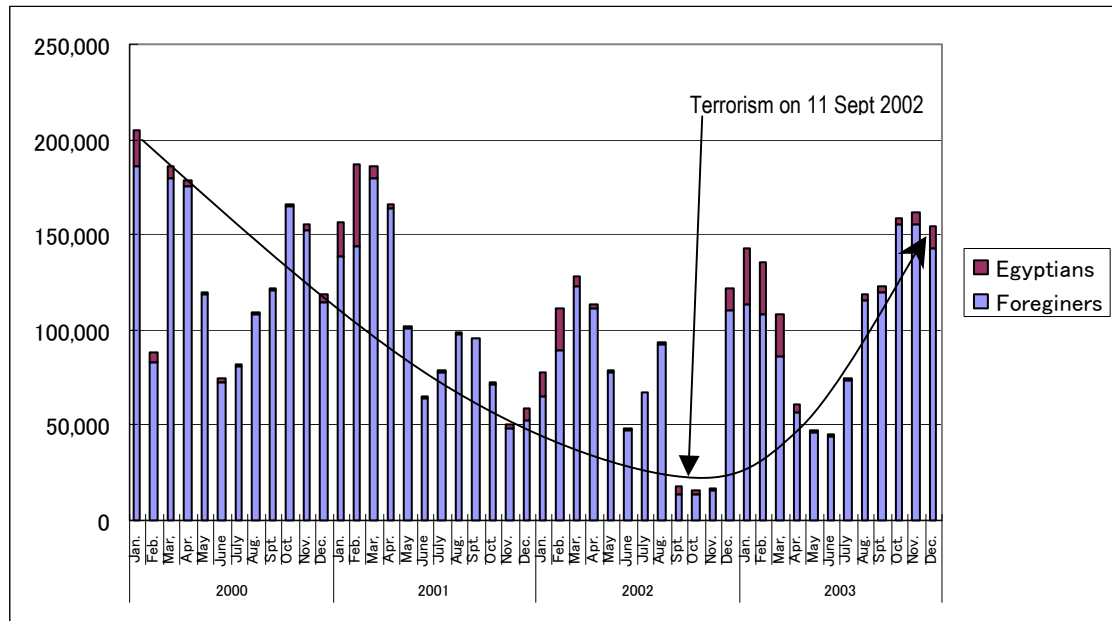


Fig. 2-2 Number of Visitors in the Valley of the Kings
(Source: SCA)

The maximum number of visitors to the Valley of the Kings during peak hours is considered 1,600/hour¹. Assuming that each visitor stays in the visitor center for a total of 15 minutes on their way to or from the ruins or both, the visitor center will house 400 people ($1,600/60 \times 15$) at a time. Based on the floor requirement rate of 2 m²/person, the required floor area of the visitor center is estimated to be 800 m². While this estimate indicates a highly congested situation, in reality, some visitors are expected to bypass the visitor center.

In general, the number of peak time visitors is estimated to be 1,000/hour and the number of visitors in the visitor center is likely to be 250. A floor area of 800 m² results in a floor area per visitor of 3.2 m²/person which is considered adequate. Meanwhile, a floor area of 800 m² is also believed to be sufficient to display the necessary information on the Valley of the Kings.

¹ The number of visitors in peak hour in the Valley of the Kings was forecasted 1,483 in 'The Comprehensive Development Plan of the Luxor, Structure Plan, 2000, Ministry of Housing, Utilities and Urban Communities'.

The inferred situation of transportation during peak visiting times to the Valley of the Kings is described below.

Twelve tombs are open for public access at the Valley of the Kings. Based on the average length of walking at each tomb and the average length required to accommodate each visitor of 60 m and 1 m respectively, 720 visitors may be inside the tombs. Together with these 720 visitors, the maximum number of peak time visitors will be some 3,000, including 800 outside the tombs, 100 on the tram, 400 in the visitor center, 400 in facilities to be constructed in the future and 800 in the bazaar/car park area.

Based on the number of visitors arriving at the Valley of the Kings of 1,600/hour and the average number of passengers per bus of 40, the operation of 40 buses/hour (arriving at 90 second intervals) is required. Given the passenger capacity of the existing tram of 36, the tram must operate at intervals of some 80 seconds to transport 1,600 passengers/hour. This requirement can be easily met if electric cars, etc. with a larger passenger capacity are introduced.

(2) Basic Principles

The following basic principles will be adopted for the building plan.

- **Harmony with the historical, geographical, archaeological and holy environments**
- **Rational lines of flow**
- **Easy understanding of information on the Valley of the Kings in a pleasant as well as appropriate surrounding**
- **Flexibility regarding future remodelling and extension**

(3) Objective and Functions of the Visitor Center

The visitor center will incorporate the following functions.

- Exhibition and information halls : display of a topographical model of the Valley of the Kings and information panels (maps, drawings, photographs and commentaries, etc.), showing of video films and touch-panel PCs to provide vital information on the Valley of the Kings
- Administration office : building management

- Ticket windows : ticket office with windows to sell tickets for the Valley of the Kings.
- Toilets : toilets for visitors to the visitor center with toilet facilities for the disabled
- Security : responsible for security at the visitor center (checking of visitors' belongings to ensure the absence of any dangerous items)

(4) Flow of Visitors and Vehicles

The visitor center will be located between the car park and the tram transfer and all visitors to the Valley of the Kings will basically pass through the visitor center. For this reason, the visitor center will be provided with two entrances. At times of heavy congestion, the flow for visitors heading towards the Valley of the Kings will be clearly separated from that for visitors returning from the Valley of the Kings. At times of no congestion, however, visitors will be allowed to freely move inside the visitor center.

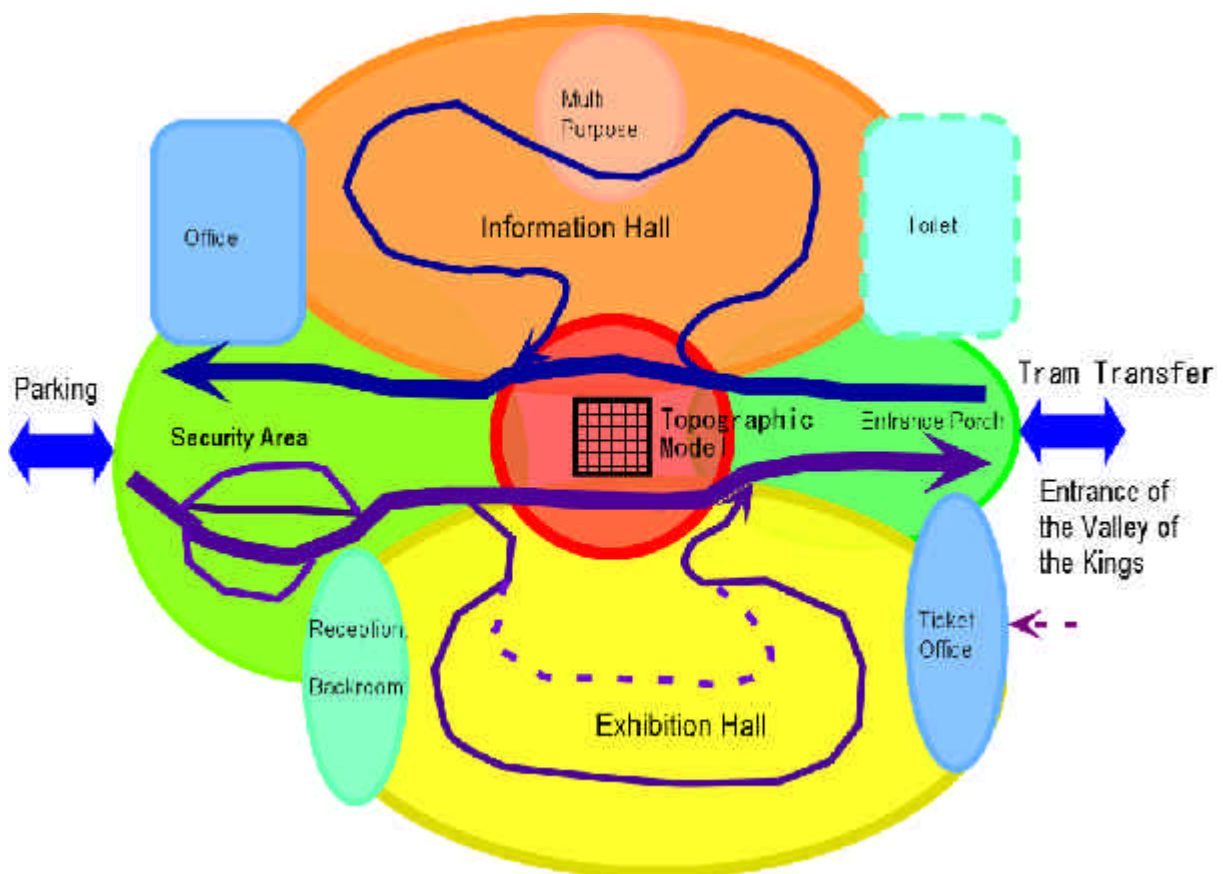


Fig. 2-3 Flow of Visitors in the Visitor Center

2.2.3 Basic Plan

(1) Building Plan

1) Planning and Finishing

The shape of the floor will be rectangular because of efficiency and flexibility in terms of renovation or extension. A central corridor which is wide enough to accommodate two opposite lines of flow will be introduced and the transparent topographical model of the Valley of the Kings made by the Japanese side will be placed in the central position. Important information, such as instructions for visitors to the tombs and on the tombs open to the public, will be displayed on the panels to be installed in the corridor. The exhibition and information space will be planned to form an H shape. Only slit windows between staggered walls will be introduced to avoid strong sunlight and to maximise the wall area for display purposes.

The space along the inward line of flow, i.e. for incoming visitors to the Valley of the Kings, will be mainly filled with information panels while the space along the outward line of flow, i.e. visitors returning from the Valley of the Kings, will be provided with two seating areas to view the videos. In these video spaces which will have parallel benches (Japanese side), a roll-up screen will be installed for use for seminar and lecture purposes (Egyptian side). More detailed information will be provided by touch-screen PCs (hardware: Japanese side). A wooden wall equipped with three stands for touch-screen PCs will be erected in the central section while an information map covering a wide area will be displayed on the topographical model side to clearly indicate the location of the visitor center vis-à-vis the Valley of the Kings and locations on the West Bank which do not appear on the topographical model. Multi-purpose area will be located in the center of the information hall.

The office to manage and monitor the building will be located on the car park side and the ticket office and toilet facilities will be located on the tram side (Kings' Valley side). A counter which is manned on a full-time basis will be introduced in the reception. The ticket office will have three ticket windows.

The toilet facilities will consist of six booths for women and four booths for men as well as four urinals based on the assumption that 5% of the 250 visitors during normal peak times will use these facilities. One toilet booth will be large enough to be used by the disabled (people with a wheelchair) or children accompanied by a parent.

The walled floor area of the visitor center will be approximately 969 m². The gross floor area, including the space under the eaves at the entrances, will be approximately 1,009 m². The floor area for the exhibition and information hall, toilets, office etc. excluding security area and ticket office will be about 800 m².

The floor area, main functions and finish of the various rooms are shown in Table 2-1. In view of the historic environment and durability, the floor of the exhibition and information hall, the security area and the toilet will be made of granite. The walls will have a plaster finish. The ceiling will have an aluminium lattice with steel mesh to allow flexible exhibitions and lighting. The office floor will be covered with terrazzo tiles.

Table 2-1 Outline of Visitor Center Building

Floor Area and Main Functions

Room	Floor Area (m ²)	Main Functions
Exhibition and Information Halls	663.0	Space to provide visitors with easy to understand information on the Valley of the Kings using panels, models, photographs and videos, etc: The central corridor with ramps will be wide enough for visitors to pass each other and the transparent topographical model of the Valley of the Kings will be placed in the central position. Remodelling will be easily conducted because of the absence of any internal walls. Connection can be made to a future building on the east side. The two areas for video display, lecture and seminar purposes will be large enough to accommodate some 50 seats and 20 seats respectively.
Administration Office	41.0	Office responsible for the operation and maintenance of the visitor center.
Reception	12.8	A person in charge for guide and facility management will attend. DVD players and server computer will be housed.
Backroom	20.0	Electrical distribution board will be installed. The projectors will be stored.
Toilets and storage	57.4	The visitor center building will be provided with toilet facilities for visitors, the number of which is estimated to be 1,400 during maximum peak times.
Vestibule	24.0	Buffer area for air-conditioning.
Ticket Office	24.6	The existing ticket office for the Valley of the Kings is a simple shed and is due to be demolished together with the cafeteria. Tickets to the Valley of the Kings will be purchased from the new ticket office immediately before boarding the tram.
Security area	126.6	The security checking of visitors will be necessary prior to their entry to the main building.
Entrance Porch	40.0	These will be outside the entrances and will not be enclosed by walls. They are introduced to prevent any adverse impacts of sunlight and wind inside the building.
Gross Floor Area	1,009.4	Gross floor area of the visitor center, including that of the entrance porches and others

Structure

Structure	RC single story building with flat roof slabs
Height	5.2 ~ 6.2 m
Foundations	Independent footings on replaced good soil (GL -1 ~ -2 m)

External Finish

External Walls	Sandstone
Roof	Asphalt waterproofing with insulation material and protective plaster
Eaves of Entrance Porch	Wood

Internal Finish

Room	Floor	Base board	Walls	Ceiling
Exhibition and Information Halls	Granite	Granite	Mortar + Plaster	Aluminium lattice with steel meshes
Reception	Terrazzo	Terrazzo	Mortar + Plaster	Gypsum board + EP
Backroom	Terrazzo	Terrazzo	Mortar + Plaster	Gypsum board + EP
Office	Terrazzo	Terrazzo	Mortar + Plaster	Gypsum board + EP
Ticket Office	Terrazzo	Terrazzo	Mortar + Plaster	Gypsum board + EP
Toilet	Granite	→	Ceramic tiles	Gypsum board + EP
Storage behind toilet	Terrazzo	Terrazzo	Mortar + EP	-
Security area	Granite	Granite	Mortar + Plaster	Gypsum board + EP
Entrance Porch	Granite	-	(Sandstone)	Wood (eaves)

EP: Emulsion paint

Doors and Windows

Entrances	Hinged swinging glass doors and Automatic sliding glass doors
Office Doors	Wood
Toilet Doors	Wood
Slit Windows	Aluminium frames
Ticket Windows	Aluminium frames

2) Elevation Plan

The building height will be approximately 5.5 m above the mean ground level to be able to accommodate the exhibition and information halls while avoiding an oppressive impression. The external walls will be made of sandstone which is quarried in the upstream of the Nile and which is used for the temples. The undulating surface will produce areas of shade, creating a changing pattern. The convex sections of the outer walls will be tilted to create the image of a cliff and to give a sense of stability. The slightly slanting sandstone walls will match up well with the environment.

3) Cross-Sectional Plan

Even though a high ceiling height is desirable for the exhibition and information halls for display purposes, the actual height is subject to the requirement that the building matches the general view of its surroundings. Accordingly, a ceiling height of 3.8 m will be adopted as the necessary and sufficient height for the exhibition and information halls.

Given the gentle inclination of the ground, ramps which each absorb 45 cm of the elevational difference will be introduced for the central corridor to absorb the total elevational difference of 90 cm. These ramps will also be designed to produce the effect of adding variety to the internal space.

4) Structural Plan

The structural frame will be reinforced concrete and the external walls will have a double layer of concrete blocks with an insulation material between these blocks. The inner walls before finishing will be made of bricks. The roof will be reinforced concrete with asphalt waterproofing, insulation material and protective mortar.

Because of the presence of an Esna shale layer at around $-GL\ 1.3 - 2.0\ m$ at the construction site, the ground will be excavated to approximately 1 m below the bottom face of the foundations for the replacement of this shale layer with good soil as illustrated below.

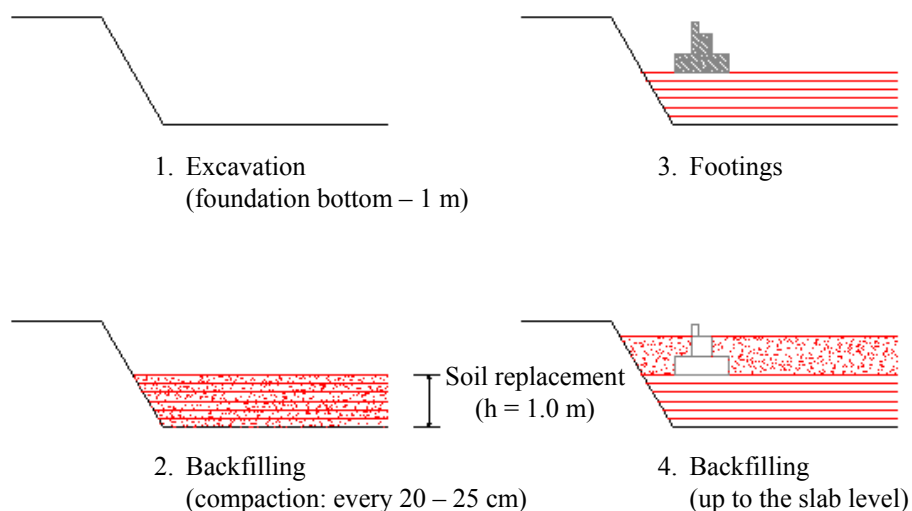


Figure 2-4 Soil Replacement

5) Building Services Plan

- Water supply : An outside water tank will be installed on the east side of the building and the water will be replenished by a tank lorry. After connection to water supply system by Egyptian side, the water tank will be used as a backup facility.
- Toilets : The toilets will be flush toilets while the urinals will have an automatic flushing mechanism
- Waste water disposal : An underground waste water holding tank will be installed on the east side of the building and waste water will be emptied by a vacuum car. After connection to sewage system by Egyptian side, the waste water tank will be used as a backup facility.
- Electricity supply : A distribution panel will be installed in the administration office. Power outlets will be installed in each room and other places.
- Lighting : Combination lighting of fluorescent lamps and spot lights will be used for the exhibition and information halls. Lighting tracks (wiring ducts) will be installed for extra spot lighting to suit the specific displays. Ordinary fluorescent lamps will be installed in the offices and toilets. Fluorescent lamps and down lights will be installed in the security area. Down lighting will be used for the entrance porches. The outside of the west wall will be externally lit by outside spot lights in underground cases.
- Telephone : Telephone connection points will be installed in the administration office for telephone and server PC connection. Another terminal will be installed in the ticket office.
- Air-conditioning : The entire building, except for the toilet area, will be air-conditioned. Cassette-type indoor units will be placed between the lattice ceiling and ceiling slabs.
- Ventilation : Mechanical ventilation will be introduced for other areas of the building (exhibition and information halls, office and toilet facilities). Ventilation openings

will only be installed on the east side. It will be possible to open the upper part of the slit windows for ventilation purposes.

(2) Exhibition Plan (For reference only)

1) Basic Policy

The exhibition at the visitor center will primarily focus on information describing the geological and topographical environments of the Valley of the Kings, how the tombs were built and the results of excavation and research work conducted by many people up to the present instead of focusing on artefacts, such as excavated as well as buried items.

A three-dimensional topographical model with a ground surface made of transparent plastic will be placed at the center of the two halls to show the topography at the central part of the valley, the distribution and structure of the tombs and other relevant information for easy understanding of the overall picture of the Valley of the Kings. This topographical model will unite the exhibition hall for mainly panel displays and the (visual) information hall for the showing of videos, providing integrated information on the ruins at the Valley of the Kings.

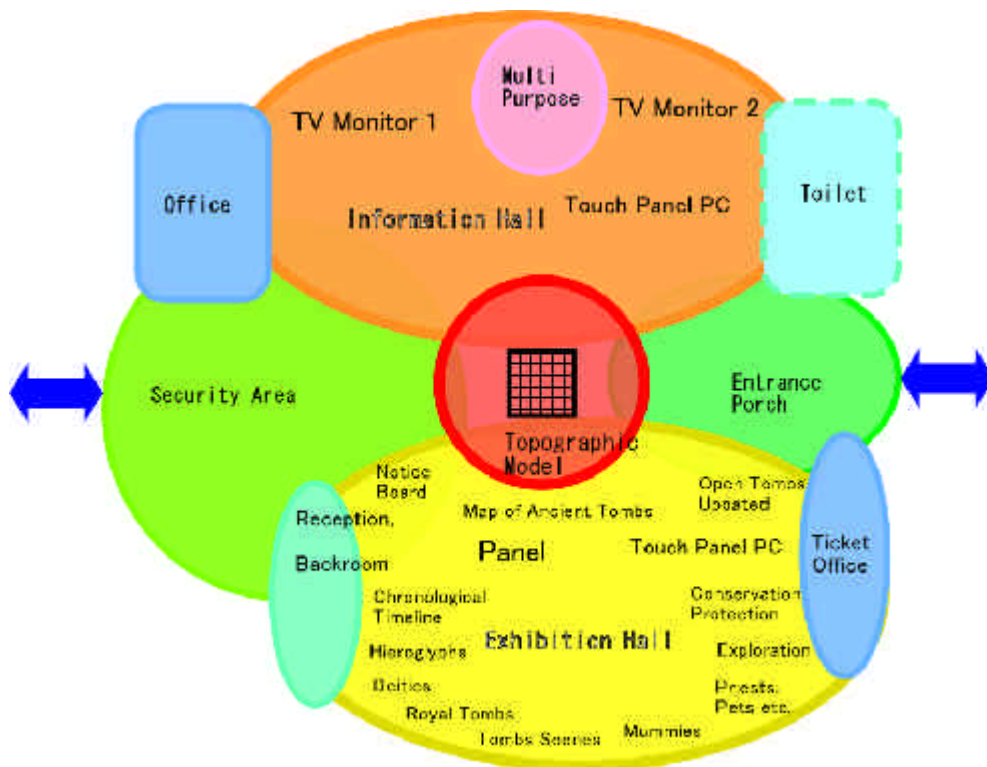


Fig. 2-5 Exhibition Concept

2) Exhibition Scenario

Design and production of the displays in the Visitor Center are to be undertaken by the Supreme Council of Antiquities with the cooperation of the Theban Mapping Project.

Panel labels are to be in Japanese, Arabic, and English. Material on the 10 PCs will be in English only. Japanese text is to be approved by the Japanese side.

The subjects to be treated are listed below. They are deliberately selected so as not to duplicate information available on the already existing signage in the Valley of the Kings.

Each of the following “panel subjects” (entries 1-11) will occupy one or more panels in the Visitor Center. They will emphasize graphics instead of lengthy text. Their placement within the Visitor Center will allow them to be seen in approximately the same order as they are presented here.

Panels

1. **Chronological Timeline.** A chart covering the whole of ancient Egyptian history, from the Neolithic to the early modern period, with expanded emphasis on the New Kingdom. The New Kingdom section will treat each pharaoh in turn, emphasizing those whose tombs are located in the Valley of the Kings. Brief text and images will focus on a pharaoh’s monuments and deeds.
2. **Map of Ancient Thebes.** The location of KV will be shown in relation to other monuments at Thebes and the relationship between royal tombs and memorial temples will be explained.
3. **Hieroglyphs and Royal Cartouches.** An introduction to the way in which royal names were written and to the hieroglyphs used to write them. Photographs of cartouches in KV tombs will be shown, along with an explanation of how they are to be read. A list of royal names found in the tombs will be provided in hieroglyphic and translated form.
4. **Principal Deities.** Images of major deities in KV scenes will be depicted and their functions described. These will include Hathor, Isis, Osiris, Horus, Anubis, Amen, Thoth, Meretseger, the Four Sons of Horus, and Nut.

5. **Cutting and Decorating a Royal Tomb.** Based on artwork supplied by the National Geographic Society, the process of cutting a royal tomb will be explained. Close-up thumbnails will illustrate the stages of work, from rough quarrying to final painting. The principles of Egyptian art will be explained, including the use of registers, and the representation of the human figure. The manufacture of paints and pigments will be shown. The workmen of Dayr al-Madina will be featured in brief biographies.
6. **How to “Read” a Tomb Scene:** Images of particular tomb scenes will be accompanied by an explanation of their symbolism, function, and relationship to adjacent text.
7. **Mummies.** Mummies found in KV, as those found by Victor Loret in KV 35 will be discussed. Other human and animal mummies will be shown. The process of mummification will be shown, using the mummy of Tutankhamun as an example. A third section will illustrate what we can learn from the mummies, and will include x-rays of bodies, photographs, and paintings to show evidence of injury, disease, and age.
8. **Grave Goods.** Materials and objects found in KV tombs and their purpose. Tutankhamun’s tomb is treated in signage in KV, so here we will use the tombs of Yuya/Thuyu, Maiherperi, and KV 5.
9. **Who Besides Pharaohs Were Buried Here?** Often overlooked, the priests, officials, family members, and pets buried in KV will be briefly described.
10. **History of Exploration.** Exploration and exploitation of KV from Graeco-Roman times to the present day. Tourism, excavation, epigraphy, and finally, conservation and site management will be examined. Important figures in these activities will be noted.
11. **Conservation and Protection.** The problems caused by human interaction with the tombs will be explained. “Then and now” images will show the changes in KV and in tomb decoration. Problems of heat and humidity will be explained and tourists will be encouraged to exercise care when visiting the tombs.

Updated Board of Currently Open Tombs.

A list of tombs open to the public and their condition at this moment (crowded, empty) will be displayed.

Model of the Valley of the Kings.

A 3-D model of the valley, to be prepared and installed by JICA.

TV Monitor #1.

A 4-5 minute film on the Valley of the Kings, prepared by the National Geographic Society, will be shown every 7-8 minutes.

TV Monitor #2.

Four minutes of film shot by Harry Burton of the opening of the tomb of Tutankhamun and Howard Carter's excavations in KV in the 1920s, in possession of the Metropolitan Museum of Art, will be shown every 5-6 minutes.

Computer Kiosks.

A simplified version of the Theban Mapping Project website will be available on ten terminals in the Visitors Center. They will provide information on every tomb in the Valley of the Kings.

(2) Equipment Plan**1) Basic Policy**

Information on the Valley of the Kings will be provided at the visitor center by means of panels, photographs, videos, information search using PCs and a transparent topographical model. The equipment to be provided by the Japanese side will be limited to that equipment which is required for the display of information. The Egyptian side will be responsible for the preparation/creation of the graphic panels, video software to be shown and touch-panel PC software, data for computer search (and retrieval) and visual software, etc.

All of the equipment to be provided will be general-purpose equipment available in the market to ensure easy maintenance in the post-project period and each equipment will be capable of operating alone.

2) Equipment to be Provided

The following types of equipment will be procured by the Japanese side based on the above-described policy and the facility plan:

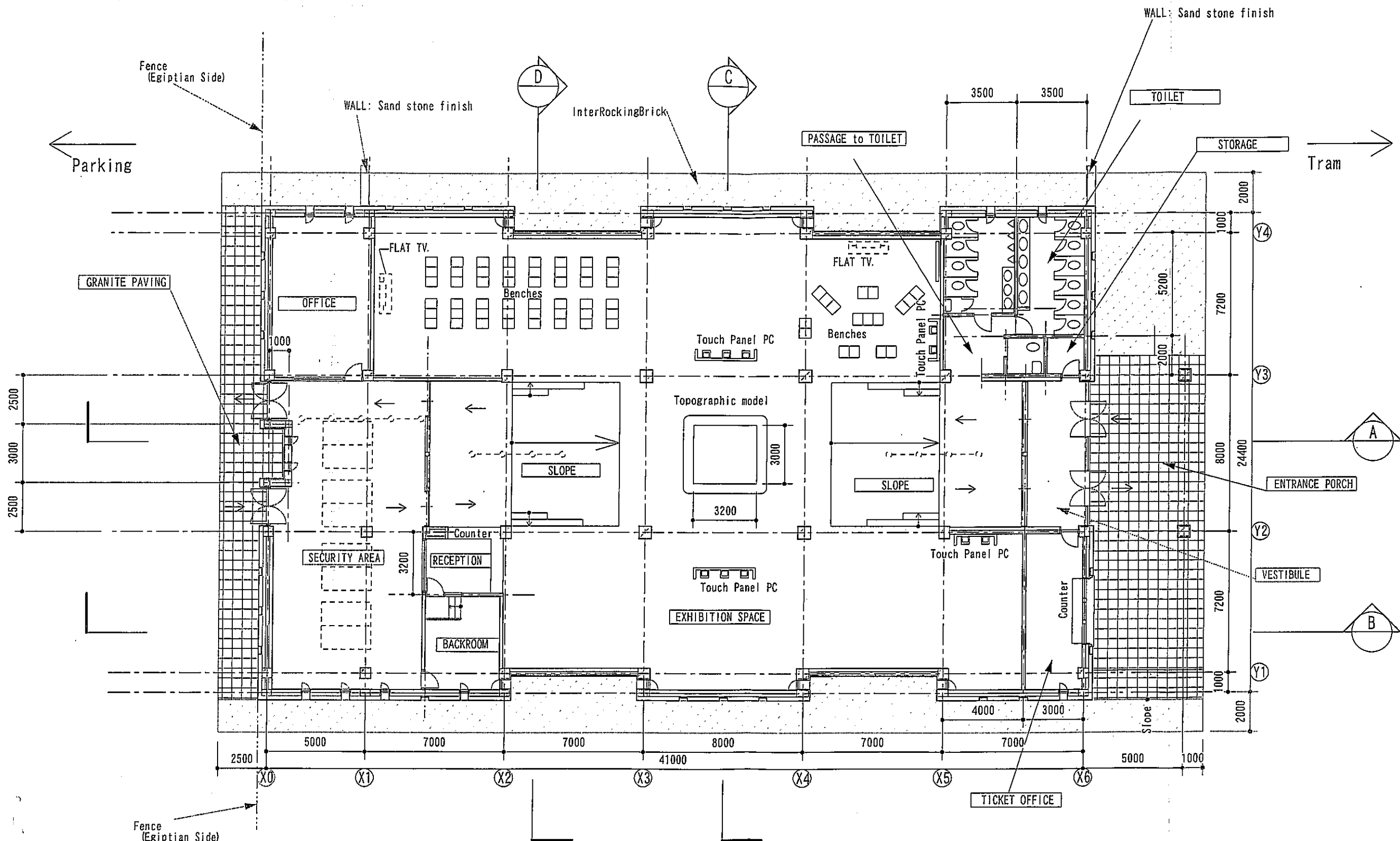
- Data management PC (with LAN connection with tablet PCs): one set
- Tablet PCs (touch-panel PCs): 10 sets

- Large flat screen television displays (for video display): two sets
- DVD players (for video play): two sets
- Projectors: three sets (data projector for PC, overhead projector and slide projector)
- Transparent topographical model of the Valley of the Kings: one set (with a built-in lighting system)

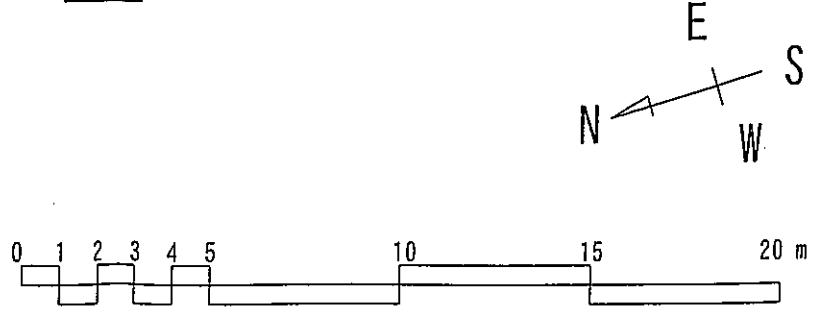
Table 2-2 Outline of Equipment to be Procured

Item	Main Specifications	Purpose of use	Quantity
Data management computer	CPU: 3 GHz; 512 MB RAM; DVD-R/RW and CD-R/RW drives; 17" monitor	To manage administrative data of the visitor center, display software, data for retrieval by the touch-panel PCs and the database on the Valley of the Kings	One set
Touch-panels PCs	Tablet PC with a 10" or larger monitor	To install software containing introductory data on the Valley of the Kings to cater for those visitors who want detailed information	10 sets
Large television Displays	42" (plasma or LCD)	To constantly show video programmes mainly featuring the ruins at the Valley of the Kings to convey visual information to visitors	Two sets
DVD players	Version suitable for Egypt	To replay video programmes to be shown on the large television display	Two sets
Data projector	1,500 lumen or higher	To be used for lectures or seminars on the tombs at the Valley of the Kings and their state of restoration	One set
Slide projector	50 trays or more	As above: as older presenters of lecture/seminar sessions tend to possess precious slides, such a projector is desirable for their presentations	One set
Overhead projector (OHP)	Compact type	As above: an OHP which is easy to use is sometimes required by presenters for lecture/seminar sessions	One set
Transparent topographical model)	Scale of 1:250 Main materials: FRP/acryl with a built-in lighting system and base	To provide a three-dimensional display of the topography of the Valley of the Kings and the location and shape of each tomb which are difficult for visitors to quickly understand	One set

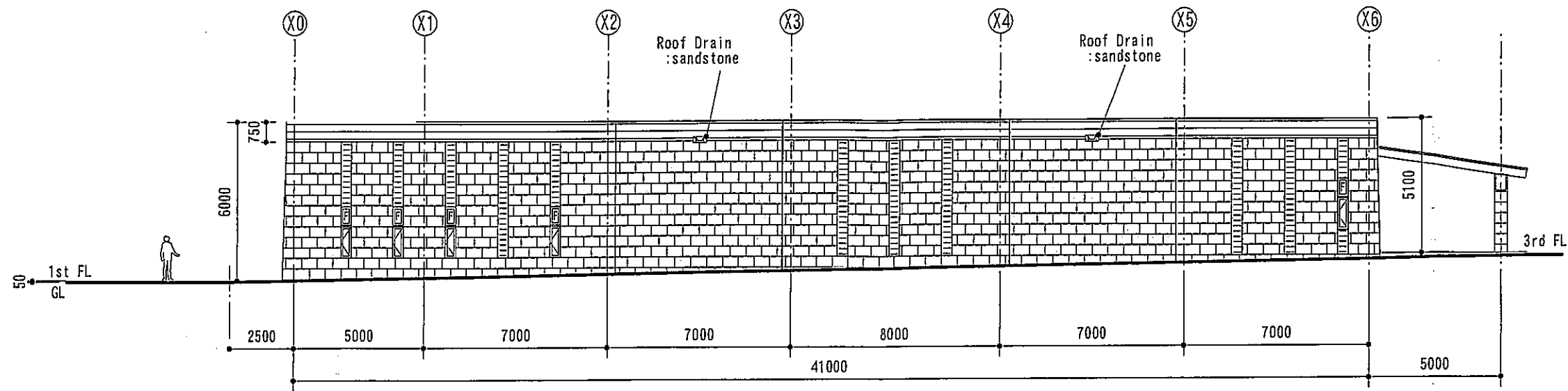
2.2.4 Basic Design Drawings



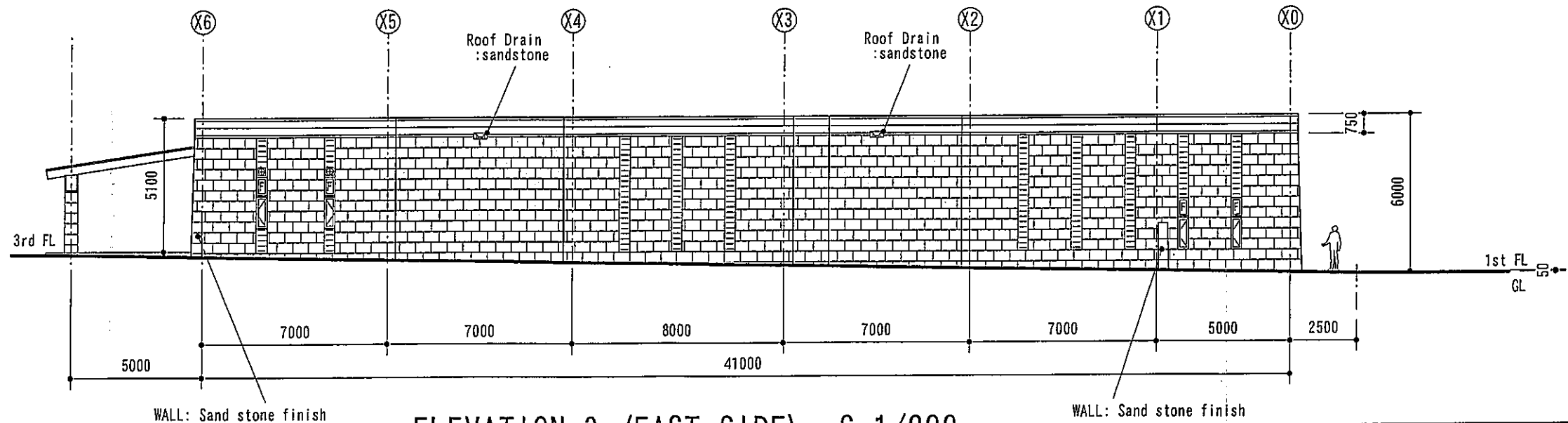
PLAN



The Project for Improvement of The Surrounding Area of The Valley of the Kings		
DRAWING TITLE:		SCALE: S=1/200
GROUND FLOOR PLAN		
VISITOR CENTER		



ELEVATION-1 (WEST SIDE) S=1/200

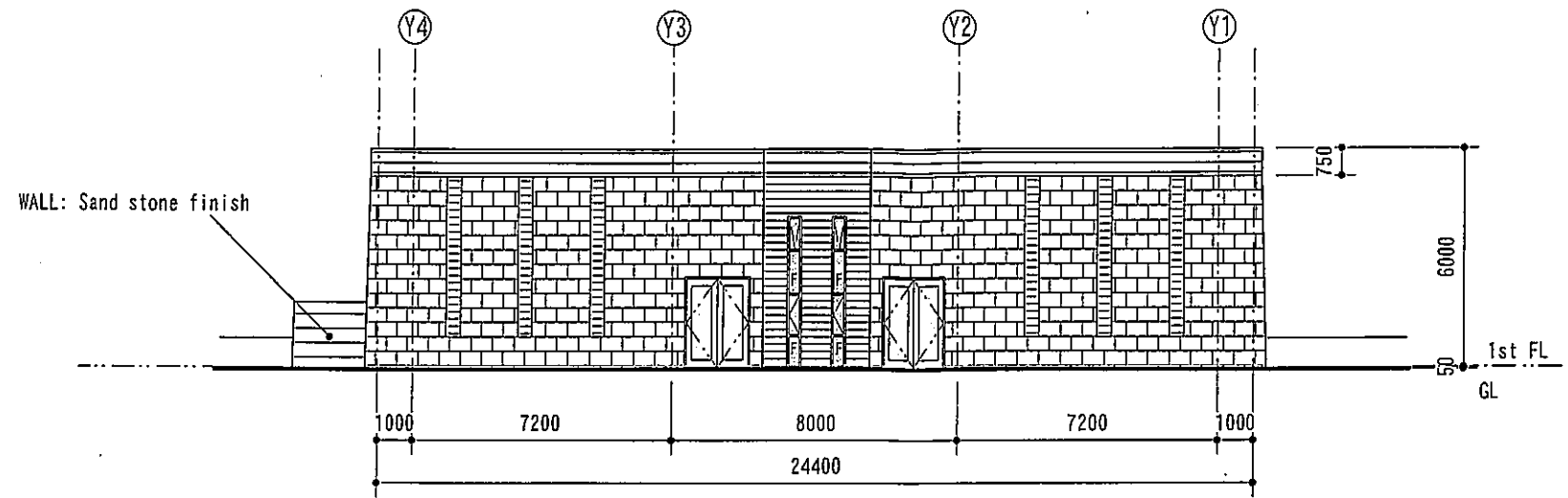


ELEVATION-3 (EAST SIDE) S=1/200

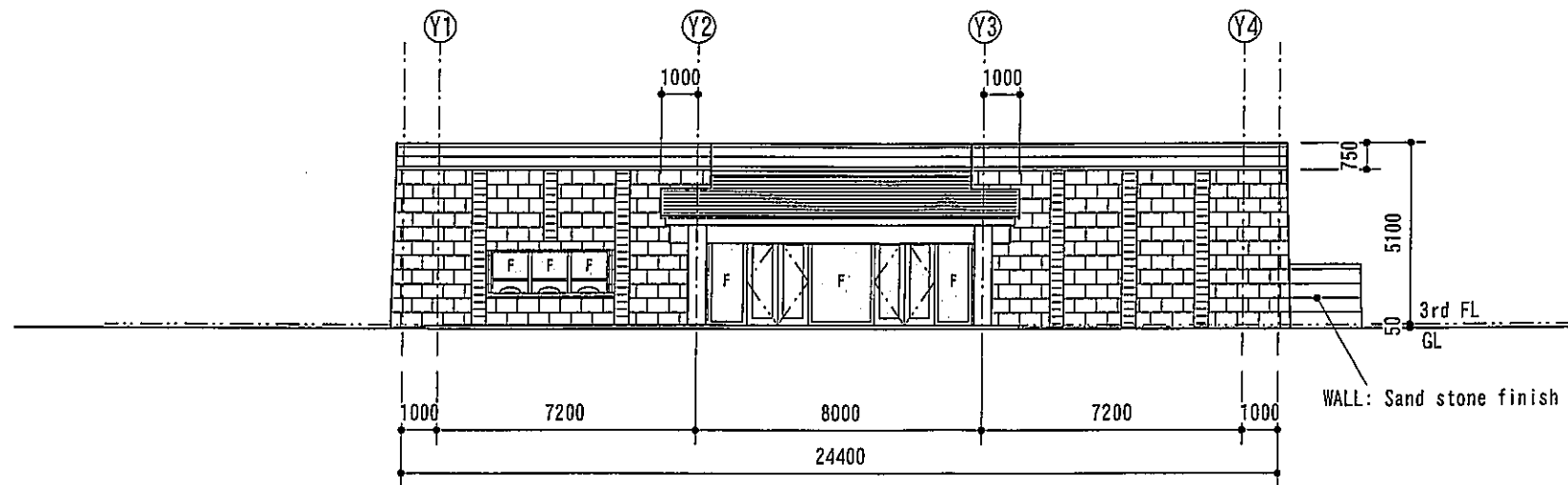
The Project for Improvement of
The Surrounding Area of
The Valley of the Kings

DRAWING TITLE:
ELEVATION-1, 3
(WEST SIDE, EAST SIDE)

VISITOR CENTER

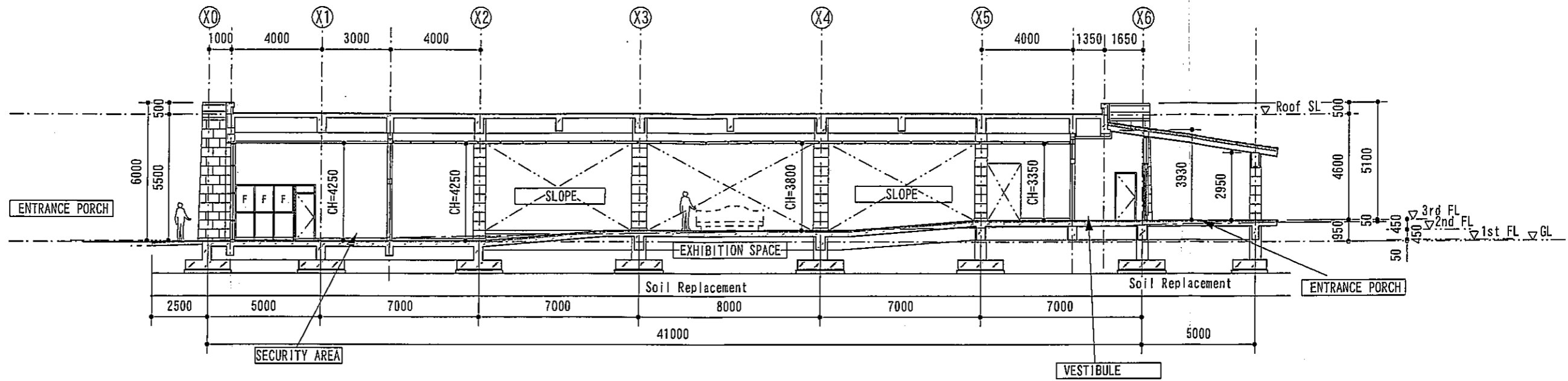


ELEVATION-2 (NORTH SIDE) S=1/200

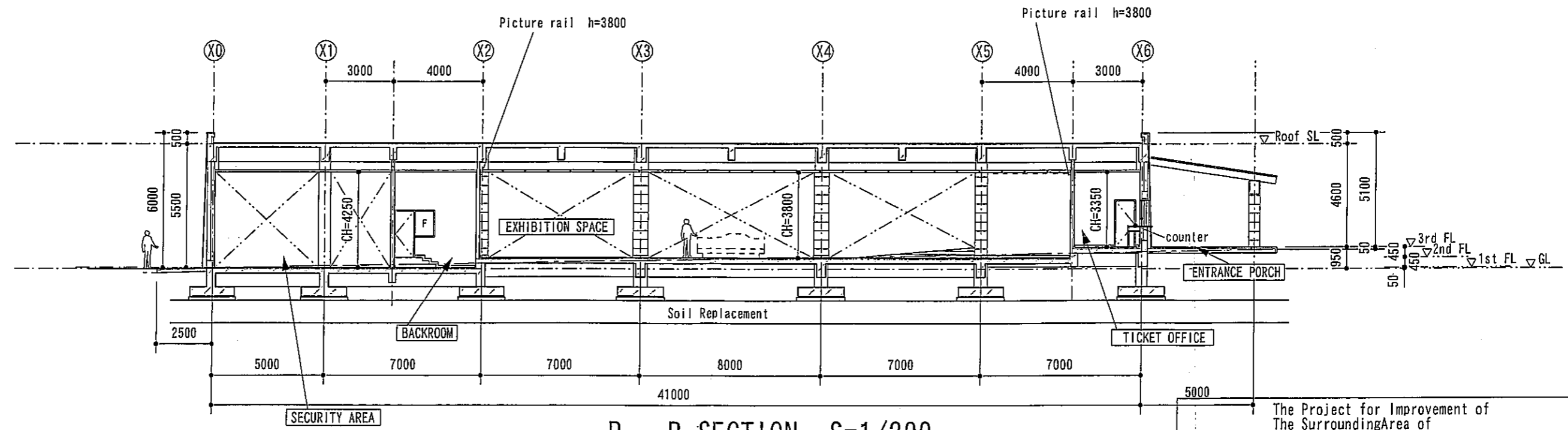


ELEVATION-4 (SOUTH SIDE) S=1/200

The Project for Improvement of The Surrounding Area of The Valley of the Kings			
DRAWING TITLE:			
ELEVATION-2, 4 (NORTH SIDE, SOUTH SIDE)			
VISITOR CENTER			

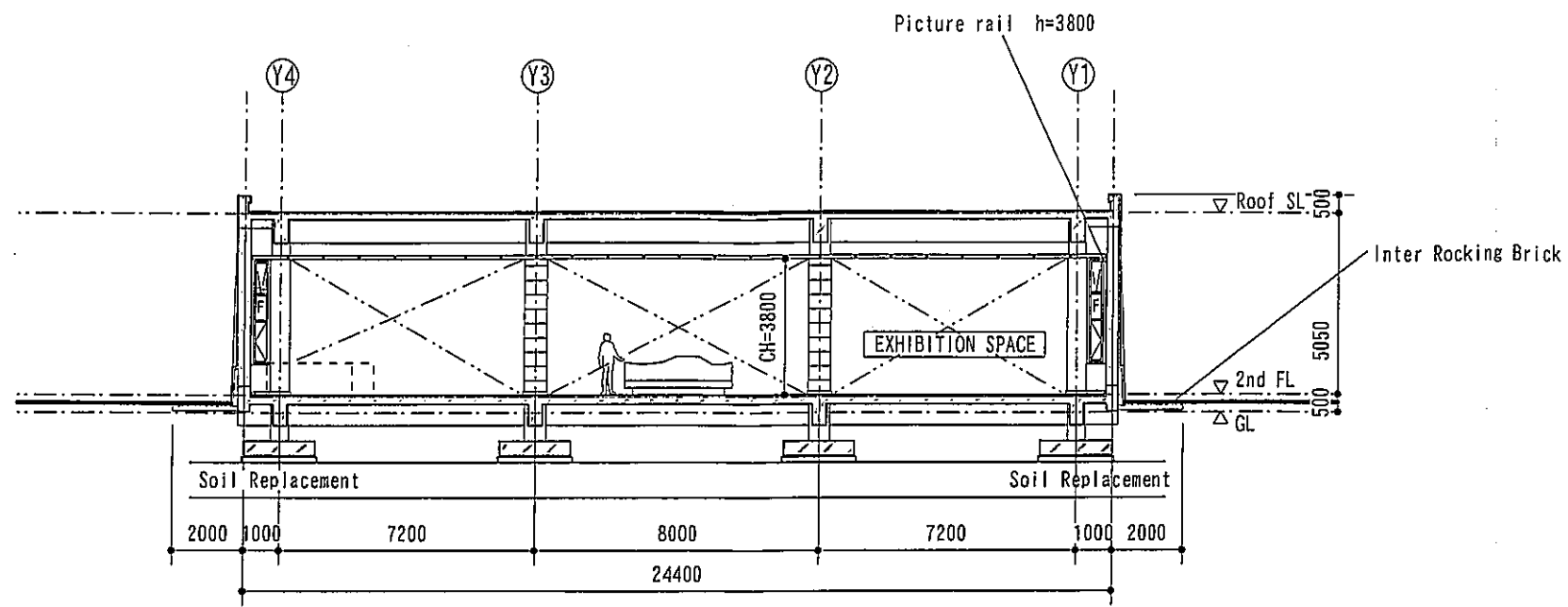


A - A SECTION S=1/200

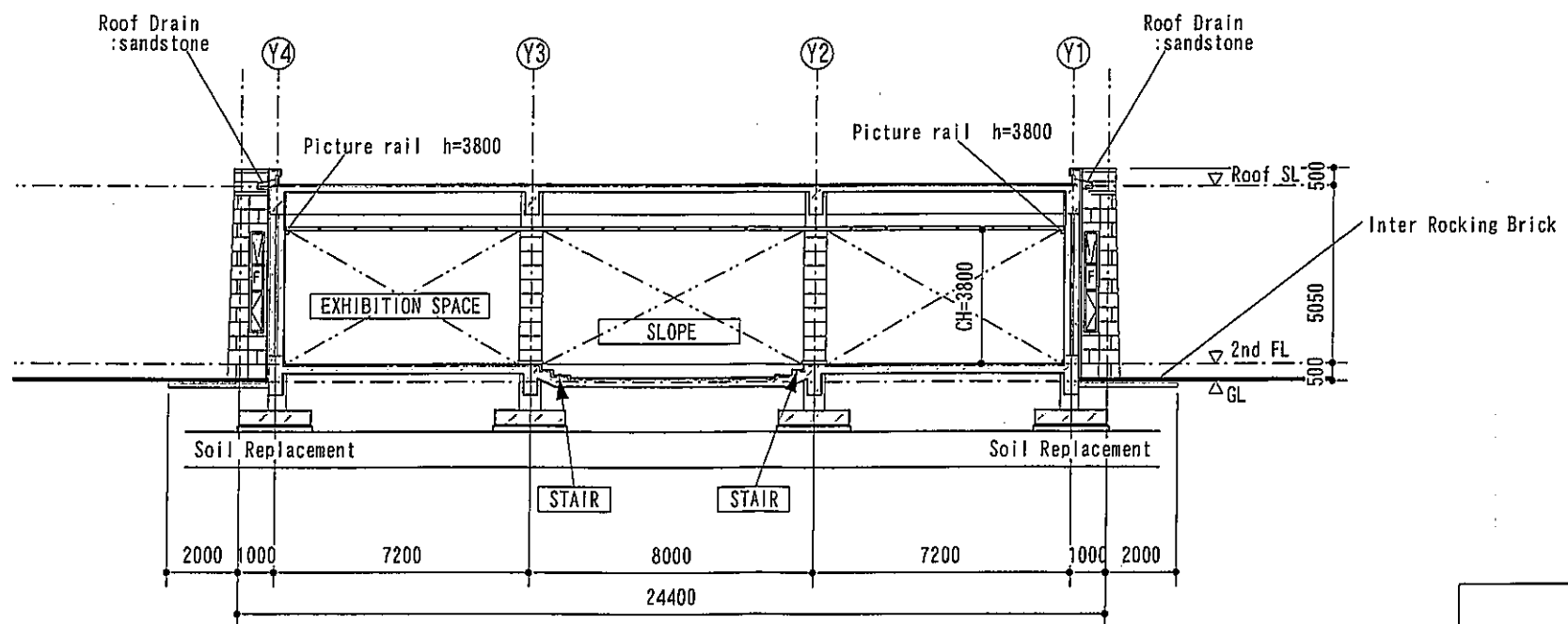


B - B SECTION S=1/200

The Project for Improvement of The Surrounding Area of The Valley of the Kings	
DRAWING TITLE:	
SECTION A-A, SECTION B-B	



C - C SECTION S=1/200



D - D SECTION S=1/200

The Project for Improvement of The Surrounding Area of The Valley of the Kings			
DRAWING TITLE:			
SECTION C-C , SECTION D-D			
VISITOR CENTER			

2.2.5 Implementation Plan

2.2.5.1 Implementation Policy

(1) Project Implementation Body

The organization responsible for the implementation of the Project on the Egyptian side is the SCA which must appoint a person to be responsible for the Project through close communication and consultation with the Japanese Consultant to ensure the smooth implementation of the Project. The selected person will discuss the compatibility of the visitor center to be constructed under the Project with the master plan for the Valley of the Kings as well as the exhibition plan with the Consultant and other relevant parties and will also supervise the agreed undertakings by the Egyptian side, including the demolition and removal of the existing cafeteria and the proper display of the exhibits without delay.

(2) Consultant

In order to construct the visitor center building and to procure the necessary equipment for the Project, the Japanese Consultant will conclude a consultancy agreement with the SCA and will conduct the detailed design and supervision of the construction work for the Project. The Consultant will also prepare the tender documents and will assist the SCA for the prequalification and tender.

(3) Contractor

The Contractor, which will be a Japanese company selected by the Egyptian side by means of open tender in accordance with Japan's grant aid scheme, will conduct the construction of the planned visitor center building and the procurement of the equipment. As it is necessary for the Contractor to provide after-care in terms of building repair, the Contractor must give proper consideration to the establishment of a post-project liaison system.

(4) Necessity for Dispatch of Japanese Engineers

The planned work for the visitor center building shall be completed in short-term period involving construction, procurement and transportation of materials and equipment. Therefore, coordinated management of the work will be required. This complexity of the work will make the dispatch of a site manager from Japan to provide consistent management and guidance on schedule control, quality control and safety control necessary. In addition, the dispatch of Japanese engineers will be necessary to provide

on-site technical guidance for the local sub-contractors and to ensure proper schedule control at the construction stage of the Project.

(5) Building Construction Policy

Local building materials and construction methods will be used as part of the efforts to ensure the smooth progress of the work and to reduce the cost.

(6) Procurement Policy

The equipment to be procured with grant aid will, in principle, be that equipment required for the display of information inside the visitor center, while equipment relating to the creation of visual software will be omitted from the scope of grant aid. Inside the visitor center, information will be displayed using such media as graphic panels, video programmes, computers with a search function, topographical model (three-dimensional diorama) of the Valley of the Kings and visual projection, etc. for visitors. Accordingly, the scope of grant aid cooperation for equipment procurement will cover that equipment which is necessary to convey information to the people concerned.

Soft displays, including graphic panels, video software and database for computer search, etc. will be undertaken by the Egyptian side. As equipment requiring special operation and maintenance would affect the ease of post-project maintenance and the production of soft displays by the Egyptian side, general-purpose equipment which is available in the market will be procured.

2.2.5.2 Implementation Conditions

(1) Conditions of Construction Industry in Egypt

Luxor is a small city which is mainly dependent on tourism and which is expected to only be able to provide labourers. It will, therefore, be necessary to recruit skilled workers and technicians from Cairo. Hardly any construction machinery can be procured locally. Concrete plants owned by construction companies do not sell fresh concrete to outsiders.

Except in winter, construction work is very hard during the day because of the extremely high temperature. Construction work in the early morning and evening will, therefore, be necessary. As the West Bank has no urban area, it is necessary for commercial and business services to rely on the East Bank to which the distance is some 20 km by roads via the Luxor Bridge.

(2) Use of Local Materials

For the formulation of the construction, the use of locally procurable materials will be included as much as possible. Given the problem of a limited supply capacity, careful advance planning will be essential for the procurement of local materials.

Because of the short construction period of 9.5 months, any delay in procurement could constitute a fatal blow to the schedule control. The primary condition to avoid any procurement delay is the establishment of a system capable of placing orders at the initial stage of the construction work. For this reason, a study on possible suppliers and materials will be conducted at the initial stage of the construction work to check the required period to obtain the necessary materials, to select suppliers and to place orders in line with the planned work schedule.

(3) Safety Measures

Careful attention should be paid to the safety of workers at the construction site. As the planned construction work under the Project involves roofing and other work in a high place, there is always a possibility of a fall or other accidents which could prove fatal. Proper safety guidance and education should, therefore, be given, including the prohibition of work when someone is below, strict confirmation of secured scaffolding and the introduction of various safety measures.

Traffic safety workers should be placed around the construction site to ensure the safety of the many visitors who will pass beside the site on their way to and from the ruins. Traffic safety will be particularly important on the west side of the construction site because of the movement of visitors to and from the tram service.

2.2.5.3 Scope of Work

The demarcation of work between the Japanese side and the Egyptian side under the Project is shown in Table 2-3 (also see '2.3 – Obligations of Recipient Country' for the general obligations of recipient countries under Japan's grant aid scheme).

Table 2-3 Demarcation of Work

Work Item	Scope of Work		Remarks
	Japan	Egypt	
1. Securing of Land			
(1) Securing of the land		O	Including matters relating to land ownership; prior to the E/N
(2) Demolition and removal of the existing cafeteria and garage; relocation of the power line		O	Prior to the commencement of work by the Japanese side
(3) Provision of land for temporary work		O	Adjacent to the construction site
2. Construction of Visitor Center			
(1) Construction of the visitor center	O		Including building services inside the building and built-in counters
(2) Permanent fencing and gates		O	This is essential to ensure the security.
(3) Temporary fencing and gates during the construction period	O		Surrounding the construction site
3. Procurement of Equipment			
(1) General furniture		O	
(2) Equipment required under the Project	O		Detailed in the Report (televisions, DVD players, PCs and projectors)
4. Security			
(1) Securing during the construction work		O	Including the posting of policemen; site guards will be employed by the Japanese side
(2) Post-project security		O	Including the posting of policemen
5. Exhibition (Exhibits and Soft Displays, etc.)			
(1) Topographical model of the Valley of the Kings	O		
(2) Exhibits other than above		O	Panels, photographs, commentaries, PC software and video programmes, etc.
6. Operation and Maintenance of the Visitor Center			
(1) Operation of the Visitor Center		O	
(2) Maintenance of the Visitor Center		O	Facilities and equipment

Note: O denotes the responsible side.

2.2.5.4 Consultant Supervision

The Consultant will organize a consistent project team to conduct the detailed design and work supervision in accordance with Japan's grant aid scheme and the principles of the basic design in order to ensure the smooth implementation of the Project. At the work supervision stage, the Consultant will maintain the consistency of the schedule control, quality control, confirmation of the executed work and safety control throughout the construction period while fully recognising the unique local situation where various religions, ethnic groups, tribes and languages co-exist. The Consultant will also conduct the inspection of the equipment/materials to be manufactured/fabricated/produced in Egypt when ever such

inspection is deemed necessary for the purpose of preventing the occurrence of any problems after their delivery to the construction site.

(1) Basic Principles for Work / Procurement Supervision

The Consultant will supervise the progress of the construction work and procurement work to ensure punctual completion within the planned period and will supervise and guide the Contractor in order to achieve the work quality and to abide by the delivery schedules for the equipment, etc. indicated in the contract without accidents or other problems at the site. The main points to be noted for the supervisory work are described below.

1) Schedule Control

The Consultant will make weekly or monthly comparisons between the actual work progress and the schedule planned at the time of the signing of the contract for the following items to comply with the delivery schedules shown in the agreement. If the Consultant foresees any delay of the work, he will issue a warning to the Contractor, requesting that the latter submit a remedial plan to ensure the completion of the construction work and equipment delivery within the planned work period.

- ① Quantity of the executed work (state of procurement of construction materials and work progress)
- ② Confirmation of the delivery of materials (construction materials and fittings)
- ③ Confirmation of the temporary work and preparations for the construction machinery (as required)
- ④ Confirmation of the work efficiency and actual number of engineers, technicians and labourers

2) Quality Control and Control of Executed Work

The Consultant will supervise the Contractor in regard to the following items to ensure that the building constructed and the construction materials delivery satisfy the required quality and the amount of completed work specified in the agreement. If the Consultant believes that the expected quality and quantity are unlikely to be met based on the results of the checks conducted, he will demand that the Contractor immediately conduct any necessary correction, change or modification.

- ① Checking of the shop drawings for the construction work and specifications for the materials (and equipment) to be used
- ② Checking of the shop drawings and specifications for the fittings, windows and doors
- ③ Witnessing of the inspection at the manufacturing/production sites of the equipment/materials or checking of the inspection results
- ④ Checking of the shop drawings as well as installation manuals for the equipment
- ⑤ Supervision and confirmation of the quantity of the completed work and the quality of the finish

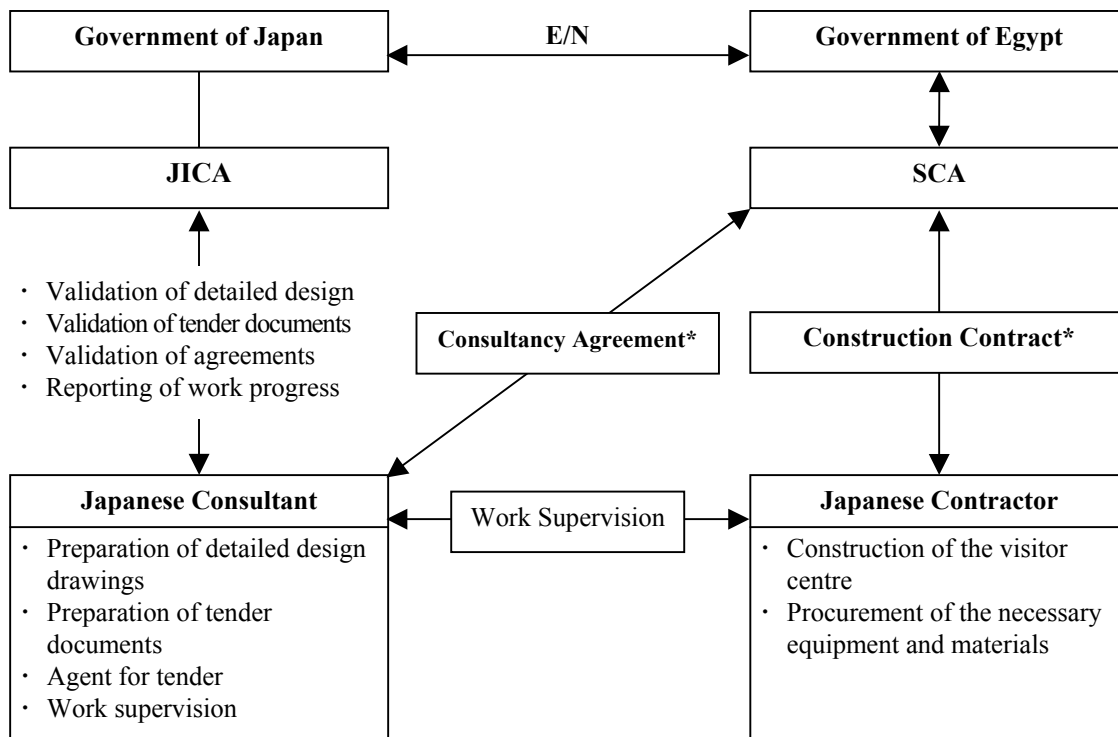
3) Safety Control

The Consultant will discuss and cooperate with the safety manager appointed by the Contractor with a view to supervising the on-site work to prevent any accidents or injury involving works and third parties (particularly visitors) during the construction work with due attention being paid to the following safety control principles.

- ① Establishment of safety control rules and appointment of a person responsible for safety
- ② Prevention of accidents to workers by means of regular inspection of the construction machinery
- ③ Introduction of travelling routes for work vehicles and construction machinery, etc. and the thorough enforcement of slow driving on the site
- ④ Installation of safety devices and their periodic inspection
- ⑤ Enforcement of welfare measures and days-off for workers

(2) Project Implementation Regime

The project implementation regime, i.e. the relationship between the parties involved in the implementation of the Project, including at the work supervision stage, is shown in Fig. 2-6.



* Both the consultancy agreement and construction contract must be validated by the Government of Japan.

Fig. 2-6 Project Implementation Regime

(3) Work Supervisors

The Consultant will dispatch the engineers shown in Table 2-4 as the need arises in correspondence with the scale and contents of the planned construction work under the Project.

Table 2-4 Engineers to be Dispatched by the Consultant

Type of Engineer	Number	Work Assignment	Dispatch Period
Full-time on-site supervisor	1	Supervision of the Project in general and negotiations as well as consultation with the various parties of the Project	During the construction period
Project manager	1	Overall management of the Project and consultation on various issues	At the beginning and end of the construction work

The very precise management of the Project by the Japanese side will be necessary to ensure the required quality of the building and the smooth progress of the work in line with the planned schedule against the very severe natural environment (high temperature, desert, sand storms and drought). For this reason, a well-experienced Japanese engineer

will be dispatched to act in principle as a full-time site manager to constantly supervise the work from the beginning to the end. Other technical staff required will be recruited locally so that technical know-how relating to work management can be transferred to them throughout the construction period. In addition, an administrator will be deployed to ensure smooth communication with and the management of the many local engineers and skilled workers to be recruited in Cairo in order to prevent any disruption of the tightly planned work schedule due to recruitment delays, inadequate procurement of materials in Cairo or insufficient communication between the people working at the site.

In view of the scale and contents of the planned building work under the Project, it is desirable for the Contractor to appoint at least those engineers listed in Table 2-5 to be stationed at the site on a full-time basis.

Table 2-5 Engineers to be Dispatched by the Contractor

Type of Engineer	Number	Work Assignment	Dispatch Period
Site Manager	1	Overall control of the work; obtaining of approvals; materials and materials procurement control; labour management; accounting	Throughout the construction period
Administrator	1	Equipment and materials procurement control; labour management; accounting	Throughout the construction period

The deployment of locally recruited personnel in an appropriate manner will be necessary, taking the ever-changing work situation into consideration.

2.2.5.5 Quality Control Plan

Compared to Japanese products, construction materials which can be procured in Egypt for the Project are of an uneven quality because of the lack of strict quality control at the production stage, making detailed quality inspection necessary prior to their delivery to the construction site. In regard to those items to be produced at the site (concrete and mortar, etc.), their required standards in line with the work control standards adopted for the preparation of the work plan will be established as the guidelines for quality control.

2.2.5.6 Procurement Plan

Most of the construction materials to be used for the Project can be procured in Egypt. In the case of materials for the civil engineering and building work (aggregate, cement, reinforcing bars, steel, wood and paint, etc.), both Egyptian and foreign products are available in the local

market in sufficient quantity and their local procurement is not difficult. As construction machinery and transport vehicles can be either leased or procured in Cairo, no problems are anticipated in regard to the implementation of the Project in this aspect.

2.2.5.7 Implementation Schedule

The Project will be implemented in accordance with the following schedule which conforms to the relevant rules of Japan’s grant aid scheme.

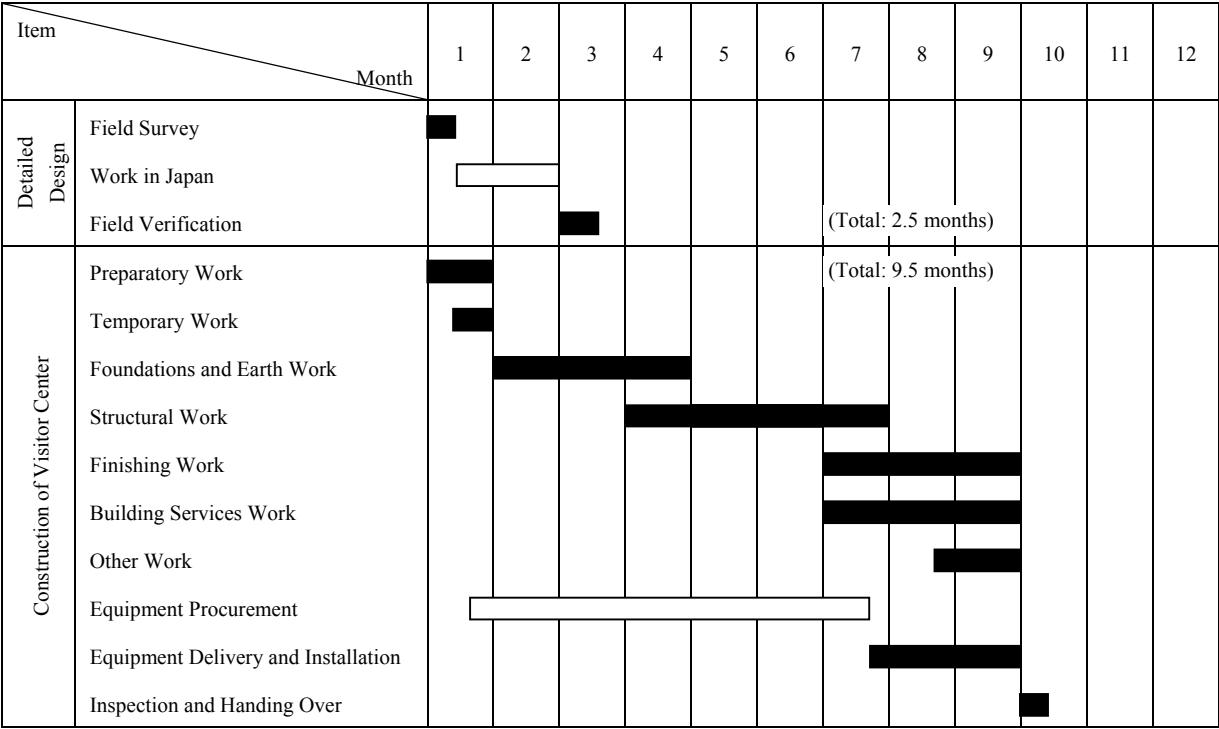


Fig. 2-7 Implementation Schedule

2.3 Obligations of Recipient Country

In the course of the implementation of this grant aid project, the Government of Egypt will be responsible for the following work and items in addition to the work listed in 2.2.4.3 – Scope of Work. In order to fulfil the outcome of the Project, the role and the work by the Egyptian side shall be indispensable.

- (1) To provide data and information required for the planning and implementation of the Project
- (2) To apply for and obtain project-related permits and approval from the relevant government ministries

- (3) To remove the existing cafeteria and garage and to sufficiently prepare the ground at the project site prior to the commencement of the work by the Japanese side
- (4) To exempt the materials and products procured for the Project from any tax
- (5) To accord Japanese nationals whose services may be required in connection with the supply of products and services under the validated contracts such facilities as may be necessary for their entry into Egypt and stay therein for the performance of their work
- (6) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Egypt with respect to the supply of the products and services under the validated contracts
- (7) To bear commissions to a Japanese bank for banking services based on the banking arrangements
- (8) To bear all expenses other than those to be borne by the grant aid necessary for the implementation of the Project
- (9) To appoint full-time counterparts for the Project in order to transfer operation and maintenance techniques
- (10) To use and properly and effectively maintain all equipment and materials provided with Japanese grant aid
- (11) To secure and maintain transport routes for the construction materials
- (12) To ensure the personal safety of all workers, visitors and others during the construction period

2.4 Operation and Maintenance Plan

(1) Visitor Center Operation and Maintenance Regime

The operation and maintenance of the visitor center after its opening will fall within the jurisdiction of the SCA. The actual work will be conducted by the Central Department of Upper Egypt and Oases.

(2) Maintenance Plan

The Central Department of Upper Egypt and Oases will conduct the operation of the visitor center, the maintenance of the building and the maintenance as well as renewal of the exhibitions.

1) Operation of the Visitor Center

The operation of the visitor center will require a range of work, including locking and unlocking of the building and the handling of visitors and two persons will be stationed at the visitor center to man the counter and the administration office. The ticket windows will require permanent staff (up to three people during peak hours). Communication with and the supervision of electrical and building service engineers will be required from time to time in addition to routine cleaning and tidying to keep the visitor center clean.

2) Building Maintenance

The building maintenance work will include the periodic inspection and maintenance of the building structure, electrical installations, air-conditioning system and automatic doors, etc., the replacement of expendables, the repair of breakdowns, the replenishment of water using a tank lorry and the dipping up of night soil using a vacuum car. The water level in the water supply tank should be regularly checked.

3) Maintenance and Renewal of Exhibitions

The types of work relating to the exhibitions will include the planning of exhibitions, the preparation and display of exhibits (panels, photographs, commentaries and models, etc.), the production and showing of video programmes, the preparation and management of touch-panel computer software featuring the Valley of the Kings and the updating of information provided in the visitor center.

2.5 Estimated Project Cost

2.5.1 Estimated Project Cost

Should the Project be implemented with grant aid provided by the Government of Japan, the total project cost will be approximately ¥261 million to be borne by the two sides as described below based on the scope of work for each side explained earlier and the estimation conditions given below. However, the total project cost given here is a provisional and would be further examined by the Government of Japan for the approval of the Grant.

(1) Japanese Portion

Construction cost of the visitor center and procurement cost of the necessary equipment (total floor area of the building: approximately 1,009 m²):

Estimated Japanese portion: approximately ¥ 261 million

Cost Item		Estimated Cost (Unit: ¥ million)	
Facility	Construction of Visitor Center	160	209
Equipment	Procurement of Equipment	49	
Detailed Design, Work Supervision, Technical Guidance		52	
Total		261	

(This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.)

(2) Egyptian Portion

The main cost items to be borne by the Egyptian side are shown in Appendix-5.

(3) Estimation Conditions

- 1) Date of estimation : June, 2004
- 2) Foreign exchange rate : US\$ 1 = ¥109.24
(average from 4th December, 2003 to 31st May, 2004)
LE1 = ¥17.70
(average from 4th December, 2003 to 31st May, 2004)
- 3) Work period : the detailed design and work period are shown in the implementation schedule
- 4) Others : Project to be implemented in accordance with the grant aid scheme of the Government of Japan

2.5.2 Operation and Maintenance Cost

The estimated operation and maintenance cost of the visitor center to be constructed under the Project is shown in Table 2-6.

Table 2-6 Estimated Operation and Maintenance Cost of the Visitor Center

Cost Item	Cost (LE/year)	Estimation Conditions*
Cleaning	9,000	$25 \times 365 = 9,125$
Electricity	235,000	
Water	25,000	$2,000,000 \times 0.05 \times 0.01 \times 25 = 25,000$
Foul Water Disposal	6,000	$2,000,000 \times 0.05 \times 0.01 \times 6 = 6,000$
Air-conditioner	17,000	
Automatic doors	8,000	
Total	300,000	

* The annual number of visitors to the visitor center is assumed to be two million.

The above maintenance cost can be met within the SCA budget.

For the operation of the visitor center, the following staff will be required.

Table 2-7 Required Staff for the Visitor Center

Workplace	Number of Staff
Administration Office (Building Management)	2
Reception and Exhibition Management	2 ~ 3
Ticket Windows	2 ~ 3
Total	6 ~ 8

* The required number of staff will be subject to seasonal fluctuations.

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effects

The Project is expected to have the effects described below.

(1) Direct Effects

Present Situation and Problems	Improvement Measures Under the Project (Japanese assistance)	Project Effects and Degree of Improvement
1. At present, there is no on-site facility to provide proper information on the Valley of the Kings for visitors, making it difficult for visitors to understand the conditions and historical as well as cultural value of the Valley of the Kings.	A visitor center equipped with a topographical model of the Valley of the Kings and a large television, etc. will be constructed.	Easy to understand information on the Valley of the Kings will be provided for the visitors on their way to and from the heritages through a topographical model, various exhibits and video displays, etc.
2. The structurally damaged cafeteria building has been left unattended, spoiling the view of the Valley of the Kings near the car park.	The visitor center building with a fine appearance will be constructed together with the demolition and removal of the cafeteria by the Egyptian side.	The view around the car park situated at the approach section to the Valley of the Kings will be improved.
3. Most visitors do not understand that wall paintings inside the tombs are deteriorating due to vandalism and breathing by visitors.	The visitor center will have spaces to instruct on the expected behaviour inside the tombs and to inform visitors about open tombs. The change of the wall paintings after discovery will be shown and the importance of conservation will be explained. The latest condition of opening and congestion will be displayed for alleviation of concentration to specific tombs.	Most visitors will understand importance of conservation and the correct behaviour inside the tombs based on the instructions and warnings provided in the visitor center.

(2) Indirect Effects

Present Situation and Problems	Improvement Measures Under the Project (Grant Aid Project)	Project Effects and Degree of Improvement
1. It is difficult to understand the current state of restoration of the tombs of the Pharaohs.	Lectures, etc. will be provided in the visitor center. Spaces providing information (video display and touch-panel computer spaces) will be introduced.	Up-to-date information on the state of restoration of the tombs will be provided to meet the demands of individual visitors for detailed information on the Valley of the Kings.
2. There is only limited resting space for visitors.	The visitor center will be air-conditioned rigid building.	The visitors will be able to get out of the outside heat in the building.

3.2 Recommendations

The Egyptian side should successfully deal with the following matters to ensure the realisation and continuation of the project effects.

- Proper management of the exhibitions, including the exhibits and video software, etc., in the visitor center will be required to provide visitors with up-to-date information.
- The allocation of sufficient manpower and budget to maintain the building and equipment provided under the Project will be required to ensure the proper operation and maintenance of the visitor center.

Appendix - 1 Member List of the Study Team

1 Member List of the Study Team

(1) Members for Basic Design Study

Name	Assingment	Position
Mr. Kazuhisa Arai	Team Leader	Chief, Living Conditions Improvement Team, Project Management Group II, Grant Aid Management Department, Japan International Cooperation Agency (JICA)
Mr. Nobutaka Kondo	Project Coordinator	Living Conditions Improvement Team, Project Management Group II, Grant Aid Management Department, Japan International Cooperation Agency
Mr. Naoyuki Minami	Project Manager / Architect I	Yachiyo Engineering Co., Ltd.
Mr. Hirofumi Nagakane	Exhibition Planner	Yachiyo Engineering Co., Ltd.
Mr. Takayasu Kase	Architect II	Yachiyo Engineering Co., Ltd.
Mr. Katsumi Fujii	Equipment Engineer / Procurement Plan / Cost Estimate	Yachiyo Engineering Co., Ltd.

(2) Members for Explanation of Draft Basic Design Report

Name	Assingment	Position
Mr. Shigeru Okamoto	Team Leader	Resident Representative, Egypt Office, Japan International Cooperation Agency
Ms. Yumiko Asakuma	Project Coordinator	Living Conditions Improvement Team, Project Management Group II, Grant Aid Management Department, Japan International Cooperation Agency
Mr. Naoyuki Minami	Project Manager / Architect I	Yachiyo Engineering Co., Ltd.
Mr. Katsumi Fujii	Equipment Engineer / Procurement Plan / Cost Estimate	Yachiyo Engineering Co., Ltd.

Appendix - 2 Study Schedule

1. Study Schedule (Field Survey)

Assignment	Officials			Consultants		
	1. Team Leader	2. Project Coordinator	3. Project Manager / Architect I	4. Equipment Engineer/ Procurement Plan / Cost Estimate	5. Architect II	6. Exhibition Planner
Name	Mr. Kazuhisa ARAI	Mr. Nobutaka	Mr. Naoyuki MINAMI	Mr. Katsumi FUJII	Mr. Takayasu KASE	Mr. Hirofumi NAGAKANE
1	9-May	Sun	Tokyo-London (11:00-15:30 VS901) London-Cairo (17:00-23:50 BA155)			
2	10-May	Mon	Courtesy call on Embassy of Japan (EOJ), JICA Office, Ministry of Foreign Affairs (MOFA) / International Cooperation Sector Meeting with UNESCO Cairo Office			
3	11-May	Tue	Kick-off Meeting with Ministry of Culture (MOC) / Supreme Council of Antiquities (SCA) Discussion with SCA (Objectives, Background) on Inception Report			
4	12-May	Wed	Cairo-Luxor(06:30-07:35 MS137) Discussion with SCA Luxor office, Visit to the site			
5	13-May	Thu	Site Survey (Construction Site, State of Preservation, Restoration Activities, Condition of Visi			Preparation for Topographic Survey and
6	14-May	Fri	Luxor-Cairo (07:00-08:05 MS132) Analysis of Survey Data		Preparation for Topographic Survey and Facility Plan	
7	15-May	Sat	Discussion on Components of Facilities/Equipment and Collaboration	Discussion on Components of Facilities/Equipment and Collaboration Plan	Site Survey / Survey on Facility Plan, Construction	
8	16-May	Sun	Discussion on Minutes of Discussions (M/D) with SCA	Discussion on Minutes of Discussions (M/D) with SCA	- ditto -	
9	17-May	Mon	Signing on the M/D Report to EOJ and JICA Egypt Office	Signing on the M/D, Supplementary Meetings with SCA	-ditto-	Tokyo-London (10:55-15:15BA006) London-Cairo (17:00-23:50 BA155)
10	18-May	Tue	Cairo-Frankfurt (16:30-19:45 LH583) Dept. Frankfurt (21:05- JL408)	Cairo-Luxor (08:30-09:35 MS135) Meeting with SCA, Site Investigation	-ditto-	Cairo-Luxor (08:30-09:35 MS135)
11	19-May	Wed	Arrive at Tokyo (-15:20)	Survey on Cultural Heritage and Visitors for the Valley of the Kings (VOK) and Exhibition Plan	-ditto-	Meeting with SCA
12	20-May	Thu		Site Investigation	Survey on Equipment and Procurement	Survey on Exhibition Plan
13	21-May	Fri		Site Investigation	Luxor-Cairo (07:00-08:05 MS132); Market Survey	Survey on Exhibition Plan
14	22-May	Sat		Meeting with Higher Council of Luxor City	Survey on Equipment and Procurement	Meeting with SCA
15	23-May	Sun		Meeting with Thebe Mapping Project Team	- ditto -	Survey on Exhibition Plan
16	24-May	Mon		Meeting with SCA, Site Survey	- ditto -	Luxor - Cairo (12:40-13:45 MS136); Market Survey
17	25-May	Tue		-ditto-	Survey on Equipment and Cost Estimate	Meeting with SCA, Survey on Construction
18	26-May	Wed		Luxor - Cairo (15:05-16:10 MS224) Operation/Maintenance Plan	Meeting with SCA; Survey on Equipment Plan	- ditto - Luxor - Cairo (15:05-16:10 MS224) Exhibition Plan
19	27-May	Thu		Meeting with SCA and MOC	Meeting with SCA and MOC	Meeting with SCA and MOC
20	28-May	Fri		Survey on Exhibition	Cairo-London (08:25-11:50 BA154) Dept London (13:40- BA005)	Survey on Exhibition
21	29-May	Sat		Meeting with SCA	Arrive at Tokyo (-09:10)	Meeting with SCA Preparation of Field
22	30-May	Sun		Meeting with SCA, Preparation of Field		Cairo-London (08:25-11:50 BA154) Dept London (13:40- BA005)
23	31-May	Mon		Meeting with SCA, Preparation of Field		Arrive at Tokyo (-09:10)
24	1-Jun	Tue		Meeting Dr. Kent Weeks		
25	2-Jun	Wed		Discussion on Field Report with SCA		
26	3-Jun	Thu		Report to EOJ and JICA Egypt Office		
27	4-Jun	Fri		Supplementary Survey in Cairo		
28	5-Jun	Sat		Cairo-London (8:25-11:50 BA154) Dept. London (13:40- BA005)		Cairo-London (8:25-11:50 BA154) Dept. London (13:40- BA005)
29	6-Jun	Sun		Arrive at Tokyo (-09:10)		Arrive at Tokyo (-09:10)

2. Study Schedule (Explanation of Draft Basic Design Report)

			Officials	Consultant	
			Project Coordinator	Project Manager/ Architect I	Equipment Planner/ Quantity Surveyor
Name			Ms. Yumiko Asakuma	Mr. Naoyuki Minami	Mr. Katsumi Fujii
1	20-Aug	Fri	Bahrain – Cairo (11:20–14:25 GF071) Arriving in Cairo	Narita – London (10:20–15:30 JL403) London – Cairo (17:00–23:50 BA155)	
2	21-Aug	Sat	Visit to Luxor	11:00 Discussion on Master Plan and Draft Basic Design Report with American University in Cairo	
3	22-Aug	Sun	9:30 Visit to JICA Egypt Office (Explanation of Draft Basic Design Report), 11:00 Embassy of Japan(EOJ) 14:00 Kick-off Meeting and Discussion on Draft Basic Design Report with SCA		
4	23-Aug	Mon	9:00 Discussion on Draft Basic Design Report with SCA		
5	24-Aug	Tue	9:00 Discussion on Minutes of Discussions with SCA		
6	25-Aug	Wed	14:00 Signing on Minutes of Discussions with SCA		
7	26-Aug	Thu	10:00 Report to JICA Egypt Office, 12:00 Report to Embassy of Japan		
8	27-Aug	Fri	Cairo – Paris (2:05–5:55 AF521) Dept. Paris – (19:05– JL406)	AM Cairo – Luxor (7:30–8:35 MS135) 11:00 Investigation on site	
9	28-Aug	Sat	Arr. Tokyo (–13:55)	10:00 Discussion with SCA	
10	29-Aug	Sun		Discussion with SCA, Site investigation PM Luxor – Cairo (12:40–13:45 MS136)	
11	30-Aug	Mon		Supplementary Survey	
12	31-Aug	Tue		Supplementary Survey	
13	1-Sep	Wed		Cairo – London (8:25–11:50 BA154) Dept. London (19:45– JL402)	
14	2-Sep	Thu	Arr. Narita (–15:30)		

Note: Mr. Shigeru Okamoto is the Resident Representative of JICA Egypt Office.

Appendix – 3

List of Parties Concerned in the Recipient Country

3 List of Parties Concerned in the Recipient Country

<u>Party and Name</u>	<u>Position</u>
Supreme Council of Antiquities (SCA)	
Mr. Sabry Abd El Aziz Khater	Head of Egyptology Sector
Dr. Holeil Ghally	Head of Luxor and Upper Egypt Antiquities
Dr. Mahoud Mabrouk	Head of Museum Sector
Dr. Khaled Abdel Hady	Head of Department of Engineering
Mr. Abdel Hamid Kotb	Director of Engineering Department
Mr. Shaban Ahmed Abdelgowad	Technical Office
Mr. Hany Elsis	Technical Office
Mr. Mohamed Asem	General Manager of Upper Egypt Antiquities
Mr. Ali El Asfur	General Manager of West Bank Antiquities
Mr. Sultan Mohamed	Manager of West Bank Antiquities
Mr. Mohamed Abdul Aziz	Chief Inspector of North West Bank (Valley of the Kings)
Mr. Noor Abd EL Ghafar	Chief Inspector of Middle West Bank
Ministry of Culture	
Mr. Ayman Abd Elmoneim	Assistant of Minister of Culture (Archaeology)
Ministry of Foreign Affaires	
Ms. Falma F. Galal	Minister Plenipotentiary, Director of Financial Committee
Ms. Nivein Semaika	Vice Minister of Foreign Affaires
Ms. Nabiala Salama	Ambassador (Manager of Agreement Affaires)
Mr. Cherif Youssef Abbas	Minister Plenipotentiary, Ambassador
UNESCO Cairo Office	
Dr. Mohamed J. Abdulrazzak	Director
Ms. Constanza de Simone	Consultant
Theban Mapping Project (TMP) / American University in Cairo (AUC)	
Dr. Kent R. Weeks	Director
Egyptian Antiquities Information System	
Dr. Naguib Amin	Team Leader, Architect-Engineer, Planner
Embassy of Japan	
Mr. Tamon Mochida	Director, Information and Culture Center
Ms. Ryoko Sasaoka	Third Secretary
JICA Egypt Office	
Mr. Norio Shimomura	Former Resident Representative
Mr. Yasuhiko Wada	Assistant Resident Representative
Mr. Naoto Mukai	Assistant Resident Representative
Mr. Wael Yahya	Project Officer
Mr. Mahmoud Addel Halim	Development Officer

Appendix - 4 Minutes of Discussions (M/D)

**Minutes of Discussions
on the Basic Design Study
on the Project for Improvement of the Surrounding Area
of the Valley of the Kings
(Explanation of Draft Final Report)**

In May 2004, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Improvement of the Surrounding Area of the Valley of the Kings (hereinafter referred to as "the Project") to the Arab Republic of Egypt (hereinafter referred to as "Egypt"), and through discussions, field survey, and technical examination of the results in Japan, JICA prepared a draft final report of the study.

In order to explain and to consult with concerned officials of Egypt on the components of the draft final report, JICA sent to Egypt the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Shigeru Okamoto, Resident Representative, JICA Egypt Office, from August 21 to September 1, 2004.

As a result of discussions, both sides confirmed the main items described on the attached sheet.

Cairo, 24 August, 2004

岡本 茂

Zahi Hawass

Shigeru Okamoto

Zahi Hawass

Leader

Secretary General

Basic Design Explanation Team

Supreme Council of Antiquities

Japan International Cooperation Agency

Arab Republic of Egypt

ATTACHMENT

1. Components of the Draft Final Report

The Egyptian side has agreed and accepted in principle the components of the draft final report explained by the Team.

Modifications described in Annex-1 were requested by Egyptian side, and will be reflected in the Basic Design Study Report.

The final decision will be made by the Government of Japan based on the examination of the result of the Basic Design Study.

2. Japan's Grant Aid Scheme

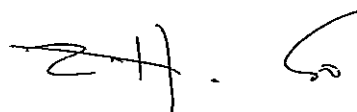
The Egyptian side understands the Japan's Grant Aid scheme and the necessary undertakings to be taken by the Government of Egypt as explained by the Team and described in Annex-2 and Annex-3 of the Minutes of Discussions signed by both sides on May 17, 2004.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Egypt by the end of October, 2004.

4. Other Relevant Issues

- 4-1 The Egyptian side has understood the schedule of the Project after the Exchange of Notes (E/N).
- 4-2 Both sides have agreed that the visitor center would have the following functions:
- to provide concise information on the Valley of the Kings for visitors through exhibition
 - to instruct and educate visitors on the appropriate manner in cultural heritages
 - to provide minimum office space for the administration of the center
- 4-3 The visitor center will be constructed in the site shown in Annex-2.
- 4-4 The entrance of the visitor center shown in the draft final report will be modified as shown in Annex-3 for security reasons.
- Four (4) units of X-ray machines and security gates will be procured by Egyptian side and they will be installed by Egyptian side promptly after completion of the building construction.
- 4-5 The Egyptian side confirmed that there are no culture relics under the planned construction site and the construction will not give serious negative effects on the environment around the site.
- 4-6 Egyptian side declared that the master plan for the Valley of the Kings was under



development and assured the following items.

- The role of the visitor center would be mentioned in the master plan.
 - The location of the visitor center as mentioned in the draft final report would be conformable to the master plan.
 - The tram station would be placed on the south side of the visitor center.
 - All of the visitors should enter the Valley of the Kings through the security gate of the visitor center.
- 4-7 The visitor center will also be used for purposes of exchanges of information and education by the persons concerned such as scholars and inspectors. Egyptian side explained that the projectors procured by the grant aid will be used for the purposes.
- 4-8 The Egyptian side has agreed to secure and allocate enough budgets to operate and maintain the building and the equipment built and supplied by the Grant Aid properly and effectively.
- 4-9 Regarding exhibition in the visitor center, both sides have agreed on the following issues:
- Japanese side proposed draft exhibition scenario in the Draft Final Report. The Egyptian side shall complete its own exhibition scenario, policy and plan referring to the draft scenario and submit them to JICA Office to indicate the need of each equipment by 9th September, 2004.
 - The content of the exhibition (explanations, videos, photos, etc.) shall be prepared by the Egyptian side by the end of December, 2005, and the exhibit will be installed in the visitor center within one month after the completion of the visitor center building.
 - The explanation in the exhibits will be described in Arabic, English and Japanese language and the Japanese version of the explanation of exhibits such as panels would be prepared by Egyptian side by the end of December, 2005 and submitted to Japanese side for confirmation before manufacturing.
- 4-10 The Egyptian side shall demolish and remove the existing cafeteria by the end of March, 2005.
- 4-11 The Egyptian side has agreed to take necessary measures regarding the following arrangements in accordance with the schedule of the Project;
- 1) To ensure necessary arrangement of construction permit and any other authorization required for construction of the visitor center.
 - 2) To ensure prompt tax exemption and customs clearance of the products at the port of disembarkation.
 - 3) To reimburse sales tax concerning local purchase under the Project, to Japanese contractor(s).
- 4-12 No cost would be incurred by using the data of Thebes Mapping Project for making three-dimensional diorama of the Valley of the Kings.

2.11.60

- 4-13 The visitor center shall not be used as an excuse for closing tombs.
- 4-14 The Egyptian side has understood that another official request on technical cooperation, etc. should be submitted through diplomatic channels such as the Embassy of Japan and/or the JICA Office.

Annex-1: Modifications to be reflected in the Basic Design Study Report

Annex-2: The site of the visitor center

Annex-3: Modification plan of the visitor center

Handwritten signature or initials, possibly reading 'Z.H.' followed by a flourish.

Modifications to be reflected in the Basic Design Study Report

1. Floor Area

Floor Area will be as follows:

Exhibition and Information Halls	663.0m ²
Administration Office	41.0 m ²
Ticket Office	24.6 m ²
Toilets Area	57.4 m ²
Security Area	125.8 m ²
Entrance Porch	40.0 m ²
Vestibule	24.0 m ²
Reception	12.8 m ²
Backroom	20.0 m ²

2. Internal Finish

The floor and skirting finish of 'Exhibition and information Halls' shall be modified to 'Granite' instead of 'Granite and Marble'.

The floor finish of 'Toilet Facilities' shall be modified to 'Granite' instead of 'Terrazzo'.

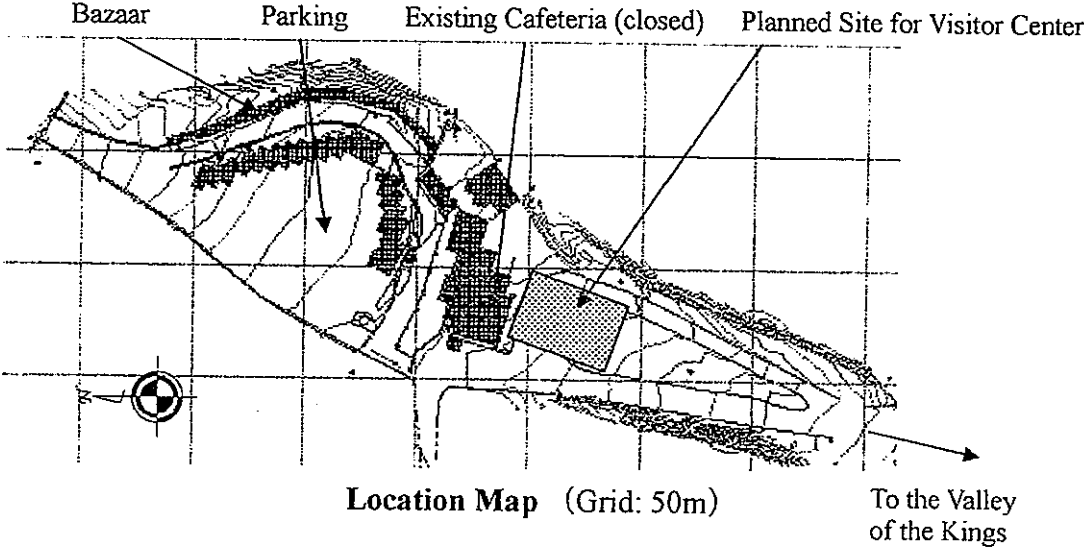
3. Doors and Windows

'Shutters: Steel electrically-operated shutters' shall be deleted.

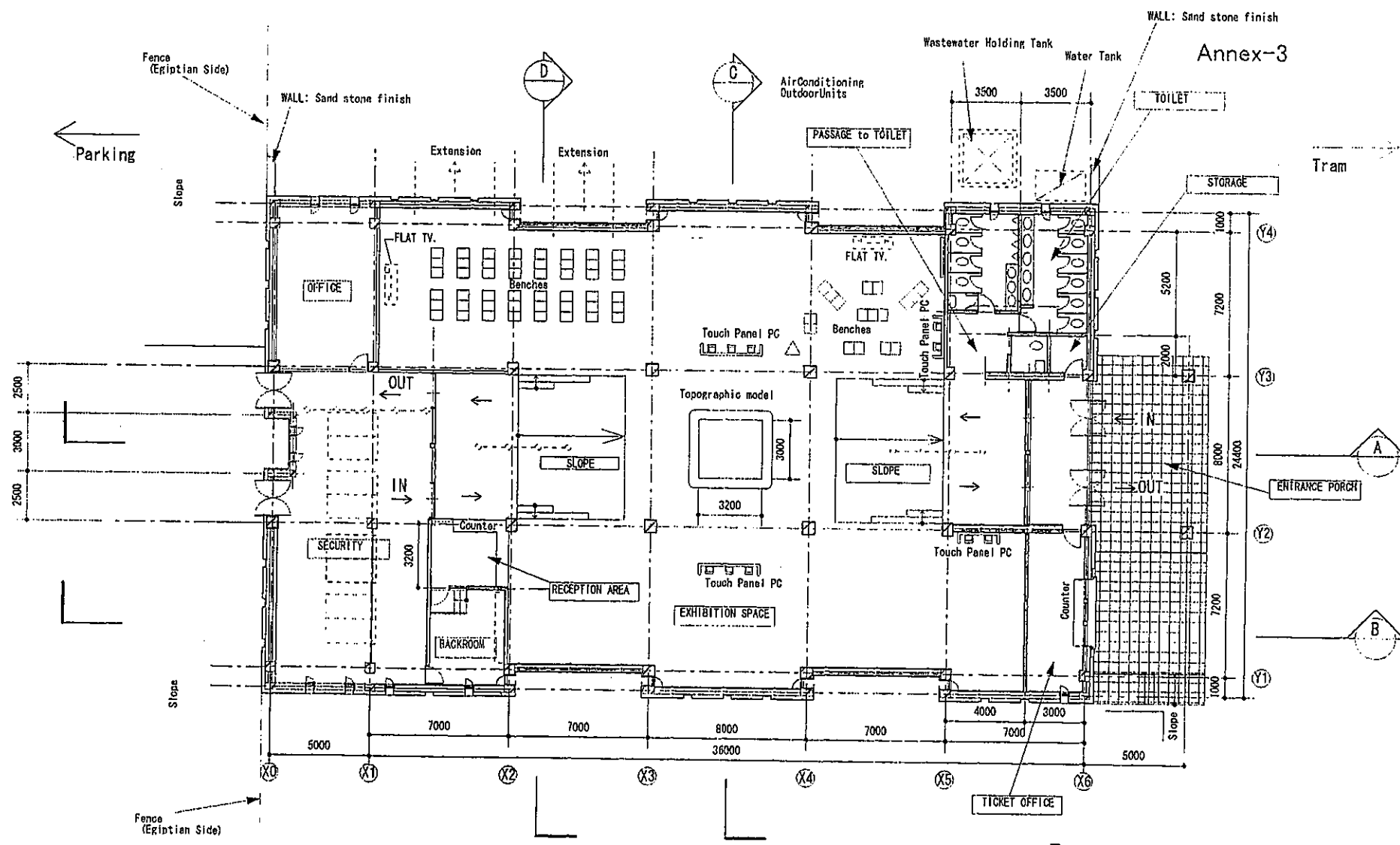
'Hinged swinging glass doors' shall be added to 'Entrances'.

4. Pavement around the building

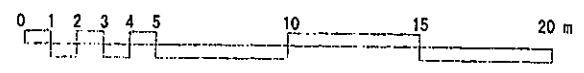
The surrounding area around the visitor center building (width 1.5 m) shall be paved.
The area between the existing asphalt road and the building on the west side should be paved.
The other external area will be responsible for Egyptian side.



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PLAN



The Project for Improvement of The Surrounding Area of The Valley of the Kings			
SEO NO.:	SHEET NO.:	DESIGNED BY:	DATE: AUG 2004
DRAWING TITLE: GROUND FLOOR PLAN		DRAWN BY:	
		CHECKED BY:	
		APPROVED BY:	
VISITOR CENTER			

2.11

Appendix – 5

Cost Estimation Borne by the Recipient Country

Appendix – 5 Cost Estimation Borne by the Recipient Country

Demolition and removal cost of the existing cafeteria and garage, cost of car park improvement with the fences and gates, including the former cafeteria site, and power line relocation cost: approximately LE 700,000 (¥12,390,000)

Table Estimated Egyptian Portion of the Project Cost

Cost Item	Cost (LE)
Demolition and removal of the existing cafeteria and garage	180,000
Car park improvement, including the fences and gates	410,000
Power cable relocation	110,000
Total	700,000

Appendix - 6 References

6 References

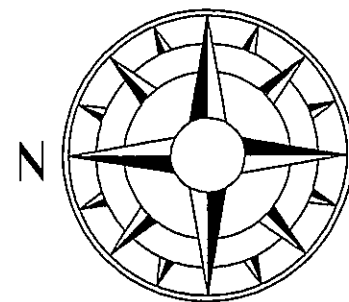
No.	Title	Media	Organization	Year
1	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Volume 1: Technical Report, Volume 2: Supplementary Documents	CD	The Ministry of Housing, Utilities and Urban Communities	2000
2	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #1, Investment Portfolio for Proposed Grant of US \$40 million to the Arab Republic of Egypt for the Restoration of the Avenue of the Sphinxes	CD	The Ministry of Housing, Utilities and Urban Communities	1999
3	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #2, Investment Portfolio for the Development of the Destination Resort of El-Toad in Luxor City	CD	The Ministry of Housing, Utilities and Urban Communities	2000
4	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #3, Investment Portfolio for the Development of the New City of New Luxor, Egypt	CD	The Ministry of Housing, Utilities and Urban Communities	2000
5	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #4, Investment Portfolio for the Development of Infrastructure serving New Luxor and El-Toad	CD	The Ministry of Housing, Utilities and Urban Communities	2000
6	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #5, Investment Portfolio for High-Value Agriculture and Agroprocessing Industries in Luxor City	CD	The Ministry of Housing, Utilities and Urban Communities	1999

No.	Title	Media	Organization	Year
7	The Comprehensive Development Plan of the City of Luxor - Final Structure Plan Investment Project #6, Investment Portfolio for the Creation of an Open Museum and Heritage District in Luxor City, Egypt	CD	The Ministry of Housing, Utilities and Urban Communities	2000
8	Atlas of the Valley of the Kings	Atlas	American University in Cairo	2000
9	The Valley of the Kings (By Alberto Siliotti)	Book	White Star Publishers	2002
10	Egypt from the Air	Book	Tames & Hudson	1991

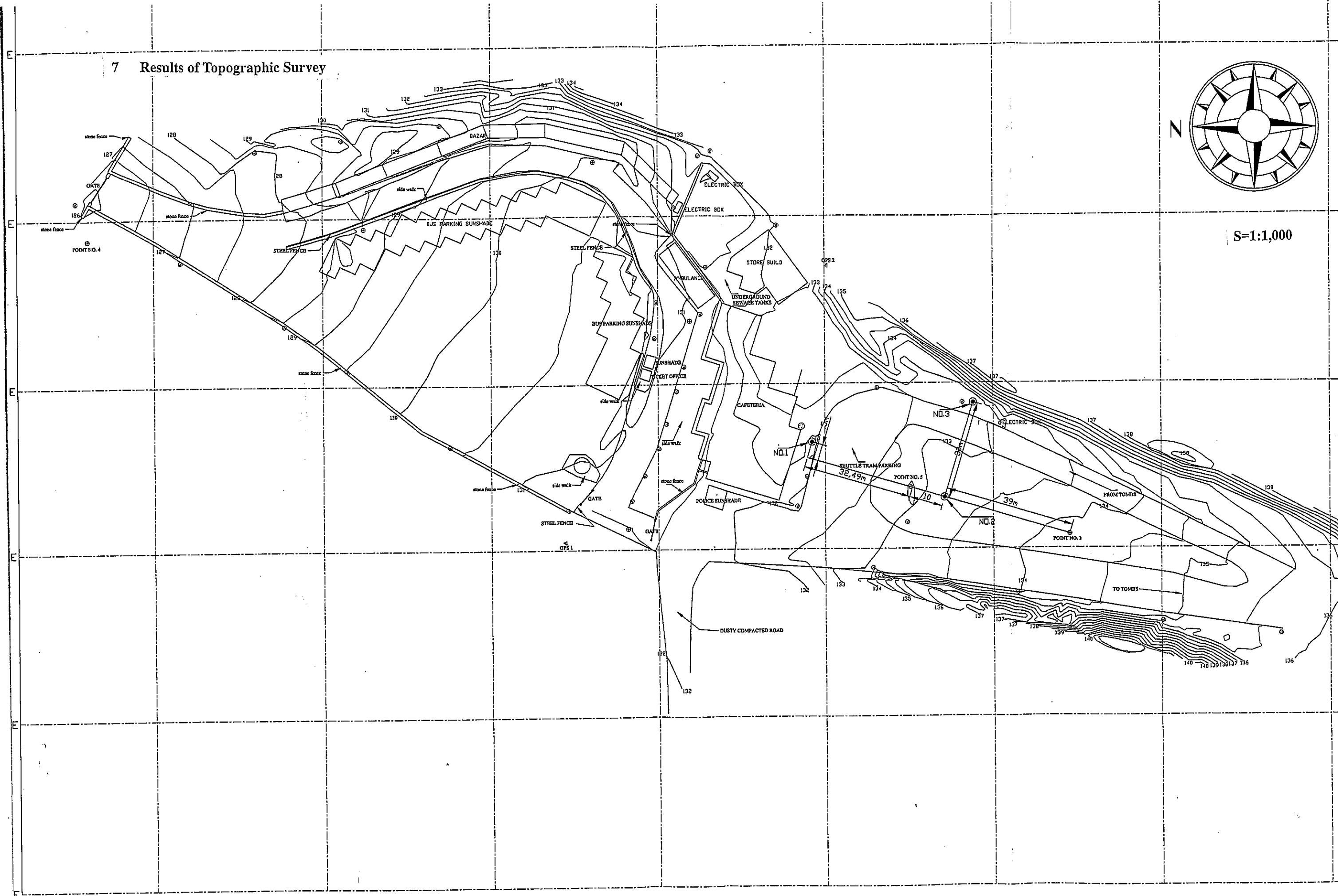
Appendix – 7

Topographic Survey

7 Results of Topographic Survey



S=1:1,000



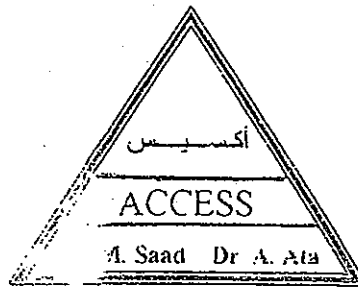
339700 N
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Appendix – 8

Results of Geotechnical Investigation

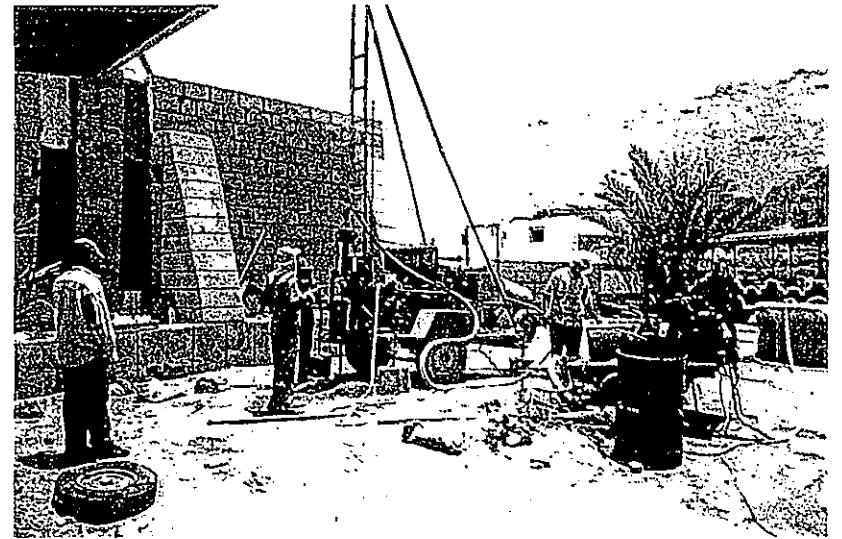
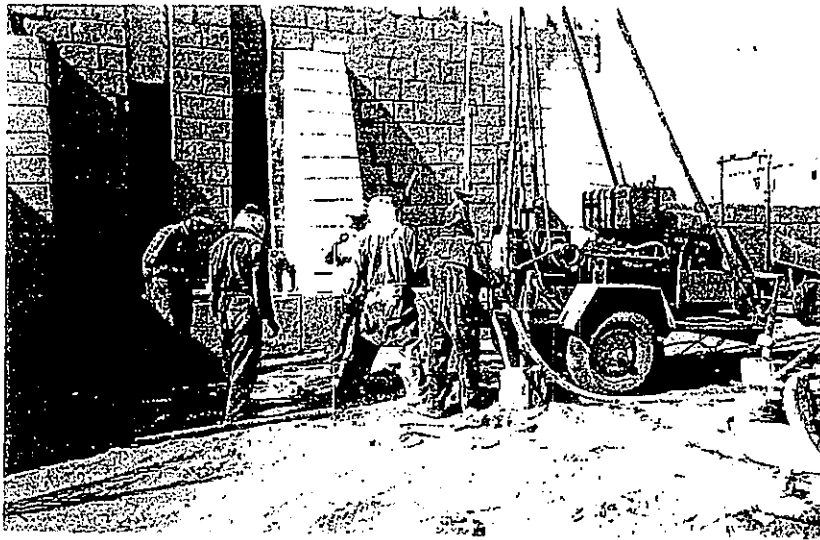
**VISITORS' CENTER
VALLEY OF THE KINGS - LUXOR**

**GEOTECHNICAL INVESTIGATION
AND
FOUNDATION RECOMMENDATION**

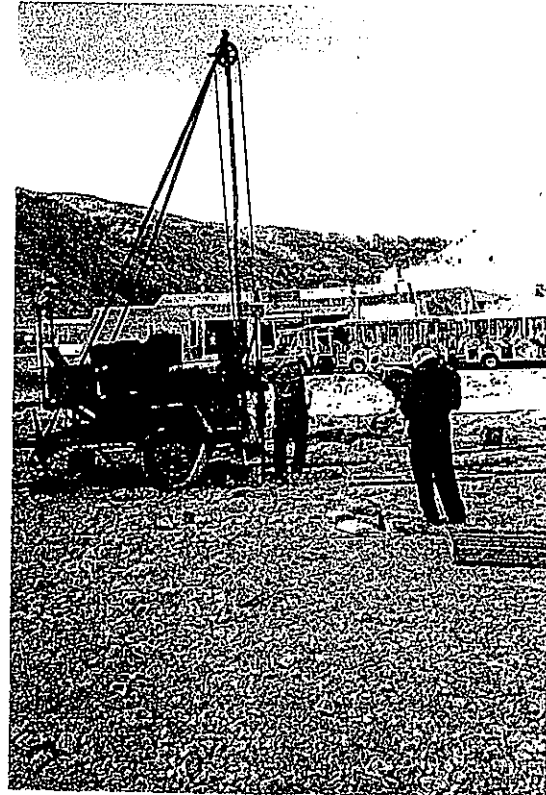
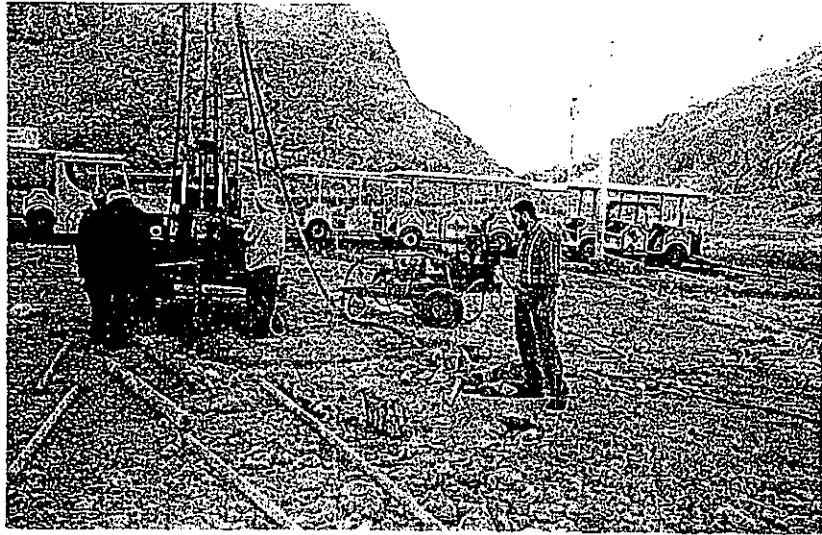
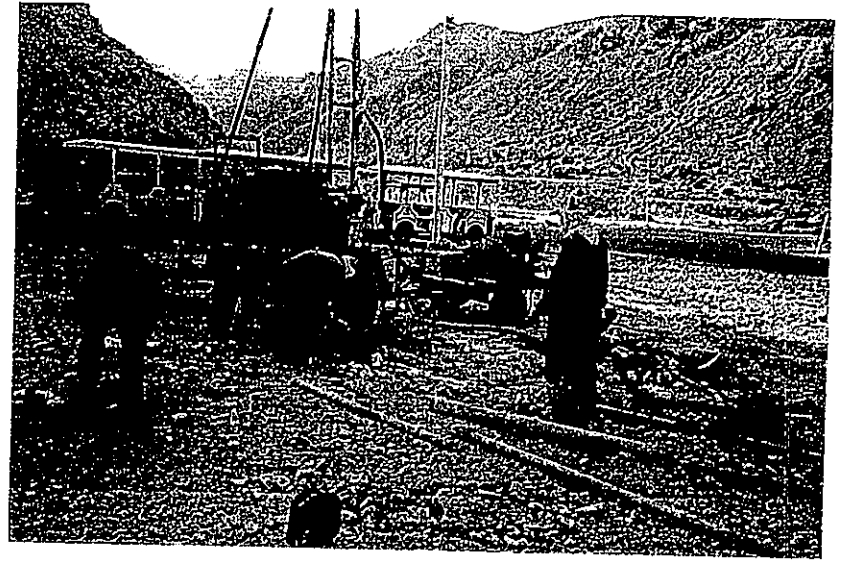
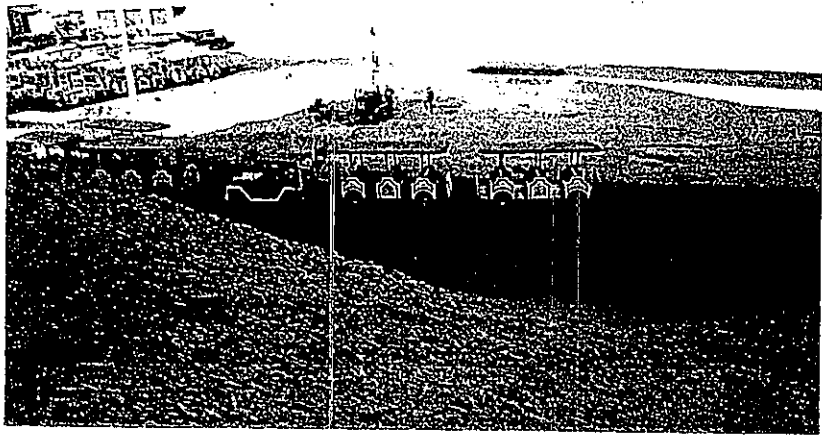


June 2004

A. Saad



Page 1.1



Bond

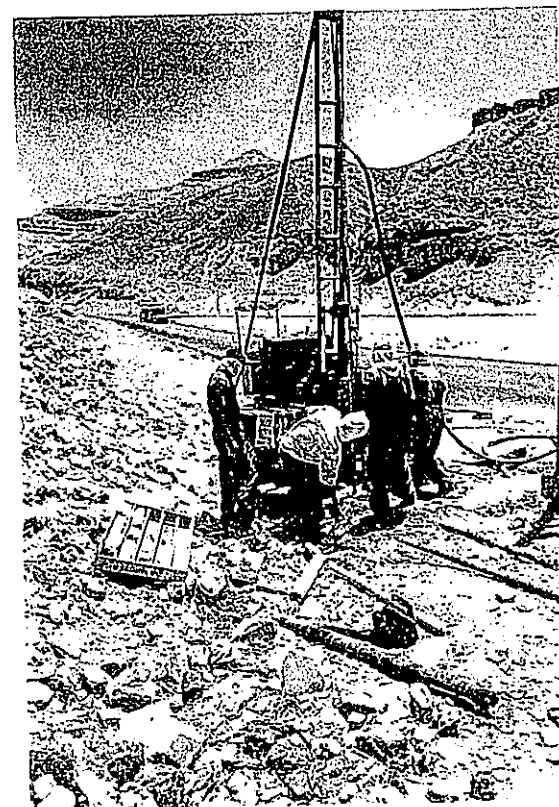
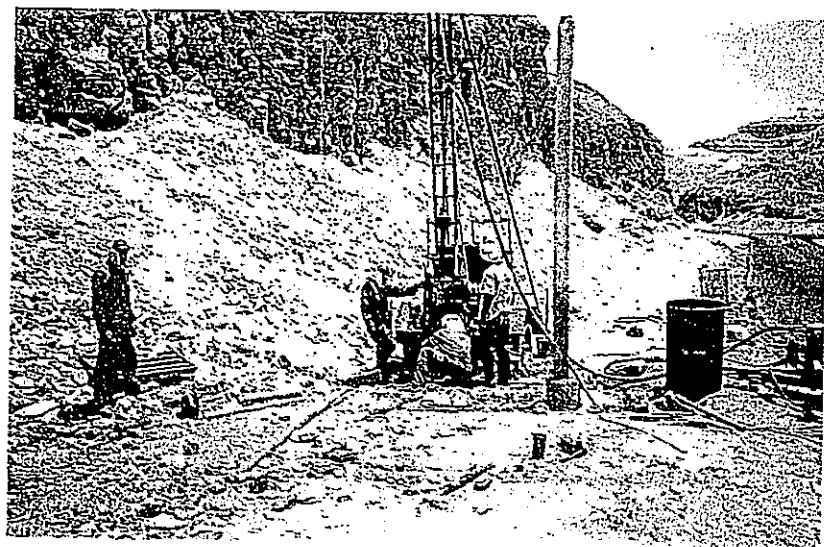
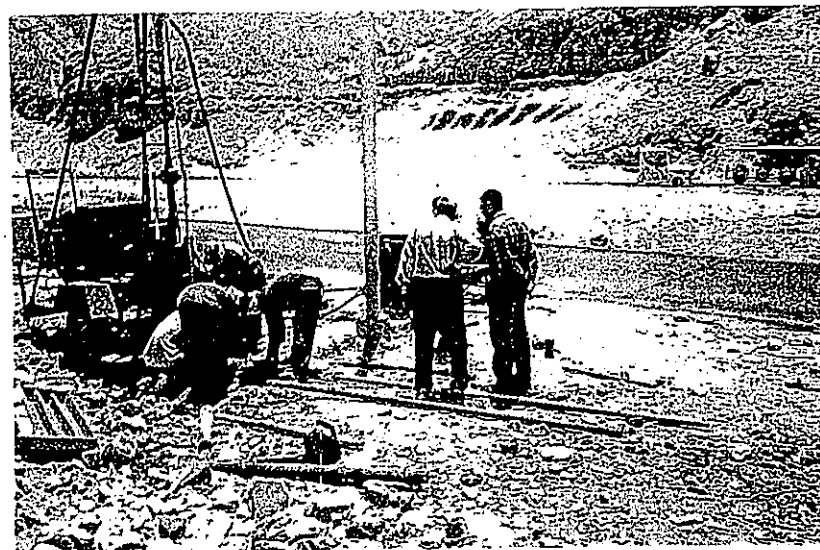
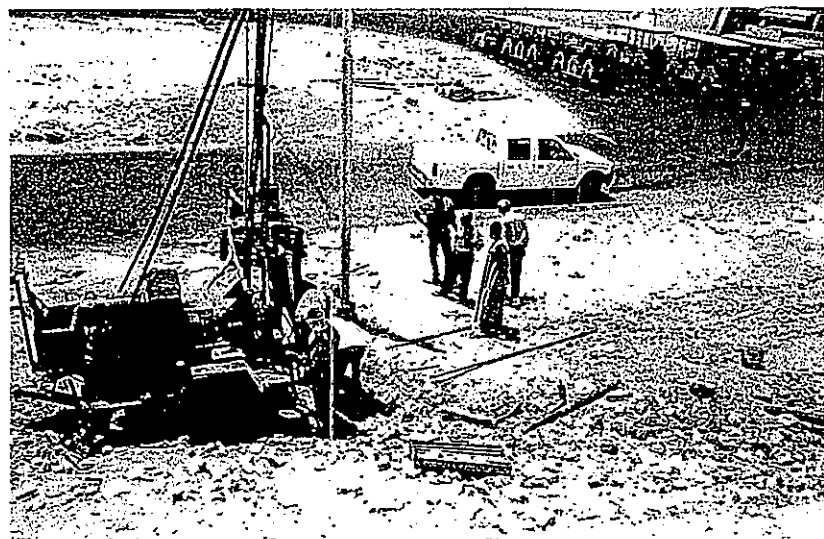


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1. INTRODUCTION

1.1 Project Description

This report is prepared upon the request of Alaref Eng. Consultants as part of the geotechnical investigation for the construction of the Visitors Center at the Valley of the Kings in Luxor City. The proposed structure is a public facility building consisting of a ground floor and one elevated floor. The building is proposed to be constructed of reinforced concrete skeleton type.

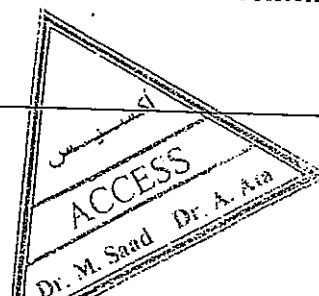
1.2 Geotechnical Evaluation and Scope of Services

The purpose of the geotechnical study was to evaluate general soil and groundwater conditions for the proposed site and to provide geotechnical recommendations for design and construction of the foundation system for the residential building.

The geotechnical study was performed in accordance with the Egyptian Code for Soil Mechanics and Design and Construction of Foundations, Revision 2001 and the American Standards for Testing of Materials Specification, ASTM, 1999.

Specifically, the scope of geotechnical services included:

- Drilling and sampling 3 boreholes to depths of 20 meters.
- Sampling of granular soils utilizing the Standard Penetration Test. In this procedure, blow counts and sampler penetration are recorded as a split-spoon sampler is driven into the soil by a 63.5-kg hammer falling 76 cm (ASTM D 1558).
- Sampling of cohesive soils utilizing core samples and thin-walled tubes. Samples are sealed with paraffin wax to preserve the natural properties until tested in the laboratory
- Performing laboratory tests on selected representative soil samples to evaluate the engineering properties the soil. Tests included moisture content, unit weight of



soil, Atterberg Limits, free swell, Swelling potential (odoemeter test), classification and X-Ray Diffraction.

- Providing analyses to develop design recommendations for the construction of the proposed building foundations.
- Making recommendations to reduce foreseeable construction problems.
- Including the above items into an engineering report incorporating site identification, plan of borings showing locations relative to the proposed structure, and log of borings. The logs include soil stratification, test data, and soil classification.
- Preparing the report under the supervision of, and the signature of, a Registered Consultant Engineer in the Egyptian Engineering Syndicate.

2. FIELD INVESTIGATION

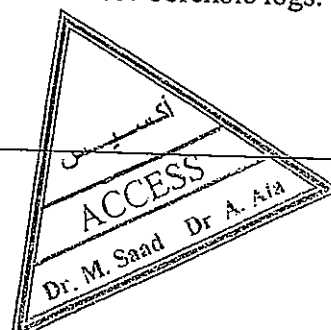
2.1 Geotechnical Borings

Figure (1) shows the locations of boreholes BH1, BH2 and BH3, at the proposed site at the Valley of the Kings in the West Bank of Luxor City. The locations of the boreholes and open pits were selected and conducted by GEOGROUP Co. for Geotechnical Investigations and Drilling. Borings were conducted using a mobile mechanical rotary drilling rig to obtain samples for classification, laboratory test and ground water information. Figure (2) a photograph of the site.

Definition of terms, and terminology of samples description and the definition of symbols in this report are given in Plates 1 and 1.

All soils recovered from the boreholes were visually examined and then properly packed, labeled and transported to the laboratory.

Figures (3) through (8) show the borehole logs. The descriptions in the log are given by the visual engineering's classification in accordance with Unified Soil Classification System. Any relevant soil data from laboratory testing were also included in those borehole logs.



3. LABORATORY TESTING

Undisturbed cohesive soil samples were recovered at representative depths. The different depths of the soil strata are indicated on the logs of borings in Figures (3) through (8). Classification of representative cohesive and rock samples recovered from each borehole consisted of performing visual classification, moisture content, bulk density, and Atterberg Limits.

The following laboratory tests were carried out on some selected samples:

3.1 Unit Weight and Moisture Content

Cohesive samples recovered from the boreholes were tested to determine the bulk unit weight. The values of the bulk unit weight and moisture content are presented on the log of borings and in the Test Tables.

3.2 Atterberg Limits

Atterberg limit tests were performed on selected cohesive samples. The tests included liquid and plastic limit determination and linear shrinkage. The results are presented in Figures (23). The results are also plotted on Casagrande Charts in Figures (24) and (25). The results show that the tested samples are characterized as Clay of medium to high plasticity with an average plasticity index of 25%.

3.3 Swell Potential Tests

Free swell and one dimensional Oedometer tests were performed on undisturbed samples of the shale to determine their constrained stress-strain behavior. Free swell tests showed low values of free swell (less than 100%) indicating minor swell activity. In Oedometer tests, samples were mounted in the 50-mm ring with the natural moisture and were then subject to an initial stress of 0.5 kg/cm^2 and left for one hour, while rerecording the change in height. After one hour, water was added at and the samples height was monitored upon inundation. The results of three different samples indicated no swelling or expansion under the initial stress.. The test results are plotted in Figures (27), (28) and (29).

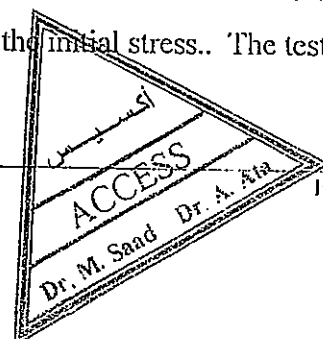


Figure (26) shows an alternative classification of the tested shale samples with regard expansiveness by evaluating the sensitivity of the clay mineral. The sensitivity is calculated by dividing the plasticity index by the percentage of clay fraction (evaluated from the XRD test explained in the next section). The results again show that the subject shale is characterized as low to medium expansive.

3.4 Mineralogical Analysis

Mineralogical analysis has been carried out on five samples selected from different boreholes. The location and description of the samples are given in Table (A). The XRD tests were conducted to find the type of the clay mineral. Due to the lithologic similarities of the samples, X-ray diffraction analysis was conducted on two samples in order to investigate the mineralogical composition including clay and non-clay minerals. The samples were first soaked overnight in distilled water for complete disaggregation after removal of carbonates with dilute (10%) hot HCl. The samples were then mounted on glass slides to produce oriented samples. The slides were left overnight at room temperature for drying.

Table (A) Description of study Samples

Sample No.	BH No.	Depth (m)	Description
1	1	3.0 - 4.5	<u>SHALE</u> , calcareous, highly laminated, soft, gypsiferous with iron-oxide patches, yellowish green.
2	1	7.5 - 9.0	<u>SHALE</u> , highly calcareous, laminated, soft, iron-oxide patches, yellowish green.
3	1	16.5 - 18.0	<u>SHALE</u> , calcareous, highly laminated, soft, highly gypsiferous with iron-oxide patches, yellowish green.
4	2	4.50 - 6.0	<u>MARL</u> , massive, light, compact with iron-oxide spots and small dark organic remains, cream color.
5	3	8.5 - 10.0	<u>SHALE</u> , calcareous, highly laminated, soft, gypsiferous with iron-oxide patches, yellowish green.

The samples were analyzed by X-ray diffractometer using Ni-filtered Cu K-alpha radiation running at 40 kV and 30 mA. The scanning speed was 0.1 2 θ /min and sensitivity 1X10⁴, slit 0.3 and time constant 1 sec. The samples were scanned from 4 to 50 2 θ (see Figures attached in the XRD Appendix).

The identification of clay and non-clay minerals is based on standard ASTM cards. The relative percent of each mineral is determined semi-quantitatively based on the area or height of the strongest peak of the mineral. The results of the data are summarized in Table (B).

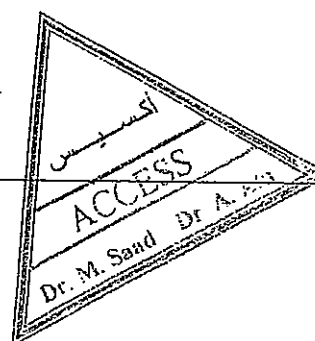
Table (B) Results of X-Ray Diffraction Analysis

Sample No.	BH No.	Depth (m)	% Clay Minerals		% Non-Clay Minerals		
			Montmorillonite	Illite	Calcite	Quartz	Gypsum
1	1	3.0-4.50	47.5	9.9	24.0	18.6	Trace
5	3	8.5-10.0	46.2	8.7	31.0	14.1	Trace
Average			46.8	9.3	27.5	16.4	Trace

X-ray diffraction data indicate that the investigated samples consist of montmorillonite and illite as the clay minerals, in addition to calcite, detrital quartz and gypsum as the only recorded non-clay minerals.

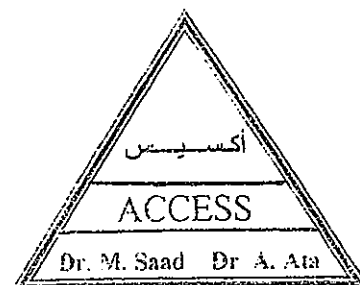
Montmorillonite, the expandable clay of high swelling potential, is recorded in both samples with an average percentage of 46.8%. This mineral is generally thought to be formed in both marine and non-marine conditions in semi-arid environments. It is also abundant in areas of submarine volcanism and produced also by continental weathering (K-degraded illites) of parent alkaline rocks under high pH conditions. Montmorillonite are known to possess a large ion-adsorbing power (Ca, Na and Mg) and high water absorption and swelling potential.

Illite is the second common and minor constituent (average 9.3%) of clay mineral group in the analyzed samples. Illites are mainly continental in origin although they are common in marine shales. They are generally thought to be of detrital origin and formed chiefly upon weathering of igneous rocks particularly from parent materials such as feldspars, amphiboles and micas. Illite has intermediate capacity of ion exchange and water absorption compared to kaolinite and montmorillonite. A moderate rainfall with cyclic wetting and drying are ideal for formation of Illites.



Quartz, calcite and gypsum as well as hematite represent the only recorded non-clay minerals in the examined samples. Quartz is known to be a detrital mineral and is characterized by the most diffraction lines at 3.34 A, 4.26 A and 1.82 A. It is likely to be formed from both mechanical and chemical weathering of acidic igneous rocks. Calcite is identified by strong diffraction line at 3.03 A, and it is mainly contributed from calcareous skeleton of organic remains. Gypsum is recorded in trace amounts in all samples, in dehydrated form, due to the hot arid weather conditions of the site. It is known as an evaporite mineral that is produced from a saline solution as a result of extensive evaporation of the water in desiccated cracks of shales.

Hematite is also a minor constituent and it is identified easily by its red color. The iron atoms in hematite are derived mostly from weathering and leaching of the common iron-rich minerals, although most hematite minerals can form after a sediment is deposited. Hematite can form wherever iron-bearing minerals are present and oxidizing conditions exist. Most near-surface environments are oxidizing and the red color caused by precipitation of Hematite is very common in the sedimentary environment.



4. SITE CHARACTERIZATION

4.1 Intercepted Soils

The stratification of the soil formation at the site can be summarized as follows:

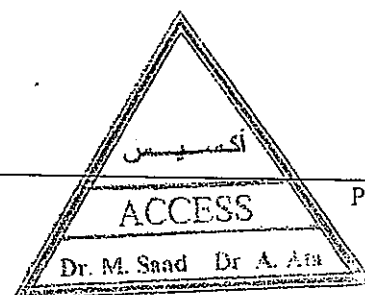
- In general, the soil formation at the site consists of intercalations of SHALE, calcareous, highly laminated, soft, gypsiferous with iron-oxide patches, yellowish green and MARL, massive, light, compact with iron-oxide spots and small dark organic remains, cream color.
- Although the main clay mineral of the shale is Montmorillonite, the results from plasticity, free swell and oedometer tests show that the swelling potential may be considered normal and should not pose a threat against the proposed light structure. The reason for that is the relatively high percentage of calcium carbonate present in the shale and the marl which limits the ability of the clay mineral to swell or expand.

Although the recovery values of the shale samples ranged between 80 and 100% , unfortunately, core samples of reasonable length could not be retrieved for unconfined tests. This is due to the laminae nature of the shale samples. Attempts to perform pocket penetrometer tests on the samples show that the unconfined compressive strength of the samples is in excess of 4.0 kg/cm².

According to the Egyptian Code for Soil Mechanics and the Design and Construction of Foundations, for cohesive soil with unconfined compressive strength greater than 4 kg/cm² the expected number of blows N per 30-cm penetration of the SPT sampler is expected to be greater than 30.

4.2 Groundwater

No groundwater table was encountered during site investigation in any borehole down to the maximum investigated depth of boreholes or the test pit. However, the natural moisture content in the top few meters of the soil are relatively high.



5. FOUNDATION RECOMMENDATIONS

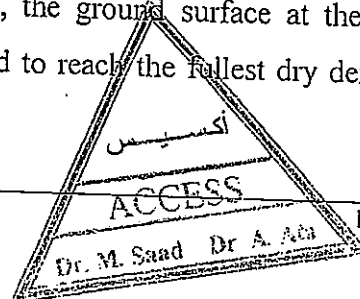
The following recommendations are based on the findings in this report, the experience gained from similar and nearby projects, and engineering judgement.

5.1 Foundation Type

Shallow foundation system is recommended. This can be isolated, strip or raft foundation based on the actual column loads. For isolated reinforced concrete footing should be connected with rigid beams in both directions.

5.2 Foundation Depth

1. The top 2.0 meters of the soil shall be excavated underneath the whole area of the proposed structure. The ground at the bottom of excavation should be flooded and soaked with water for at least 24 hours, then left to dry and then thoroughly compacted to achieve maximum dry density using the proper machinery.
2. A 1.0-m thick layer of structural fill (e.g., clean graded sand or preferably sand and gravel in the ratio of 1:2) shall be backfilled in four layers or lifts (each lift not to exceed 25 cm). After backfilling each lift the ground shall be compacted to 95 % of the soil maximum dry density using Modified Proctor Test. Backfill materials should be granular with fines percentage less than 10 %. The Plasticity Index of the backfill material should not exceed 7 %. Backfill materials should not contain any roots, construction debris, salts, deleterious materials, organic matters, cobbles or boulders.
3. The foundation shall be therefore placed at a depth of 1.0 m below the existing natural ground surface or in other words directly above the replaced soil.
4. Prior to pouring the foundation concrete, the ground surface at the bottom of excavation should be thoroughly compacted to reach the fullest dry density of the soil.



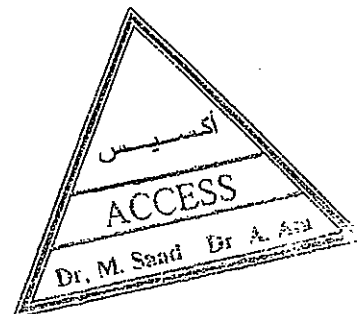
5. This also applies to the slab on grade that carries the ground floor uniform loads. A replacement and compaction of at least one meter is recommended under the ground floor slab.

5.3 Allowable Net Bearing Capacity

The allowable net bearing capacity at foundation level of 1.0 m is 0.75 kg/cm^2 . This pressure is the allowable excess pressure at the foundation level in addition to the overburden pressure at the same level.

5.4 Excavation and Backfill

Backfill operation around foundations should be carried out in lifts not to exceed 25 cm. The backfill should be compacted to 95 % of the soil maximum dry density using Modified Proctor Test. Backfill materials should be granular with fines percentage less than 10 %. The Plasticity Index of the backfill material should not exceed 7 %. Backfill materials should not contain any roots, construction debris, salts, deleterious materials, organic matters, cobbles or boulders. Before pouring the concrete, the ground surface at the bottom of excavation should be thoroughly compacted to reach the fullest dry density of the soil.



6. CONSTRUCTION CONSIDERATIONS

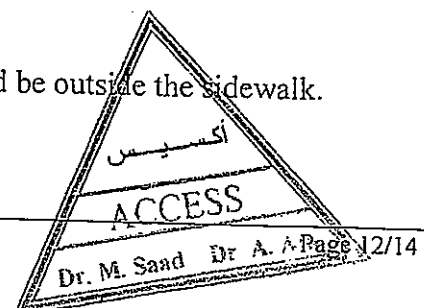
The purpose of our study has been to develop information relative to the soil and groundwater conditions for design and construction considerations for the foundations of the proposed building. These data may be evaluated by contractors for use in selecting proper equipment, materials and techniques to be utilized in the construction.

To provide proper safeguards and techniques during the construction operations, it is important that the contractor be fully aware of the anticipated ground behavior. This ground behavior is a function of the type of the materials encountered during the construction process. Conditions may vary from our interpretation, particularly between borings.

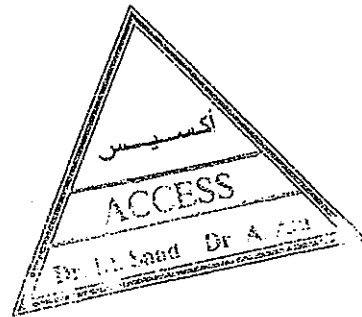
6.1 Precautions for Water Supply, Wastewater Drainage and Flash Floods

The following precautions are essential to minimize moisture change in soils underneath the foundation, which could result in volumetric change or slakeness of the shale and potential loss of the strength due to wetting.

- All water supply and sewage drainage should be fixed to the outside walls and its connections must be flexible and executed to highest standard and under strict engineering supervision. Manholes should be at least 2.5 meters outside building limits.
- Asphalt concrete sidewalk of a minimum width of 2.0 m, should be constructed around all the building. The minimum asphalt thickness should be 10 cm. The sidewalk should be sloped by 1:15 to the street site. No utilities should be constructed underneath it.
- All sewage pipes should have flexible joints.
- Drip or sprinkler system should be used for irrigation (IF ANY). Flooding is not allowed.
- All manholes or water collection utilities should be outside the sidewalk.



-
- Special precautions and protective measures shall be considered against flash floods to protect the structure and the foundations as the structure is located in an area that might be subject to flash floods.



6.2 Concrete

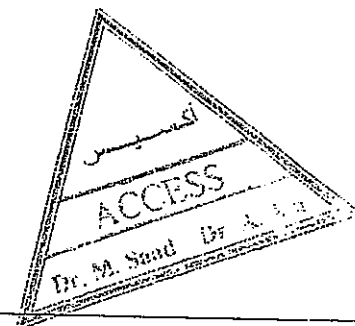
The following requirements shall be considered in the reinforced concrete design and construction:

- Normal Portland Cement may be used in the concrete foundation.
- Minimum concrete cover is 6.0 cm.
- Water / Cement Ratio should not exceed 0.45
- Reinforced concrete should be dense with minimum cement content of 350 Kg/m³ of concrete.
- Plain concrete, at least 0.10 m thick, should be used below the reinforced concrete.
- All reinforced concrete in the foundations should be properly insulated using three layers of modified bituminous coatings.

7. LIMITATIONS

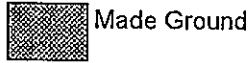
The conclusions and recommendations presented in this report are based on the soil test borings performed for a geotechnical evaluation. Although GEOGROUP field personnel visually surveyed the site for surface features indicative of variable soil conditions, subsurface conditions may be encountered that differ from these data. If unexpected soil/water conditions are discovered, GEOGROUP and ACCESS should be notified immediately so that the effects of these conditions on design and construction can be addressed as part of an additional phase of activities.

ACCESS



TERMS AND SYMBOLS USED ON BORING LOGS

Soil Types



Made Ground



Organic Soil
or (Peat)



Shells



Gravel



Sandy Gravel
Gravelly Sand



Sand with
rock fragments



Sand



Silty Sand
Sandy Silt



Sand with pockets
of silty clay



Silt



Silty Clay
Clayey Silt



Cemented Sand



Clay



Clayey Sand
Sandy Clay



Silt Stone



Limestone



Sand Stone



Rock Fragments



SHALE



MARL



Limestone boulders

Samples and Samplers



Cored Sample



Sample from SPT



Washed



Undisturbed Thin wall



Big Split Spoon

- The boring logs present the soil stratification as observed and classified in the field and the laboratory.
- Ground water levels shown on the boring logs are those observed at the time of boring.
- The depths indicated on the boring logs represent the actual depth at the time of boring.
- Standard penetration test results (SPT) represent the number of blows (n) for 30-cm penetration and does not include any type of correction.

TERMS AND SYMBOLS USED ON BORING LOGS

Density of Granular Soils

Description	Blows per 30 cm	Relative
Very Loose	0 to 4	< 15
Loose	5 to 10	15-35
Medium Dense	11 to 30	35-65
Dense	31 to 50	65-85
Very Dense	> 50	> 85

Strength of Cohesive Soils

Term	Blows/30 cm SPT	Undrained Shear Strength (kPa)
Very Soft	0 to 2	< 12.5
Soft	2 to 4	12.5-25
Medium Stiff	4 to 8	25-50
Stiff	8 to 16	50-100
Very Stiff	16 to 32	100-200
Hard	> 32	>200

Relation Between Rock Hardness and Strength

Degree of Hardness	Strength kg/cm ²
Hard	2000
Very Stiff	1000- 2000
Stiff	500-1000
Medium Stiff	125-500
Medium Soft	50-125
Soft	12.5-50
Very Soft	< 12.5

Rock Quality Designation RQD (%)

RQD (%)	Classification
90-100	Excellent
75-90	Good
50-75	Fair
25-50	Poor
0-25	Very Poor

$$RQD = \frac{\text{core lengths that are 10 cm or longer}}{\text{length of coring}}$$

Laboratory Tests

UC = Unconfined

q_p = Pocket Penetrometer

T = Torvane

O = Oedometer

UU = Unconsolidated Undrained Triaxial

GSA = Grain Size Analysis

SV = Shear Vane

DS = Direct Shear

Classification

Trace: 1-10%

Some: 11-25%

Adjective: 26-35%

And: 36-50%

Soil Structure

Calcareous: Contains appreciable amount of carbonate (10 to 49%)

Carbonate: Contains more than 50% carbonate

Fissured: Containing shrinkage cracks, often with fine sand or silt

Pocket: Inclusion of material of different texture smaller than the sample's diameter

Parting: Inclusion less than 3 mm thick extending through the sample

Seam: Inclusion 3 mm to 75 mm thick extending through the sample

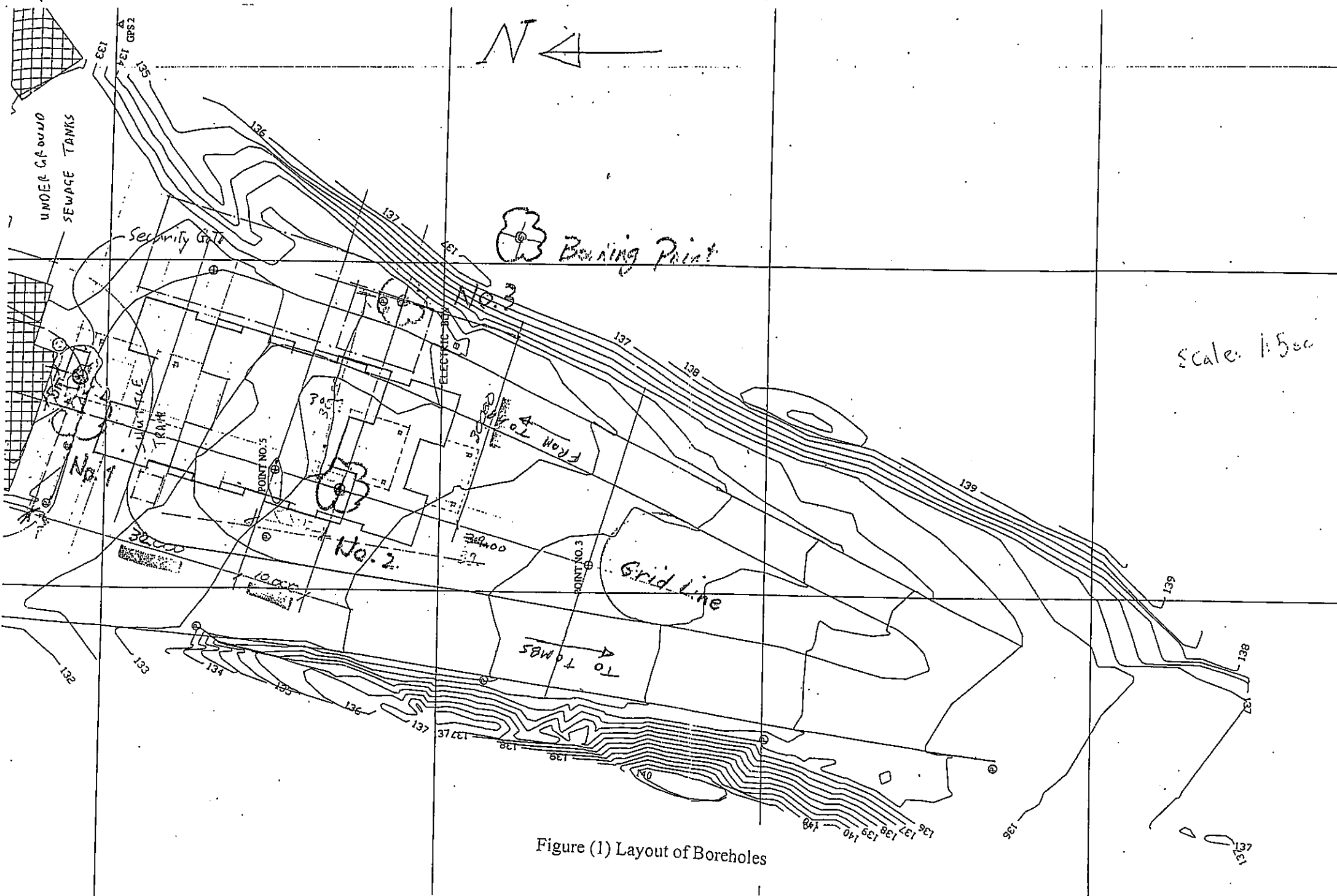
Layer: Inclusion greater than 75 mm thick extending through the sample

Laminated: Soil sample composed of alternating partings or seams of different soil type

Interlayered: Soil sample composed of alternating layers of different soil type

Intermixed: Soil sample composed of pockets of different soil type not laminated nor layered

Slickensided: Having planes of weakness that appear slick and glossy



Scale: 1:500

Figure (1) Layout of Boreholes

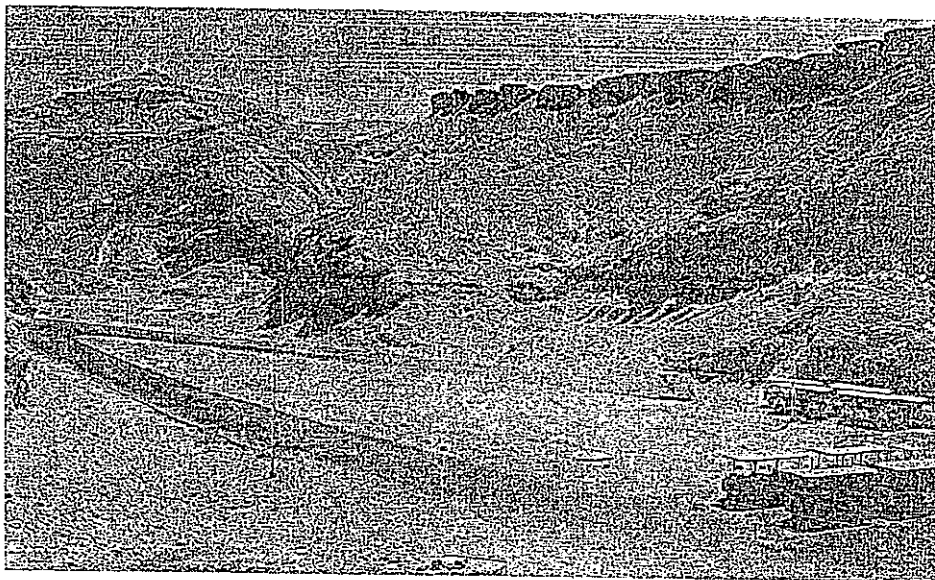

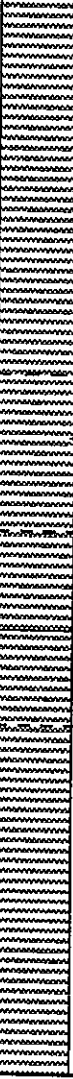


Figure (2) Bird's Eye View of the Site

LOG OF BORING NO. BH1

Project:	New Visitor Center, Valley of the Kings	Coordinates	See Figure 1
Location:	Luxor	Start Date:	٠٤ - يونيو - ٠٦
Client:	Elaref Eng. Consultants	End Date:	٠٤ - يونيو - ٠٦

Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m ³	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	*Strength kg/cm ²	Test Type
1	1.5		GRAVEL, large, some calcareous silty clay, trace of limestone fragments, white to light brown								
2			SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, yellowish green to light brown	70							
3				90							
4				80				27.5	49.3		
5			← trace of marl								
6				90				30.8	56.2		
7											
8			becomes highly calcareous	100		1.99	22	23.5	53.6		
9				100							
10				90				31	21.4	54.6	

<p>NOTES: Ground Water Level = Not encountered</p> <p>T Torvane: Shear strength</p> <p>PP Pocket Penetrometer: Compressive strength</p>	<p>Total Depth: 20</p> <p>Shell & Auger NA</p> <p>Wet Rotary: 0-20 m</p> <p>Driller: Geogroup</p>
--	---

LOG OF BORING NO. BH1 (Continued)

Project:	New Visitor Center, Valley of the Kings	Coordinates	See Figure 1
Location:	Luxor	Start Date:	٠٤ - يونيو - ٠٦
Client:	Elaref Eng. Consultants	End Date:	٠٤ - يونيو - ٠٦

Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m ³	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	*Strength kg/cm ²	Test Type
11			SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, yellowish green to light brown	90							
12				100							
13											
14				100							
15											
16				100							
17											
18				100							
19											
20		End of bore hole			100						

NOTES: Ground Water Level = Not encountered T Torvane: Shear strength PP. Pocket Penetrometer: Compressive strength	Total Depth: 20 Shell & Auger NA Wet Rotary: 0-20 m Driller: Geogroup
--	--

LOG OF BORING NO. BH2

Project:		New Visitor Center, Valley of the Kings		Coordinates		See Figure 1					
Location:		Luxor		Start Date:		٠٧ يونيو - ٠٤					
Client:		Elaref Eng. Consultants		End Date:		٠٧ يونيو - ٠٤					
Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m ³	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	*Strength kg/cm ²	Test Type
1	1.3		GRAVEL, large, some calcareous silty clay, trace of limestone fragments, white to light brown								
2			SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, yellowish green to light brown	60							
3				80		16.3		19.4	51.6		
4	4.0							32.4	67.1		
5			MARL, massive, light, compact with iron-oxide spots and small dark organic remains, cream color	90							
6				90				20.7	39.3		
7											
8				100		2.01	30.3	32	64.1		
9				100							
10											
NOTES: Ground Water Level = Not encountered				Total Depth:		20					
T Torvane: Shear strength				Shell & Auger		NA					
PP Pocket Penetrometer: Compressive strength				Wet Rotary:		0-20 m					
				Driller:		Geogroup					

LOG OF BORING NO. BH2 (Continued)




Project: New Visitor Center, Valley of the Kings	Coordinates: See Figure 1
Location: Luxor	Start Date: ٠٧ - ٠٤ - ٠٧
Client: Elaref Eng. Consultants	End Date: ٠٧ - ٠٤ - ٠٧

Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m^3	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	* Strength kg/cm^2	Test Type
11		[Vertical lines pattern]	MARL, massive, light, compact with iron-oxide spots and small dark organic remains, cream color	100				30.1	56.9		
12											
13					100			23.7	66.9		
13.5		[Vertical lines pattern]	SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, intercalated with thin layers of marl, yellowish green to cream								
14		[Horizontal lines pattern]			100						
15		[Horizontal lines pattern]									
16		[Horizontal lines pattern]			100						
17		[Horizontal lines pattern]									
18		[Horizontal lines pattern]			100						
19		[Horizontal lines pattern]									
20		[Horizontal lines pattern]	End of bore hole	100							

NOTES: Ground Water Level = Not encountered T Torvane: Shear strength PP Pocket Penetrometer: Compressive strength	Total Depth: 20 Shell & Auger: NA Wet Rotary: 0-20 m Driller: Geogroup
--	---

LOG OF BORING NO. BH3

Project: New Visitor Center, Valley of the Kings	Coordinates: See Figure 1
Location: Luxor	Start Date: ٠٧ يونيو - ٠٤
Client: Elaref Eng. Consultants	End Date: ٠٧ يونيو - ٠٤

Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m ³	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	*Strength kg/cm ²	Test Type
1	2.0		GRAVEL, large, some calcareous silty clay, some limestone fragments, white to light brown	60							
2				90							
3	7.0		MARL, fragmented, some calcareous material, cream color	100		2.0	18	27.2	49.8		
4						24.2	70				
5				100		22.8	22.2	57.8			
6											
7				100		18.4	24.6	63.9			
8			SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, yellowish green to light brown	90							
9											
10				90							

NOTES: Ground Water Level = Not encountered T Torvane: Shear strength PP Pocket Penetrometer: Compressive strength	Total Depth: 20 Shell & Auger: NA Wet Rotary: 0-20 m Driller: Geogroup
--	---

LOG OF BORING NO. BH3 (Continued)

Project:	New Visitor Center, Valley of the Kings	Coordinates	See Figure 1
Location:	Luxor	Start Date:	07/06/2004
Client:	Elaref Eng. Consultants	End Date:	07/06/2004

Depth (m)	End of Layer	Legend	Stratum Description	Recovery	SPT	Unit weight ton/m^3	Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	*Strength kg/cm^2	Test Type	
11			SHALE, calcareous, laminated, soft, gypsiferous with iron-oxide patches, yellowish green to light brown									
					90							
12												
13					90			30.7	60.1			
14												
15					90							
16				100								
17												
17.5				100								
18			INTERCALATIONS OF MARL- AND SHALE, trace of white gypsum, trace of iron oxides, light brown									
19					100							
20			End of bore hole	100								

NOTES:	Ground Water Level = Not encountered	Total Depth:	20
		Shell & Auger	NA
		Wct Rotary:	0-20 m
		Driller:	Geogroup



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرجج (السيولة واللدونة)

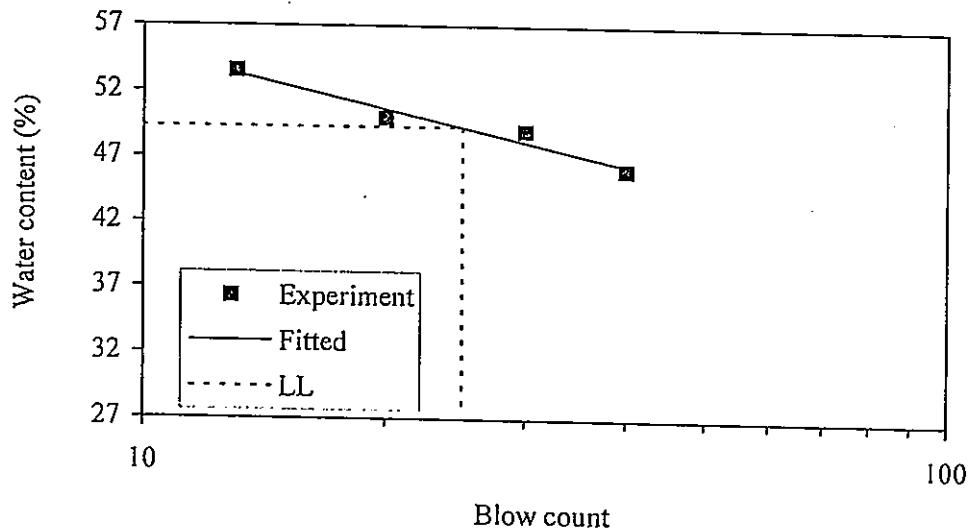
Project: Visitors Center **Date:** May, 2004
Client: Alaref Eng. Consultants
Borehole: 1 **Depth:** 3.00 - 4.50

Analyst name: ahmed
Test date: ٢٠ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	54.70	69.60	64.90	40	46.08	46.43
2	54.00	69.20	64.20	30	49.02	48.19
3	55.60	77.50	70.20	20	50.00	50.68
4	53.20	79.30	70.20	13	53.53	53.32

Liquid limit (%) = 49.31
 Slope of flow line = 0.123

10.00	49.31
25.00	49.31
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	20.90	32.50	30.00	27.47

Plastic limit (%) = 27.47 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

Project: Visitors Center Date: May, 2004

Client: Alaref Eng. Consultants

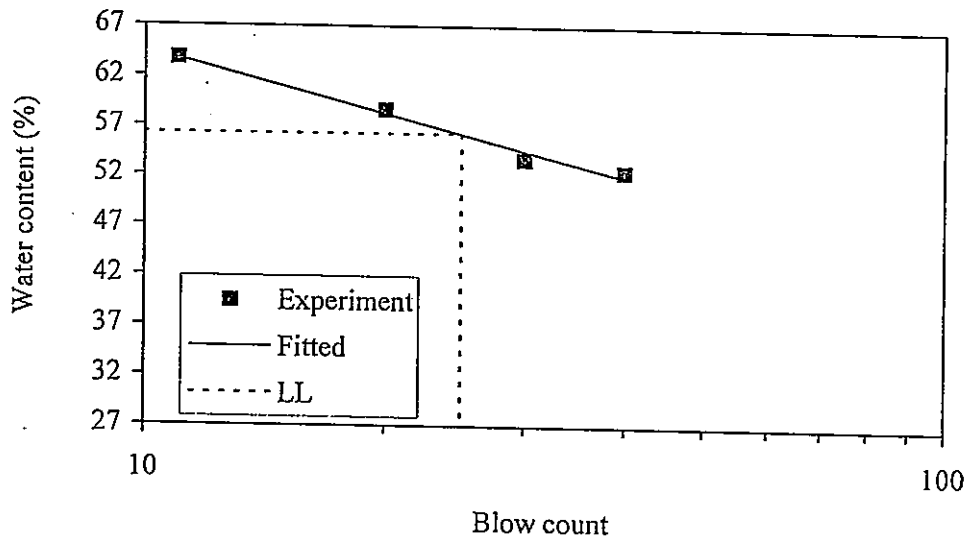
Borehole: 1 Depth: 4.50 - 6.00

Analyst name: *ahmed*
 Test date: ٢٠ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	46.70	65.00	58.70	40	52.50	51.95
2	46.70	59.30	54.90	30	53.66	54.57
3	45.40	59.20	54.10	20	58.62	58.27
4	46.10	74.10	63.20	11	63.74	63.73

Liquid limit (%) = 56.24
 Slope of flow line = 0.158

10.00	56.24
25.00	56.24
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	44.00	54.20	51.80	30.77

Plastic limit (%) = 30.77 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

Project: Visitors Center Date: May. 2004

Client: Alaref Eng. Consultants

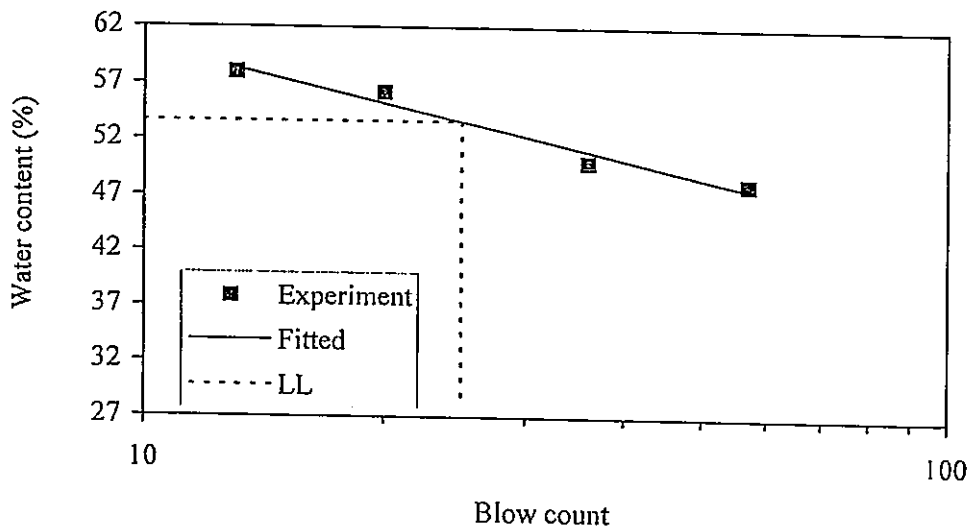
Borehole: 1 Depth: 6.00-7.50

Analyst name: ahmed
 Test date: ١٠ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	30.50	50.50	44.00	57	48.15	47.72
2	32.00	51.20	44.80	36	50.00	51.02
3	32.50	51.40	44.60	20	56.20	55.25
4	38.60	57.40	50.50	13	57.98	58.34

Liquid limit (%) = 53.64
 Slope of flow line = 0.136

10.00	53.64
25.00	53.64
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	21.50	32.00	30.00	23.53

Plastic limit (%) = 23.53 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتبرج (السيولة واللدونة)

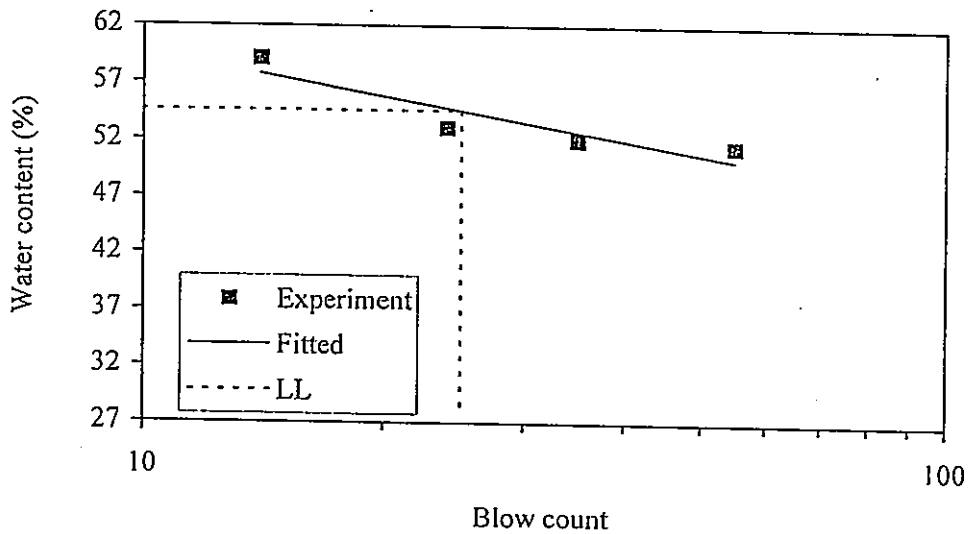
Project:	Visitors Center	Date:	May. 2004
Client	Alaref Eng. Consultants		
	Borehole: 1	Depth:	9-10.50

Analyst name: *ahmed*
 Test date: *٠٠ يونيو ٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	33.70	54.00	47.10	55	51.49	50.30
2	33.00	52.00	45.50	35	52.00	52.76
3	30.60	50.50	43.60	24	53.08	54.82
4	37.50	57.70	50.20	14	59.06	57.75

Liquid limit (%) = 54.59
 Slope of flow line = 0.099

10.00	54.59
25.00	54.59
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	21.20	33.10	31.00	21.43

Plastic limit (%) = 21.43 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

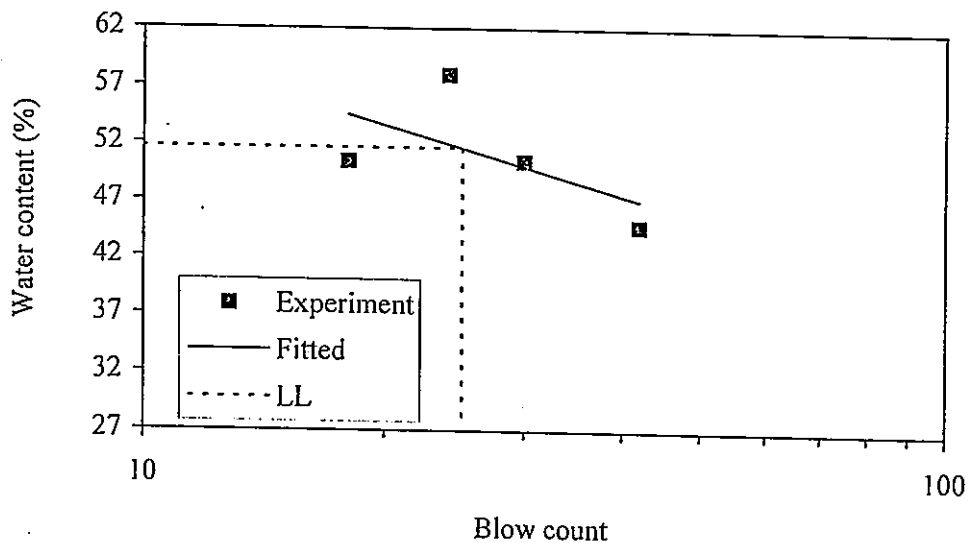
Project: Visitors Center Date: May. 2004
 Client: Alaref Eng. Consultants
 Borehole: 2 Depth: 1.50-3.00

Analyst name: *ahmed*
 Test date: ٠١ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	55.10	74.50	68.50	42	44.78	47.06
2	46.40	63.10	57.50	30	50.45	50.02
3	53.30	70.20	64.00	24	57.94	51.98
4	45.00	64.40	57.90	18	50.39	54.50

Liquid limit (%) = 51.62
 Slope of flow line = 0.179

10.00	51.62
25.00	51.62
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	18.10	30.40	28.40	19.42

Plastic limit (%) = 19.42 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتيربيرج (السيولة واللدونة)

Project: Visitors Center Date: May. 2004

Client: Alaref Eng. Consultants

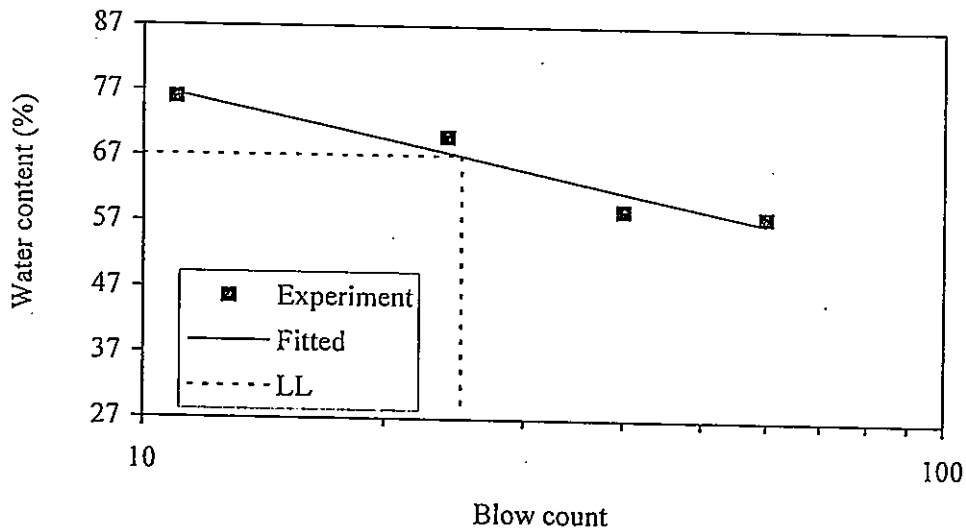
Borchole: 2 Depth: 3.00 - 4.50

Analyst name: *ahmed*
 Test date: ٣٠ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	41.00	59.50	52.70	60	58.12	57.07
2	35.00	49.30	44.00	40	58.89	61.73
3	40.50	55.80	49.50	24	70.00	67.59
4	39.70	58.70	50.50	11	75.93	76.55

Liquid limit (%) = 67.12
 Slope of flow line = 0.173

10.00	67.12
25.00	67.12
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	19.80	29.20	26.90	32.39

Plastic limit (%) = 32.39 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتيرج (المسيولة واللدونة)

Project: Visitors Center Date: May. 2004

Client: Alaref Eng. Consultants

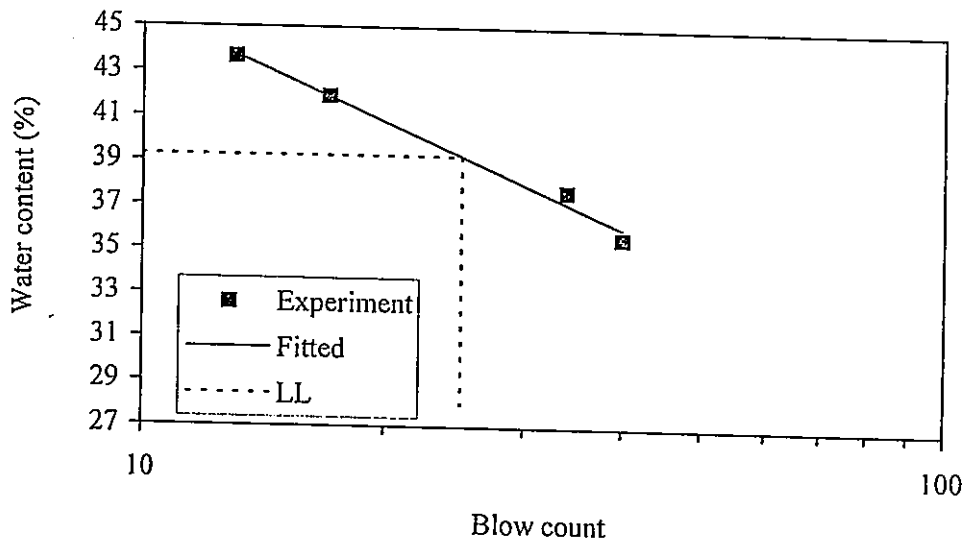
Borehole: 2 Depth: 4.50 - 600

Analyst name: *ahmed*
 Test date: *٢٠ يونيو ٢٠٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	32.60	56.60	50.30	40	35.59	36.04
2	30.50	49.50	44.30	34	37.68	37.16
3	29.70	49.00	43.30	17	41.91	41.90
4	36.30	64.60	56.00	13	43.65	43.74

Liquid limit (%) = 39.26
 Slope of flow line = 0.173

10.00	39.26
25.00	39.26
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	17.30	27.20	25.50	20.73

Plastic limit (%) = 20.73 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

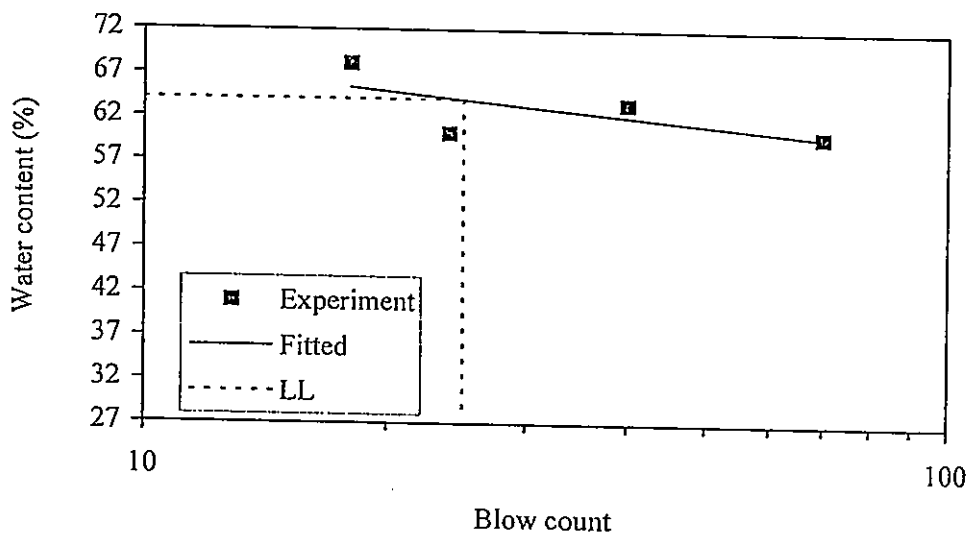
Project: Visitors Center **Date:** May. 2004
Client: Alaref Eng. Consultants
Borehole: 2 **Depth:** 6-7.50

Analyst name: ahmed
Test date: ٠١ يونيو ٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	30.70	47.50	41.20	70	60.00	59.93
2	40.80	58.30	51.50	40	63.55	62.20
3	35.00	55.50	47.80	24	60.16	64.27
4	41.00	64.20	54.80	18	68.12	65.43

Liquid limit (%) = 64.10
 Slope of flow line = 0.063

10.00	64.10
25.00	64.10
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	20.00	32.80	29.70	31.96

Plastic limit (%) = 31.96 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

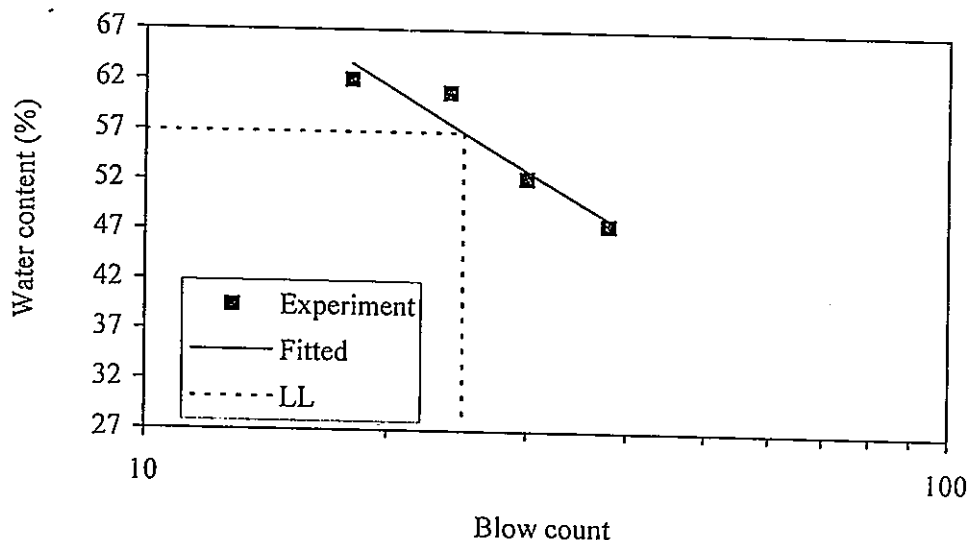
Project: Visitors Center **Date:** May, 2004
Client: Alaref Eng. Consultants
Borehole: 2 **Depth:** 9.00-10.50

Analyst name: ahmed
Test date: ٠٠ يونيو ٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	55.60	71.40	66.30	38	47.66	48.29
2	46.20	62.50	56.90	30	52.34	53.14
3	54.80	71.20	65.00	24	60.78	57.73
4	54.60	75.50	67.50	18	62.02	63.64

Liquid limit (%) = 56.89
 Slope of flow line = 0.374

10.00	56.89
25.00	56.89
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	44.50	54.00	51.80	30.14

Plastic limit (%) = 30.14 %



ATTEBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرج (السيولة واللدونة)

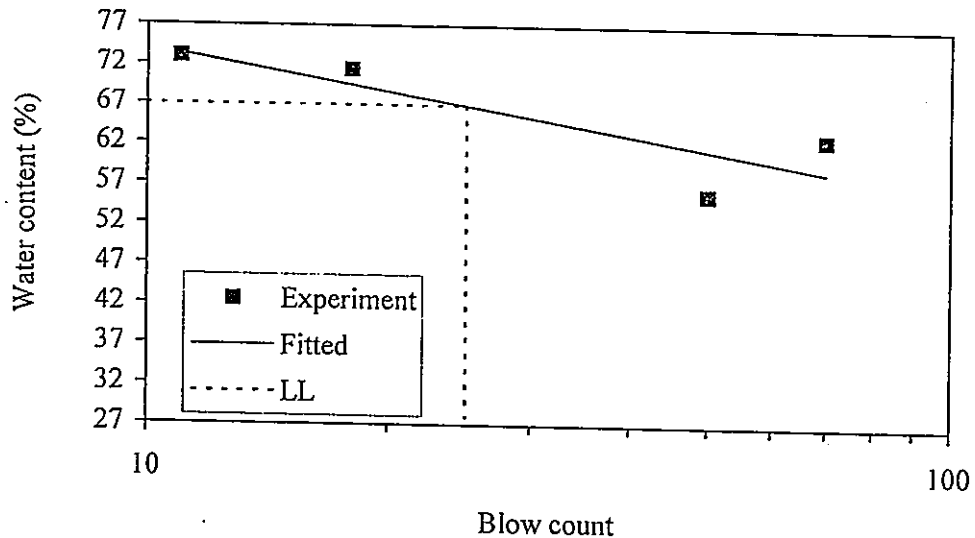
Project: **Visitors Center** Date: **May. 2004**
 Client: **Alaref Eng. Consultants**
 Borehole: **2** Depth: **12.00-13.50**

Analyst name: *ahmed*
 Test date: *٢٠ يونيو ٢٠٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	53.60	72.50	65.20	70	62.93	58.88
2	52.80	71.20	64.60	50	55.93	61.51
3	52.50	76.50	66.50	18	71.43	69.50
4	53.70	89.50	74.40	11	72.95	73.35

Liquid limit (%) = 66.93
 Slope of flow line = 0.119

10.00	66.93
25.00	66.93
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with drv M_d	Water content (%) w
1	31.50	43.50	41.20	23.71

Plastic limit (%) = 23.71 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتبرج (السيولة واللدونة)

Project: Visitors Center Date: May. 2004

Client: Alaref Eng. Consultants

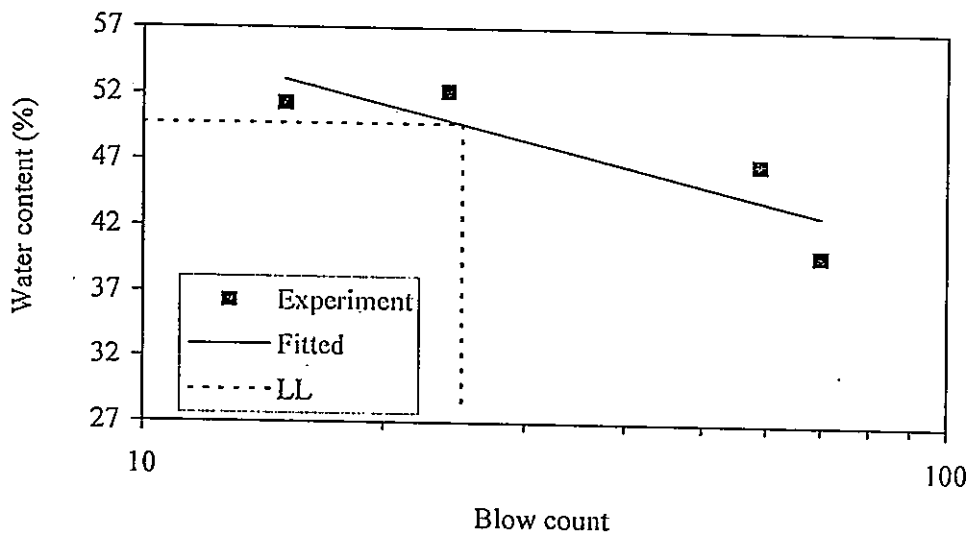
Borehole: 3 Depth: 2.00 - 3.00

Analyst name: *ahmed*
 Test date: *٢٠ يونيو ٢٠٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	30.50	47.30	42.50	70	40.00	43.04
2	31.50	50.00	44.10	59	46.83	44.16
3	33.30	60.70	51.30	24	52.22	50.04
4	33.20	62.40	52.50	15	51.30	53.11

Liquid limit (%) = 49.77
 Slope of flow line = 0.141

10.00	49.77
25.00	49.77
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	47.20	57.50	55.30	27.16

Plastic limit (%) = 27.16 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتبرج (السيولة واللدونة)

Project: Visitors Center Date: May. 2004

Client: Alaref Eng. Consultants

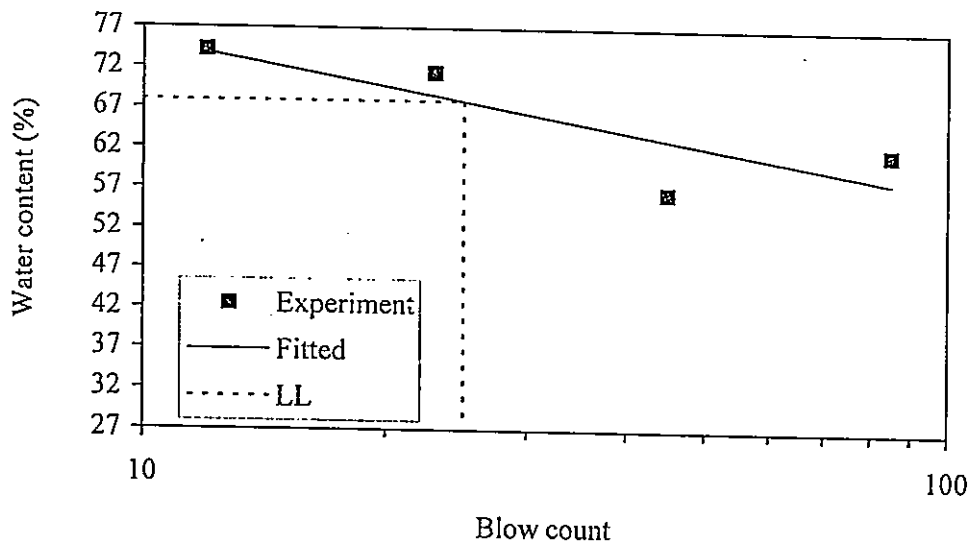
Borehole: 3 Depth: 3.00-4.00

Analyst name: *ahmed*
 Test date: *٠٠ يونيو ٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	29.90	45.10	39.30	85	61.70	58.12
2	36.00	55.10	48.20	45	56.56	63.24
3	52.20	69.00	62.00	23	71.43	68.63
4	46.50	67.40	58.50	12	74.17	73.86

Liquid limit (%) = 67.96
 Slope of flow line = 0.121

10.00	67.96
25.00	67.96
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with drv M_d	Water content (%) w
1	17.70	30.00	27.60	24.24

Plastic limit (%) = 24.24 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتيربرج (السيولة واللدونة)

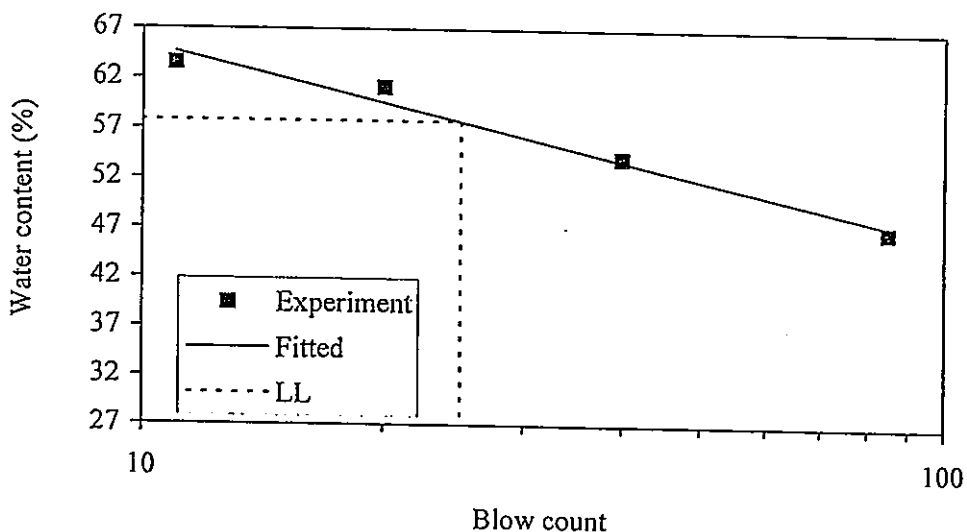
Project:	Visitors Center	Date:	May. 2004
Client	Alaref Eng. Consultants		
	Borehole: 3	Depth:	4.00-5.50

Analyst name: *ahmed*
 Test date: *٠٠ يونيو ٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	55.60	75.00	68.80	85	46.97	47.57
2	56.00	76.50	69.30	40	54.14	53.86
3	53.50	73.80	66.10	20	61.11	59.64
4	55.30	86.20	74.20	11	63.49	64.63

Liquid limit (%) = 57.78
 Slope of flow line = 0.152

10.00	57.78
25.00	57.78
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	47.20	60.40	58.00	22.22

Plastic limit (%) = 22.22 %



ATTERBERG LIMITS

Liquid and Plastic Limits

اختبارات حدود أتبرج (السيولة واللدونة)

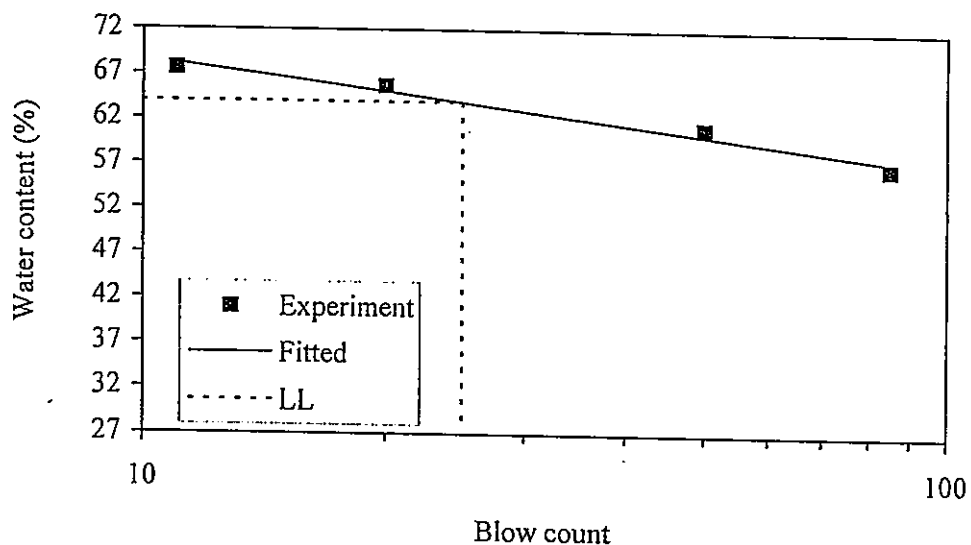
Project:	Visitors Center	Date:	May. 2004
Client	Alaref Eng. Consultants		
	Borehole: 3	Depth:	5.50-7.00

Analyst name: *ahmed*
 Test date: *١٠ يونيو ٢٠٠٤*

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	55.00	73.50	66.80	85	56.78	57.53
2	56.50	74.70	67.80	50	61.06	60.30
3	53.80	70.70	64.00	20	65.69	65.08
4	52.40	77.20	67.20	11	67.57	68.20

Liquid limit (%) = 63.91
 Slope of flow line = 0.084

10.00	63.91
25.00	63.91
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	Mass of container with wet soil M_w	Mass of container with dry soil M_d	Water content (%) w
1	31.30	46.00	43.00	25.64

Plastic limit (%) = 25.64 %



ATTERBERG LIMITS
Liquid and Plastic Limits
 اختبارات حدود أتبرجج (السيولة واللدونة)

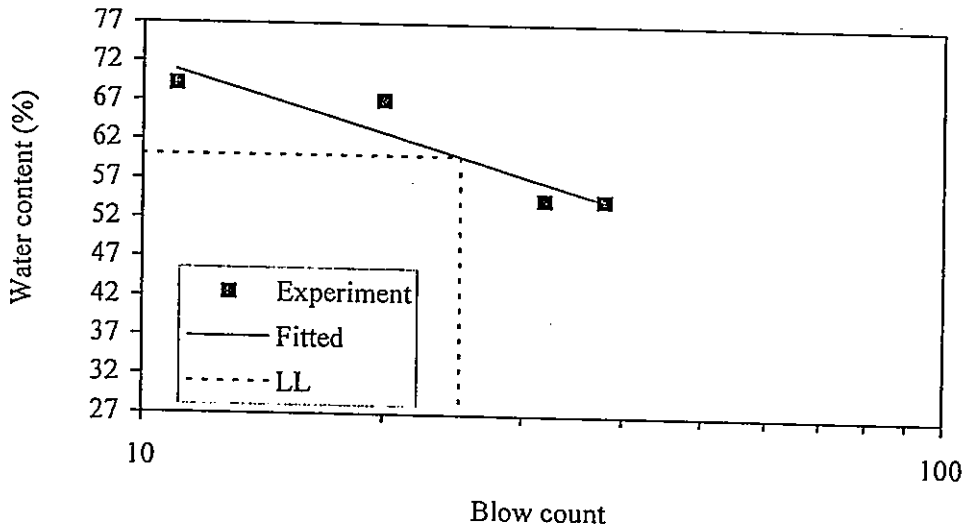
Project:	Visitors Center	Date:	May. 2004
Client	Alaref Eng. Consultants		
	Borehole: 3	Depth:	12.00 - 13.00

Analyst name: *ahmed*
 Test date: ٢٠ يونيو ٢٠٠٤

Set number	Tare mass (g) W_c	Tare with wet soil (g) W_w	Tare with dry soil (g) W_d	Blow count N	Water content (%) w	Water content fitted (%)
1	53.40	67.00	62.20	38	54.55	54.56
2	54.30	69.60	64.20	32	54.55	56.82
3	32.60	46.30	40.80	20	67.07	63.00
4	38.30	61.80	52.20	11	69.06	70.86

Liquid limit (%) = 60.06
 Slope of flow line = 0.214

10.00	60.06
25.00	60.06
25.00	28.00



Plastic limit

Set number	Mass of container (g) M_c	- Mass of container with wet soil M_w	Mass of container with drv M_d	Water content (%) w
1	19.20	29.00	26.70	30.67

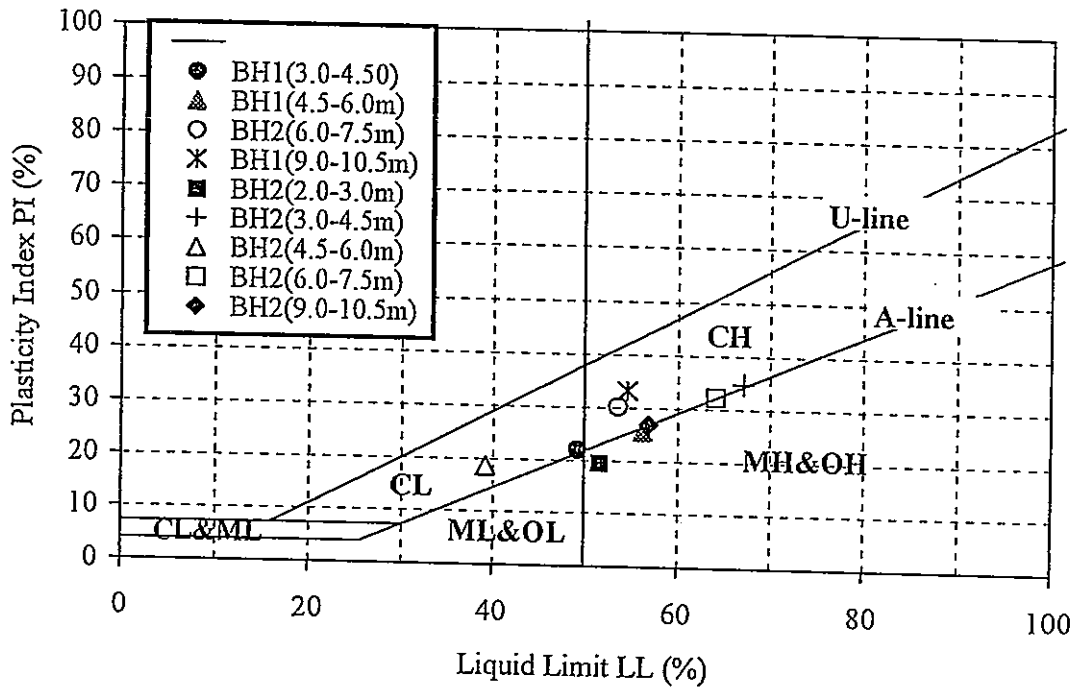
Plastic limit (%) = 30.67 %



Plasticity Limits

ACCESS

Project: Visitors Center
 Client: Alaref Eng. Consultants



Results

Sample	w_L	w_p	PI
BH1(3.0-4.50)	49.31	27.47	21.84
BH1(4.5-6.0m)	56.24	30.77	25.47
BH2(6.0-7.5m)	53.64	23.53	30.11
BH1(9.0-10.5m)	54.59	21.43	33.16
BH2(2.0-3.0m)	51.62	19.42	32.20
BH2(3.0-4.5m)	67.12	32.39	34.73
BH2(4.5-6.0m)	39.26	20.73	18.53
BH2(6.0-7.5m)	64.10	31.96	32.14
BH2(9.0-10.5m)	56.89	30.14	26.75

Where

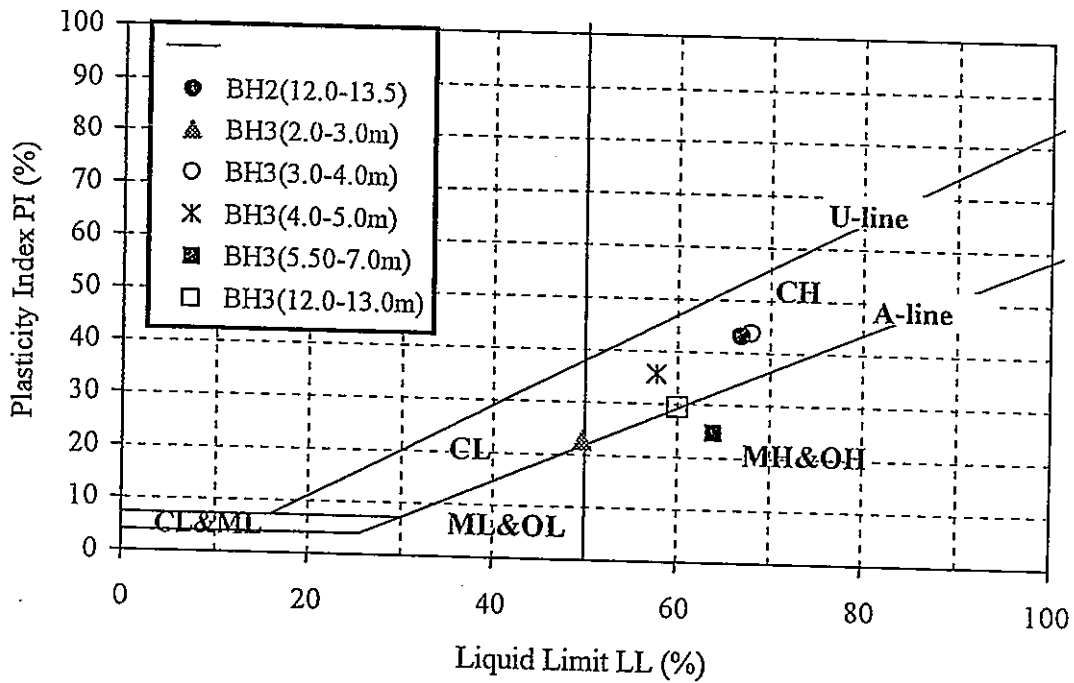
w_L = Liquid Limit
 w_p = Plastic Limit
 PI = Plasticity Index



Plasticity Limits

ACCESS

Project: Visitors Center
 Client: Alaref Eng. Consultants



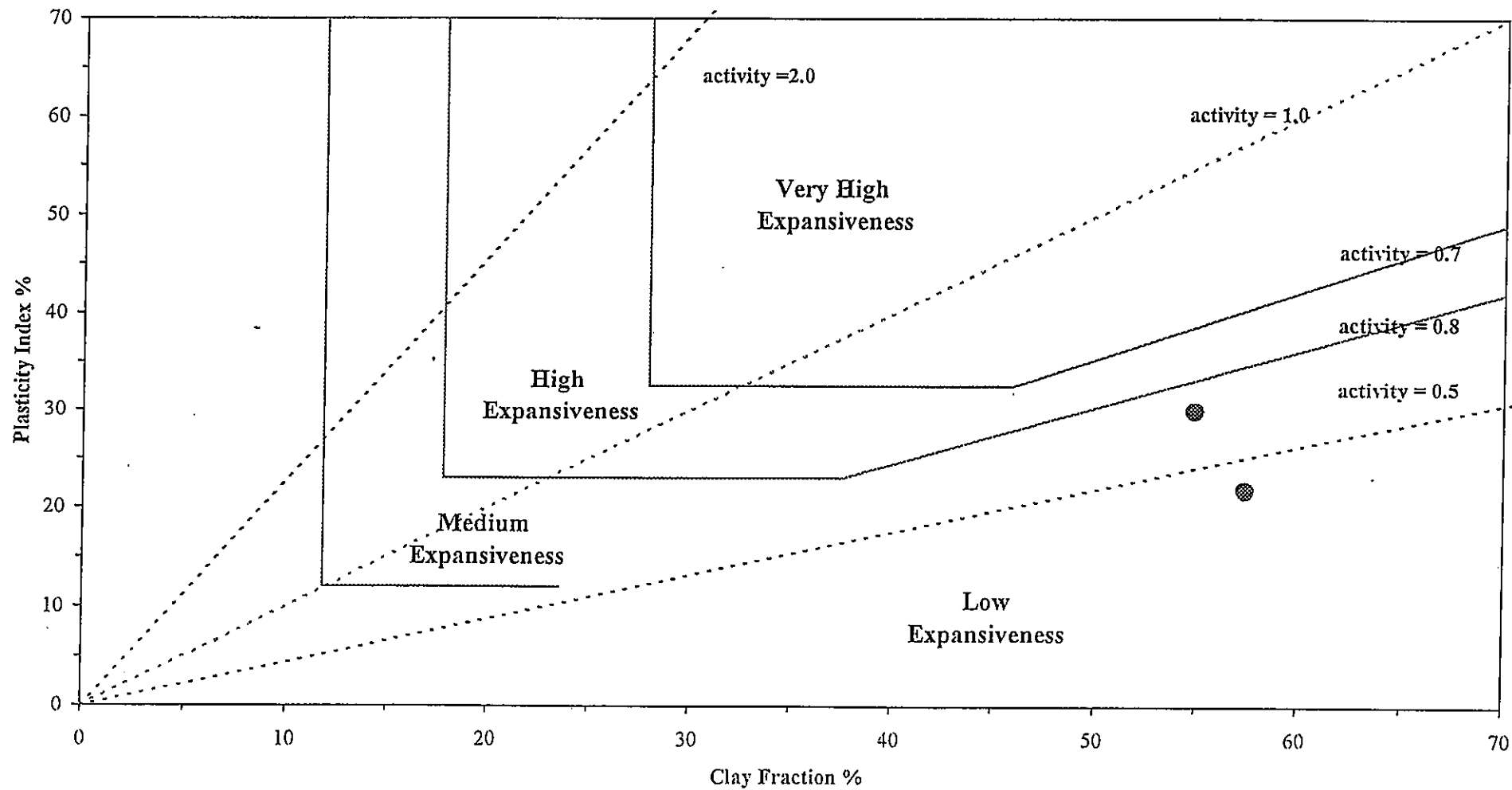
Results

Sample	w_L	w_P	PI
BH2(12.0-13.5)	66.93	23.71	43.22
BH3(2.0-3.0m)	49.77	27.16	22.61
BH3(3.0-4.0m)	67.96	24.24	43.72
BH3(4.0-5.0m)	57.78	22.22	35.56
BH3(5.50-7.0m)	63.91	24.64	39.27
BH3(12.0-13.0m)	60.06	30.67	29.39

Where

- w_L = Liquid Limit
- w_P = Plastic Limit
- PI = Plasticity Index

Figure (26) MODIFIED CHART OF EXPANSIVENESS
(Williams and Donaldson 1980)





Determination of Swelling Potential

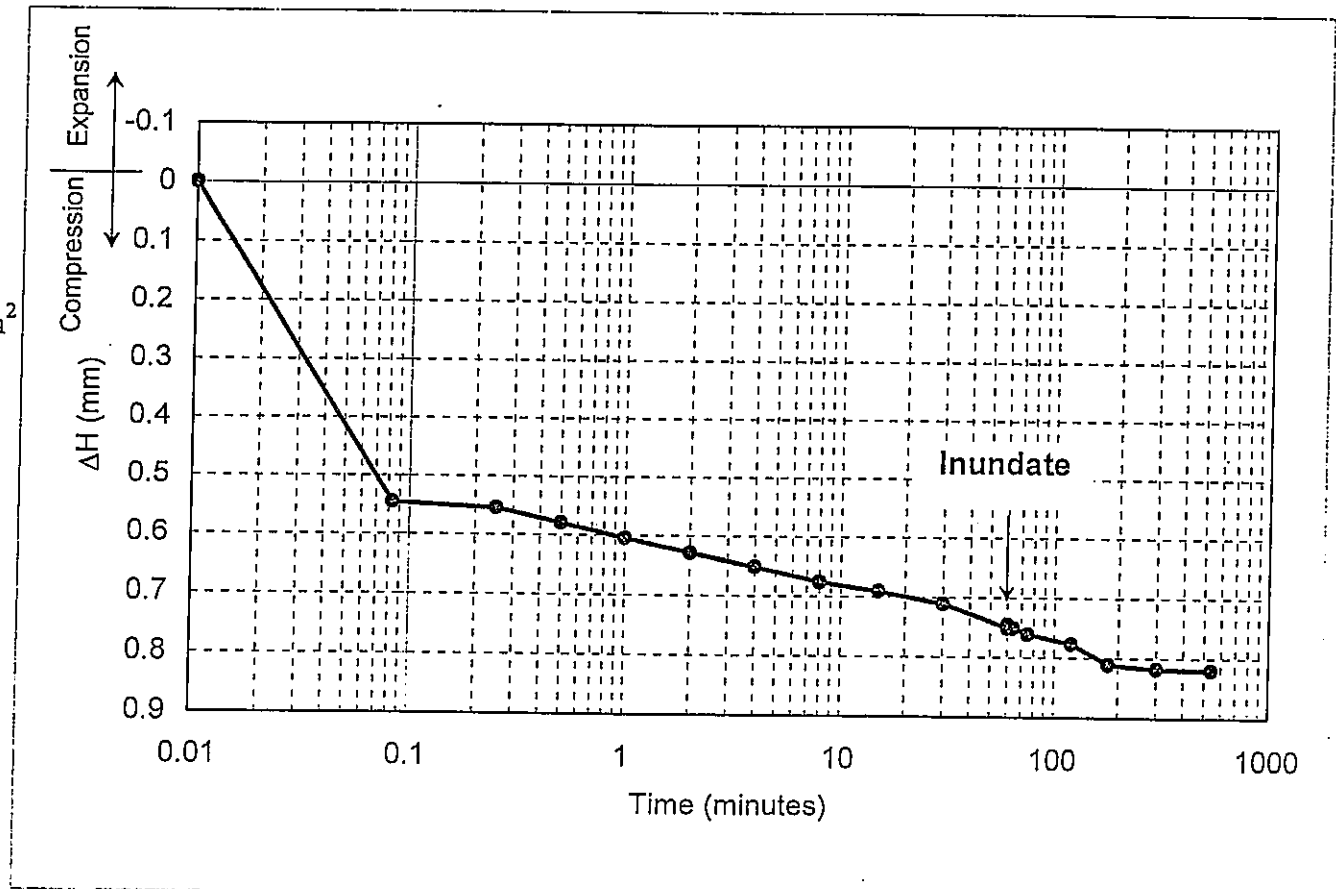
Project: Visitors Center - Luxor
Client: Alaref Eng.

Borehole: 1
Depth: 6.0-7.5 m

Test No. 1

Initial sample height = 19.0 mm
Bulk Unit Weight = 1.52 t/m³
Initial Moisture Content = 0.22 %
Final Moisture Content 0.45

Initial Sustained Pressure 0.5 kg/cm²
Swelling Potential NA %



Determination of Swelling Potential

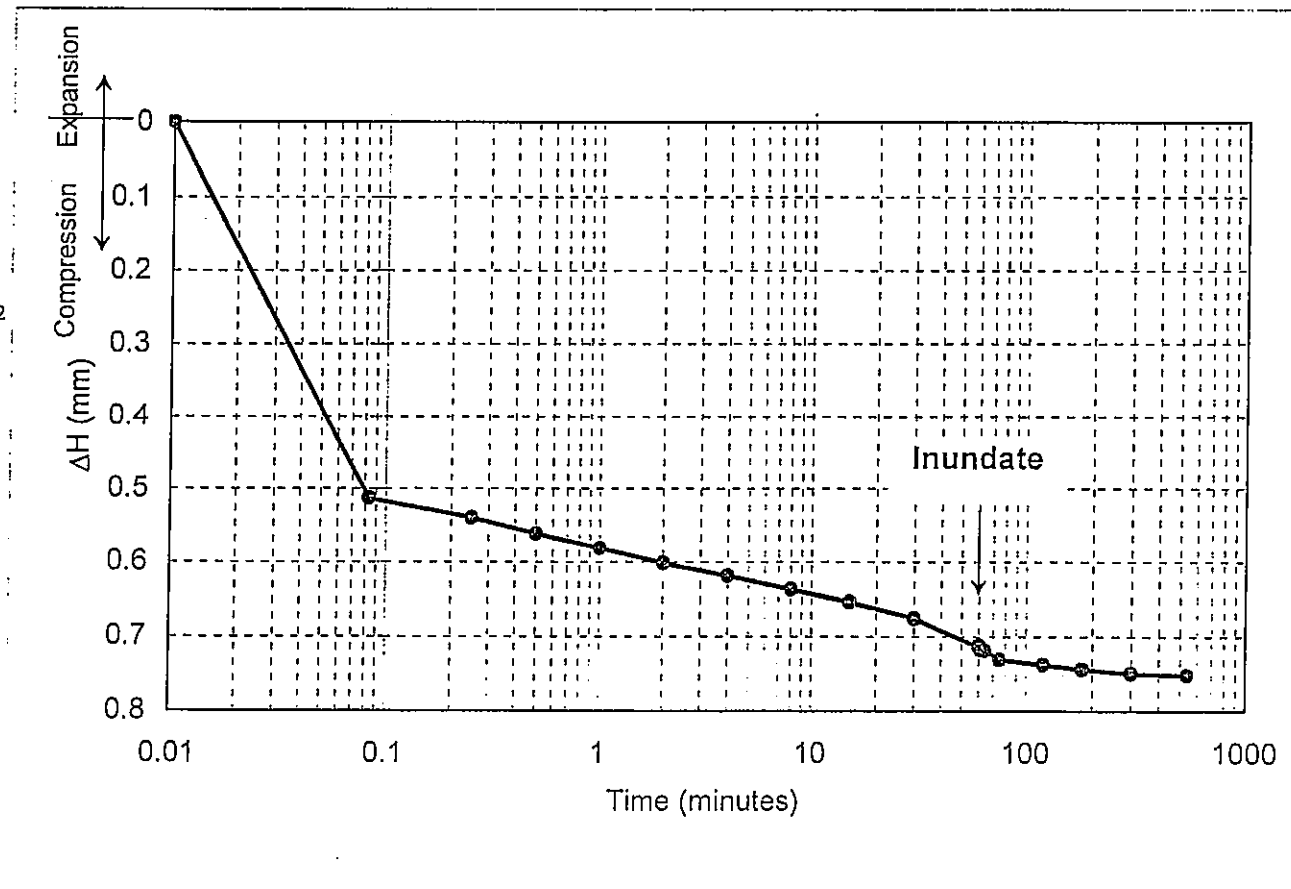
Project: Visitors Center - Luxor
 Client: Alaref Eng.

Borehole: 1
 Depth: 9.0-10.5 m

Test No. 2

Initial sample height = 19.0 mm
 Bulk Unit Weight = 1.72 t/m³
 Initial Moisture Content = 0.29 %
 Final Moisture Content = 0.37

Initial Sustained Pressure = 0.5 kg/cm²
 Swelling Potential = NA %





Determination of Swelling Potential

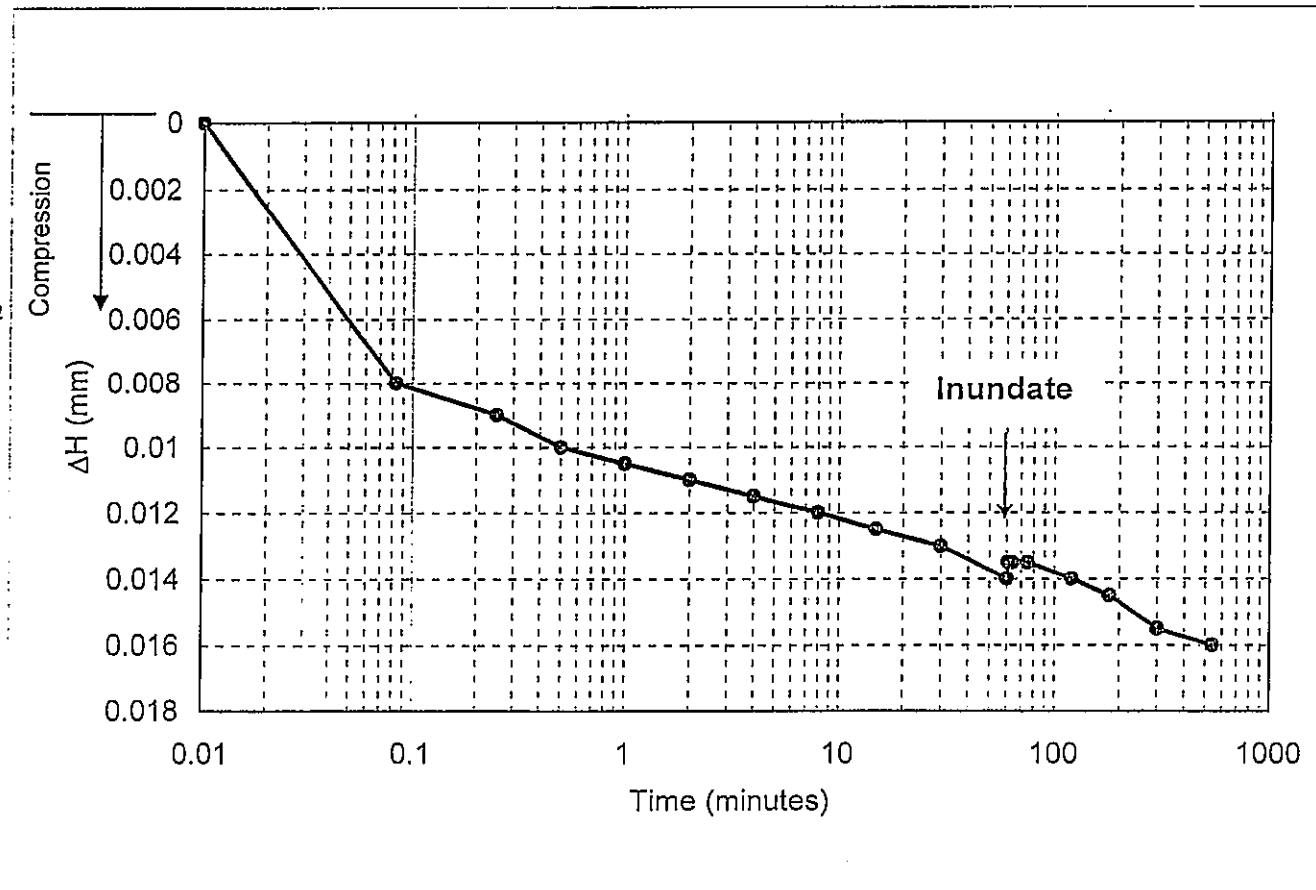
Project: Visitors Center - Luxor
Client: Alaref Eng.

Borehole: 2
Depth: 6.0-7.5 m

Test No. 2

Initial sample height = 19.0 mm
Bulk Unit Weight = 1.67 t/m³
Initial Moisture Content = 0.279 %
Final Moisture Content = 0.47

Initial Sustained Pressure = 0.5 kg/cm²
Swelling Potential = NA %





Bulk Unit Weight

ACCESS

Project: Visitors Center - VOK - Luxor
Client: Alaref Eng. Consultants

Sample No.	Borehole	Depth (m)	Unit Weight (g/cm ³)
1	1	7.50-9.00	1.99
2	2	7.50-9.00	2.01
3	3	2-3.00	2.00



Linear Shrinkage

ACCESS

Project: Visitors Center - VOK - Luxor
Client: Alaref Eng. Consultants

Sample No.	Bore hole	Depth (m)	Linear Shrinkage (%)
1	1	9.0-10.50	6.15
2	2	1.5-3.0	8.21
3	2	9.0-10.5	7.35
4	3	3.0-4.0	5.38
5	3	5.5-7.0	10.00

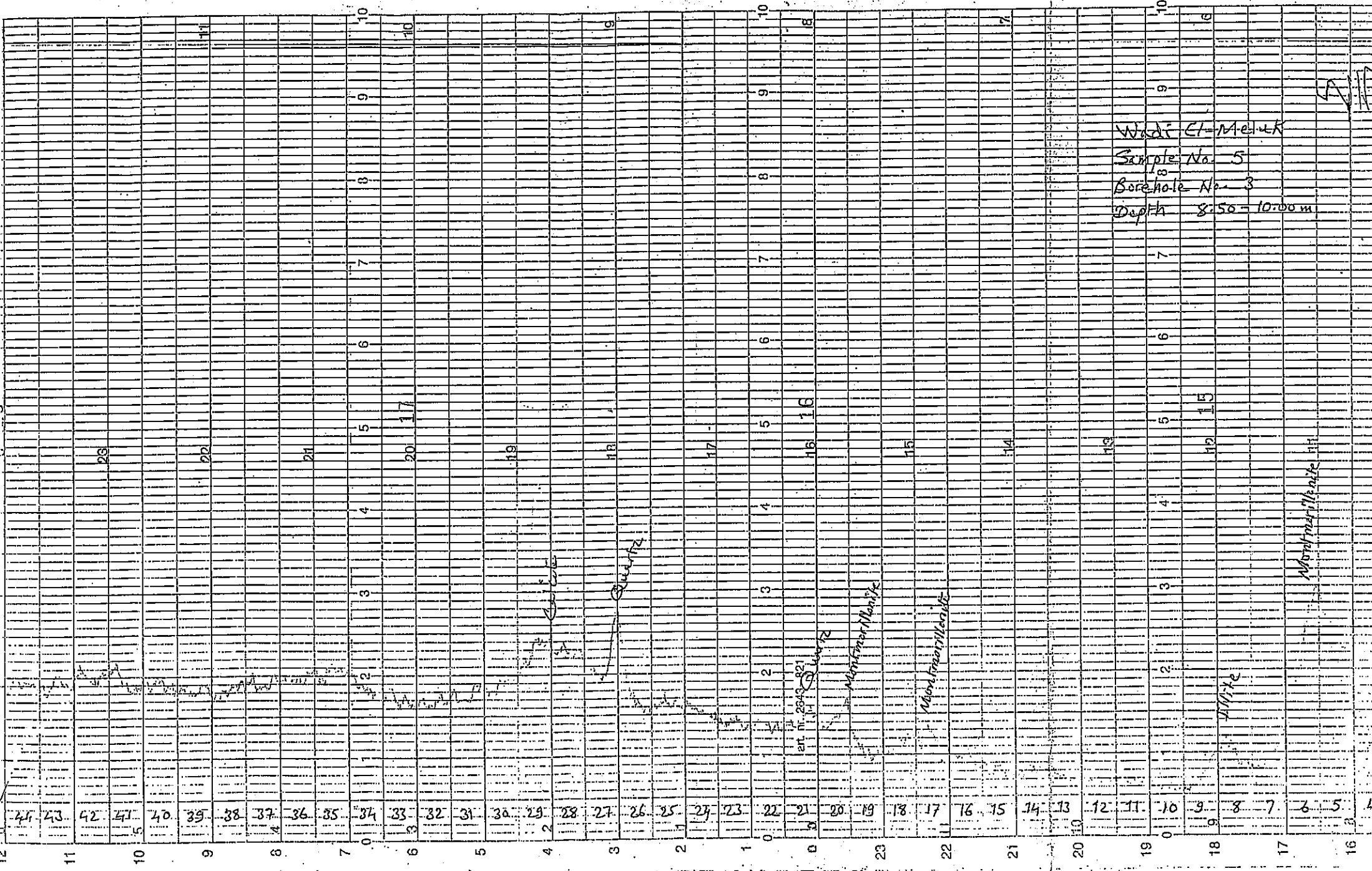


Free Swell

ACCESS

Project: Visitors Center - VOK - Luxor
Client: Alaref Eng. Consultants

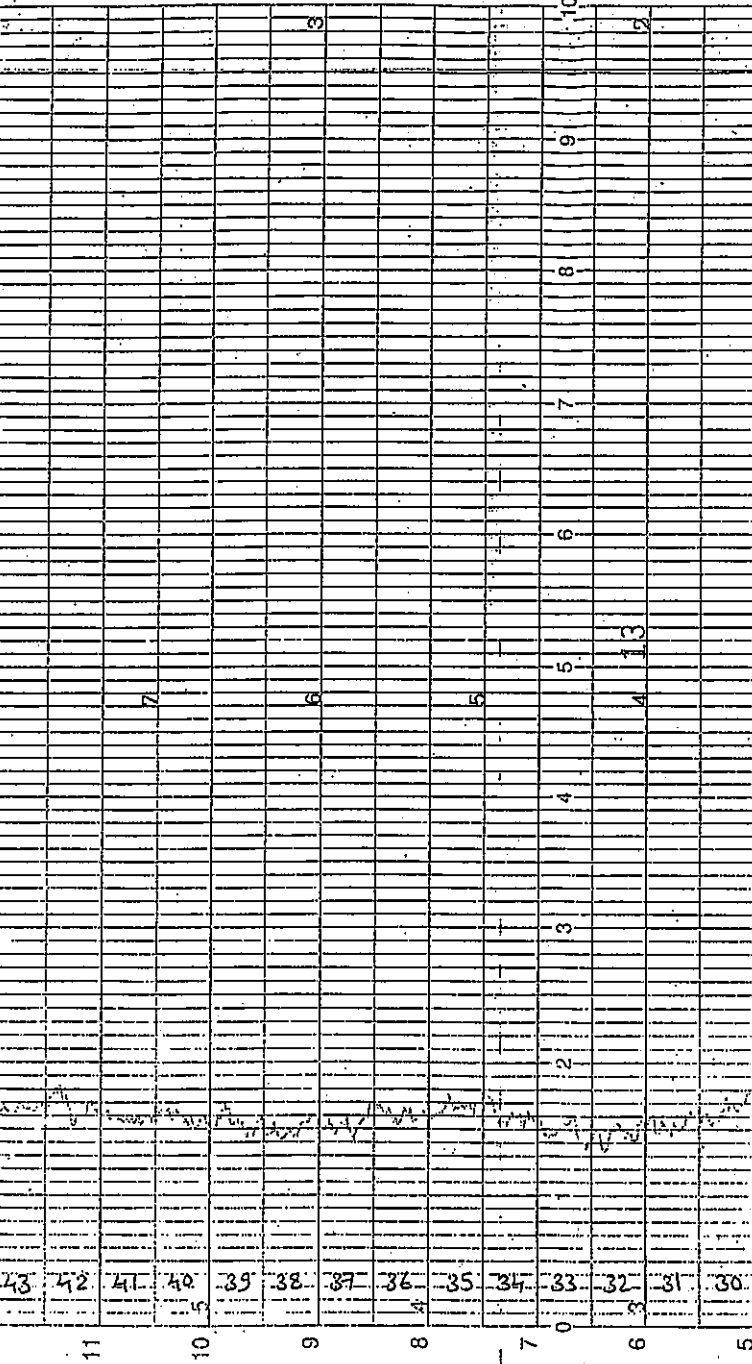
Sample No.	Bore hole	Depth (m)	Free Swell (%)
1	1	6-7.50	80.00
2	1	9-10.5	100.00
3	2	1.50-3.00	80.00
4	2	6-7.50	80.00
5	3	3-4.00	50.00
6	3	4-5.50	110.00



col. nr. 2043-821

8 14

12 11 10 9 8 7 6 5 4 3 2 1 0 23 22 21 20 19 18 17



Calcite

Quartz

2

1

col. nr. 2043-821

0 12

0 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 23 22 21 20 19 18 17

Quartz

Montmorillonite

23

22

23

Quartz

15

Wadi El Meluk
 Sample No. 1
 Borehole No. 1
 Depth 3.00-4.50 m

Montmorillonite

19

22